MEASURING SUSTAINABLE DEVELOPMENT

APPLICATION OF THE GENUINE PROGRESS INDEX TO NOVA SCOTIA

THE HEALTH COSTS OF POVERTY IN CANADA

A LITERATURE REVIEW OF THE EVIDENCE AND METHODOLOGIES NEEDED TO PRODUCE A FULL REPORT

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PREFACE

Paradoxically, many health costs associated with poverty, including direct medical costs, are included in the Gross Domestic Product (GDP) and are thus conventionally counted as contributions to economic growth and prosperity. An increase in these costs is therefore mistakenly interpreted as a sign that society is "better off." In the Genuine Progress Index (GPI), by contrast, the costs of illness, accidents, crime, pollution, and other liabilities are counted as costs, not gains, to the economy. Instead, the GPI uses population health indicators to measure progress. In other words, if the population is becoming healthier then wellbeing and quality of life are also improving.

Because the GDP is our primary measure of progress, increased spending on hospitals, physicians, pharmaceuticals, and other disease-related costs is actually counted as a contribution to our wellbeing and prosperity. The same is true for sickness, crime, gambling, overwork, toxic pollution, divorce, accidents and natural resource depletion. The GDP makes no distinction between economic activities that create benefit and those that cause harm, and thus sends misleading signals to policy makers.

By contrast, the GPI counts the costs of poverty, including those for poor health and crime, as a loss and a liability that should be deducted, rather than added to the GDP. It explicitly values equity, educational attainment, health, and peace in society as valuable social assets, and regards higher rates of poverty and ill health as signifying a deterioration or depreciation of that social capital. Unlike the GDP, *lower* poverty and *lower* rates of ill health make the GPI go up. Reduced poverty and health costs are regarded as savings that can be invested in more productive activities that contribute to wellbeing and social welfare.

The GPI, consisting of 20 social, economic and environmental components, is intended to provide a more comprehensive assessment of our social wellbeing and quality of life than market statistics alone are able to do. As such, it is a small step towards full cost accounting. It aims to provide annual benchmarks of progress and tell us whether our development strategies and social policies are sustainable and beneficial to society. It is a temporary but necessary step in order to overcome the conventional tendency to undervalue the services of unpaid labour, leisure time, natural resources, and other hidden or "free" assets, and in order to make their contribution to prosperity clearly visible.

This study is intended as a preliminary step towards assessing the economic costs society incurs as a result of poverty. It is also a first step towards distinguishing between areas of the economy where growth is clearly undesirable and those that bring long-lasting societal benefit. In the long term, this work may help reaffirm that previously hidden social and natural capital assets and non-material contributions to our quality of life are valuable, and thus bring these values and assets more fully into the policy arena.

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EXECUTIVE SUMMARY

Purpose of the literature review

Poverty creates tremendous suffering in society, is costly to society in general, and negatively affects the physical and mental health of the population as well as many other aspects of wellbeing. The World Bank Poverty Net identifies three aspects of poverty: "poverty defined as whether households or individuals have enough resources or abilities today to meet their needs; inequality in the distribution of income, consumption or other attributes across the population; and vulnerability, defined as the probability or risk today of being in poverty—or falling deeper into poverty—in the future."[1] In other words, poverty can be absolute in the sense that people do not have the material necessities for wellbeing, or relative such that their ability to participate in the activities of daily living that are considered important in their society is limited.

According to Dennis Raphael of York University who recently published *Poverty and Policy in Canada*:

> In wealthy industrialized nations such as Canada, poverty is best understood as the experience of material and social deprivation that prevents individuals, communities, and entire societies from reaching their full human and societal potential. This is the case since living under conditions of material and social deprivation limits participation in a wide range of cultural, economic, educational, political and other societal activities normally expected of individuals, families, and communities.[2]

Socioeconomic status is a key determinant of health in population health models. Health Canada has recognized poverty as one of the most reliable indicators of poor health. When all measures of health and mortality are examined, low income Canadians are more likely to have poor health outcomes and die earlier than those who are not living in poverty.[3] Individuals living in poverty are at least four times more likely to report fair or poor health and are at least twice as likely to have a long-term activity limitation than those with the highest incomes.[4]

Low income—a measure of socioeconomic status—is not only associated with poorer outcomes in health and life expectancy, it is also associated with poorer outcomes in terms of risk behaviours, education, and child development, with increased criminal and delinquent activity, and with a wide range of other negative outcomes for both children and adults. Poverty maintains its influence throughout the life course. There is evidence that children living in poverty develop

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[1] The World Bank Poverty Net. *Poverty Analysis: Measuring Poverty*, 2002; accessed Nov 2007; available from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,,contentMDK:20202198~menuPK:435055~pagePK:148956~piPK:216618~theSitePK:430367,00.html.

[2] Raphael, Dennis. *Poverty and Policy in Canada. Implications for Health and Quality of Life*, Toronto: Canadian Scholars' Press Inc., 2007. p. 6.

[3] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.phac-aspc.gc.ca/ph-sp/phdd/pdf/toward/toward_a_healthy_english.PDF.

[4] Ibid., accessed., pp. 15, 43.

health conditions that may plague them throughout their lives or manifest in adulthood.[5] As well, poverty is a dynamic rather than a static condition. Some people move in and out of poverty, depending on socioeconomic circumstances, but others experience chronic poverty and find it difficult to escape.

In 2005, the poverty rate in Canada, based on after-tax income, was 10.8% of the population. However, when broken down by group the rate for children under the age of 18 was 11.7%, but for children living in families headed by lone-mothers the rate was 33.4%. For adults between the ages 18 and 64, the rate was 11.4%, but the rate for unattached individuals was 30.4%.[6] When the poverty rate is based on before-tax income, 16.8%, or 1.13 million Canadian children were living in poverty in 2005.[7]

As stated, in 2005, 11.7% of children in Canada—or 788,000 children— were living in poverty, down from the rates of the mid-1990s, but unchanged from the 1989 child poverty rate.[8] This was the year in which the House of Commons voted to end child poverty by the year 2000. Campaign 2000 reports that child poverty persists "despite a 50% real increase in the size of our economy over the same period."[9] It point outs that there is a growing momentum for poverty reduction in Canada, with Quebec, Newfoundland and Labrador, Nova Scotia, Manitoba and Ontario working towards poverty-reduction strategies, and it calls for a renewed effort to create a national poverty reduction strategy in Canada.[10] Campaign 2000 also argues that, "reducing poverty is good for the economy:"

> Poverty is expensive. Just as it is much more costly to treat a disease than prevent one, it costs more to provide emergency hostels than affordable housing, more to take a child into the care of child welfare agencies than to make sure their families have adequate incomes and more to cope with school drop-outs than to train our youth for the jobs Canada needs to fill in the coming years.[11]

Despite its timeliness and importance to policy makers and others, there is currently no comprehensive study that quantifies the economic costs of poverty in Canada. According to David Hay of the Canadian Policy Research Networks, economic arguments in support of action on the social determinants of health, which recognize the interdependence of economic and

[5] Case, Anne, Angela Fertig, and Christina Paxson. "The Lasting Impact of Childhood Health and Circumstance," *Journal of Health Economics*, 2005, vol. 24, no. 2: 365 – 389.
[6] Statistics Canada. *Persons in Low Income after Tax, by Prevalence in Percent (2001 to 2005)*, 2007; accessed January 2008; available from http://www40.statcan.ca/l01/cst01/famil19a.htm.
[7] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, 2007; accessed March 2008; available from http://www.campaign2000.ca/rc/rc07/2007_C2000_NationalReportCard.pdf. Original data are from Statistics Canada's *Income Trends in Canada,* Table 802.
[8] Novick, Marvyn. *Summoned to Stewardship: Make Poverty Reduction a Collective Legacy*, Campaign 2000 Policy Perspective, 2007; accessed March 2008; available from http://www.campaign2000.ca/res/dispapers/summoned_to_stewardship.pdf.
[9] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, accessed.
[10] Campaign 2000 partner organizations. *Open Letter to the First Ministers*, January 11, 2008; accessed Jan 2008; available from http://www.campaign2000.ca/res/openltrs/OpenlettertotheFirstMinistersJan11_08.pdf.
[11] Ibid., accessed.

social policies, are growing in importance in Canada and Europe.[12] Framing this subject is the discourse known as "social policy as a productive factor," which is most often interpreted as an "efficiency argument for specific social policies." In other words, Hay explains that "poverty and inequality are regarded as evidence of an inefficient society."[13] This perspective, which is in line with that of the Genuine Progress Index (GPI), views social spending as an investment in individual or public goods, rather than as consumption or a cost to the economy. "The orientation of policy-makers [is changed] to focus on outcomes in the medium-and long-term and away from a narrow focus on inputs and outputs."[14]

These realizations, along with work that is currently taking place at the national and provincial levels, make the completion of a full cost of poverty study for Canada both timely and relevant.[15]

This literature review provides the technical background information that would be required to produce a report assessing the health costs associated with poverty for Canada. As such, it reviews methodologies used in previous studies to assess: the broad social and economic costs of poverty in Canada (Calgary), the United States, and Europe; methodologies used in socioeconomic health disparity studies with an emphasis on studies from New Zealand and The Netherlands, as well as general cost of illness studies; basic information on Canadian and international poverty measures; and evidence for the association of poverty with various health indicators. In addition, it briefly reviews several groups that are especially vulnerable to the health impacts of poverty, and other social issues that influence the relationship between poverty and health.

The emphasis of this report is on the information and data that would be required to assess the external health costs of poverty, rather than the private costs incurred by those living in poverty. These external health costs, which all have major policy implications in terms of government decisions to invest in poverty reduction programs, include costs to the health care system that result from the association between poorer health outcomes and low income. There are, however, other external costs, which result from the effects of poverty on society in general. These include costs related to the criminal justice system, social assistance programs, educational systems, and to employment and productivity. In addition, other social issues that result in social exclusion, such as homelessness, food insecurity, and the environment also register as costs. Due to time and resource limitations, these social costs are only explored briefly in this report.

This report is intended as a useful starting point for further work in this area—in particular the eventual development of a full-fledged study assessing the health and other social costs of poverty for Canada and the provinces that will hopefully make a significant contribution to advancing work in the field of social and economic determinants of health. In the short term, it is hoped that even this modest first step of summarizing key results from the existing evidence can

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[12] Hay, David I. *Economic Arguments for Action on the Social Determinants of Health*, Canadian Policy Research Networks and Public Health of Canada, 2006; accessed Nov 2007; available from http://www.cprn.org/documents/46128_en.pdf.

[13] Ibid., accessed.

[14] Ibid., accessed.

[15] At the national level, the Public Health Agency of Canada, through its health disparities project, is working to develop a rationale for investing in the social determinants of health. Other work is currently underway at the provincial level to develop poverty reduction strategies.

raise the profile of this important issue and facilitate the practical application of this information to decisions made in the policy arena and in this field of research.

Structure of the literature review

This literature review is divided into four parts, with the main focus being on the first two. It also includes appendices with additional figures and tables and a list of references cited. Part 1 discusses the methodology to assess the costs of poverty on a national level. It consists of an introduction, a detailed review of four major cost of poverty studies—one from Calgary, two from the United States, and one from the European Union. It also includes a review of methodologies used to assess the distribution of health risk by socioeconomic position, especially as employed in New Zealand, and other methodologies commonly used in cost of illness studies.

Part 2 includes a section on poverty measurements used in Canada, and a major section that reviews studies that associate various health indicators with poverty. Behavioural risk factors for chronic disease, self-rated health, specific chronic diseases, unintentional injuries, mental health, mortality, life expectancy, two health summary measures, and health service use are reviewed.

Because of time and resource limitations, Parts 3 and 4 are not as comprehensive as the first two parts. Part 3 provides a brief review of several vulnerable populations and social issues other than health that are important to understanding the impacts of poverty. Part 4 is the conclusion and provides recommendations for next steps towards completing a full cost of poverty report.

Risk and causality

Although poverty is considered to be a "risk condition" that can lead to a range of diseases and other health problems, it is rarely treated as a "risk factor," at least not in the way that behavioural risk factors such as tobacco use, diet, substance abuse, and physical exercise are studied and targeted for interventions. The World Health Organization (WHO) defines risk as the probability of an adverse outcome, or a factor that raises this probability, and argues that poverty lies "at one end of the risk factor scale."[16] Thus, if a risk factor is anything that increases the probability that a person will suffer harm, then, according to the U.S. Surgeon General, poverty can also be considered a risk factor for poor health.[17] The Surgeon General clearly refers to poverty in these terms:

> Of the risk factors that are amenable to change, some are not realistic targets of preventive efforts. Eliminating poverty is not a realistic short-term goal, for example, but

[16] World Health Organization. *Reducing Risks, Promoting Healthy Life*, 2002; accessed Dec 2007; available from http://www.who.int/whr/2002/Overview_E.pdf. p. 8.

[17] The Surgeon General of the Public Health Service. *Youth Violence: A Report of the Surgeon General*, United States Department of Health and Human Services, 2001; accessed Dec 2007; available from http://www.surgeongeneral.gov/library/youthviolence/toc.html.

programs that counter some of the effects of poverty are. (Eliminating or reducing poverty should be a high-priority long-term goal, however.)[18]

In order to determine the costs of poverty it is first necessary to determine the statistical associations between the risk factor, or poverty, and health or other social issues. Tony Blakely et al. observe that, "an underlying assumption in all calculations of the disease burden is that the associations between risk factors and disease are causal," i.e. that poverty *causes* increased risk and disease.[19] They describe two major problems with determining causality for poverty-risk factor relationships: the first is concerned with the potential bi-directional causal association (called "endogeneity"), and the second is concerned with the multidimensionality of poverty ("called "confounding"). For example, in the first instance, it is often not clear whether poverty leads to poor health or whether poor health leads to poverty. And in the second instance, it may not be clear whether health outcomes are the result of low-income, education, occupation, or other factors that are correlated with poverty.

The reverse causation theory—that poor health limits the ability to engage in paid work and, therefore, leads to poverty—has, for the most part, been discredited in the literature as the main direction of causality. For example, longitudinal studies, which take a life-course approach, such as those conducted in England have consistently seen poverty occurring before and leading to ill health.[20] According to Shelley Phipps, "most of the studies reviewed … all conclude that *reverse causation* is not a serious problem and that the main direction of influence is *from* poverty *to* poor(er) health."[21]

Because of the multidimensionality of poverty, researchers try to control for various variables such as income, education, occupation, family history, gender, and so on to determine the causes or relative risks of disease.[22] Blakely et al. argue that, in practice, this is difficult because there is little information on many potentially confounding factors, and when the information is known, it is often not clear how to best control for the confounding factors. The approach they take is to report or "map" crude associations of poverty and health risk factors. In other words, they do not take possible confounders such as education, etc. into account. Rather, for the most part, they limit the poverty association with health to unadjusted measures of high and low income. They note that "[w]hile this approach is limited by problems of endogeneity and confounding [the two problems just mentioned], it also avoids tenuous assumptions about controlling for confounders

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[18] Ibid., accessed. Chapter 4. Risk factors for Youth Violence.

[19] Blakely, Tony, Simon Hales, and Alistair Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, Environmental Burden of Disease Series No. 10, World Health Organization, 2004; accessed Nov 2007; available from http://www.who.int/quantifying_ehimpacts/publications/en/ebd10.pdf. p. 5.

[20] Benzeval, Michaela, and Ken Judge. "Income and Health: The Time Dimension," *Social Science & Medicine*, 2001, vol. 52: 1371-1390. See also: Benzeval, Michaela, Andrew Dilnot, and Ken Judge. "Income and Health over the Lifecourse: Evidence and Policy Implications," in *Understanding Health Inequalities*, ed. Graham, H., 96-112. Buckingham, UK: Open University Press, 2001.

[21] Phipps, Shelley. *The Impact of Poverty on Health: A Scan of Research Literature*, Canadian Population Health Initiative, 2003; accessed Nov 2007; available from http://dsp-psd.communication.gc.ca/Collection/H118-11-2003-1E.pdf. p. 13. Emphasis is in original.

[22] Blakely, Hales, and Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, accessed.

that are part of the constellation of factors that accompany poverty."[23]

Harry Holzer et al. use a similar approach in their cost of poverty study.[24] They use simple estimates of the relationships between poverty and the outcomes rather than estimates from studies that, in an attempt to isolate the effects, adjust for factors correlated with poverty such as education or occupation. They note that these attempts to control for variables are mostly unsuccessful since the list of variables is almost always incomplete. They found that by adapting a broad definition of poverty that includes "not only the effects of low parental incomes, but also of the entire range of environmental factors associated with poverty," that they could "avoid this issue entirely."[25]

Other empirical studies have found that indicators such as income, education, and occupation have independent effects beyond their collective influences.[26] However, most researchers agree that all of these factors work together in producing ill health, with the presence of any number of variables influencing the effect of the other. Therefore, interventions that reduce risk conditions in one area could also reduce the risks in other areas as well.

Health Canada suggests that, in order to take action on health problems and determinants, public health needs "sufficient evidence," but "it does not need absolute evidence."[27] It offers the following quote from McKeown on the degree of evidence necessary for public action:

> [A]ction is often needed to protect and promote health in circumstances where the evidence is less than complete. Moreover, in many cases it is questionable whether within the foreseeable future the evidence will be complete. To assess precisely the respective roles of diet, exercise and smoking in the causation of coronary artery disease, a massive human experiment would be needed, with division of a population into multiple experimental and control groups. Such an investigation would present formidable ethical, technical and administrative difficulties. Does this mean that no action can be taken in this and similar cases because the grounds, however suggestive, are not conclusive?
>
> In the light of such difficulties … it will often be desirable to act on the basis of high, or even moderate probabilities, on what has been called 'a burden of prudence' rather than 'a burden of proof.' [.… I]t should be recognized that conclusive evidence of harm or

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[23] Blakely, Tony, Simon Hales, Charlotte Kieft, Nick Wilson, and Alistair Woodward. "Distribution of Risk Factors by Poverty," in *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attribution to Selected Major Risk Factors*, ed. Ezzati, Majid, Alan D. Lopez, Anthony Rodgers and Christopher J.L. Murray, Volume 1, Chapter 24: 1941-2127. Geneva: World Health Organization, 2004; accessed Nov 2007; available from http://www.who.int/publications/cra/chapters/volume2/1941-2128.pdf. p. 1948.

[24] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.

[25] Ibid., accessed. pp. 6-7.

[26] Mechanic, David. "Population Health: Challenges for Science and Society," *The Milbank Quarterly*, 2007, vol. 85, no. 3: 533-559.

[27] Health Canada. *Canadian Handbook on Health Impact Assessment. Vol 3: Roles for the Health Practitioner*, 1999; accessed Dec 2007; available from http://dsp-psd.communication.gc.ca/Collection/H46-2-99-235-3E-9.pdf. p. F8.

benefit to health is often an unrealistic requirement.[28]

The "precautionary principle," which is used by Health Canada, is an example of the government's commitment to incorporate uncertainty into decision making. Health Canada remarks:

> A key feature of health risk management is that decisions are often made against a backdrop of considerable scientific uncertainty. A precautionary approach to decision-making emphasizes the need to take timely and appropriately preventive action, even in the absence of a full scientific demonstration of cause and effect. This emphasis in decision-making is reflected in the final report of the Krever Commission of Inquiry, which concludes that a lack of full scientific certainty should not be used as a reason not to take preventive measures when reasonable evidence indicates that a situation could cause some significant adverse health effect.[29]

Colin Mathers et al., writing for WHO, suggest that, since mechanisms of causality are only partially known, "[i]t is therefore important to make judgement based on best available science and data and document all assumptions and sources of uncertainty."[30]

Cost of poverty studies

In Chapter two of this report, we review the following cost of poverty studies in some detail, emphasizing the methodologies used. These four reports were the only comprehensive studies of the topic found in the literature. All of the reports are recent:

1. Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. 2007. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*[31]

2. Shiell, Alan, and Jenny Zhang. 2004. *The External Costs of Poverty: A Conservative*

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[28] McKeown, T. *The Role of Medicine - Dream, Mirage or Nemesis?*, Princeton, New Jersey: Princeton University Press, 1979. cited in Health Canada. *Canadian Handbook on Health Impact Assessment. Vol 3: Roles for the Health Practitioner*, accessed. p. F8.

[29] Health Canada. *Canadian Handbook on Health Impact Assessment - Volume 2: Approaches and Decision-Making, Appendix C: Health Canada's Underlying Principles of Risk Management, Take A "Precautionary" Approach*, 2004; accessed February 2008; available from http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/handbook-guide/vol_2/appendix-annexe-c_e.html. #8.

[30] Mathers, Colin, Theo Vos, Alan Lopez, Josh Salomon, and Majid Ezzati. *National Burden of Disease Studies: A Practical Guide*, Edition 2.0. Global Program on Evidence for Health Policy. Geneva: World Health Organization, 2001; accessed Nov 2007; available from http://www.who.int/healthinfo/nationalburdenofdiseasemanual.pdf. p. 129.

[31] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.

Assessment [Calgary][32]

3. Oppenheim, Jerrold, and Theo MacGregor. 2006. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*[33]

4. Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. 2007. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*[34]

The studies all use very different methodologies and assumptions, and represent different levels of complexity. Therefore they are not easily comparable.

1. Harry J. Holzer, Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig
The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor.

Harry Holzer, of Georgetown University and the Urban Institute, et al. presented their report in January 2007 to the United States House of Representatives Ways and Means Committee Hearing on the Economic and Societal Costs of Poverty.[35] They calculate the economic costs of poverty in the U.S. by focusing on how childhood poverty affects outcomes for adults later in life and how these outcomes affect the society as a whole.[36]

They estimated that the costs associated with childhood poverty equal nearly 4% of the GDP, or about US$500 billion per year. In other words, if child poverty were eliminated in the U.S., US$500 billion would be saved annually and could be used in other ways to increase the quality of life of the entire population. If the full costs of adult poverty had been included, the costs would have been much higher.

Holzer et al. use only three categories in order to calculate costs, which are all associated with adults who grew up in low income (or poverty) households—lost earnings, or reduction in the annual aggregate production of goods and services, crime, and health. They note that, although crime and health are not the only costs associated with poverty, they are likely to be the largest and most easily quantifiable. In addition, they reason that costs associated with low levels of

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[32] Shiell, Alan, and Jenny Zhang. *The External Costs of Poverty: A Conservative Assessment*, Centre for Health and Policy Studies, University of Calgary, and Institute of Health Economics, 2004; accessed November 2007; available from http://tamarackcommunity.ca/downloads/vc/cal_costsofpoverty04.pdf.
[33] Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf.
[34] Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.
[35] United States House of Representatives. *Hearing on the Economic and Societal Costs of Poverty*, Committee on Ways and Means, 2007; accessed October 2007; available from http://waysandmeans.house.gov/hearings.asp?formmode=detail&hearing=508.
[36] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.

education, except for benefits of education that go beyond higher wages and are difficult to quantify, should be captured by costs associated with lost earnings.

As previously noted, the authors use fairly simple estimates of the statistical relationships between child poverty and adult outcomes, rather than adjusting for or isolating effects of variables such as parental education or race. Choice of a reference group for the poor—the group with which to compare the poor—is an important factor in any cost of poverty calculation. The authors generally use *"those with family incomes at twice the poverty line"* as their reference group since they find a consensus among researchers that that is where a true "poverty line" might be constructed and is a realistic goal for policy efforts.[37] [emphasis original]

The dynamic effects of poverty, including the time spent in poverty, the depth of poverty, and in what phase of the lifecourse the poverty took place, are not captured by the authors who explain that research attempts that try to separate the effects of permanent from transitory income changes have not been conclusive.[38]

Lost earnings

The authors found that lost earnings for the 17% of the nation's children growing up in poverty reduces the GDP by about 1.3% or about US$170 billion per year. The calculations for lost earnings only include those who report positive earnings. Those who are not part of the labour force and have no earnings are excluded from the calculations. Therefore, the actual estimates could be much higher if those who are incarcerated, or who rely on social assistance or disability payments were included.

Costs of crime

Holzer et al. found that the poverty costs of crime were the same as those for lost earnings—1.3% of the GDP or about US$170 billion per year. In order to estimate the costs of crime, the authors use victimization costs of "street crime," as opposed to economic crimes such as fraud and white collar offenses, and exclude protective measures of crime such as spending on policing, prisons, and private security, which they note are essentially unchanged with marginal changes in crime rates. They assume that poverty only affects street crime, although they admit that, "this is surely not the case in practice."[39] The overall victimization costs of street crime were estimated to be US$700 billion per year. The authors note that victimization costs are costs to victims of crime. However, they base their costs on previous costing reports in the U.S. and do not detail which costs are included.

According to Holzer et al., youth who grow up in the bottom quintile (20%) of the income distribution range are from 1.3 to 4 times as likely to commit violent crimes compared with youth from the second or third income quintiles. From this, Holzer et al. infer:

- Low income during childhood doubles the likelihood that individuals will commit violent

[37] Ibid., accessed. p. 9.
[38] Ibid., accessed. p. 14.
[39] Ibid., accessed. p. 18.

crimes, relative to children growing up in families with incomes around twice the poverty line.
- The annual incidence of crime attributable to poverty is then 0.2*(100 percent),[40] or 20%, with 20% representing the fact that 20% of children are in the bottom quintile of income distribution.[41]

These calculations were then adjusted for several factors, including by a factor of two for "survey bias," which is based on research that shows self-reported crimes to be understated in surveys by a factor of from two to four.

Costs of health

To compute estimates of the effects of child poverty on the incidence of poor health in adulthood, and the economic costs associated with poor health, Holzer et al. included two dimensions: additional expenditures on health care, and the value of lost quantity and quality of life associated with early mortality and morbidity.[42] They found that poverty raises health care costs by 1.2% of the GDP per year, or about US$162 billion.

To estimate direct expenditures on health care the authors converted age-specific estimates of health care use by children living in poverty to aggregated annual health costs by discounting the value of additional health costs for all children born in poverty in a year (for four million births per year, 15% child poverty rate) by 3% discount rate and 3% inflation rate in medical costs.

To indicate quantity and quality of life estimates associated with early mortality and morbidity the authors used Quality Adjusted Life Year (QALY) estimates. Because QALYs are life expectancies that are adjusted for various illnesses based on self-reported quality of health, they include the effects of both mortality and morbidity in one measure. As a basis of their estimates, Holzer et al. used $200,000 per year as the value of a statistical life in order to value each year of life lost.

In conclusion, Holzer et al. note that any estimate on the costs of poverty is bound to be uncertain because the range of estimates found in the literature is either very large or does not exist. Consequently the authors must rely on their best judgments when choosing from the range, or make a number of assumptions that may not always be accurate. In addition, only a small fraction of the total impact of poverty on social and economic costs to society can be captured in these studies, mainly because it is not possible to consider all of the factors that may be important.

[40] The * is used in the Holzer et. al. report and it represents a multiplication sign.
[41] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed. p. 17.
[42] Ibid., accessed. p. 19.

2. Alan Shiell and Jenny Zhang
The External Costs of Poverty: A Conservative Assessment.

In a 2004 report for the United Way of Calgary and Area, Alan Shiell and Jenny Zhang used an explicit economic approach to estimate the external costs of poverty in Calgary.[43] They define "external costs" as costs that are incurred by society as a whole, separate from the costs incurred by people living in poverty, and note that these costs represent potential savings that could be realized if poverty was reduced.

Only those costs deemed to be caused by poverty and result in a net loss of resources were considered by the authors. Therefore, unemployment is not considered to be a cost of poverty since the authors consider poverty to be a *result* of unemployment, not a cause. Thus, lost production as a result of unemployment is not considered to be a cost of poverty. Social assistance payments to those living in poverty are considered to be transfers of income from one sector of society to another, are not a payment for resources, do not change the aggregate amount of resources available to citizens, and are, therefore, not considered to be costs of poverty.

Shiell and Zhang make a distinction between "bad consequences"—or the adverse social consequences associated with poverty—and resources, which they define as being the additional economic needs required to support those in poverty. For example, the increased incidence of low birth weight babies or the increased burden of illness incurred by people living in poverty would not be considered a cost according to Shiell and Zhang, only a bad consequence. But the additional economic burden on the health care system would be a resource cost of poverty. The resources affected by poverty and considered in the report include:

- the additional burden on the health care system
- resources forgone because of lack of educational attainment
- increased costs associated with policing and the judicial system
- costs associated with providing programmatic support for people living in poverty.

The authors identified both conservative and speculative costs of poverty for the city of Calgary. The speculative list includes a number of somewhat arbitrary assumptions that the authors made in order to generate data that was unobtainable. They estimate that between $8.25 million and $56.8 ($2000) million could be saved annually if poverty were eliminated in Calgary.

The conservative estimate includes excess costs of health care, lack of high school completion, and special education. The speculative costs increase costs for the items comprising the conservative costs, and add costs for socioeconomic deprivation, the criminal justice system, and administrative costs for income support.

Excess costs of health care

Health care costs include additional number of family practitioner consultations and excess number of days spent in the hospital. Shiell and Zhang used two studies to estimate the additional costs of health care associated with low income—a study by Roos and Mustard on

[43] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed.

health service use in Winnipeg,[44] and a study by Mustard et al. on health service use in Manitoba.[45] The Roos and Mustard study used 1992 neighbourhood data sorted by income quintile for Winnipeg, and the Mustard et al. study used 1986/1987 household income for Manitoba adjusted for age, gender, and family size, rather than neighbourhood income. This study found no relationship between income and physician use, so Shiell and Zhang only use the acute hospital service data.

In order to use these data, Shiell and Zhang made a number of assumptions, including:

1. that the data from other places (i.e., Winnipeg and Manitoba) would likely be similar to that for Calgary, and therefore the outcomes could be applied to Calgary. For example, if those in the lowest income decile in Manitoba account for 12% of the acute hospital care costs, then that percentage could be applied to the lowest income decile in Calgary.

2. that the bottom quintile of neighbourhoods also contained the bottom quintile of individuals—an assumption they admit is unlikely, but one that probably understates the effect of income on health care costs. This assumption is important and necessary because the data refer to neighbourhoods sorted by income quintile rather than to people sorted by individual income. Therefore, the authors needed to make an assumption about the income of the *individuals* who live in the lowest income quintile neighbourhoods.

3. that if the incomes of those in the lowest quintile were equal to those in the second quintile, then the differences in health care utilization between the two groups would be eliminated with a corresponding cost saving. Therefore, the *reference group* in this study is the second income quintile population.

Excess education costs

For excess education costs, the authors include both private and public costs in their calculations because they found that available evidence did not make a distinction between these costs. They first estimated the number of high school drop outs above and below the poverty line by using 1991 data for drop out rates for Canada from the calculations made by Ross et al.[46] that *5.1% of students not living in poverty drop out and 12.9% of students living in poverty drop out*.[47] They then estimated the number who could be expected to graduate if all of the students were living in non-poverty households was between 120 and 200 students. To estimate the costs the authors used a 1992 report from the Conference Board of Canada (CBC)[48] that reported the per capita cost of each drop out to be $24,840 in 1989 dollars, or $37,560 in 2000 dollars. Therefore, with

[44] Roos, N.P., and C.A. Mustard. "Variation in Health Care Use by Socioeconomic Status in Winnipeg, Canada: Does the System Work Well? Yes and No," *Millbank Quarterly*, 1997, vol. 75, no. 1: 89-111.
[45] Mustard, C.A., M. Shanahan, S. Derksen, J. Horne, and R. Evans. "Use of Insured Health Care Services in Relation to Household Income in a Canadian Province," in *Health, Health Care and Health Economics*, ed. Barer, M.L., T.E. Getzen and G. Stoddart. Chichester, West Sussex, England: John Wiley & Sons, Inc., 1998.
[46] Ross, D.P., E.R. Shillington, and C. Lochhead. *The Canadian Fact Book on Poverty 1994*, Canadian Council on Social Development (CCSD), 1994; accessed http://www.cfc-efc.ca/docs/ccsd/00000328.htm.
[47] Ross, D.P., E.R. Shillington, and C. Lochhead. *The Canadian Fact Book on Poverty 1994*, Canadian Council on Social Development (CCSD), 1994; accessed http://www.cfc-efc.ca/docs/ccsd/00000328.htm.
[48] LeFleur, Brenda. *Dropping Out: The Cost to Canada*, Ottawa, ON: The Conference Board of Canada, 1992.

120 to 200 youth failing to complete high school at a cost of $37,560 per capita, the total cost to Calgary was between $4.5 million and $7.5 million (in $2000 dollars).

Shiell and Zhang also included costs for special education services and the costs of schooling associated with socioeconomic deprivation. For special education services, the authors base the calculation of the cost of early childhood services on the 2000 edition of the *Canadian Fact Book on Poverty*, which finds that low income children are 1.8 times as likely to be enrolled in remedial or special education classes than are children with adequate income.[49] At an average cost of $2,155 per child, this suggests that Calgary could save $394,250 ($2000) in these costs if poverty were to be eliminated.

For the cost of schooling associated with socioeconomic deprivation the authors use 10% of the amount Alberta school boards receive to reflect additional costs associated with children who experience socioeconomic deprivation and found that eliminating poverty in Calgary could save $1.2 million in this budget.

Criminal justice system costs

Shiell and Zhang could find no way of estimating the poverty share of costs to the criminal justice system. They note that reports show that poorer people are not more likely to engage in illegal activities, although they may be arrested and charged by the police more often than those not living in poverty. Therefore, the authors arbitrarily chose 1% to represent the cost savings to the judicial system if poverty were reduced.

Based on a total cost of the criminal justice system in Calgary of $3,050 per criminal event, the cost was nearly $195 million in $2000. One percent of the total cost of the criminal justice system , or the costs attributable to poverty, was approximately $2 million.

Costs of social support system programs and social assistance

The authors note that avoidable social system program costs are administration items not considered to be transfers, such as staff time, vehicle costs, and possibly the capital costs associated with the programs that are specifically aimed at alleviating poverty. They found no way to determine what the avoidable costs for social support systems would be. Therefore, in order to capture a portion of these costs, the authors identified 50 programs in existence to help people on low incomes, which, combined, receive approximately $12 million per year from Family and Community Support Services of the City of Calgary. The authors arbitrarily assigned $600,000 as the avoidable cost, or saving, if poverty was eliminated.

Social support payments are considered to be transfers, and not costs, in the authors' economic model. However, the authors did estimate the costs associated with raising the funds needed to support the transfers to be $18 million.

[49] Ross, D. P., K. Scott, and P. Smith. *The Canadian Fact Book on Poverty 2000*, Ottawa, Canada: Canadian Council on Social Development (CCSD), 2000.

3. Jerrold Oppenheim and Theo MacGregor
The Economics of Education: Public Benefits of High-Quality Preschool Education for Low-Income Children. Building Communities for Change.

In January 2007, Jerrold Oppenheim and Theo MacGregor, legal and energy consultants, presented their findings on the costs of poverty to the U.S. House of Representatives Committee on Ways and Means Hearing on the Economic and Societal Costs of Poverty.[50]

Unlike the two aforementioned studies, Oppenheim and MacGregor's report includes factors such as transfers from government programs, direct costs to victims of crime, and some unemployment costs.

The report calculates avoidable annual costs of poverty using 2005 data for four broad categories: crime, health, unemployment/underemployment, and current anti-poverty investments. The total cost of poverty was estimated to be US$1.5 trillion in US$2005. Oppenheim and MacGregor in general did not explain all of the costs included in the estimations or exactly what methodology was used.

After calculating the total avoidable costs of poverty, Oppenheim and MacGregor used these estimates to calculate the costs per non-low-income household, which indicates the amount of increased resources per household that would be available if poverty were eliminated, and to calculate the maximum investment needed to bring every low-income household to 60% of the median income—the amount needed to rise above the poverty level. They note that this would result in a benefit:cost ratio of investment in poverty eradication of 3:75. In other words, by eliminating the avoidable costs of poverty, the benefit would return nearly four times the cost of the investment. The amount estimated to lift all people out of poverty was US$397.2 billion.

Finally, they briefly review a few return rates for poverty investment programs:

- Simple cash payments sufficient to lift everyone out of poverty would immediately be returned nearly fourfold. [Oppenheim and MacGregor do not recommended this as the most cost-effective solution.]
- Investing in weatherization and installing efficient appliances in low-income homes returns seven times the investment.
- Investing in the education of three-and-four-year-olds returns nine times the investment.[51]

Costs of crime

Oppenheim and MacGregor state that the total net burden of crime in the United States is estimated to be US$1 trillion per year, and based on a profile of prisoners, they attribute 50% of these costs to poverty, although their final estimate of $660.8 billion per year is higher than 50%.[52] They calculate the sum of the costs of crime using data from various agencies that

[50] United States House of Representatives. *Hearing on the Economic and Societal Costs of Poverty*, accessed.
[51] Oppenheim, and MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, accessed. p. 17.
[52] The authors did not explain this discrepancy.

include costs to victims—medical expenses, lost earnings, costs for victim services, and intangible costs such as pain and suffering, and reduced quality of life, cost of burglaries and larceny, value of stolen motor vehicles, incarceration costs, police and judicial system costs, and arson and assault costs per victim.

Cost of healthcare

To calculate healthcare costs attributable to poverty, Oppenheim and MacGregor used a 2004 Kaiser Commission study that found the total cost spent on healthcare for the uninsured population by uninsured hospital services and other programs was US$125 billion.[53] Information on how this figure was derived was not given. The authors then assumed that all low-income individuals (28.7% of the population) were uninsured, and multiplied this percentage by the total healthcare cost of the uninsured to get a total cost of uninsured healthcare resulting from poverty to be US$35.8 billion. To this they added US$180 billion for Medicaid paid by the federal government and the US$120 billion for Medicaid paid by the state governments for a total of US$335.8 billion (US$2005).

Cost of unemployment and underemployment

Oppenheim and MacGregor calculated the costs of underemployment, which includes unemployment, to be US$222.5 billion (US$2005). They define the underemployed as consisting of those who are officially unemployed, discouraged workers who are no longer looking for work, and part-time workers who would prefer to work full time if they could find the employment. The authors relied on the cost of underemployment calculated by Clifford Cobb, Gary Sue Goodman, and Mathis Wackernagel in a genuine progress indicator (GPI) report, which found the cost of underemployment in 1999 to be US$112 billion.[54] They adjusted this cost by basing lost wages on a minimum wage of $5.15 per hour—which is not enough to lift people out of poverty—rather than basing it on the $11.20 per hour used by Cobb et al.

They also used a spending multiplier of 2.0 that assumes all of the income would be spent (increasing the multiplier effect). Thus, the impact of an increase in income would be doubled throughout the economy. In addition, they included transfer payments to or on behalf of the underemployed, such as unemployment insurance and job training.

Current anti-poverty investments

Oppenheim and MacGreagor define "current anti-poverty investments" as "investments made by the rest of us, through taxes or other social service supports, to mitigate or alleviate the high

[53] Gralla, Joan. "U.S. Uninsured Health Care Cost Put at $125 Billion." *Common Dreams News Center*: Reuters, May 11, 2004. This is the reference for the Kaiser Commission report given by Oppenheim and MacGregor. It is a short newspaper article that gives very little detail. The reference for the actual Kaiser Commission report was not cited.

[54] Cobb, Clifford, Gary Sue Goodman, and Mathis Wackernagel. *Why Bigger Isn't Better: The Genuine Progress Indicator 1999 Update*, Redefining Progress, 1999; accessed December 2007; available from http://www.rprogress.org/publications/1999/gpi1999.pdf. This is a summary report that does not explain the factors used to calculate the total costs of underemployment.

costs … to society."[55] Cost estimates of public and private (such as from charities) financial support for those who lack sufficient shelter, food, education, or money to pay for home utilities are included in this category.

These costs are those incurred by homeless shelters, public housing, and public subsidies to private housing; direct food subsidies; federal and state subsidies for education to schools with a high percentage of low-income students; utility company, government, and social service agency assistance programs; and other programs. The other programs were legal aid services, Transitional Aid to Needy Families (federal and state costs), Supplemental Security Income, Earned Income Tax Credit, Services to low-income seniors, other social services (US$2.7 billion), Community Services Block Grants, and Community Development Block Grants. The total cost was US$270.1 billion per year.

4. Johan P. Mackenbach, Willem Jan Meerding, and Anton E. Kunst
Economic Implications of Socio-Economic Inequalities in Health in the European Union, European Commission.

In a 2007 report written for the European Commission, Dutch researchers Johan Mackenbach, Willem Jan Meerding, and Anton Kunst use data from the European Community Household Panel (ECHP) to identify the economic costs associated with socioeconomic inequalities in health for 25 European countries.[56] The authors were also interested in clarifying the potential economic benefits of reducing the health inequalities experienced by those with lower levels of income, occupation, or education, who consistently have higher mortality and morbidity rates than socioeconomic groups with higher incomes.[57]

Although socioeconomic inequalities in health have been recognized as an important public health issue and the subject of research in Europe for the past two decades, Mackenbach et al. note that their report is "the first exploratory study" of these important economic issues.[58] They also point out that their report represents only a part of the full range of economic costs associated with socioeconomic inequalities on health and that further research will be needed for more definitive and complete estimates. They specifically recommend that systematic reviews or meta-analyses are needed to assess causal effects of socioeconomic inequalities on health.

As is often the case in Europe, socioeconomic status is indicated by education level, rather than by income (Canada or the U.S.) or by occupational or class status (U.K.). Two education levels are used, which are divided into a lower group—lower secondary education and lower—and a higher group—completion of upper secondary education and higher. Mackenbach et al. note that education levels emphasize the cultural and cognitive aspects of socioeconomic position (SEP),

[55] Oppenheim, and MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, accessed. p. 11.
[56] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. In Canada and the United States "health inequalities" are more often referred to as "health disparities."
[57] Ibid.
[58] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 6.

while income emphasizes the role of poverty and living conditions. In the Canadian context, income is most often used as a more direct indicator of low socioeconomic status or poverty.[59]

The Mackenbach et al. report addresses four main questions, which the authors again emphasize is the "first analysis dealing with such questions."[60] The questions relate to information that is needed in order to estimate the costs of poverty.

1. How should the economic impact of socioeconomic inequalities in health be conceptualized and measured?
2. How large are socioeconomic inequalities in health in the European Union, and how large is the burden of ill health and premature mortality associated with inequalities in health?
3. What is the economic impact of socioeconomic inequalities in health in the European Union?
4. What actions can reasonably be taken to reduce socioeconomic inequalities in health, and what would be the economic benefits of investing in these strategies?[61]

Measurement of the magnitude of socioeconomic inequalities in health

The health indicators that Mackenbach et al. use to measure socioeconomic inequalities in health are:

- mortality rates in numbers of deaths per 1,000 persons per year, and
- self-assessed health to indicate morbidity rates.

They chose these outcomes since they are the ones—along with functional impairments and disability (captured in self-assessed health)—that may directly determine economic productivity. They did not focus on disease-specific outcomes such as mortality rates by cause of death or morbidity rates by type of disease. For the same reason, the authors also focus on health inequalities at working ages (approximately ages 25 – 65), which they note is because these ages are most relevant for estimating macroeconomic impacts of health inequalities.

The report uses health indicators to calculate relative risks and the proportion of the total burden of ill health that can be attributed to low socioeconomic status. It uses the epidemiology method most often used in cost of illness studies to estimate the burden of ill health and premature mortality associated with socioeconomic status and specific risk factors such as smoking and obesity. This approach is based on the concept of Population Attributable Risk (PAR)—also called the Population Attributable Fraction (PAF). Basically, the PAR compares the current situation of ill health with a hypothetical reference situation in which everyone in the population would have the same health status as those with a high SEP. The difference between the current and hypothetical situations represents the potential costs of low SEP.

In this case, as noted, a simple dichotomy is used to measure socioeconomic status—high and

[59] Raphael, Dennis, Jennifer Macdonald, Ronald Colman, Ronald Labonte, Karen Hayward, and Renee Torgerson. "Researching Income and Income Distribution as Determinants of Health in Canada: Gaps between Theoretical Knowledge, Research Practice, and Policy Implementation " *Health Policy*, 2005, vol. 72: 217–232
[60] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 8.
[61] Ibid., accessed. p. 8.

low socioeconomic status are defined as the upper and lower 50% of the population distributed by SEP. Thus, the authors note: "Using the PAR approach, we thus assess the burden of ill health that is attributable to the fact that about half of the population has (the poorer health status corresponding to) a lower SES than the upper half of the population."[62] This method produces a very rough estimate and is not precise enough to measure the costs of poverty, which affects less than half the population, but the basic methodology is useful in both cases.

The authors use data from 1991–1995 to estimate risk ratios for mortality rates. For morbidity rates—the rates of illness or disease—they use data from 2000 to estimate odds ratios for "less than good" self-assessed health. Calculations made for the population attributable risks associated with low socioeconomic status use 2004 educational levels as the main socioeconomic indicator. The PAR is estimated for mortality rates or deaths averted, morbidity rates or cases of ill-health averted (self-assessed health), life expectancy or years of life gained, and morbidity-free life expectancy or the number of morbidity-free years gained.

Economic costs of socioeconomic inequalities in health

In order to estimate economic costs, Mackenbach et al. value health both as a "capital good" and as a "consumption good." These values correspond to those calculated with a human capital approach and a quality of life approach, respectively. According to the authors, "capital good" represents health as an important component of "human capital," which the authors note is "economic language for the value of human beings as means of production."[63] "Consumption good" is "economic language for 'happiness' or 'satisfaction,'" which is referred to in economic models as an individual's "utility."[64] In addition to these costs, the authors also do separate calculations for the total costs of social security benefits and health care utilization that are associated with the ill health of those in a low SEP. The impact of inequalities-related health losses is expressed in relation to the Gross Domestic Product (GDP).

Calculating the monetary value of inequalities-related losses to health as a *capital good* involves estimating the effect of ill-health on labour supply and labour productivity, particularly for those in lower socioeconomic groups. The authors found that average personal income in the E.U. would increase by 2.77% if people in the lower educational groups were to have the same level of health as those in the higher educational groups and their income increased correspondingly. Wages and salaries account for 39% of the GDP. When income is increased by 2.77%, the GDP would increase by 1.08%, which is €113 billion for the 25 E.U. states combined.

To this the authors then added the effect of health inequalities on "firm profits and mixed income," but it is not clear how they derived these results. It was assumed by the authors that the effect of health inequalities on this category is 0.69%, or one-quarter of the 2.77% effect on wages and salaries. The share of firm profits is 38.5% of the GDP, and the impact on the total GDP is 0.27%. Total income represents 77.4% of GDP and the share of the impact of health inequalities is 1.74%. The combined effect of health inequalities on total income amounts to 1.35% of the GDP, or €141 billion. The authors note that relative to the GDP, these amounts are

[62] Ibid., accessed. p. 12.
[63] Ibid., accessed. p. 16.
[64] Ibid., accessed. p. 16.

modest, but the results are significant in absolute terms (€141 billion) in €2004. This is equivalent to about $255 billion in CDN$2008.[65]

According to Mackenbach et al., because the GDP only calculates market goods and services, it is necessary to also value health as a "utility" or consumption good, which, as noted above, implies "satisfaction" or "happiness." This indicator includes estimates of costs for mortality and morbidity (self-assessed health) inequalities.

Mackenbach et al. calculate their estimates on willingness to pay figures proposed by the American economist, William D. Nordhaus of Yale University:[66]

- US$3.0 million per life saved (€2.3 million). Adjusted to €862,500 by Mackenbach et al.
- Value of one current life-year – US$100,000 (approximately €77,000).

Mackenbach et al. adjusted the first figure, which they note is based on death at working age, to reflect the loss of life due to health inequalities. They estimated *a loss of 15 years per death due to inequalities*, and a loss of 40 years per death at working age for the general population. After adjusting the €2.3 million by a factor of 15/40, the resulting estimate is €862,500 per death avoided. However, because of the uncertainty of these figures, the authors note that they used them for illustrative purposes only.

Social security benefits

Social security benefits and health care utilization costs are dealt with separately because these costs overlap with health as both a capital and a consumption good. Mackenbach et al. suggest that since social security benefits are transfer payments, there are no opportunity costs to society, and these benefits should not be added to the costs of ill health through its effects on wages and the GDP. However, social security benefits may have indirect effects on the economy. Only unemployment and disability benefits were considered in their study.

According to Mackenbach et al., people with "very poor" health receive an average of 20 times more in disability benefits than those with "very good" health, and the same association exists for both higher and lower educational groups. Similar patterns were found for both men and women in all E.U. countries. However, the association between health status and unemployment benefits was much weaker.

The estimates for the decrease in benefits if all persons had the same health status of those with high educational levels—based on the ECHP data analysis and €2004—were:

[65] According to the Bank of Canada (http://www.bankofcanada.ca/en/rates/converter.html), €141 billion was the equivalent of $235 billion in CDN$2004. One European euro was the equivalent of $1.67 in CDN dollars in June 2004. Canadian dollars were then converted to 2008 dollars using the Bank of Canada's Inflation Calculator, April 3, 2008.

[66] Nordhaus, William D. *The Health of Nations: The Contribution of Improved Health to Living Standards*, Yale University, 2002; accessed Nov 2007; available from http://www.econ.yale.edu/~nordhaus/homepage/health_nber_1.doc. cited in Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 20.

- Unemployment benefits – would decrease by 2.7% in EU as a whole, representing about €5 billion per year in social security costs.
- Disability benefits – would decrease by 24.7%, representing €55 billion per year
- Total – €60 billion represents 14.9% of the total costs of social security systems.

Health care utilization

Health care costs are included in the GDP as part of the total production of goods and services, so Mackenbach et al. deal with them separately as "repair costs." In these costs they included physician services and hospital services defined as the number of nights in hospital. They found the impact of health inequalities on health costs to be nearly 20% of total costs to the health care system.

For physician services, in both higher and lower educational groups, people with "very poor" health had 6 times more visits to a physician and about 9 times more specialist visits than those with "very good" health. The number of general physician and specialist visits would decrease by 16.4%, if all persons had the health corresponding to high education levels and "very good" health, which would translate to €26 billion. For hospital services, the number of nights in hospital would be reduced by 22.1% in all persons aged 16 years and older, which translates to €59 billion.

The total cost of physician and hospital services was doubled to reflect the fact that these costs represent half of the total costs of health care services, which translate to €177 billion (adjusted by €7 billion to include children) (€2004).

Methodologies used in socioeconomic health disparity studies

Chapter 3 discusses the methodologies used in comprehensive socioeconomic health disparity studies, which involve many steps. Anton Kunst et al. of Erasmus University in The Netherlands, working with the E.U. Working Group on the Socio-economic Inequalities in Health, have developed guidelines for monitoring socioeconomic inequalities in health at the national level.[67] In order to estimate the costs of poverty, it is important to understand the magnitude of these inequalities, which are referred to more often in Canada as health disparities. The monitoring process developed by Kunst et al. for use in the E.U. involves five steps:

1. identification of data sources,
2. measurement of socioeconomic variables,
3. tabulation of health indicators by socioeconomic status,
4. measurement of the magnitude of health inequalities, and

[67] Kunst, Anton E., Vivian Bos, Johan P. Mackenbach, and EU Working Group on Socio-economic Inequalities in Health. *Monitoring Socio-Economic Inequalities in Health in the European Union: Guidelines and Illustrations. A Report for the Health Monitoring Program of the European Commission*, Rotterdam, The Netherlands: Erasmus University, 2001; accessed Nov 2007; available from http://ec.europa.eu/health/ph_projects/1998/monitoring fp_monitoring_1998_frep_06_a_en.pdf.

5. evaluation and interpretation of the results.[68]

In Section 3.4 we briefly review these steps and how they relate to the costs of poverty. Within these steps there are intermediate steps that must be taken, such as those used in cost of illness studies and discussed below.

Health disparities

Disparities are differences in patterns of health most often associated with socioeconomic position, gender, race/ethnicity, and geography. According to John Lynch and Sam Harper of the University of Michigan, the U.S. National Institutes of Health (NIH) Strategic Plan to Reduce and Ultimately Eliminate Health Disparities—the plan that guides NIH research—defines health disparities as follows:

> [H]ealth disparities are differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups.[69]

Lynch and Harper note that health disparities can be estimated with a variety of measures such as range measures, un-weighted regression-based measures, population-weighted regression-based measures including the Slope Index and Relative Index of Inequality, Index of Disparity, between-group variance and disproportionality measures such as the Concentration Index, Theil Index, Mean Log Deviation, and Gini coefficient.[70]

Although disparities in health exist across all socioeconomic groups, in this case, since we are most interested in poverty, the range measures are most useful. Range measures, which use relative risk and excess risk (absolute) comparisons, are often used in epidemiological literature to estimate the disease burdens at the extremes of socioeconomic groups and are the measures that are most easily calculated and interpreted. Range measures are useful for estimating poverty differences in health because poverty is an extreme condition and can be compared with the other extreme—groups that are not living in poverty, which are usually the groups with the best health. If necessary, group size and middle range data can be included in the data interpretations.

Intermediate steps in cost of illness studies

Within the overall steps identified by Kunst et al. above, there are intermediate steps that need to be taken in a comprehensive study. These are the steps used most often in cost of illness studies. With the exception of the Mackenbach et al. study, the cost of poverty studies previously reviewed did not include these steps, and were therefore not as rigorous or as comprehensive as the Mackenbach study.

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[68] Ibid., accessed. p. 11.
[69] Lynch, John, and Sam Harper. *Measuring Health Disparities*, Computer-based course MHDID0806. Michigan Public Health Training Center, Prevention Research Center of Michigan, and Center for Social Epidemiology and Population Health, Department of Epidemiology, University of Michigan, 2005; accessed Nov 2007; available from http://www.sitemaker.umich.edu/mhd/home. p. 17.
[70] Ibid., accessed.

Writing for the World Health Organization (WHO), New Zealand researchers Tony Blakely, Simon Hales, and Alistair Woodward present the basic approach to assessing the impact of socioeconomic position on health risk factors and health status, and describe methods to measure these associations.[71] Their report uses income as the main indicator of socioeconomic position and, therefore, is directly relevant to methods needed to assess costs of poverty. The steps for estimating the prevalence of risk factors or health status by income poverty level use methods based on burden of disease studies and are as follows:

1. Determine the population distribution of the socioeconomic factor
2. Determine the relative risks for the association between socioeconomic position and risk factors and/or health status
3. Determine the current distribution of risk factor/health status levels within the population by poverty levels
4. Calculate the population attributable risks
5. Estimate uncertainties

To this list we can add a sixth step, which is to use the above calculations to estimate economic costs. The methodology for all of these steps is described in detail in Section 3.1 of Chapter 3.

Association between poverty and health: relative risk ratios, odds ratios, and population attributable fractions

As noted, the association between poverty and health must be established before the health costs of poverty can be estimated. Epidemiological studies use regression-based measures to find associations between dependant and independent variables that can model causal relationships or correlations between variables. These associations—in this case between poverty and health—can be found in the epidemiological literature and used in range measurements.

Information must be gathered or calculated on the prevalence of the risk in the population, the relative risk ratio for the outcome in question, and the proportion of the outcome that can be attributed to the risk. According to U.S. researchers Keith Scott et al., epidemiological measures have direct relevance to public policy and action since these measures focus on differences in *proportions* in the population—rather than the focus on *means* and *variance* that regression-based measures of effect supply—and have the ability to separate risk to the population from risk to the individual.[72]

The most commonly used epidemiological measures of relative risk are the risk ratio, the odds ratio, and the population attributable fraction. These measures are briefly discussed in Section

[71] Blakely, Hales, Kieft, Wilson, and Woodward. "Distribution of Risk Factors by Poverty." See also: Blakely, Tony, Simon Hales, Charlotte Kieft, Nick Wilson, and Alistair Woodward. "The Global Distribution of Risk Factors by Poverty Level," *Bulletin of the World Health Organization*, 2005, vol. 83, no. 2. accessed Nov 2007; available from http://www.who.int/bulletin/volumes/83/2/118.pdf.
[72] Scott, Keith G., Craig A. Mason, and Derek A. Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy," *Child Development*, 1999, vol. 70, no. 5: 1263-1272.

3.1, and are presented in Section 3.3 in more detail. Basically, the risk ratio is a relative measure of effect and is defined as "the increase in the probability of an outcome given one situation, relative to the probability of an outcome given some other situation."[73] The ratio consists of that between one group that is experiencing the risk factor and has the probability of developing a particular outcome, compared with a reference group that is not experiencing the risk factor. In most cases the increased risk of experiencing a negative outcome is compared between the groups.

Odds ratio is defined as "the increase in the odds of an outcome given one situation relative to the odds of the outcome given some other situation."[74] Whereas risk ratios estimate "differences in the *relative probability of an outcome,*" odds ratios estimate "differences in the *relative odds of an outcome*."[75] According to Tu, the risk ratio is generally preferred over the odds ratio.

Holcomb et al. explain that both the risk and odds ratios have the same numerator—the number of cases with the outcome.[76] However, the denominator is different in the two measures. The risk ratio compares the number of cases with the outcome to the number of total cases, whereas the odds ratio compares the number of cases with the outcome to the number of cases without the outcome. According to Zhang et al., the two measures are not interchangeable because they produce different results, although for outcomes that are rare, the results may be similar.[77] Logistic regression yields an odds ratio rather than a risk ratio, and the odds ratio can be used to estimate the risk ratio if the occurrence in the unexposed group—the group without the factor—is known.[78] Zhang et al. recommend following this correction procedure if the incidence of the outcome is more than 10% and the odds ratio is more than 2.5 or less than 0.5.

Risk ratios and odds ratios both reflect the degree of risk for an individual. However, attributable risk ratios reflect the effect of a risk factor upon the community as a whole, and are therefore important for public health policy.[79] As Scott et al. note, uncommon risk factors that have a large effect on individuals may have a small impact on rates of a disorder in the community, and a common risk factor that has a small effect on individuals may have a large impact on disorder rates in the community.[80]

Attributable risk ratios refer to the proportion of risk that can be attributed to causal effects of a risk factor or condition. Basically, the risk ratio differences are adjusted by the prevalence of the risk factor in the population, which results in an "estimate of the percentage of cases of the

[73] Tu, Shihfen. "Developmental Epidemiology: A Review of Three Key Measures of Effect " *Journal of Clinical Child and Adolescent Psychology*, 2003, vol. 32, no. 2: 187-192. p. 187.
[74] Ibid. p. 188.
[75] Scott, Mason, and Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy." p. 1267.
[76] Holcomb Jr., William L., Tinnakorn Chaiworapongsa, Douglas A. Luke, and Kevin D. Burgdorf. "An Odd Measure of Risk: Use and Misuse of the Odds Ratio," *Obstetrics and Gynecology*, 2001, vol. 98, no. 4: 685-688.
[77] Zhang, Jun, and Kai F. Yu. "What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes," *JAMA (Journal of the American Medical Association)*, 1998, vol. 280, no. 19: 1690-1691.
[78] Ibid.
[79] Scott, Mason, and Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy."
[80] Ibid.

disorder in the entire community that is related to the risk factor."[81] This method involves the assessment of relative risks (RR) for known diseases, risk factors (e.g. obesity or tobacco use), or risk conditions (e.g., poverty[82]), and calculation of the population attributable fraction (PAF or PAR–population attributable risk) due to exposure to the disease, risk factor, or risk condition, according to the relative risk and the probability of a person having an outcome in a particular jurisdiction.

Estimation of costs

In order to estimate the health costs of poverty it is necessary to know the costs of the illnesses attributable to poverty. Cost of illness studies provide a measure of social costs by estimating the economic burden of mortality or morbidity and the amount of money that could potentially be saved if the burden was eliminated.[83] GPI*Atlantic* has used this basic approach in health costing reports conducted over the past ten years in areas such as tobacco use, obesity, physical activity, and chronic disease.[84] Section 3.2 of this report briefly reviews the methodology used in cost of illness studies, including those for direct costs and for indirect costs using the human capital approach.

Here we are mainly concerned with prevalence-based costs since these can be directly connected with costs calculated by Health Canada in its *Economic Burden of Illness in Canada* (EBIC) estimates.[85] EBIC supplies information on the magnitude of the economic burden of illness in Canada based on standard reporting units and methods. For most of the burden of disease, except for mortality costs, EBIC uses a prevalence-based approach to estimate costs in 1998. However, for mortality costs, an incidence-based human capital approach is used.

In the EBIC report, total, direct, and indirect costs are allocated by cost component, standard diagnostic categories, age group, gender, and province/territory.[86] Unfortunately, these costs are not disaggregated by socioeconomic position or by groups that may be experiencing health disparities. Standard diagnostic categories are from the World Health Organization International Classification of Diseases, 9th and 10th Revisions.[87]

Comprehensive costs of illness studies include both direct and indirect costs, although the factors that are included depend on the perspective of the study, that is whether the purpose of the study

[81] Ibid. p. 1,267.
[82] Scott et al. refer to "poverty" as a "risk factor," while other authors consider "poverty" to be a "risk condition" in order to distinguish it from lifestyle risk factors such as smoking or obesity.
[83] Kuchler, Fred, and Elise Golan. *Assigning Values to Life: Comparing Methods for Valuing Health Risks*, Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture, Agricultural Economic Report No. 784, 1999; accessed Nov 2007; available from http://www.ers.usda.gov/publications/aer784/aer784.pdf.
[84] See publications at: GPI Atlantic. *Publications Website*, Genuine Progress Index for Atlantic Canada (GPI Atlantic), accessed October 2007; available from http://www.gpiatlantic.org/publications/pubs.htm.
[85] Health Canada. *Economic Burden of Illness in Canada, 1998*, 2002; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/publicat/ebic-femc98/pdf/ebic1998.pdf.
[86] Age groups are children (0 – 14 years), and individuals aged 15 – 34 years, aged 35 – 64 years, and seniors (65 years and over).
[87] World Health Organization. *Website: International Classification of Diseases (ICD)*, 2007; accessed Nov 2007; available from http://www.who.int/classifications/icd/en/.

is to estimate costs to society overall, or to the health care system, government, business, or to patients and their families.[88] Basically, direct costs measure medical expenses that result from an illness or injury, and indirect costs measure the value of lost productivity because of the illness, injury, or premature mortality. EBIC estimates indirect costs based on the three following components:

- Mortality costs – the value of years of life lost due to premature death,
- Morbidity costs – the value of activity days lost due to short-term disability, and
- Morbidity costs – the value of activity days lost due to long-term disability.[89]

Not included are other indirect costs such as the value of time lost from work, the value of lost leisure time of family members or friends who care for the patient as well as of the patients themselves, and intangible costs due to pain and suffering.

Transfer payments to individuals are generally not included in economic costing models since they represent a shift in resources, rather than a use of resources. However, Finkelstein and Corso note that the inclusion of transfer payments may depend on the perspective of the study, because although the estimate may represent a transfer from one entity to another, "to the payer they are actual expenses."[90] They give an example from a previous obesity study they had conducted:

> For example, in the obesity study, the authors quantified expenditures to specific payers, including Medicare and Medicaid. This allowed quantifying of the financial burden associated with obesity that falls to taxpayers. Whether or not these taxes represent actual costs or transfers is likely to be of little importance to those who were unaware that they were financing these expenditures in the first place.[91]

[88] Segel, Joel E. *Cost of Illness Studies: A Primer*, RTI-UNC [Research Triangle Institute-University of North Carolina at Chapel Hill] Center of Excellence in Health Promotion Economics, 2006; accessed Nov 2007; available from http://www.rti.org/pubs/COI_Primer.pdf.
[89] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 1.
[90] Finkelstein, Eric, and Phaedra Corso. "Cost-of-Illness Analyses for Policy Making: A Cautionary Tale of Use and Misuse," *Expert Review of Pharmacoeconomics Outcomes Research*, 2003, vol. 3, no. 4: 367-369. p. 369.
[91] Ibid., p. 369.

Associations between Poverty and Health

As an important determinant of health, poverty is strongly and inversely related to almost every health indicator, including general, self-reported health status, mortality and morbidity rates associated with various diseases, health-related "lifestyle" behaviours, and health care access and use.[92]

Chapter 5 of the literature review explores the associations between poverty and indicators of morbidity, mortality, and behavioural risk factors as precursors to chronic disease. The focus is on the proportion of morbidity and mortality that can be attributed to poverty or low income, and specifically on relative risk ratios and population attributable fractions where these are available.

This is somewhat challenging. Proximal risk factors for chronic disease and mortality, such as tobacco use, obesity, alcohol and other substance abuse, and physical inactivity, are often the focus of chronic disease prevalence and health promotion reports. These risk factors are largely preventable and are estimated to be responsible for 25% of direct medical costs.[93] However, distal risk factors or conditions such as poverty and other socioeconomic factors also play a large role in chronic disease incidence, prevalence, and mortality but are discussed less often. As Jayadeep Patra et al. note, there is a lack of information on the social determinants of health in general:

> [D]istal factors such as air, water and land environments, working conditions and social determinants of health should be the foci of future cost studies. The methodology is no doubt challenging for all risk factors, but particularly for the latter."[94]

The focus is on the associations between poverty and the excess burden of disease found in Canada, although the information is more limited than that found in the U.S. or Europe. The information that was found on the excess burden of disease in Canada that is attributable to poverty is briefly summarized below. However, only a sample of the studies reviewed are mentioned. More detail can be found in the body of the literature review.

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92 Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
93 Colman, Ronald. *The Cost of Chronic Disease in Nova Scotia*, GPI Atlantic, Dalhousie University, and Atlantic Region Population and Public Health Branch, Health Canada, 2002; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chronic.pdf.
94 Patra, Jayadeep, Svetlana Popova, Ju_rgen Rehm, Susan Bondy, Robynne Flint, and Norman Giesbrecht. *Economic Cost of Chronic Disease in Canada, 1995-2003*, Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association, 2007; accessed Dec 2007; available from http://www.ocdpa.on.ca/docs/OCDPA_EconomicCosts.pdf.

Behavioural risk factors for chronic disease

Behavioural risk factors are often identified as mediators leading from poverty to chronic disease.[95] The World Health Organization (WHO) has identified the risk factors that most often contribute to the burden of disease in developed countries as tobacco use, obesity (high body mass index–BMI), alcohol consumption, low consumption of fruits and vegetables, high cholesterol, physical inactivity, and high blood pressure.[96] Although these risk factors affect the entire population, they are especially associated with poverty in high-income countries. For example, those in the lowest-income category are two and a half times more likely to smoke than those in the highest income category, and are more likely to be obese, have a poor diet, and exercise less than those with higher incomes.[97] As well, several of these risk factors are often clustered together in high-risk individuals, and may have synergistic effects on the potential for disease.

According to Ronald Colman, excess risk factors for a small number of behaviours or factors, such as smoking, obesity, lack of physical exercise, and poor nutrition, account for 40% of chronic disease, 50% of chronic disease mortality, 25% of medical care costs, and 38% of the total direct and indirect costs of illness in Canada.[98]

Paula Lantz et al. report that behavioural risk factors play a small role in understanding poverty impacts on health,[99] and Michaela Benzeval et al. note that an emphasis on behavioural factors does not address the underlying reasons why people living in poverty adopt these behaviours.[100]

Tobacco use, obesity, and alcohol/illegal drug abuse—the leading risk factors that affect the most outcomes, are discussed in greater detail in the literature review. Tobacco use and obesity have been identified as two key factors that contribute the most to the costs generated by chronic disease and mortality.[101] While alcohol and illegal drug abuse affect relatively fewer people than do tobacco use and obesity, they frequently account for more deaths at younger ages and for relatively more preventable years of life lost before the age of 65.

[95] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
[96] World Health Organization, Cited in Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.
[97] Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.
[98] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
[99] Lantz, Paula M., James S. House, James M. Lepkowski, David R. Williams, Richard P. Mero, and Jieming Chen. "Socioeconomic Factors, Health Behaviors, and Mortality," *Journal of the American Medical Association*, 1998, vol. 279, no. 21: 1703-1708.
[100] Benzeval, Michaela, Ken Judge, and Margaret Whitehead. *Tackling Inequalities in Health: An Agenda for Action*, London: King's Fund Centre, 1995.
[101] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.

Tobacco use

In high-income countries, the poor are more likely to smoke than the rich and, therefore, the risk of smoking-related and premature death among the poor is also greater. Parviz Ghadirian notes, "In high- and middle-income countries, men in the lowest socio-economic groups are up to twice as likely to die in middle age as men in the highest socio-economic groups, and smoking accounts for at least half their excess risk."[102] Smoking and mortality rates for tobacco-specific diseases such as lung cancer and COPD are also highest among the poorest populations.[103] For example, the evidence indicates lung cancer rates decline as median income increases.

Cora Lynn Craig et al. used 2000/2001 CCHS data to look at socio-demographic and lifestyle factors.[104] Those living in households in the lowest income quintile had higher rates of smoking than those living in households with higher incomes. Results showed almost 18% of the population living in low income and 32% of those being daily smokers, compared with 22% in the higher income population being daily smokers.

In 2007, Ronald Colman and Janet Rhymes updated Colman's 2000 GPI*Atlantic* report on the costs of tobacco use in Nova Scotia.[105] They found that smoking accounts for 21% of all deaths in the province, which is approximately 1,700 deaths per year. In addition, in Nova Scotia, tobacco use costs $171.3 million in direct health care costs, and $526 in indirect productivity loss costs due to long- and short-term disability and premature mortality. When additional costs are added—such as on-the-job productivity losses (incurred through smoking breaks), prevention and research costs, and losses due to fires—smoking costs the Nova Scotia economy approximately $943.8 million per year. Using cost data from the Canadian Centre on Substance Abuse, the authors also examined the benefits of a hypothetical reduction in the number of current smokers in Nova Scotia from 22% to 16%—a 27% reduction bringing Nova Scotia in line with the 2002 smoking rate in British Columbia. They found that this reduction would save Nova Scotia approximately $206.50 per capita ($2006), or a total of $193 million.[106]

Although the GPI report is for Nova Scotia, its approach and calculations used can be used as a template in national studies.

Another study by Makomaski Illing and Kaiserman, "*Mortality Attributable to Tobacco Use in Canada and its Regions*," calculates RRs and is widely used to estimate mortality due to tobacco

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[102] Ghadirian, Parviz. *Sleeping with a Killer: The Effects of Smoking on Human Health*, Health Canada, 2002; accessed Nov 2007; available from http://www.hc-sc.gc.ca/hl-vs/alt_formats/hecs-sesc/pdf/pubs/tobac-tabac/swk-dat/swk-dat_e.pdf. p. 8.
[103] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[104] Craig, Cora Lynn, Christine Cameron, and Adrian Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, Canadian Population Health Initiative and the Canadian Institute for Health Information, 2005; accessed Dec 2007; available from http://secure.cihi.ca/cihiweb/products/Sociodemographic_Lifestyle_e.pdf.
[105] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[106] Ibid., accessed. This calculation does not take into account the fact that British Columbia has a lower percentage of former smokers than does Nova Scotia. Total cost saving based on a population estimate of 934,405.

use in Canada.[107] Peter Tanuseputro et al. also use RR estimates to calculate Smoking Attributable Mortality (SAM) rates for all Canadian provinces.[108] As well, they calculated smoking attributable cardiovascular and all-cause mortality estimates for each health region in Canada. In 2006, Rehm et al. calculate RR ratios and Smoking Attributable Fractions (SAFs) for various diseases for both mortality and morbidity by sex and age. These RR ratios and SAFs are listed in Tables 53 and 54 in the Appendices.

Obesity

Obesity can be costly because it often results in chronic diseases that require frequent use of health care resources. Laird Birmingham et al. estimated the total 1997 direct cost of obesity in Canada to be more than $1.8 billion or 2.4% of the total health care expenditure. Peter Katzmarzyk and Ian Janssen estimated the total direct health care costs associated with obesity in Canada in 2004 to be more than $1.6 billion or 2.2% of the total health care expenditures for all diseases.[109] Colman estimated direct health care costs due to obesity attributable to Nova Scotia alone in 1997 to be between $68.2 million and $120 million, depending on which diseases and costs are included in the estimate.[110] And when indirect productivity losses of $140 million per year were added, it was possible to conclude that obesity in Nova Scotia cost more than $250 million per year.[111]

Obesity is not only a growing health problem, it is also an economic issue related to poverty and cannot be solely attributed to metabolic diseases or personal health and lifestyle choices.[112]

LePetit and Berthelot, writing for Statistics Canada, used the National Population Health Survey (NPHS), which is a longitudinal survey that interviewed the same individuals every two years from 1994/1995 to 2002/2003, to estimate obesity patterns in Canada.[113] They calculated adjusted risk ratios for overweight men and women aged 20 to 56 years becoming obese by income quintiles. Overweight individuals in low-income households were more than twice as likely to become obese than individuals in high-income households.

A 2007 study by Wei Luo et al. in *Chronic Diseases in Canada* reports relative risks (RR) and population attributable fractions (PAF) for nine chronic diseases and mortality associated with

[107] Makomaski Illing, Eva M., and Murray J. Kaiserman. "Mortality Attributable to Tobacco Use in Canada and Its Regions, 1998," *Canadian Journal of Public Health*, 2004, vol. 95, no. 1: 38-44.
[108] Tanuseputro, Peter, Douglas G Manuel, Mark Leung, Kathy Nguyen, and Helen Johansen. "Risk Factors for Cardiovascular Disease in Canada," *Canadian Journal of Cardiology*, 2003, vol. 19, no. 11: 1249-1259.
[109] Katzmarzyk, Peter T., and Ian Janssen. "The Economic Costs Associated with Physical Inactivity and Obesity in Canada: An Update," *Canadian Journal of Applied Physiology*, 2004, vol. 29, no. 1: 90-115.
[110] Colman, Ronald. *Cost of Obesity in Nova Scotia*, GPI Atlantic and Cancer Care Nova Scotia, 2000; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/obesity/ns-obesity.pdf.
[111] Ibid., accessed.
[112] Drewnowski, Adam, Session Chair. "The Links between Poverty and Obesity." Paper presented at the Poverty and Obesity: Disparities in Diet and Health Interdisciplinary Forum, Exploratory Center for Obesity Research, Seattle, Washington, University of Washington, March 2, 2007; available from http://depts.washington.edu/uwecor/events/poverty_obesity.htm.
[113] LePetit, Christel, and Jean-Marie Berthelot. *Obesity: A Growing Issue*, Statistics Canada, Catalogue No. 82-618-MWE2005003, 2005; accessed Dec 2007; available from http://www.statcan.ca/english/research/82-618-MIE/2005003/pdf/82-618-MIE2005003.pdf.

obesity in Canada.[114] Obese individuals are 2.2 to 5.7 times more likely to become hypertensive than non-obese individuals; RRs for type 2 diabetes can vary dramatically from 1.4 to 47.1; and RR for coronary heart disease ranges from 1.3 to 3.6.[115]

Alcohol and illicit drug use and misuse

Studies reporting associations between poverty or lower socioeconomic status and levels of alcohol and illicit drug use have been mixed. British researchers Martin Frisher et al., who reviewed the literature on predictive factors for illicit drug use among young people, report that some studies have found an association, while other studies have not.[116] However, they also note that lifetime rates of drug dependence do not vary significantly by socioeconomic group.

The Victorian Alcohol and Drug Association in Australia reviewed the literature exploring the link between poverty and levels of alcohol and illicit drug use and, although it found a strong association, it noted that, "research studies have not been able to establish conclusively whether there is a causal link between alcohol and drug use and poverty."[117] However, researchers have been able to establish an association between poverty and alcohol and illicit drug use through barriers and difficulties that users face—alcohol and drug abusers tend to experience barriers and difficulties in the areas of employment, health, housing, legal and financial security (i.e., due to high rates of incarceration). However, a causal link has yet to be established.

Kathleen Kost and Nancy Smyth examined the literature regarding the association between substance abuse and poverty and found that poverty is a clear risk factor for adolescent substance abuse, but that "there is little research documenting the relationship beyond adolescence."[118] They also looked at 11 years of data from the National Longitudinal Survey of Youth in the U.S. and found that children who had a long history (9 or more years) of living with an alcoholic relative and were poor for 6 or more years were at greater risk of having low income and problems with alcohol as adults than those who had a shorter family history of alcoholism and poverty.

In 2006, the Canadian Centre on Substance Abuse (CCSA), in collaboration with over ten organizations including federal, provincial, and territorial agencies and Health Canada, produced a major report on the costs of tobacco, alcohol, and illegal drug use in Canada in 2002.[119] The

[114] Luo, Wei, Howard Morrison, Margaret de Groh, Chris Waters, Marie DesMeules, Elaine Jones-McLean, Anne-Marie Ugnat, Sylvie Desjardins, Morgan Lim, and Yang Mao. "The Burden of Adult Obesity in Canada," *Chronic Diseases in Canada*, 2007, vol. 27, no. 4: 135-144.
[115] Ibid.
[116] Frisher, Martin, Ilana Crome, John Macleod, Roger Bloor, and Matthew Hickman. *Predictive Factors for Illicit Drug Use among Young People: A Literature Review*, U.K. Home Office Online Report 05/07, 2007; accessed Feb 2008; available from http://www.homeoffice.gov.uk/rds/pdfs07/rdsolr0507.pdf.
[117] Victorian Alcohol and Drug Association (VAADA). *The Links between Alcohol and Drug Use and Poverty: Vaada's Submission to the Senate Inquiry into Poverty*, Victoria, Australia, 2003; accessed Feb 2008; available from http://www.vaada.org.au/resources/items/2005/08/16142-upload-00001.pdf.
[118] Kost, Kathleen A., and Nancy J. Smyth. "Two Strikes against Them? Exploring the Influence of a History of Poverty and Growing up in an Alcoholic Family on Alcohol Problems and Income," *Journal of Social Science Research*, 2002, vol. 28, no. 4: 23-52. p. 24.
[119] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007;

report, which was authored by Jurgen Rehm et al., provides the most comprehensive and up-to-date information on this subject available in Canada. The study, which took three years to complete and cost approximately $500,000, began in 2003 and used 2002 data because of the time required to compile the information and complete the analysis. The study builds on an earlier 1996 CCSA study by Single et al., but according to Rehm et al. the two cost estimates are not strictly comparable because of the different methodologies used.[120] However, the underlying epidemiological figures show that, when adjusted for increases in population, alcohol and illegal drug use have increased (while tobacco use, the other substance studied, has decreased).

The authors note that, when referring to alcohol and illegal drug use, they decided to use the terms "use and misuse," rather than "abuse," because these terms:

> cover costs attributable to all consequences associated with the use of psychoactive substances, rather than just those costs associated with physical dependence or heavy use, or with substance-use disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders.[121]

Rehm et al. used prevalence data on levels of alcohol consumption from the 2003/2004 Canadian Addiction Survey (CAS). The CAS did not find heavy drinking to be significantly correlated with income adequacy. However, 18.2% of those with the lowest income adequacy were heavy drinkers, compared with 16.8% in the middle level and 16.1% in the highest level. Among respondents with low income, 8.7% reported weekly heavy drinking and 26.6% reported monthly heavy drinking, compared to 6.7% and 25.5% respectively among those with the highest incomes.

Illicit drugs included in the CAS are cannabis, heroin and other opiates, cocaine and crack, amphetamines, and hallucinogens. Cannabis use was actually highest in the highest income category. In 2004, the CAS found that lifetime experiences with cannabis increased with income adequacy from 42.9% of those with a low income, 44.6% for those with middle incomes, and 54.8% of those with high incomes.[122]

When use is estimated by income adequacy, the percentage of respondents reporting use of any of the other illicit drugs (cocaine, amphetamines, ecstacy, hallucinogens, and heroin) is not consistent between lifetime and past-year use. Of those reporting lifetime use, the percentage of users in the lowest income category (17.9%) is less that the percentage of the highest income users (19.4%). However, among those who report past-year use, the percentage is higher among the lowest income users (4.5%) than among the highest income users (2.8%).

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available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

[120] Single, Eric, Linda Robson, Xiaodi Xie, and Jurgen Rehm. *The Costs of Substance Abuse in Canada. Highlights*, Ottawa: Canadian Centre on Substance Abuse, 1996; accessed Feb 2008; available from http://www.ccsa.ca/NR/rdonlyres/A6B92C8C-4EFB-42DD-8AE2-566B602C2B61/0/ccsa0062771996.pdf.

[121] Rehm, Jurgen, William Gnam, Svetlana Popova, Dolly Baliunas, Serge Brochu, Benedikt Fischer, Jayadeep Patra, Anna Sarnocinska-Hart, and Benjamin Taylor. "The Costs of Alcohol, Illegal Drugs, and Tobacco in Canada, 2002," *Journal of Studies on Alcohol and Drugs*, 2007, vol. 68, no. 6: 886-895. p. 887.

[122] Adlaf, E.M., P. Begin, and E. Sawka, eds. *Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report*. Ottawa, Canadian Centre on Substance Abuse 2005.

The CAS asked respondents whether or not drug use had a harmful effect in areas of: friendships and social life; physical health; home life or marriage; work, studies or employment opportunities; financial position; legal problems; housing; and learning. The odds ratios of those in the lowest compared with the highest income groups who reported one or more types of harm from illicit drug use, show that those in the lowest income group have significantly more harm associated with their drug use than those who are in the highest income group. In the lowest income group 18.9% of past-year users and 36.3% of lifetime users reported one or more harms, compared with 13.1% of past-year users and 17.8% of lifetime users in the highest income category.

Rehm et al. also calculated attributable fractions (AF), which they define as "the fraction of the disease in the population that would not have occurred if the effect associated with the substance under consideration were absent."[123] Relative risk ratios used to calculate the substance-attributable fractions came from the authors' review of the epidemiological literature. However, many the relative risk ratios are the same ratios used by Single et al. in their 1996 study.[124] Rehm et al. note that estimations of relative risks for chronic disease in the epidemiological literature do not take patterns of drinking into account and most of the same relative risks are used for all age groups, which leads to an overestimation of the impacts of alcohol in older age groups. Rehm et al. combine the relative risk ratios with different levels of alcohol consumption for each gender and age group to obtain an AF for each.

After the AFs were calculated they were then applied to respective outcomes such as mortality and hospital days. Specifically, AFs attributable to substance use and misuse were assessed for alcohol and illegal drugs for more than 80 disease categories, deaths, potential years of life lost, hospitalizations, and crimes and charges in the criminal justice system. An AF of 100% was attributed to disease conditions that would not exist without the existence of the substance, such as alcohol dependence, fetal alcohol syndrome, or drug intoxication. The same approach was taken with assigning an AF for the disease conditions caused by illegal drugs.

The Rehm et al. study uses a cost-of-illness approach and calculates direct and indirect costs of substance use and misuse, including alcohol and illegal drug use (as well as tobacco use).[125] Rehm et al. present aggregate costs compared with a hypothetical situation where no substance use or misuse exists. As such, it provides a foundation for other types of studies, such as those measuring avoidable costs, and those assessing specific vulnerable populations such as those living in poverty. Costing data were mostly obtained from the Canadian Institute for Health Information (CIHI).

[123] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed. p. 19.
[124] Single, Robson, Xie, and Rehm. *The Costs of Substance Abuse in Canada. Highlights*, accessed.
[125] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed.

Physical health status

In principle, estimates of the costs of poverty could be constructed for a wide variety of health outcomes, including behavioural risk factors, morbidity measures of self-rated health, the presence of one or more chronic conditions, disability or the number of days not worked due to illness, restrictions on daily activities, and a variety of mortality indicators. The choice of health indicators to use will depend on the purpose of the study. The most important health indicators are reviewed in the literature review with reference to their associations to poverty or low income.

Self-rated health

Self-rated health is a general indicator of overall health and a main health indicator reported by Statistics Canada. Statistics Canada reports self-rated health by gender, but special tabulations are needed to access self-rated health data by income. Self-rated health has repeatedly been shown to correspond to objective measures of outcomes such as chronic disease and mortality.[126] The indicator is based on the question, "In general, would you say your health is: excellent, very good, good, fair, or poor?" This question has routinely been asked of individuals over the age of 12 on health surveys such as the National Population Health Survey (NPHS) (1994–1999) and the Canadian Community Health Survey (CCHS) (beginning 2000/2001).[127]

There is a significant income gradient for self-rated health—those with lower incomes are more likely to report poor health than those with higher incomes across all age groups and for both men and women.

The report, *Statistical Report on the Health of Canadians,* examines self-rated health status data from the 1996/1997 NPHS and reports results by income.[128] Of the population over the age of 12, 25% rated its health as excellent, 38% as very good, 27% as good, 7% as fair, and 2% as poor. A definite gradient was seen in responses by income level—21% of low-income individuals rated their health as fair or poor compared with 5% of individuals in the highest income category, and only 19% in the lowest group rated their health as excellent, compared with 33% of those with the highest incomes.

Stephane Tremblay et al. used data from the 2000/2001 CCHS to examine both individual and regional socioeconomic contexts and health.[129] Of those who reported fair or poor health the highest proportions were in the lowest (27.6%) and lower-middle (26.6%) income categories. In the middle-income category, 18.3% reported fair or poor health and in the upper-middle income

[126] Health Canada. *Statistical Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.hc-sc.gc.ca/hppb/phdd/report/stat/pdf/english/all_english.pdf.
[127] Statistics Canada. *Health Indicators. Health Status. Well-Being: Self-Rated Health*, Catalogue No. 82-221-XIE, 2007; accessed Jan 2008; available from http://www.statcan.ca/english/freepub/82-221-XIE/2004002/defin1.htm#selfrated.
[128] Health Canada. *Statistical Report on the Health of Canadians*, accessed.
[129] Tremblay, Stéphane, Nancy Ross, and Jean-Marie Berthelot. "Regional Socio-Economic Context and Health," *Health Reports*, 2002, vol. 13: 33-44. accessed Nov 2007; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002003.pdf.

category, which is used as the reference category to estimate odds ratios, 10.2% reported fair or poor health. In the highest income category 5.7% reported the same.

Chronic disease: cardiovascular disease, cancer, respiratory disease, diabetes

Chronic diseases—many of which are preventable—contribute a significant portion of health costs for Canadians. These diseases not only cause premature mortality, but they also contribute to adverse effects on the quality of life of the individuals affected by the diseases, as well as that of their friends, relatives, caretakers, and employers. Many of the same social, economic, and psychosocial factors, including poverty, income disparity, and the resulting lack of resources, are associated with the development of almost every chronic disease.[130]

Chronic disease is most often studied in terms of mortality data, which the Heart and Stroke Foundation of Canada notes is primarily due to data availability.[131] Wilkins et al. have calculated the risk ratio and risk difference, by gender and neighbourhood income quintile for mortality in urban Canada between 1971 and 1996 for a number of chronic diseases such as ischemic heart disease, lung, breast and prostate cancer, and diabetes.[132] Table 53 in the Appendices shows these rate ratios, which can also be used to calculate population attributable fractions relating income and chronic disease mortality.

Cardiovascular disease

According to Raphael, income disparities contribute to cardiovascular disease independently of risk behaviours such as smoking, diet, and physical exercise, which are often the main risk factors studied in connection with chronic diseases.[133] Raphael notes that cardiovascular disease is the disease that is most associated with low income among Canadians.

Cancer

The Canadian Cancer Society, Statistics Canada, and other organizations report annual cancer statistics with a lag time of several years. For example, the 2007 report notes that at that time, 2003 data were the most recent. However, *Canadian Cancer Statistics* last reported cancer rates by income level in 1990.[134] The 2007 report does note, “Lower socio-economic status has been associated with higher cancer mortality in general, and with an increased incidence of certain cancers, such as cervical cancer, but a decreased incidence of breast cancer.”[135]

[130] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed.
[131] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[132] Wilkins, Russell, Jean-Marie Berthelot, and Edward Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.
[133] Raphael, Dennis. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, Toronto: North York Heart Health Network, 2001; accessed Nov 2007; available from http://action.web.ca/home/narcc/attach/Inequality%20is%20Bad%20for%20Our%20Hearts%20-%202001%20Report%5B1%5D.pdf.
[134] Canadian Cancer Society. *Canadian Cancer Statistics 2007*, Canadian Cancer Society, National Cancer Institute of Canada, Statistics Canada, Provincial/Territorial Cancer Registries, and Public Health Agency of Canada, 2007; accessed Jan 2008; available from http://www.cancer.ca/vgn/images/portal/cit_86751114/36/15/1816216925cw_2007stats_en.pdf.
[135] Ibid., accessed. p. 17.

Several epidemiological studies have found an association between low socioeconomic status and cancer. In 1996, Wilkins et al. found that both prostate and breast cancer mortality were higher in the more affluent income groups in urban Canada than in poorer groups.[136] Lung cancer mortality, on the other hand, was more prevalent in lower income groups and its incidence in general is higher than that of prostate and breast cancer.

Respiratory disease—asthma

Asthma is the most common chronic disease of childhood. Although mortality rates for asthma in Canada have declined since 1984, prevalence rates have nearly doubled since at least 1994.[137] In 2003, 8.4% of the population, or approximately 2.2 million people, had asthma.[138] Asthma is highest among children ages 0 to 19 years, although rates increase again after the age of 45. In 2001, asthma was among the top five leading causes of hospitalization, with 5%–7% of people with asthma requiring hospitalization. Murray Krahn et al. estimated the direct and indirect costs of asthma in Canada to be between $504 million and $648 million in 1990 (current dollars).[139]

Research has consistently shown an inverse association between asthma and socioeconomic status. Diane Gold and Rosalind Wright of Harvard Medical School note that asthma disparities have been well-documented in the U.S. in the past two decades, "though the environmental exposures contributing to these disparities are only partially understood."[140]

Lethbridge and Phipps used data from the 2000 National Longitudinal Survey of Children and Youth (NLSCY) to examine the role that poverty plays with regards to asthma rates in children between the ages of 2–7 years.[141] The results showed that children living in chronic poverty in the Maritimes have asthma rates (20.9%) more than 30% higher than the national average (12.4%). Chronically poor children living in the Maritimes were 1.5 times more likely to have had a recent asthma attack than children not living in poverty.

Diabetes

Diabetes has consistently been associated with low-income levels.[142] Raphael presents evidence linking material deprivation, psychosocial stress and the adoption of unhealthy behaviours to an

[136] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[137] Lethbridge, Lynn N., and Shelley A. Phipps. "Chronic Poverty and Childhood Asthma in the Maritimes Versus the Rest of Canada," *Canadian Journal of Public Health*, 2005, vol. 96, no. 1: 18-23.
[138] Chen, Yue, Helen Johansen, Satha Thillaiampalam, and Christie Sambell. "Asthma," *Health Reports*, 2005, vol. 16, no. 2: 43-46.
[139] Krahn, Murray 0., Catherine Berka, Peter Langlois, and Allan S. Detsky. "Direct and Indirect Costs of Asthma in Canada, 1990," *Canadian Medical Association Journal*, 1996, vol. 154, no. 6: 821-831.
[140] Gold, Diane R., and Rosalind Wright. "Population Disparities in Asthma," *Annual Review of Public Health*, 2005, vol. 26: 89-113. p. 95.
[141] Lethbridge, and Phipps. "Chronic Poverty and Childhood Asthma in the Maritimes Versus the Rest of Canada."
[142] Raphael, Dennis, Susan Anstice, Kim Raine, Kerry R. McGannon, Syed Kamil Rizvi, and Vanessa Yu. "The Social Determinants of the Incidence and Management of Type 2 Diabetes Mellitus: Are We Prepared to Rethink Our Questions and Redirect Our Research Activities?," *Leadership in Health Services*, 2003, vol. 16, no. 3: 10-20.

increase in the incidence of diabetes.[143]

Using the Ontario Diabetes Database, Janet Hux and Mei Tang found a significant socioeconomic gradient with higher rates of diabetes among lower income quintiles, especially in the 35–64 year age group.[144] The overall prevalence in the lowest income quintile was 7.8% compared with 5.1% in the highest quintile.

The Heart and Stroke Foundation of Canada presents prevalence of type 2 diabetes data from the 2000/2001 CCHS by income adequacy, which divides household income into quartiles. Men and women in the lower and lower middle categories had a higher prevalence of diabetes (7.2% and 6.9%, respectively) than those in the upper middle and highest income categories (3.9% and 2.9%, respectively).

Using data from the 2000/2001 CCHS, Craig et al. found that the chance of having diabetes decreased with higher income.[145] They divided respondents into two income groups—low income and middle/high-income. Odds ratios (OR) were adjusted for age, education, income, marital status, language, ethnicity, region, lifestyle factors, and body mass index. OR for high-income men was 0.682 (95% CI 0.550–0.845) and for high-income women 0.512 (95% CI 0.419–0.624).[146]

Unintentional traumatic injuries

Unintentional traumatic injuries are a burden to society not only because of the disability, pain, and suffering they cause, but also because of the resulting health costs to society and potential life lost.[147] Traumatic injuries are the leading cause of death among those under the age of 45, and are responsible for 56% of deaths for children and adolescents between the ages of 1–19 years.[148] They are also the second largest contributor to potential years of life lost (after cancer) before the age of 70.[149] It is estimated that 90% of injuries are preventable.[150] Health Canada reports that injury mortality declined by 40% between 1980 and 1997, mainly because of a

143 Ibid.
144 Hux, Janet E., and Mei Tang. "Patterns of Prevalence and Incidence of Diabetes," in *Diabetes in Ontario: An ICES Practice Atlas*, ed. Hux, Janet E., Gillian Booth, P.M. Slaughter and A. Laupacis, Chapter 1. Toronto: Institute for Clinical Evaluative Sciences, 2003; accessed Nov 2007; available from http://www.ices.on.ca/file/DM_Chapter1.pdf.
145 Craig, Cameron, and Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, accessed.
146 Ibid., accessed.
147 Cubbin, Catherine, and Gordon S. Smith. "Socioeconomic Inequalities in Injury: Critical Issues in Design and Analysis," *Annual Review of Public Health*, 2002, vol. 23: 349-375.
148 Health Canada. *National Statistics and Trends: Injury in Canada*, 1999; accessed Dec 2007; available from http://www.injurypreventionstrategy.ca/downloads/HC_stat.pdf.
149 Public Health Agency of Canada. *Facts on Injury*, 2007; accessed Dec 2007; available from http://www.phac-aspc.gc.ca/injury-bles/facts_e.html.
150 McKeag, Ali Moses, Fang Yang, and Margaret Keresteci. *National Trauma Registry Report: Major Injury in Canada, 2004 - 2005*, National Trauma Registry, Canadian Institute for Health Information, 2006; accessed Dec 2007; available from http://secure.cihi.ca/cihiweb/products/NTR_Major_Injury_in_Canada_2006.pdf.

reduction in deaths associated with motor vehicle collisions.[151] Marni Brownell et al. suggest that injuries should not be referred to as being—or being caused by— "accidents," since this implies that the incidents are "random and beyond our control."[152]

Evidence of the associations between injuries and low socioeconomic status are mixed. Generally, there is a strong association between low income and mortality rates due to injuries, but several studies have found the association with morbidity rates weak. However, one study from Manitoba concluded: "Clearly, injuries are not random events but are related to social factors, including income level, and the overall healthiness and socioeconomic well-being of the population."[153]

The most recent national data on major injury in Canada are available for 2004–2005 through the National Trauma Registry Report at the Canadian Institute for Health Information (CIHI).[154] The data are reported annually, and 2005–2006 data are scheduled to be released in 2008.

Injury attributable to socioeconomic status

Catherine Cubbin and Gordon Smith reviewed the international literature published between 1960 and 2002 on socioeconomic status and fatal/nonfatal injuries.[155] They found a strong association between socioeconomic status and fatal unintentional injuries (and homicides), but the relationship with nonfatal injuries was less consistent. This is also the case with Canadian reports of injuries. The strength of the socioeconomic/injury relationship varies according to the type of injury, the ages affected, the injury outcome, gender, and place of occurrence.[156] Generally, injuries due to motor vehicle crashes and sports and recreation are more likely to be experienced by individuals with high socioeconomic status, because of their higher rates of participation in these types of activities.

According to David Hay et al., rural residents face a disproportionate number of traumatic deaths. Approximately 31% of Canadians live in rural areas, but 70% of traumatic deaths occur in these areas, and the mortality rate of these injuries is twice that of urban Canadians with similar injuries.[157] Occupational hazards create unique patterns of injury in rural areas from farming, forestry, mining, and fishing. Hay et al. note that "road accidents, bad weather, poor roads, lack of vehicle maintenance and inadequate use of restraint systems all contribute to the increased mortality rates."[158]

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151 Health Canada. *National Statistics and Trends: Injury in Canada*, accessed.
152 Brownell, Marni, David Friesen, and Teresa Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences," *Canadian Journal of Public Health*, 2002, vol. 93, no. S2: S50-S56.
153 Ibid. p. S55.
154 McKeag, Yang, and Keresteci. *National Trauma Registry Report: Major Injury in Canada, 2004 - 2005*, accessed.
155 Cubbin, and Smith. "Socioeconomic Inequalities in Injury: Critical Issues in Design and Analysis."
156 Alberta Centre for Injury Control and Research. *Socioeconomic Status and Injury*, 2006; accessed Dec 2007; available from http://www.acicr.ualberta.ca.
157 Hay, David, Judi Varga-Toth, and Emily Hines. *Frontline Health Care in Canada: Innovations in Delivering Services to Vulnerable Populations*, Canadian Policy Research Networks Inc., 2006; accessed Nov 2007; available from http://www.cprn.org/documents/45652_en.pdf.
158 Ibid., accessed. p. 8.

Russell Wilkins et al. used data from the Canadian Mortality Data Base and census tracts to examine mortality trends in urban Canada by neighbourhood income. According to Wilkins et al., those living in the poorest income quintile suffered higher injury mortality rates—other than from motor vehicle crashes and suicides— for injuries such as falls, poisoning, drowning, fires, etc. than did those living in the highest income quintile.[159] However, income differences in mortality rates for pedestrians struck by motor vehicles show very little income difference, and the mortality of occupants in motor vehicle crashes is reversed by income difference, with those in the highest income quintile having the highest rates. Wilkins et al. note that this may be due to the different exposures to risk. In other words, those living in poorer neighbourhoods may travel by motor vehicle less often than those living in more affluent neighbourhoods.

Wilkins et al. calculated the age-standardized mortality rates per 100,000 population, and the risk ratios and risk differences for injuries—excluding motor vehicle traffic crashes, mortalities of pedestrians in motor vehicle traffic crashes, motor vehicle occupants in traffic crashes, and suicide—by gender and neighbourhood income quintile for urban Canada between 1971 and 1996. Table 42 showing these rates can be found in the Appendices.

Childhood injury

In 1997, Choiniere reported that children living in the poorest urban neighbourhoods in Canada had a 39% higher mortality rate and a 25% higher hospitalization rate due to injuries than children living in the wealthiest urban neighbourhoods.[160]

Catherine Birken et al. examined mortality and census tract data to determine the influence of socioeconomic status—measured by the proportion of families living below the low-income cut-off level in a census tract—on trends in the rates of death of children aged 14 and under from unintentional injuries in urban Canada from 1971–1998.[161] They found a large drop in mortality rates from 1971 to 1998 for both high- and low-income children. The rate for high-income children fell from 12.39 per 100,000 children in 1971 to 2.74 in 1998. The rate for low-income children fell from 25.33 per 100,000 children in 1971 to 5.90 in 1998. However, despite the large drop in mortality rates, the *relative* mortality rate changed very little. The rate ratio of lowest–highest income quintiles actually rose from 2.04 in 1971 to 2.15 in 1998, and low-income children remained over twice as likely to die from unintentional injuries and high-income children.

Marni Brownell et al. also report that income differences were greater for some types of injuries than others. Income was not significantly associated with deaths due to motor vehicle crashes, poisonings, or suicide, but "children in the lowest income group were 1.5 times more likely to

[159] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[160] Choiniere, R. "Injury-Related Mortality and Hospitalization Disparities," in *For the Safety of Canadian Children and Youth: From Injury Data to Preventive Measures*, ed. Health Canada. Ottawa: Minister of Public Works and Government Services, Canada, 1997. Cited in Brownell, Friesen, and Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences."
[161] Birken, Catherine S., Patricia C. Parkin, Teresa To, and Colin Macarthur. "Trends in Rates of Death from Unintentional Injury among Canadian Children in Urban Areas: Influence of Socioeconomic Status," *Canadian Medical Association Journal*, 2006, vol. 175, no. 8: 867-868.

die from drowning, twice as likely to die from falls, over 4 times more likely to die from homicide, and over 18 times more likely to die from fires."[162] Income was significantly associated with hospitalization rates for children from the poorest neighbourhoods, which were "1.5 times higher for choking and suffocation, over 1.5 times higher for suicide attempts, 2 times higher for poisonings, over 2 times higher for fires and burns, and almost 3 times higher for violent attacks."[163] For hospitalizations due to injury there were no income effects observed in regards to falls or motor vehicle crashes.

Mental health

A variety of mental illness-related disorders cause varying degrees of distress and disability in the Canadian populace. These disorders include mood disorders, such as major depressive episodes, bipolar disorder, or dysthymia, schizophrenia, anxiety disorders, personality disorders, eating disorders, and suicidal behaviour.[164] The World Health Organization (WHO) has attributed approximately 14% of the global burden of disease to "neuropsychiatric disorders, mostly due to the chronically disabling nature of depression and other common mental disorders, alcohol-use and substance-use disorders, and psychoses."[165] However, Martin Prince et al., writing recently in *The Lancet,* suggest that the prevalence of mental disorders is likely underestimated because of "inadequate appreciation of the connectedness between mental illness and other health conditions…. Mental disorders increase risk for communicable and non-communicable diseases, and contribute to unintentional and intentional injury."[166]

Research has consistently shown a strong association between poverty or low socioeconomic status (SES) and mental illness.[167] According to Carles Muntaner et al., who conducted a review of the literature on the associations between socioeconomic position (SEP) and major mental disorders, there is more of an association between SEP and depression than between SEP and anxiety disorders because the diagnosis for these disorders has been subject to more fluctuation.[168] However, the authors note that evidence from the U.S. Epidemiologic Catchment Area Study "consistently suggest that lower socioeconomic status groups have a higher prevalence of panic, all types of phobias, and generalized anxiety disorder. The evidence is less conclusive for obsessive-compulsive disorder."[169] The evidence for an association between schizophrenia and SEP, especially for low income, has been mixed, although most studies do

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[162] Brownell, Marni, David Friesen, and Teresa Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences," *Canadian Journal of Public Health*, 2002, vol. 93, no. S2: S50-S56. p. S55.
[163] Brownell, Friesen, and Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences." p. S55.
[164] Haydon, Emma, Michael Roerecke, Norman Giesbrecht, Ju_rgen Rehm, and Marianne Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association, 2006; accessed Dec 2007; available from http://www.ocdpa.on.ca/docs/CDP-FullReport-Mar06.pdf.
[165] Prince, Martin, Vikram Patel, Shekhar Saxena, Mario Maj, Joanna Maselko, Michael R Phillips, and Atif Rahman. "Global Mental Health 1. No Health without Mental Health " *The Lancet*, 2007, vol. 370: 859-877. p. 859.
[166] Ibid. p. 859.
[167] The terms SES and SEP are used interchangeably. In this report, the terms used by the original author are retained.
[168] Muntaner, Carles, William W. Eaton, Richard Miech, and Patricia O'Campo. "Socioeconomic Position and Major Mental Disorders," *Epidemiologic Reviews*, 2004, vol. 26: 53-62.
[169] Ibid. p. 53.

show a higher risk for those living on low income. Referring mainly to studies conducted in the U.S. and U.K., Muntaner et al. note:

> Although studies to date in the area of mental health have been descriptive or exploratory, findings on associations between residential poverty (e.g., indices of deprivation, disadvantage or poverty rate indicators) and mental health are consistent across type of study, country, level of aggregation, and outcome.[170]

In 2003, U.K. researchers Tom Fryers et al. also conducted a systematic review of the evidence from large-scale population studies conducted since 1980 on the associations between social inequalities and 'common mental disorders.'[171] They defined these disorders as "widespread 'neuroses,' mostly anxiety and depression, often combined," but not the more severe disorders such as schizophrenia, depressive psychosis, bi-polar disorder, organic psychoses and the dementias.[172] In the nine studies that met their criteria, the authors found that the most consistent associations were with low income or material standard of living, less education, and unemployment, and concluded that "common mental disorders are significantly more frequent in socially disadvantaged populations."[173]

Odds ratios in these studies—most of which were from the U.S. and U.K.—which all associated low income with depression and compared individuals in the highest and lowest income categories, ranged from 1.11–2.25 for women and 1.53–2.59 for men.[174] These results are unusual because they show men have a higher risk for depression, which is the opposite of what is typically found.

Depression

Low-income individuals have consistently been found to be at a higher risk of depression relative to high-income individuals.[175] Muntaner et al. note that most longitudinal studies suggest a causal direction from SEP to depression and anxiety rather than from depression to low SEP.[176] They also report the evidence indicates that the association between low-SEP and depression reflects both short-term influences in adulthood such as financial hardship and job insecurity, as well as long-term influences rooted in child and adolescent life stages.

Lorant et al. suggest that "poorer coping styles, ongoing life events, stress exposure, and weaker social support are some examples of psychiatric risk factors that are more prevalent in lower SES groups."[177] Social and emotional supports have been found to be protective factors for depression

[170] Ibid. p. 57.
[171] Fryers, Tom, David Melzer, and Rachel Jenkins. "Social Inequalities and the Common Mental Disorders. A Systematic Review of the Evidence " *Social Psychiatry and Psychiatric Epidemiology*, 2003, vol. 38: 229-237.
[172] Ibid. p. 234.
[173] Ibid. p. 229.
[174] Confidence intervals (CI) – for women: 1.11 (0.87–1.41), 2.25 (1.85–2.74); for men: 1.53 (1.12–2.09), 2.59 (1.99–3.37)
[175] Stewart, Donna E., Enza Gucciardi, and Sherry L. Grace. *Depression*, Women's Health Surveillance Report, Canadian Institute for Health Information, 2003; accessed Dec 2007; available from http://www.phac-aspc.gc.ca/publicat/whsr-rssf/pdf/WHSR_Chap_18_e.pdf.
[176] Muntaner, Eaton, Miech, and O'Campo. "Socioeconomic Position and Major Mental Disorders."
[177] Lorant, V., D. Delie_ge, W. Eaton, A. Robert, P. Philippot, and M. Ansseau. "Socioeconomic Inequalities in

among both high- and low-income individuals.[178] In Canada, lone parenthood has been found to be particularly associated with depression in women, and lone mothers are twice as likely to experience a major depressive episode than other women (15% compared with 7%, respectively).[179]

A 2003 meta-analysis of the research on socioeconomic position and depression by Belgian researchers Lorant et al. found that persons in the lowest socioeconomic group had odds of reporting depression about 1.81 (CI – 1.57–2.10) times higher than those in the highest socioeconomic group.[180] Most of the studies reviewed used education as the measure of socioeconomic status. However, of the four that specifically used income as the main measure and compared the highest and lowest income groups with depression, three studies had higher odds ratios.

In Canada, Beaudet reports that in the 1994/1995 NPHS, men in the lowest household income quartile were twice as likely as men in the highest quartile to experience depression, and that 10% of women in the lowest quartile experienced major depression compared with 7% of women in the highest quartile.[181]

Using the 2000/2001 CCHS, Katherine Smith et al. of the University of Toronto found the prevalence of depression in Canadian urban centres for adults aged 18–74 years was 9.2% overall, with 6.8% for men and 11.4% for women.[182] Among the low-income individuals (9.9% of total population) the depression rate was 14.5%, with 10.8% for low-income men (8.2% of total population) and 17.1% for low-income women (11.6% of total population).[183] This compares with middle/high-income individuals where the depression rate was 8.7%, with 6.5% for men and 11% for women. Across all categories, women had higher depression rates than men, with those who were lone parents having the highest rates (19.2%). The odds ratios for low-income vs. middle/high income were calculated as 1.37 overall, 1.31 for men, and 1.42 for women.

Mortality and Suicide

In addition to poverty, suicide is associated with many factors, such as physical illness, substance abuse, family violence, and social isolation.[184] Russell Wilkins et al. of Statistics Canada associated neighbourhood income quintiles with mental health for urban Canada between 1971

Depression: A Meta-Analysis " *American Journal of Epidemiology*, 2003, vol. 157, no. 2: 98-112. p. 98.
[178] Beaudet, Marie P. "Psychological Health - Depression," *Health Reports*, 1999, vol. 11, no. 3: 63-75.
[179] Ibid.
[180] Lorant, Deliege, Eaton, Robert, Philippot, and Ansseau. "Socioeconomic Inequalities in Depression: A Meta-Analysis ".
[181] Beaudet, Marie P. "Depression," *Health Reports*, 1996, vol. 7, no. 4: 11-24.
[182] Smith, Katherine L.W. Smith, Flora I. Matheson, Rahim Moineddin, and Richard H. Glazier. "Gender, Income and Immigration Differences in Depression in Canadian Urban Centres," *Canadian Journal of Public Health*, 2007, vol. 98, no. 2: 149-153. Low income – <$15,000 for 1–2 people, <$20,000 for 3–4 people, <$30,000 for 5+ people. Low income – n = 3,785 (9.88%), middle / high income – n = 34,528 (90.12%); 95% CI – low income total = 13.20–15.83; men – 8.93–12.65; women – 15.29–18.85.
[183] The low income categories were <$15,000 for 1–2 people, <$20,000 if 3–4 people, <$30,000 if 5+ people.
[184] Stewart, Gucciardi, and Grace. *Depression*, accessed.

and 1996.[185] They calculated the age-standardized mortality rates due to mental disorders and suicide per 100,000, by gender and neighbourhood income quintile, risk ratios and risk differences comparing the highest and lowest quintiles, and population attributable risk ratios. For both men and women, however, the disparity between rates for the low- and high-income groups is substantial. For example, for males in the highest income category, the suicide rate in 1996 was 15.6% and for males in the lowest income category the rate was 27.5%.

Mortality and summary measures

Data on income and other measures of socioeconomic status are not routinely collected at the time of death in Canada, so most reports on the association between income and mortality from various diseases link neighbourhood data from the census tract of the last known residence of the deceased with mortality data in order to estimate the individual's income.[186] According to Raphael, this method produces conservative estimates of the relationship between low income and mortality rates.[187] Also, the method is not always accurate because it does not capture mortality rates for those low-income individuals who live in more affluent neighbourhoods, and conversely, may include high-income individuals who live in low-income neighbhourhoods.

General mortality

One of the most important and widely cited studies on the relationship between poverty or low income and mortality patterns is that conducted by Wilkins, Berthelot, and Ng of Statistics Canada, which examined changes in income-related differences in mortality rates in urban Canada from 1971 to 1996.[188] Because of its relevance to the poverty–health association, and as one of the few studies to calculate both absolute rate differences and relative risk (RR) ratios based on income differences, the study is discussed in detail in Section 5.5.1 of the literature review. For estimating the cost of poverty, the relative ratios from 1996 could be used for both mortality and morbidity, because more recent rates have not been calculated and since the rates did not, for the most part, dramatically change in the 1990s. However, prevalence and incidence rates would need to be updated. In addition, in comparing the results of their study with other international studies, the authors remark:

> Thus, the differentials found for Canada appear to be reasonable estimates of what might have been found with individual-level methods and longitudinal study designs and are not simply due to differences in risk factors across the quintiles.[189]

The Wilkins et al. study included residents of Canadian census metropolitan areas (CMAs),

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[185] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[186] Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.
[187] Ibid., accessed.
[188] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[189] Ibid. p. 11.

which represent about 60% of the population. According to Wilkins et al., "segregation by income is more pronounced in big cities than in small towns and rural areas."[190]

Approximately 357,000 deaths were analyzed by neighbourhood income quintile.[191] Within each CMA, the neighbourhoods were grouped by quintiles that were based on the percentage of population in the neighbourhood living below the low-income cut-off for that year, which varied according to CMA and family size. In the quintile grouping, the richest quintile neighbourhood had the fewest number of households living below the LICO, and the poorest quintile neighbourhood had the highest number of households living below the LICO. In 1996, the percentage in each neighbourhood income quintile who were living below the low-income cut-off were:

- total population living below the low-income cut off in all quintiles– 21.5%
- quintile 1 (richest) – 7.6%
- quintile 2 – 12.8%
- quintile 3 – 19.2%
- quintile 4 – 27.1%
- quintile 5 (poorest) 41.7%

The two poorest quintiles had lower average income, a higher percentage of lone parent families, a higher percentage of renters, lower levels of education, a higher unemployment rate, and a lower percentage of people with professional and managerial occupations.

Rate ratios were calculated by dividing mortality rates for the poorest quintile by mortality rates for the richest quintile, and rate differences were calculated by subtracting the mortality rate for the richest quintile from that for the poorest quintile. Excess mortality was defined as the age-standardized mortality rate for the total population less the rate of the richest quintile.

Results for general mortality trends show that for all quintiles and both men and women there was a decline in mortality for most causes of death between 1971 and 1996. However the pattern in each year showed the highest mortality rates in the lowest quintile compared with those in the highest quintile, and the relative rates declined by a lesser extent than absolute rates.

Other studies in Canada at the provincial level have also shown a negative association between low income and mortality rates. For example, Cameron Mustard et al. examined age-specific socioeconomic differences in morbidity and mortality by education and household income for adults aged 15 years and over in Manitoba.[192] The study linked data from records of health care utilization and vital statistics to the 1986 census. Mortality was inversely associated with both income and education, but this association was more consistent for income.

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[190] Ibid. p. 2.

[191] These were 73,990 deaths in 1971, 88,129 in 1986, 93,328 in 1991, and 101,786 in 1996, which represented 98% of non-institutional deaths in 1971 and 99% of non-institutional deaths in subsequent years.

[192] Mustard, Cameron A., Shelley Derksen, Jean-Marie Berthelot, Michael Wolfson, and Leslie L. Roos. "Age-Specific Education and Income Gradients in Morbidity and Mortality in a Canadian Province," *Social Science & Medicine*, 1997, vol. 45, no. 3: 383-397.

Diabetes

Diabetes is one of the few chronic diseases for which mortality rates have been increasing, especially among males in the lowest income group. According to Wilkins et al., rates for mortality caused by diabetes for males in the lowest income group increased from 17.1% in 1971 to 21.2% in 1996.[193] This compares with rates for males in the highest income group, which decreased from 15.0% in 1971 to 13.5% in 1996.
Mortality rates for diabetes for females also declined between 1971 and 1986. Since 1986 the rates have remained steady for high-income groups, but have increased for low-income groups. The mortality rate for low-income females increased from 10.6% in 1991 to 13.4% in 1996. This compares with mortality rates for high-income females, which were 9.1% in both 1991 and 1996. According to Wilkins et al. the relative risk ratio between the highest and lowest income quintiles for diabetes mortality in 1996 were 1.56 for males, and 1.47 for females.

Other causes of mortality

According to Wilkins et al., most mortality rates have declined for all causes, but the disparity between the high- and low-income groups remains significant in almost all cases.[194] However, mortality rates have increased and income disparities have also increased for lung cancer in females, and for infectious diseases, mental disorders, and diabetes for both men and women. Infectious diseases are mainly HIV/AIDS, but the risk of tuberculosis is increasing in low-income groups.

For cirrhosis of the liver among females there are no income differences, but the differences among males are still strong. Also, there is little income difference in mortality rates for breast and prostate cancer, but the incidence is stronger in the higher income groups. Lung cancer mortality rates for males were higher for lower-income groups.

In sum, Wilkins et al. have calculated the age-standardized mortality rates per 100,000 and the risk ratio and risk difference, by gender and neighbourhood income quintile for urban Canada between 1971 and 1996 for the following: ischemic heart disease; cirrhosis of the liver; uterine cancer; lung, breast and prostate cancer; diabetes; perinatal conditions; pedestrians in motor vehicle traffic collisions; motor vehicle collision occupants; injuries except motor vehicle traffic accidents and suicide; suicide; mental disorders; infectious diseases; and ill-defined conditions. These rates can be found in Table 42 in the Appendices.

Infant mortality

In Canada, Wilkins et al. calculated the infant mortality rate per 1,000 by neighbourhood income quintile, as well as rate ratios between the highest and lowest neighbourhood income quintiles in urban Canada from 1971 to 1996.[195] In 1996, the absolute mortality rate in the lowest income quintile was 6.4 deaths for every 1,000 live births, and in the highest income quintile it was 4.0

[193] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[194] Ibid.
[195] Ibid.

deaths for every 1,000 live births. According to Wilkins et al., the absolute rate difference between infant mortality in the lowest and highest income quintiles in urban Canada declined from 9.8 per 1,000 in 1971 to 2.4 per 1,000 in 1996.[196]

However, the relative rate ratios declined much less—from 1.97 in 1971 to 1.61 in 1996. In other words, in 1996, infants born in families in the lowest income quintile were 60% more likely to die before the age of one than infants born into families in the highest income quintile.

Luo et al., including Wilkins, of Statistics Canada recently completed two studies of birth outcomes by neighbourhood income in British Columbia and Quebec.[197, 198] Both studies showed that neighbourhoods with low socioeconomic status, especially in urban areas, were associated with higher risks of neonatal death (0–27 days) and postneonatal death (28–264 days), as well as with pre-term birth, low birthweight, and stillbirth. Differences in adverse outcomes related to neighbourhood income remained after accounting for maternal characteristics such as education, age, marital status, and ethnicity.

Life expectancy at birth

Statistics Canada defines life expectancy at birth as a standardized statistical indicator of the number of years a person would be expected to live, starting from birth, based on “mortality statistics for a given period, typically a calendar year.”[199] It adds that life expectancy is “related to socio-economic factors such as poverty and education.”[200] Women consistently have higher life expectancy than men, although the gap is shrinking. Life expectancy has been rising at least since 1920 when it was 59 years for males and 61 years for females.[201] Recent statistics reporting the 2006 Census now list life expectancy at 82.5 years for women and 77.7 years for men.[202]

Statistics Canada has calculated the life expectancy at birth by income group and gender for Canada and the provinces for 2001.[203] The calculation is based on work by Wilkins et al. who used 1996 life tables to calculate life expectancy by income terciles. Statistics Canada notes:

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[196] Ibid.

[197] Luo, Z., W.J. Kierans, R. Wilkins, R.M. Liston, J. Mohamed, and M.S. Kramer. "Disparities in Birth Outcomes by Neighbourhood Income: Temporal Trends in Rural and Urban Areas, British Columbia," *Epidemiology*, 2004, vol. 15, no. 6: 679-686.

[198] Luo, Zhong-Cheng, Russell Wilkins, and Michael S. Kramer. "Effect of Neighbourhood Income and Maternal Education on Birth Outcomes: A Population-Based Study," *Canadian Medical Association Journal*, Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System, 2006, vol. 174, no. 10: 1-7. accessed Dec 2007; available from http://www.cmaj.ca/cgi/reprint/174/10/1415

[199] Statistics Canada. *Comparable Health Indicators 2006. 36b-HLT Life Expectancy by Income*, Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/36bhlt.htm.

[200] Ibid., accessed.

[201] ________. *Life Expectancy at Birth, by Sex, by Province*, 2005; accessed Dec 2007; available from http://www40.statcan.ca/l01/cst01/health26.htm.

[202] ________. "2006 Census: Age and Sex." *The Daily*, July 17, 2007, accessed Dec 2007; available from http://www.statcan.ca/Daily/English/070717/d070717a.htm.

[203] ________. *Comparable Health Indicators 2006. 36b-HLT Life Expectancy by Income*, accessed.

> Average income for each enumeration area (EA) was calculated and then EAs were assigned to the bottom, middle, or highest income tercile. Deaths were coded to the EA based on postal codes. The life tables were then constructed using deaths assigned to each income tercile. … The 1996 percentage of deaths in each tercile is being applied to the 2000/01 abridged life table (i.e. if 40% of deaths occurred in the lowest income tercile in 1996 then 40% of deaths occurred in the lowest income tercile in 2000/01).[204]

The life expectancy calculations made by Statistics Canada clearly reveal an income gradient in life expectancy, with high-income males living 3.2 years longer than low-income males, and high-income females living 1.1 years longer than low-income females.[205]

Health-adjusted life expectancy (HALE)

Life expectancy measures the number of years one might be expected to live, but it does not consider the quality of the life lived. Health-adjusted life expectancy (HALE) measures both quantity and quality of life. It is a standardized statistical indicator that combines mortality data with health status data to produce a summary measure that represents "the number of expected years of life equivalent to years lived in full health, based on the average experience in a population."[206] Marthe Gold et al. note that HALEs, which they refer to as "health-adjusted life years" or HALYs, are useful for "overall estimates of burden of disease, comparisons of the relative impact of specific illnesses and conditions on communities, and in economic analyses."[207]

HALE is calculated at birth, based on data for those aged 15 years and over, and for those aged 65. HALE varies considerably by gender—while women live longer lives than men, their lives are not necessarily free of illness.

In addition to life expectancy, Statistics Canada has also calculated HALE at birth by income group and gender for Canada and the provinces for 2001.[208] The calculation is based on the same

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[204] Ibid., accessed.

[205] ________. *Table 36b1-HLT Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/tables/dt006.htm.

[206] ________. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy (HALE)*, Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/37bhlt.htm.

[207] Gold, Marthe R., David Stevenson, and Dennis Fryback. "HALYs and QALYs and DALYs, Oh My: Similarities and Differences in Summary Measures of Population Health," *Annual Review of Public Health*, 2002, vol. 23: 115-134. p. 115. They explain that HALY is a broad category of measures that include HALE, QALY (quality-adjusted life years) and DALY (disability-adjusted life years). According to Gold et al., QALYs are mainly used in cost-utility analyses of medical interventions. The World Bank and World Health Organization developed DALYs as a metric to quantify the global burden of disease and disability in populations, primarily in developing countries, but the metric is beginning to be used more widely. According to Flanagan et al., "HALY is computationally identical to DALY; however, it reflects a shift in terminology away from disability towards the broader term health, following recommendations originating from the International Network on Health Expectancy." Flanagan, William, Jane Boswell-Purdy, Christel Le Petit, and Jean-Marie Berthelot. "Estimating Summary Measures of Health: A Structured Workbook Approach," *Population Health Metrics*, 2005, vol. 3, no. 5: 1-12. accessed Dec 2007; available from http://www.pophealthmetrics.com/content/pdf/1478-7954-3-5.pdf (open access). p. 2.

[208] Statistics Canada. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy.* For an

work by Wilkins et al. who used 1996 life tables to calculate life expectancy by income terciles, based on average incomes in each enumeration area (EA) in 1996. The 1996 percentage of deaths in each income tercile has been applied to the 2000/2001 life tables.

The health-adjusted life expectancy calculations made by Statistics Canada illustrate an income gradient in HALE, with high-income males living 4.7 healthy years longer than low-income males, and high-income females living 3.2 healthy years longer than low-income females.[209]

Potential years of life lost (PYLL)

Potential years of life lost (PYLL) is a complementary indicator to life expectancy that focuses on mortality among the non-elderly. PYLL is the difference in the number of years between the age at death and a life expectancy of 75 years.[210] Statistics Canada calculates potential years of life lost "by taking the median age in each age group, subtracting from 75, and multiplying by the number of deaths in that age group disaggregated by sex and cause of death. These data are presented as a standardized rate per 100,000 population."[211]

Wilkins et al. found that in 1996, PYLL from birth to age 74 was highest for all cancers (30.9%), both intentional and unintentional injuries (19.2%), and circulatory diseases (17.6%).[212] Wilkins et al. define income-related excess PYLL "as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population."[213] Therefore, the estimate for excess PYLL includes four quintiles related to the richest quintile, rather than only considering the poorest quintile in relation to the richest. Wilkins et al. found that in 1996, excess years of life lost—the percentage of total PYLL that was related to income differences—was 24.0%, which the authors note was higher than the percentage due to injuries or circulatory diseases.

Health Canada reported in 1999 that it is "estimated that if the same death rates as for the highest income earners applied to all Canadians, over one-fifth of all potential years of life lost before age 65 could be prevented."[214] According to Raphael, 23% of potential years of life lost can be attributed to income differences between low- and high-income individuals, and 22% of all years

example of a study using HALY as an outcome measure, see Boswell-Purdy, Jane, William M. Flanagan, Helene Roberge, Christel Le Petit, Kathleen J. White, and Jean-Marie Berthelot. "Population Health Impact of Cancer in Canada, 2001," *Chronic Diseases in Canada*, 2007, vol. 28, no. 1-2: 42-55. This study does not address low-income heath disparities.

209 Statistics Canada. *Table 36b1-HLT Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, accessed.

210 Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

211 Statistics Canada. *Potential Years of Life Lost (PYLL): Three Year Average, by Sex, Population Aged 0 to 74, Canada, Provinces, Territories, Health Regions and Peer Groups*, 2007; accessed Jan 2008; available from http://www.statcan.ca/english/freepub/82-221-XIE/2007002/tblstructure/1hlthstat/1de/de1pyo-en.htm.

212 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

213 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996." p. 10.

214 Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed. p. 2.

lost can be attributed to income differences caused by cardiovascular disease.[215] He notes that this calculation uses mortality rates in the wealthiest quintile of neighbourhoods as a baseline, and considers all deaths above that rate to be excess related to income differences.

Health service use

Rural–urban divide

The relationship between higher rates of health service use by low-income individuals is mainly confined to urban areas in Canada because rural Canadians face greater challenges in accessing health services than urban Canadians do.[216] Rural residents account for 31% of the Canadian population and, on the whole, rural populations have a lower average income than urban Canadians but a smaller proportion living in poverty—14% live below low-income cut-offs in rural areas, compared with 18% who live below low-income cut-offs in urban populations.[217]

Physician services and hospitalization rates

Dunlop, Coyle, and McIsaac use data from the 1994 NPHS to examine visits to general practitioners and specialists by household income, adjusted for size of household and divided by quintiles.[218] The likelihood of a visit to a general practitioner at least once during the year was found to be independent of income. However, those with lower incomes were more likely to be more frequent users (more than six visits a year) of primary physician services than those with higher incomes. On the other hand, those with higher incomes were more frequent users of specialist services (odds ratio = 1.89, females; 1.31, males, with the lowest income quintile as the reference group.)

Kephart, Thomas, and Maclean linked data from the 1990 Nova Scotia Nutrition Survey with the Nova Scotia Medical Services Insurance Physicians' Services claims database from 1991–1994 to examine use of physician services by household income.[219] Total household income was adjusted for household size, based on Statistics Canada low-income cut-offs. They found the ratio of physician service use to be 1.43 (95% confidence interval– 1.12–1.84)—that is, those in the lowest income group were 43% more likely to use physician services than those in the two highest income groups (combined into one group to match the N.S. Nutrition Survey), after controlling for age, gender, and region. Also, the excess use associated with income inequality—assuming that those in the lowest income category had the same rate of physician use as those in the highest income category—was estimated to be 11.3% or $27.5 million per year.

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[215] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
[216] Hay, Varga-Toth, and Hines. *Frontline Health Care in Canada: Innovations in Delivering Services to Vulnerable Populations*, accessed. Rural areas are defined as communities that have a population of less than 10,000 people.
[217] Ibid., accessed.
[218] Dunlop, Sheryl, Peter C. Coyle, and Warren McIsaac. "Socio-Economic Status and the Utilisation of Physicians' Services: Results from the Canadian National Population Health Survey," *Social Science and Medicine*, 2000, vol. 51: 123-133.
[219] Kephart, G., V. Thomas, and D. MacLean. "Socioeconomic Differences in the Use of Physician Services in Nova Scotia," *American Journal of Public Health*, 1998, vol. 88, no. 5: 800-803.

A Nova Scotia study by Veugelers and Yip also found the same patterns. Veugelers and Yip identified heavy users of the health care system as those who had a level of usage greater than the median level of usage.[220] When Veugelers and Yip adjusted odds ratios for health service use by income group for age and gender they found that respondents “with an income of more than $40,000 were about half as likely (odds ratio = 0.51) to be heavy users of family physician services than those with an income of less than $20,000.”[221] A similar result was found for hospital use (odds ratio = 0.58), but specialist use showed less difference (odds ratio = 0.96.) (The low-income group is the reference group).

Vulnerable populations

Some populations in Canada are especially vulnerable to high rates of poverty including children, lone-parent mothers, Aboriginal people, unattached people, people with disabilities, immigrants who are visible minorities, and working people whose jobs pay low wages.[222] In Part 3, Chapter 6 of this review, we briefly profile the first three groups—children, lone mothers, and Aboriginal peoples. The other groups are equally important when identifying and understanding the costs to our society that result from poverty, but because of time and resource limitations, it has been necessary to limit our focus.

Child poverty

Evidence has shown that children who live in poverty are more likely than children living in higher-income households to have physical, psychological, emotional, and behavioural problems.[223] These problems are seen in higher rates of respiratory illnesses and infections, sudden infant death syndrome, obesity, high blood lead levels, iron deficiency anaemia, chronic ear infections, mental retardation, fetal alcohol syndrome, and dental problems. Health Canada reports that low-income children are more likely to have a clustering of exposures manifesting in low birth weights, poor health, less nutritious foods, higher rates of hyperactivity, and delayed vocabulary development.[224]

As previously noted, Marvyn Novick, a co-founder of Campaign 2000 and Professor Emeritus of Ryerson University, reports that the Canadian child poverty rate in 2005—11.7% (788,000 children) based on after-tax Low Income Cut-offs–LICOs—was exactly the same as the rate in 1989—the year that the House of Commons voted to end child poverty by 2000.[225] When the

[220] Veugelers, P.J., and A.M. Yip. "Socioeconomic Disparities in Health Care Use: Does Universal Coverage Reduce Inequalities in Health?," *Journal of Epidemiology and Community Health*, 2003, vol. 57: 424-428.
[221] Ibid. p. 426.
[222] National Council of Welfare. *The Cost of Poverty*, 2001; accessed Nov 2007; available from http://www.ncwcnbes.net/documents/researchpublications/OtherPublications/2002Report-TheCostOfPoverty/ReportENG.htm.
[223] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
[224] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed.
[225] Novick. *Summoned to Stewardship: Make Poverty Reduction a Collective Legacy*, accessed.

poverty rate is based on before-tax LICOs, 16.8%, or 1.1 million Canadian children are living in poverty.[226]

Child poverty rates are higher in vulnerable populations that face persistent disparities. Almost half (47% before tax) of lone mothers and their children live in poverty.[227] Low income for recent immigrants is three times higher than for people born in Canada and 49% of children in recent immigrant families live below the poverty line. For children with disabilities, the poverty rate is 28%. The poverty rate for First Nations children is also extremely high—in 2001, 40% for children living outside of First Nations communities and 28% for children living in First nations communities were living in poverty. In both Saskatchewan and Manitoba, First Nations child poverty rates were more than 50%.

On average, low-income families are living on between $9,000 and $11,000 below Statistics Canada's Low Income Cut-off (before tax), which is the amount of money needed just to bring them *to* the poverty line. In addition, 41% of children who live in poverty live in families with at least one income earner working full-time on an annual basis. Campaign 2000 notes, " No matter where you live in Canada, the minimum wage does not bring a full-time, year-round minimum wage worker up to the poverty line. In 2006, 2.1 million workers across Canada—full and part-time—were low wage workers earning less than $10/hour."[228]

As David Ross and Paul Roberts of the Canadian Council on Social Development report, although children's opportunities depend on public services such as education, health, supports for housing, neighbourhoods, and communities, "low income is a common factor that influences outcomes, whatever the pathway."[229] They also note that there is a growing body of evidence that shows "as family incomes fall, the risks of poor developmental outcomes in children's health, behaviour, learning and socialization rise."[230]

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[226] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, accessed.
[227] Ibid., accessed.
[228] Ibid., accessed. p. 3.
[229] Ross, David P., and Paul Roberts. *Income and Child Well-Being: A New Perspective on the Poverty Debate. Part II: Linking Poverty to Child Outcomes*, Canadian Council on Social Development, 1999; accessed March 2008; available from http://www.ccsd.ca/pubs/inckids/. p. 4.
[230] Ibid., accessed.

Lone-parent mothers[231]

Lone parents include never-married, separated or divorced persons not currently living with a legal or common-law spouse, and who are living with a dependent child at home under the age of 18 years.[232] In 2001, 81.4% of lone parents were female.[233] In 2001, there were more than a million lone-parent mothers in Canada, which was 8.7% of all women.[234] In addition, in that same year, lone-parent mothers headed 20% of all families with children. Lori Curtis and Michael Pennock, who recently reviewed the literature on lone-parent families, found widespread evidence that mothers heading lone-parent families are at a higher risk of living in poverty and suffering from variety of health-related problems than those living in two-parent families.[235]

Children living in lone-parent families are also at risk of living in poverty and of developing health and behavioural problems. In 2005, 33.4% of the 788,000 children under the age of 18 living in low-income families were living with a lone-parent mother, compared to 7.8% of low-income children who were living with two parents.[236] As noted, in 2007, Campaign 2000 found that 47% (before tax) of lone mothers and their children were living in poverty.[237]

In 2006, the Statistics Canada Target Groups Project (TGP) produced a statistical report on women in Canada that included the most recent data available at that time on lone-parent mothers taken from published Statistics Canada sources.[238] According to Statistics Canada's TGP, the proportion of women who are lone parents has doubled since 1981.

Galarneau of Statistics Canada reports that in 2001, 71.1% of lone mothers were employed (60.8% of these mostly full time), 7.9% were unemployed, and 21.0% were not in the labour

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[231] A note on the term "lone parent:" Ross et al. of the Canadian Council on Social Development report that the term "lone parent" is preferable to the term "single parent." They state, "The term *lone parent* is synonymous with the common usage of the term *single parent*, but in statistical surveys *single* is sometimes used to denote *never married*…. Lone parents include never-married, separated or divorced persons not currently living with a legal or common-law spouse. Additionally, unless noted otherwise, lone parents include only those with a dependent child at home under the age of 18 years. Thus, this definition excludes persons who may otherwise be single parents but whose children are older or have moved away from the home." Ross, Shillington, and Lochhead. *The Canadian Fact Book on Poverty 1994*, accessed. Chapter 5.

[232] Ibid., accessed.

[233] Galarneau, Diane. "Education and Income of Lone Parents," *Perspectives on Labour and Income*, Statistics Canada, Catalogue no. 75-001-XIE, 2005, vol. 6, no. 12. accessed March 2008; available from http://www.statcan.ca/english/freepub/75-001-XIE/11205/art-1.pdf.

[234] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, Statistics Canada, Social and Aboriginal Statistics Division, Catalogue no. 89-503-XIE, 2006; accessed March 2008; available from http://www.statcan.ca/english/freepub/89-503-XIE/0010589-503-XIE.pdf.

[235] Curtis, Lori J., and Michael Pennock. "Social Assistance, Lone Parents and Health. What Do We Know, Where Do We Go?," *Canadian Journal of Public Health*, 2006, vol. 97, no. Supplement 3: S4-S10.

[236] Statistics Canada. *Persons in Low Income after Tax, by Prevalence in Percent (2001 to 2005)*, accessed. Based on after tax income.

[237] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, accessed.

[238] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed. The main sources are the Census of Canada, the Labour Force Survey, the Survey of Labour and Income Dynamics, the General Social Survey and the Canadian Community Health Survey.

force.[239] In 2004, 68% of lone-mothers were employed, which was a reduction from the 2001 rate, but still higher than the early 1990s, when fewer than half were employed.[240]

However, according to Statistics Canada's TGP, families headed by lone-parent mothers have the lowest incomes of all family types. [241] Curtis and Pennock note that in the mid-1990s, 26% of employed lone parents and 73% of unemployed lone parents lived in poverty.[242] In 2003, 38% of all families headed by lone-parent mothers, whether employed or not, had incomes that were below the after-tax LICOs, compared with 13% of lone-parent fathers, and 7% of non-elderly two parent families with children.

Government transfer payments also contribute a relatively large share of the income of female-headed lone-parent families. In 2003, 27% of the income of these families came from transfer payments, compared with 11% of the income of male-headed lone-parent families and 6% of the income for two-parent families with children.

In 2004, approximately 16% of lone-parent families received social assistance payments, which have been decreasing in value since the mid-1990s. Between 1996 and 1999, welfare incomes for lone parents decreased by as much as 39%, which could be a major cause of the increased entrance of lone mothers into the work force.[243]

In 2005, social assistance payments for lone-parent families ranged from 48% of the poverty line in Alberta to 73% of the poverty line in Newfoundland and Labrador, but most of the payments in the other provinces were between 50% and 60% of the poverty line.[244] Colman argues that cuts in federal transfers to the provinces in the 1990s and the consequent reductions in social assistance payments actually forced more lone mothers into the market economy, thereby reducing their parenting time and producing higher rates of time stress, which has implications for the health of both the mothers and their children.[245]

As noted, lone mothers are more likely than any other family type to be living in poverty. Marie Beaudet and Claudio Perez report that in the 1996/1997 National Population Health Survey (NPHS), lower self-perceived health was associated with receiving social assistance, and that inadequate income added high distress levels.[246] They found that being a lone mother, per se, was not a significant predictor of health status. However, when accompanied by inadequate income, the association with poor self-perceived health was positive.

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239 Galarneau. "Education and Income of Lone Parents."
240 Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed.
241 Ibid., accessed.
242 Curtis, and Pennock. "Social Assistance, Lone Parents and Health. What Do We Know, Where Do We Go?."
243 Ibid.
244 National Council on Welfare (NCW). *Welfare Incomes 2005*, 2006; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/WelfareIncomes/2005Report_Summer2006/ReportENG.pdf.
245 Colman, Ronald. *A Profile of Women's Health Indicators in Canada*, GPI*Atlantic,* Prepared for the Women's Health Bureau, Health Canada, 2003; accessed March 2008; available from http://www.gpiatlantic.org/pdf/health/womens/whbreport.pdf.
246 Beaudet, Marie P., and Claudio Perez. "The Health of Lone Mothers," *Health Reports*, 1999, vol. 11, no. 2: 1-29.

Statistics Canada's TGP also reports that, in the Canadian Community Health Survey on Mental Health and Wellbeing conducted in 2002, lone mothers were likely to be "especially vulnerable to life stresses."[247]

Aboriginal Peoples

In the 2006 Census, 1,172,790 Canadians—or 3.8% of the population—identified themselves as part of one or more Aboriginal groups, including First Nations, Métis, and Inuit. The First Nations Regional Longitudinal Health Survey (RHS) recorded that 57.5% of First Nations peoples live on reserves.[248] While this is not a percentage of the total Aboriginal population, First Nations peoples make up the majority (59.5%) of the total population, so it is reasonable to assume that more than half of all Aboriginal peoples in Canada live on reserves.

While Aboriginal peoples accounted for 3.8% of the Canadian population in 2001, 5.6% of all children under the age of 15 were of Aboriginal descent. The Aboriginal population is growing faster than the non-Aboriginal population.[249] This is particularly true for Aboriginal peoples living on reserves, where 12% of the population is younger than 9 years of age, as compared with 8% of the Aboriginal off-reserve population and 6% of the non-Aboriginal population. In fact, Statistics Canada predicts that by 2017, Aboriginal children will account for 7.4% of all children in Canada—up from 5.6% in 2001.[250]

There is not only a greater proportion of Aboriginal than non-Aboriginal children in Canada, but these children, as with the overall Aboriginal population, are more likely to live in poverty than non-Aboriginal Canadians. In 2000, 41% of off-reserve Aboriginal children aged 0–14 years were living below Statistics Canada's Low Income Cut-Off (LICO), whereas 18% of non-Aboriginal children were living below the LICO—a difference of 23 percentage points.[251]

A similarly large gap is seen across all demographic categories. In 2000, 31% of off-reserve Aboriginal peoples living in families were subsisting below the LICO, whereas only 12% of non-Aboriginal people living in families were doing so. As well, 56% of unattached Aboriginal individuals had a household income below the LICO, whereas 38% of non-Aboriginal unattached individuals had incomes below the LICO. Unfortunately, there are currently no data available on on-reserve Aboriginal peoples living below the LICO.

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[247] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed.
[248] Assembly of First Nations / First Nations Information Governance Committee. *First Nations Regional Longitudinal Health Survey (RHS) 2002/03:Results for Adults, Youth and Children Living in First Nations Communities*, 2007; accessed March 2008; available from http://rhs-ers.ca/english/pdf/rhs2002-03reports/rhs2002-03-technicalreport-afn.pdf.
[249] National Council of Welfare. *First Nations, Metis and Inuit Children and Youth: Time to Act*, 2007; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/FirstNationsMetisInuitChildrenAndYouth/2007Report-TimeToAct/ReportENG.pdf.
[250] Ibid., accessed.
[251] Ibid., accessed.

Not only are Aboriginal peoples more likely to live below the LICO, but measures of health across all income groups, including measures of chronic diseases, injuries, and self-reported health, are almost always lower as well.[252] For example, while only 16% of non-Aboriginal Canadians had arthritis in 2001, 26% of off-reserve Aboriginal peoples had this chronic disease.[253] As well, while 4% of the non-Aboriginal population had diabetes, 9% of off-reserve Aboriginal peoples had diabetes.[254] Due to both the higher rates of illness and the lower household incomes in the Aboriginal population, it is likely that poverty plays an important role in the health status of this group.

Social issues: Indicators of social exclusion

Based on the literature reviewed in this report, the health costs of poverty are likely to be considerable. However, health is not the only area in which poverty produces excess costs. For example, poverty also contributes excess costs in the areas of employment, education, homelessness, food insecurity, crime, the environment, and social assistance. Presumably, a comprehensive report on the costs of poverty would also need to acknowledge costs related to these social issues. It should be noted that an extensive search of the literature pertaining to the relationship between poverty and specific social issues was beyond the scope of this report, which has concentrated on the health costs of poverty. Therefore Chapter 7 in this review briefly reports salient information on social issues, but does not represent a comprehensive review of the literature in the field of social costs of poverty. More research is required before any assessments can be made regarding the portions of the social outcomes that can be attributed to poverty.

Conclusion

Estimating the costs of poverty is complex and involves many steps. Basically, the literature review found that there is sufficient evidence in the literature to enable calculations of the excess burden of disease that can be attributable to poverty in Canada. Relative risk ratios were found that can potentially be used to calculate poverty attributable fractions (PAF) to estimate the excess burden of illness attributable to poverty. This information can be used to estimate the economic costs of poverty in terms of direct health care costs and indirect costs measured in terms of lost production from illness or premature death—the value of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long- and short-term disability), which are the categories used by Health Canada in costing the economic burden of illness in Canada (EBIC).[255]

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[252] Canadian Institute for Health Information. *Improving the Health of Canadians*, 2004; accessed March 2008; available from http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=PG_39_E&cw_topic=39&cw_rel=AR_322_E.
[253] Tjepkema, Michael. *"The Health of the Off-Reserve Aboriginal Population." Health Reports: How Healthy Are Canadians? 2002 Annual Report*, 82-003-SIE, 2002; accessed January 2008; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002001.pdf. Data for the Aboriginal and non-Aboriginal population are from the 2000/2001 Canadian Community Health Survey.
[254] Ibid., accessed. The First Nations Regional Longitudinal Health Survey reports that there are no significant differences in diabetes rates among Aboriginal peoples by income.
[255] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed.

However, as noted above, because this review focused on the health costs of poverty, more work is required to find the empirical evidence in the literature of the portion of costs of other social issues that could be attributed to poverty and used to estimate the excess costs that poverty generates in these areas. In addition, more research is needed to evaluate potential benefits of poverty reduction strategies in relation to costs, and to understand the portion of the annual costs that fall to business, governments, the health care sector, and individual citizens through their taxes. It is recommended that a review of the literature on the other social and policy issues be conducted before a full cost of poverty study is undertaken.

PART 1: INTRODUCTION AND METHODOLOGIES

1. Introduction

This report provides the technical background information that would be required to produce a report assessing the health costs associated with poverty for Canada. As such, it reviews methodologies used in previous studies to assess: the broad social and economic costs of poverty in Canada (Calgary), the United States, and Europe; methodologies used in socioeconomic health disparity studies with an emphasis on studies from New Zealand and The Netherlands, as well as general cost of illness studies; basic information on Canadian and international poverty measures; and evidence for the association of poverty with various health indicators. In addition, it briefly reviews several groups that are especially vulnerable to the health impacts of poverty, and other social issues that influence the relationship between poverty and health.

The emphasis of this report is on the information and data that would be required to assess the external health costs of poverty, rather than the private costs incurred by those living in poverty. These external health costs, which all have major policy implications in terms of government decisions to invest in poverty reduction programs, include costs to the health care system that result from the association between poorer health outcomes and low income. There are, however, other costs, which result from the effects of poverty on society in general. These include costs related to the criminal justice system, social assistance programs, educational systems, and to employment and productivity. In addition, other social issues that result in social exclusion, such as homelessness, food insecurity, and environmental problems also register as costs. Due to time and resource limitations, these social costs are explored only briefly in this report.

The review is intended as a useful starting point for further work in this area—in particular the eventual development of a full-fledged study assessing the health and other social costs of poverty for Canada and the provinces that will hopefully make a significant contribution to advancing work in the field of social and economic determinants of health. In the short term, it is hoped that even this modest first step of summarizing key results from the existing evidence can raise the profile of this important issue and facilitate the practical application of this information to decisions made in the policy arena and in this field of research.

1.1 Economic arguments in support of poverty reduction

Despite its timeliness and importance to policy makers and others, there is currently no comprehensive study that quantifies the economic costs of poverty in Canada.. According to David Hay of the Canadian Policy Research Networks, economic arguments in support of action on the social determinants of health, which recognize the interdependence of economic and social policies, are growing in importance in Canada and Europe.[256] Framing this subject is the discourse known as "social policy as a productive factor," which is most often interpreted as an "efficiency argument for specific social policies." In other words, Hay explains that "poverty and

[256] Hay, David I. *Economic Arguments for Action on the Social Determinants of Health*, Canadian Policy Research Networks and Public Health of Canada, 2006; accessed Nov 2007; available from http://www.cprn.org/documents/46128_en.pdf.

inequality are regarded as evidence of an inefficient society."[257] This perspective, which is in line with that of the GPI, views social spending as an investment in individual or public goods, rather than as consumption or a cost to the economy. "The orientation of policy-makers [is changed] to focus on outcomes in the medium-and long-term and away from a narrow focus on inputs and outputs."[258]

On January 11, 2008, members of the partner organizations of Campaign 2000 submitted an open letter to the First Ministers of Canada urging them to create a national Poverty Reduction Strategy.[259] They point out that there is a growing momentum for poverty reduction in Canada, with Quebec, Newfoundland and Labrador, Nova Scotia, Manitoba and Ontario working towards poverty-reduction strategies. They also argue that, "reducing poverty is good for the economy:"

> Poverty is expensive. Just as it is much more costly to treat a disease than prevent one, it costs more to provide emergency hostels than affordable housing, more to take a child into the care of child welfare agencies than to make sure their families have adequate incomes and more to cope with school drop-outs than to train our youth for the jobs Canada needs to fill in the coming years.[260]

This echos the words of John Cashore, aBritish Columbia MLA, who in 1987 declared that poverty is expensive and urged the Legislative Assembly to adopt a poverty strategy.

> I submit that it is not welfare that is expensive, it is poverty that is expensive in this province at this time. It is expensive in human cost, and it is expensive in economic cost. A penny-wise, pound-foolish approach is something that future generations will have to live with and deal with as additional members of our society are added into the welfare syndrome and find it difficult to break out of that pattern.[261]

Harry Holzer of Georgetown University, who recently completed a study on the cost of poverty in the U.S. (reviewed in section 2.1 below) notes in the *CCPA Monitor* that most arguments for reducing poverty are based on moral arguments for social justice.[262] However, an economic case for reducing poverty is also becoming prominent as a realization is dawning that "investing significant resources in poverty reduction might be more cost-effective over time than we previously thought."[263] He notes that, "poverty imposes hugh costs on society in the form of increased crime, higher health care spending, broken neighbourhoods, and squandered human resources."[264] In particular, Holtzer calculated costs of poverty to the U.S. economy for health,

[257] Ibid., accessed.
[258] Ibid., accessed.
[259] Campaign 2000 partner organizations. *Open Letter to the First Ministers*, January 11, 2008; accessed Jan 2008; available from http://www.campaign2000.ca/res/openltrs/OpenlettertotheFirstMinistersJan11_08.pdf.
[260] Ibid., accessed.
[261] Cashore, John M. *Official Report of Debates of the Legislative Assembly*, British Colunbia, 1987 Legislative Session: 1st Session, 34th Parliament, morning sitting, March 12, 1987; accessed Nov 2007; available from http://www.leg.bc.ca/Hansard/34th1st/34p_01s_870312a.htm#00081.
[262] Holzer, Harry J. "It Would Be Less Costly to Eliminate Than to Tolerate Poverty," *CCPA Monitor*, Canadian Centre for Policy Alternatives, 2007, vol. 14, no. 2: 5. p. 5
[263] Ibid. p. 5
[264] Ibid. p. 5.

crime, and education. In terms of health, he points out that, "poor health generates illness and early mortality that require large health care expenditures, impedes productivity, and ultimately reduces … quality and quantity of life."[265]

In the same issue of the *CCPA Monitor*, Ed Finn argues that, although the most compelling case for reducing child poverty is based on moral and social costs, this case has not received the policy support it warrants.[266] He reasons that the economic argument that ending child poverty could increase the GDP should appeal to the "business first bias" of politicians and CEOs. As an illustration, which Finn warns is probably not accurate, if Canada, with a population one-tenth the size of the U.S., were to spend one-tenth of what has been calculated to be theeconomic costs of child poverty in the U.S. as calculated by Holzer et al., it would save $40 billion in spending on crime, health care, and economic productivity as a result of poverty.[267]

In Europe there is also a realization that "equity can go hand in hand with more efficiency."[268] Didier Fouarge notes that the European Commission has made "comprehensive efforts … to demonstrate that social policies are to be seen as a productive factor and not as a hindrance to economic activity." He continues:

> One of the obvious costs of non-social policy is poverty…. In other words, a generous level of social protection does not necessarily lead to lower economic achievements. On the contrary, social policies based on investments in human and social capital are conducive to higher economic efficiency for they improve productivity and the quality of the labour force. Social policy is therefore a productive factor, even though its costs are generally visible in the short term while its benefits are often only apparent in the long term.[269]

These realizations, along with work that is currently taking place at the Public Health Agency of Canada, through its health disparities project, to develop a rationale for investing in the social determinants of health, and other work underway at the provincial level to develop poverty reduction strategies, make the completion of a full cost of poverty study for Canada both timely and relevant.

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[265] Ibid.
[266] Finn, Ed. "Ending Child Poverty Has Economic as Well as Moral Benefits," *CCPA Monitor*, Canadian Centre for Policy Alternatives, 2007, vol. 14, no. 2: 4.
[267] Ibid.
[268] Fouarge, Didier. *Costs of Non-Social Policy: Towards an Economic Framework of Quality Social Policies - and the Costs of Not Having Them*, Employment and Social Affairs DG, 2003; accessed http://ec.europa.eu/employment_social/news/2003/jan/costofnonsoc_final_en.pdf. p. 3.
[269] Ibid., accessed. p. 3.

1.2 An overview of poverty definitions and impacts

Poverty creates tremendous suffering in society, is costly to society in general, and negatively affects the physical and mental health of the population as well as many other aspects of wellbeing. In 2005, the poverty rate in Canada, based on after-tax income, was 10.8% of the population. When broken down, however, the rate for children under the age of 18 was 11.7%, but for those living in families headed by lone-mothers the rate was 33.4%. For adults between the ages 18 and 64, the rate was 11.4%, but the rate for unattached individuals was 30.4%.[270] When the poverty rate is based on before-tax income, 16.8%, or 1.13 million Canadian children are living in poverty.[271]

The 11.7% poverty rate, which indicates that 788,000 children are living in poverty in Canada, is exactly the same as the rate in 1989—11.7%.[272] This was the same year that the House of Commons voted to end child poverty by the year 2000. Campaign 2000 reports that this is the case "despite a 50% real increase in the size of our economy over the same period."[273]

Poverty is a complex and multidimensional social phenomenon. The U.K., for example, uses 41 indicators to monitor changes in poverty.[274] In Canada, the National Council of Welfare notes in its 2001 report, *The Cost of Poverty*, that "[t]here are many indicators of the human cost of poverty, from low birth-weight babies and increased illness to lower labour force participation to family disintegration and young lives lost to homicide or suicide."[275] It discusses the social costs of poverty—lack of access to resources such as safe and affordable housing and food, education, and jobs that pay enough to lift people out of poverty—and the ways these costs lead to social impacts such as social exclusion, crime, and ill health, among others.[276]

The World Bank Poverty Net identifies three aspects of poverty: "poverty defined as whether households or individuals have enough resources or abilities today to meet their needs; inequality in the distribution of income, consumption or other attributes across the population; and vulnerability, defined as the probability or risk today of being in poverty—or falling deeper into poverty—in the future."[277] In other words, poverty can be absolute in the sense that people do

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270 Statistics Canada. *Persons in Low Income after Tax, by Prevalence in Percent (2001 to 2005)*, 2007; accessed January 2008; available from http://www40.statcan.ca/l01/cst01/famil19a.htm.
271 Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, accessed.
272 Novick, Marvyn. *Summoned to Stewardship: Make Poverty Reduction a Collective Legacy*, Campaign 2000 Policy Perspective, 2007; accessed March 2008; available from http://www.campaign2000.ca/res/dispapers/summoned_to_stewardship.pdf.
273 Ibid., accessed.
274 Tomlinson, Mark, Robert Walker, and Glenn Williams. *Measuring Poverty in Britain as a Multi-Dimensional Concept, 1991 to 2003*, University of Oxford, 2007; accessed Nov 2007; available from http://www.spsw.ox.ac.uk/fileadmin/documents/pdf/BarnettPaper20076MTRWGW.pdf.
275 National Council of Welfare. *The Cost of Poverty*, 2001; accessed Nov 2007; available from http://www.ncwcnbes.net/documents/researchpublications/OtherPublications/2002Report-TheCostOfPoverty/ReportENG.htm. p. 3.
276 Ibid., accessed.
277 The World Bank Poverty Net. *Poverty Analysis: Measuring Poverty*, 2002; accessed Nov 2007; available from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPA/0,,contentMDK:20202198~me

not have the material necessities for wellbeing, or relative in that they are not able to participate in the activities of daily living that are important in their society.

According to Dennis Raphael of York University who recently published *Poverty and Policy in Canada*:

> In wealthy industrialized nations such as Canada, poverty is best understood as the experience of material and social deprivation that prevents individuals, communities, and entire societies from reaching their full human and societal potential. This is the case since living under conditions of material and social deprivation limits participation in a wide range of cultural, economic, educational, political and other societal activities normally expected of individuals, families, and communities.[278]

Socioeconomic status is a key determinant of health in population health models. Health Canada has recognized poverty as one of the most reliable indicators of poor health. When all measures of health and mortality are examined, low income Canadians are more likely to have poor health outcomes and die earlier than those who are not living with poverty.[279] Individuals living in poverty are at least four times more likely to report fair or poor health and are at least twice as likely to have a long-term activity limitation that those with the highest incomes.[280]

Low income—a measure of socioeconomic status—is not only associated with poorer outcomes in health and life expectancy, it is also associated with poorer outcomes in terms of risk behaviours, education, and child development, with increased criminal and delinquent activity, and with a wide range of other negative outcomes for both children and adults. Poverty maintains its influence throughout the life course. There is evidence that children living in poverty develop health conditions that may plague them throughout their lives or manifest in adulthood.[281] As well, poverty is a dynamic rather than a static condition. Some people move in and out of poverty, depending on socioeconomic circumstances, but others experience chronic poverty and find it difficult to escape.

According to Tomlinson et al. of the University of Oxford, although poverty is normally defined relative to the living standards of the society in which it is found, material deprivation and environmental aspects of people's lives are increasingly being given priority over shortfalls in income. They note that, "income is merely an indirect measure of poverty that is truly experienced as the unavoidable low consumption that denies people access to a normal way of life."[282] However, Tomlison et al. note that, in general, measures have not been developed that

nuPK:435055~pagePK:148956~piPK:216618~theSitePK:430367,00.html.

[278] Raphael, Dennis. *Poverty and Policy in Canada. Implications for Health and Quality of Life*, Toronto: Canadian Scholars' Press Inc., 2007. p. 6.

[279] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.phac-aspc.gc.ca/ph-sp/phdd/pdf/toward/toward_a_healthy_english.PDF.

[280] Ibid., accessed., p. 15, 43.

[281] Case, Anne, Angela Fertig, and Christina Paxson. "The Lasting Impact of Childhood Health and Circumstance," *Journal of Health Economics*, 2005, vol. 24, no. 2: 365 – 389.

[282] Tomlinson, Walker, and Williams. *Measuring Poverty in Britain as a Multi-Dimensional Concept, 1991 to 2003*, accessed. p. 1.

both capture the multidimensional aspects of poverty as well as facilitate comparison of trends over time. For example, the U.K., which has focused on reducing poverty for at least two decades, has no "means of simultaneously measuring and aggregating … measures to produce a stable composite measure."[283]

Canada has no official definition of poverty or poverty measure, but researchers most often measure or define poverty in terms of income. In most research, poverty is measured by low income, based on dividing the population into income segments, or by the low-income cut-offs (LICOs) produced by Statistics Canada. Shelley Phipps argues that despite the limitations in poverty measures, the best readily available measure of individual socioeconomic status, "consistent with a clear consensus in the literature," is "household income after taxes and transfers, appropriately adjusted to account for differences in family size and assigned to *each individual* within the family."[284] While household income is a widely used measure in Canada, it is often used inconsistently, which makes comparisons between reports difficult. For example, researchers use unadjusted and adjusted household income, before tax income, and after tax income. However, according to Raphael:

> [T]he implicit assumptions behind the various measures of low income used in Canada are clearly consistent with relative assumptions about the definition and measurement of poverty. For this reason, the findings from Canadian applications of low-income measures … are seen as indicating the incidence and depth of poverty—not low income [per se].[285]

Specific measures of poverty used in Canada are discussed in more detail in Part 2, Section 4 below.

[283] Ibid., accessed. p. 3.
[284] Phipps, Shelley. *The Impact of Poverty on Health: A Scan of Research Literature*, Canadian Population Health Initiative, 2003; accessed Nov 2007; available from http://dsp-psd.communication.gc.ca/Collection/H118-11-2003-1E.pdf. p. i, emphasis in original.
[285] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*. p. 34.

1.3 Health definitions

The World Health Organization (WHO) has defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[286] As stated in the 1986 *Ottawa Charter for Health Promotion,* "Health is a resource for living that enables people of all ages to realize their hopes and needs, and to change or cope with the environments around them."[287] This charter was recognized at the 1986 International Conference on Health Promotion organized by WHO, the Canadian Department of Health and Welfare, and the Canadian Public Health Association, and was adopted by 38 countries. It also declared, "The fundamental conditions and resources for health are peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice and equity. Improvements in health require a secure foundation in these basic prerequisites."[288]

Health Canada also takes this broad view of health and regards health as the complex interplay between social, economic, and environmental determinants:

> [A] variety of factors affect health including gender, age, genetics, personal health practices, coping skills, social support, working conditions, the physical environment and early childhood experience. Perhaps the most powerful influence on health, however, is socioeconomic status, which is measured ... by income and education levels. Whether we look at how people rate their own health, premature mortality, psychological well-being or the incidence of chronic disease, socioeconomic status remains strongly related to health status…. [P]eople's health improves on virtually all measures and in all of the factors that influence health as levels of income and education increase.[289]

Health Canada notes that it is the "interplay of all of these factors that ultimately determines the health of individuals, families and communities."[290]

[286] World Health Organization (WHO). *WHO Definition of Health*, 2003; accessed Nov 2007; available from http://www.who.int/suggestions/faq/en/. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19 June–22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. The definition has not been amended since 1948.
[287] World Health Organization. *Ottawa Charter for Health Promotion*, World Health Organization (WHO), Europe Office, 1987; accessed Nov 2007; available from http://www.who.dk/policy/ottawa.htm.
[288] Ibid., accessed.
[289] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed. p. 2.
[290] Ibid., accessed. p. 3.

1.4 Social determinants of health and pathways from poverty to poor health status

Associations between poverty and disease have long been recognized. In the 1850s, John Snow, the British physician often called the "father of epidemiology," traced the source of cholera through water supplies and poverty:

> It is amongst the poor, where a whole family live, sleep, cook, eat, and work in a single room that cholera has been found to spread when once introduced, and still more in those places termed common lodging-houses, in which several families were crowded into a single room. It was amongst the vagrant class, who lived in this crowded state, that cholera was most fatal in 1832; but the Act of Parliament for the regulation of common lodging-houses, has caused the disease to be much less fatal amongst these people in the late epidemics.[291]

Poverty is widely accepted as a social determinant of health.[292] Social determinants of health include, but go well beyond, factors such as individual genetic endowment, lifestyle health behaviours, and the health care system to comprise "more pervasive forces in the physical, social and economic environment."[293] In the 1994 report, *Strategies for Population Health: Investing in the Health of Canadians*, the Federal, Provincial and Territorial Advisory Committee on Population Health (ACPH) identified the following key influences or "determinants" of health: living and working conditions (the socioeconomic environment), the physical environment, health services, early childhood development, social support, personal health practices and coping skills, and biology and genetic endowment.[294] The WHO also includes income and social status, gender, and culture as determinants of health.[295]

The Heart and Stroke Foundation of Canada says that "risk conditions" such poverty, powerlessness, and lack of social support, are also forces or determinants of health and it recommends that these forces be the focus of "primordial prevention" policies that would aim "at avoiding the emergence of the social, economic and cultural patterns of living that are known to contribute to an elevated risk of disease."[296]

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[291] Snow, John. *Snow on Cholera*, New York: The Commonwealth Fund, 1936. Reprint of two papers by John Snow, M.D., together with a biographical memoir by B. W. Richardson, M.D. and an introduction by Wade Hampton Frost, M.D. Cited inTerris, Milton. "The Development and Prevention of Cardiovascular Disease Risk Factors: Socioenvironmental Influences," *Journal of Public Health Policy*, 1996, vol. 17, no. 4: 426-441. p. 427.

[292] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed.

[293] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf. p. 21.

[294] Federal Provincial and Territorial Advisory Committee on Population Health. *Strategies for Population Health: Investing in the Health of Canadians*, Ottawa: Federal, Provincial, and Territorial Advisory Committee on Population Health, 1994.

[295] World Health Organization. *Reducing Risks, Promoting Healthy Life*, 2002; accessed Dec 2007; available from http://www.who.int/whr/2002/Overview_E.pdf.

[296] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

The social determinants of health have been found to affect health outcomes through several interdependent pathways or processes, commonly referred to as the materialist, psychosocial, and political/economic pathways.[297] This model is illustrated in Figure 1 below. Barbara Starfield from John Hopkins University, suggests that an understanding of these pathways is an essential element in determining policies that could effectively intervene to reduce disparities.[298] Although a direct cause and effect between these pathways and health is difficult to establish, according to Robert Chernomas, the correlation between them is clear.[299]

The materialist explanation is that low-income individuals are exposed to health-risk conditions over the course of their lifetimes, which accumulate to produce negative health outcomes. Researchers such as Paula Lantz et al. emphasize the material necessities required for health, which include the availability of food, clean water, clothing, and housing, as well as opportunities for education, livelihood, transportation, and recreation.[300]

Other researchers such as John Lynch et al. point to the lack of social support and the chronic psychosocial stress, caused by the deprivations of poverty, that can lead to lowered immune systems and disease.[301] The psychosocial pathway also includes the relative income inequality effects in a society, i.e., societies with high levels of inequality in the distribution of incomes also experience high levels of health disparities. In these cases, psychosocial effects of perceived position in the socioeconomic hierarchy produce stress and poor health. Both the materialist and psychosocial pathways can lead to the individual adopting behavioural risk factors as coping mechanisms, which in turn can lead directly to ill health. At the community level, the inequality weakens social capital and social cohesion, which also can negatively affect health.

The political/economic pathway examines the root causes of material and psychosocial disparities, including those caused by social structures, market economies, globalization, and governmental policies, which could lead to conditions of poverty and chronic disease.[302] Researchers such as David Coburn and Vincent Navarro have shown that economic and political structures can affect poverty levels and inequity and eventually lead, through the previous two

p. 21.

297 Shaw, M., D. Dorling, D. Gordon, and G. Davey Smith. *The Widening Gap: Health Inequalities and Policy in Britain*, Bristol, UK: The Policy Press, 1999. See also Hayward, Karen, and Ronald Colman. *The Tides of Change: Addressing Inequity and Chronic Disease in Atlantic Canada. A Discussion Paper*, Health Canada, Population and Public Health Branch, Atlantic Region, 2003; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/canada/regions/atlantic/pdf/Tides_Inequity_and_Chronic_Disease.pdf.

298 Starfield, Barbara. "Pathways of Influence on Equity in Health," *Social Science and Medicine*, 2007, vol. 64: 1355-1362.

299 Chernomas, Robert. *The Social and Economic Causes of Disease*, Ottawa, Canada: Canadian Centre for Policy Alternatives (CCPA), 1999.

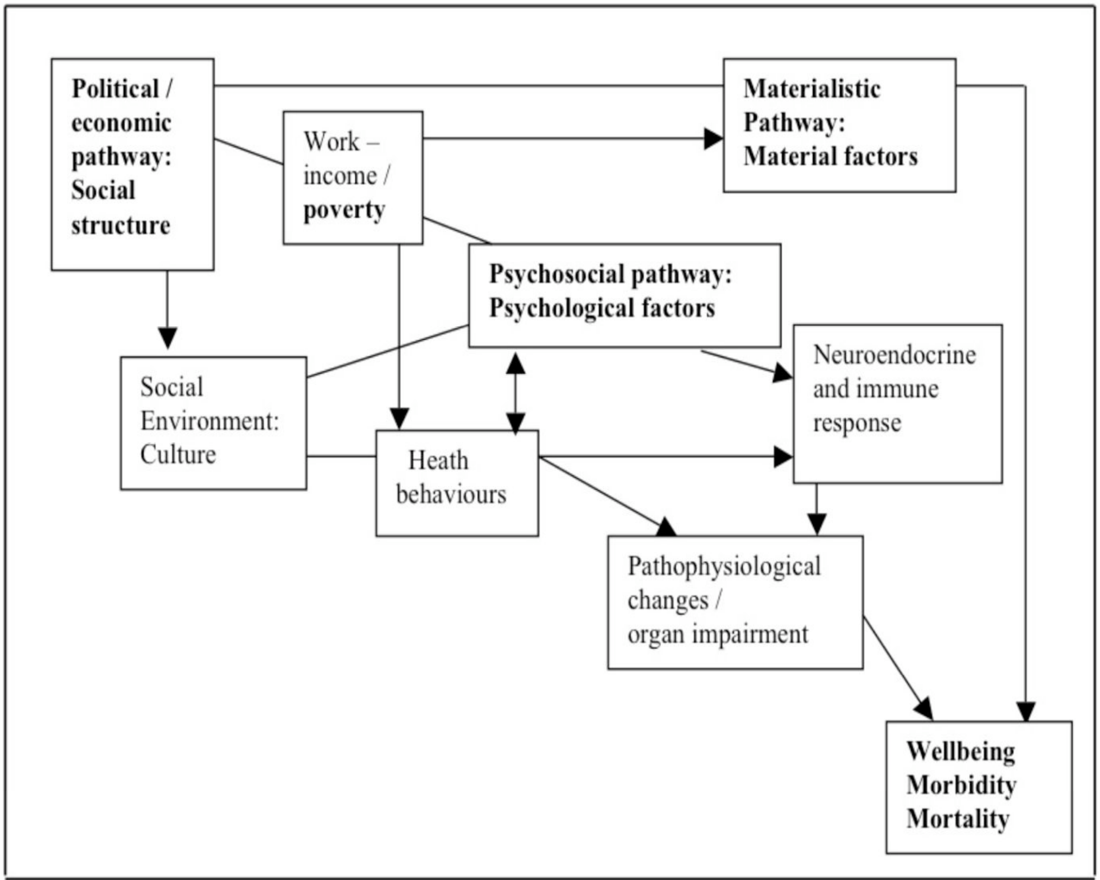
300 Lantz, Paula M., James S. House, James M. Lepkowski, David R. Williams, Richard P. Mero, and Jieming Chen. "Socioeconomic Factors, Health Behaviors, and Mortality," *Journal of the American Medical Association*, 1998, vol. 279, no. 21: 1703-1708.

301 Lynch, .J., G. Davey Smith, M. Hillemeier, M. Shaw, T. Raghunathan, and G.A. Kaplan. "Income Inequality, the Psychosocial Environment, and Health: Comparisons of Wealthy Nations," *The Lancet*, 2001, vol. 358: 194-200.

302 Navarro, Vincent, ed. *The Political Economy of Social Inequalities: Consequences for Health and Quality of Life*. Amityville, NY, Baywood Press, 2002.

pathways, to poor health.[303, 304]

Figure 1. Social determinants of health pathways leading to health status



Source: Adapted from Raphael, Dennis. *Poverty and Policy in Canada. Implications for Health and Quality of Life*, Toronto: Canadian Scholars' Press Inc., 2007. p. 242. Original source: Brunner, E. and M.G. Marmot, "Social Organization, Stress, and Health," in M.G. Marmot and R.G. Wilkinson (eds.), *Social Determinants of Health,* Oxford: Oxford University Press, 2006, p. 9.

[303] Coburn, David. "Beyond the Income Inequality Hypothesis: Globalization, Neo-Liberalism, and Health Inequalities," *Social Science & Medicine*, 2004, vol. 58, no. 1: 41-56.
[304] Navarro, Vincent , and L. Shi. "The Political Context of Social Inequalities and Health," in *The Political Economy of Social Inequalities: Consequences for Health and Quality of Life*, ed. Navarro, V. Amityville, NY: Baywood, 2002.

1.5 Risk and causality

Although poverty is considered to be a "risk condition" that can lead to a range of diseases and other health problems, it is rarely treated as a "risk factor," at least not in the way that behavioural risk factors such as tobacco use, diet, substance abuse, and physical exercise are studied and targeted for interventions. The World Health Organization (WHO) defines risk as the probability of an adverse outcome, or a factor that raises this probability, and argues that poverty lies "at one end of the risk factor scale."[305] Thus, if a risk factor is anything that increases the probability that a person will suffer harm, then, according to the U.S. Surgeon General, poverty can also be considered a risk factor for poor health.[306] The Surgeon General clearly refers to poverty in these terms:

> Of the risk factors that are amenable to change, some are not realistic targets of preventive efforts. Eliminating poverty is not a realistic short-term goal, for example, but programs that counter some of the effects of poverty are. (Eliminating or reducing poverty should be a high-priority long-term goal, however.)[307]

Tony Blakely et al. observe that, "an underlying assumption in all calculations of the disease burden is that the associations between risk factors and disease are causal."[308] They describe two major problems with determining causality for poverty-risk factor relationships: "endogeneity (i.e. the inseparability of poverty and health owing to dynamic, synergistic and bi-directional causal associations…) and confounding (since poverty may be correlated with other determinants of health such as education)."[309] For example, in the first instance, it is often not clear whether poverty leads to poor health or whether poor health leads to poverty. And in the second instance, it may not be clear whether health outcomes are the result of low-income, education, occupation, or other factors that are correlated with poverty.

Emma Haydon et al. remark that isolating specific causes of chronic disease is difficult considering the relationships between various risk factors.[310] They note that multicausality,

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305 World Health Organization. *Reducing Risks, Promoting Healthy Life*, accessed. p. 8.
306 The Surgeon General of the Public Health Service. *Youth Violence: A Report of the Surgeon General*, United States Department of Health and Human Services, 2001; accessed Dec 2007; available from http://www.surgeongeneral.gov/library/youthviolence/toc.html.
307 Ibid., accessed. Chapter 4. Risk factors for Youth Violence.
308 Blakely, Tony, Simon Hales, and Alistair Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, Environmental Burden of Disease Series No. 10, World Health Organization, 2004; accessed Nov 2007; available from http://www.who.int/quantifying_ehimpacts/publications/en/ebd10.pdf. p. 5.
309 Blakely, Tony, Simon Hales, Charlotte Kieft, Nick Wilson, and Alistair Woodward. "Distribution of Risk Factors by Poverty," in *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attribution to Selected Major Risk Factors*, ed. Ezzati, Majid, Alan D. Lopez, Anthony Rodgers and Christopher J.L. Murray, Volume 1, Chapter 24: 1941-2127. Geneva: World Health Organization, 2004; accessed Nov 2007; available from http://www.who.int/publications/cra/chapters/volume2/1941-2128.pdf. p. 1947
310 Haydon, Emma, Michael Roerecke, Norman Giesbrecht, Ju_rgen Rehm, and Marianne Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association, 2006; accessed Dec 2007; available from http://www.ocdpa.on.ca/docs/CDP-FullReport-Mar06.pdf.

which implies that diseases have several causes acting together, is an established concept.[311] Because of the multidimensionality of poverty, researchers try to control for various variables such as income, education, occupation, family history, gender, and so on to determine the causes or relative risks of disease.[312] Blakely et al. argue that, in practice, this is difficult because there is little information on many potentially confounding factors, and when the information is known, it is often not clear how to best control for the confounding factors. The approach they take is to report or "map" crude associations of poverty and health risk factors. In other words, they do not take possible confounders such as education, etc. into account. Rather, for the most part, they limit the poverty association with health to unadjusted measures of high and low income. They note that "[w]hile this approach is limited by problems of endogeneity and confounding, it also avoids tenuous assumptions about controlling for confounders that are part of the constellation of factors that accompany poverty."[313]

Raphael notes that causality is probabilistic rather than absolute—a cause leads to an increase in the *probability* of an outcome, rather than always leading to an outcome per se:

> Many philosophers and scientists use the idea of *efficient cause* based upon Aristotle's notion of what puts an event in motion. For a situation such as low income to be an efficient cause of an outcome such as cardiovascular disease it must: a) occur prior in time to the outcome; b) represent a process that produces the changes that lead to the outcome; and c) be part of a causal network that includes direct and indirect effects on the outcome of interest.[314]

Thus, in order to determine causality, the consensus is that poverty must occur before poor health. However, there has been a debate in epidemiological and social research concerning whether poverty causes poor health or whether poor health more often leads to poverty. The reverse causation theory—that poor health limits the ability to engage in paid work and, therefore, leads to poverty—has, for the most part, been discredited in the literature as the main direction of causality. For example, longitudinal studies, which take a life-course approach, such as those conducted in England or reviewed by Michaela Benzeval and Ken Judge, have consistently seen poverty occurring before and leading to ill health.[315] According to Shelley Phipps, "most of the studies reviewed … all conclude that *reverse causation* is not a serious problem and that the main direction of influence is *from* poverty *to* poor(er) health."[316]

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[311] Hallqvist, J., A. Ahlbom, F. Diderichsen, and C. Reuterwall. "How to Evaluate Interaction between Causes: A Review of Practices in Cardiovascular Epidemiology," *Journal of Internal Medicine*, 1996, vol. 239: 377-382.
[312] Blakely, Hales, and Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, accessed.
[313] Blakely, Hales, Kieft, Wilson, and Woodward. "Distribution of Risk Factors by Poverty." p. 1948.
[314] Raphael, Dennis. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, Toronto: North York Heart Health Network, 2001; accessed Nov 2007; available from http://action.web.ca/home/narcc/attach/Inequality%20is%20Bad%20for%20Our%20Hearts%20-%202001%20Report%5B1%5D.pdf. p. 5.
[315] Benzeval, Michaela, and Ken Judge. "Income and Health: The Time Dimension," *Social Science & Medicine*, 2001, vol. 52: 1371-1390. See also: Benzeval, M., A. Dilnot, K. Judge, and J. Taylor. "Income and Health over the Lifecourse: Evidence and Policy Implications," in *Understanding Health Inequalities*, ed. Graham, H. Buckingham, UK: Open University Press, 2001; http://195.89.185.89/bd.cgi/openup/isb?0335205534.
[316] Phipps. *The Impact of Poverty on Health: A Scan of Research Literature*, accessed. p. 13. Emphasis is in original.

In addition, the debate has both an individual and a societal orientation. Studies with an individual orientation associate poverty with individual health status, and studies with a societal orientation associate poverty and poor health outcomes with living in neighbourhoods or societies with a more unequal distribution of income. Phipps notes that at the individual level, "there is a very clear and very robust relationship between individual income and individual health. That is, poverty leads to lower health status."[317] Yen and Syme report that the epidemiology literature also "strongly suggests that the social environment is a risk factor for a variety of health outcomes."[318]

Poverty is often referred to in the literature as a "distal cause" of disease, in comparison with individual behavioural risk factors, which are referred to as "proximal causes."[319] Haydon et al. note that distal causes are less certain and consistent than the more direct, proximal, and individual risks of chronic disease:

> This is due in part to the amplifying effects of distal causes, in that they can affect many different sets of proximal causes, thus having the potential to make quite large differences in disease outcomes. The WHO (2002) suggests that more complex multilevel models of causal webs of interactions among risk factors may lead to more appropriate estimates of the contributions of risk factors.[320]

Other empirical studies have found that indicators such as income, education, and occupation have independent effects beyond their collective influences.[321] However, most researchers agree that all of these factors work together in producing ill health, with the presence of any number of variables influencing the effect of the other. Therefore, interventions that reduce risk conditions in one area could also reduce the risks in other areas as well.

Health Canada suggests that, in order to take action on health problems and determinants, public health needs "sufficient evidence," but "it does not need absolute evidence."[322] It offers the following quote from McKeown on the degree of evidence necessary for public action:

> [A]ction is often needed to protect and promote health in circumstances where the evidence is less than complete. Moreover, in many cases it is questionable whether within the foreseeable future the evidence will be complete. To assess precisely the respective roles of diet, exercise and smoking in the causation of coronary artery disease, a massive human experiment would be needed, with division of a population into multiple experimental and control groups. Such an investigation would present formidable ethical, technical and administrative difficulties. Does this mean that no action can be taken in

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[317] Ibid., accessed.
[318] Yen, I.H., and S.L. Syme. "The Social Environment and Health: A Discussion of the Epidemiologic Literature," *Annual Review of Public Health*, 1999, vol. 20: 287-308.
[319] Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.
[320] Ibid., accessed. p. 48. citing World Health Organization. *Reducing Risks, Promoting Healthy Life*, accessed.
[321] Mechanic, David. "Population Health: Challenges for Science and Society," *The Milbank Quarterly*, 2007, vol. 85, no. 3: 533-559.
[322] Health Canada. *Canadian Handbook on Health Impact Assessment. Vol 3: Roles for the Health Practioner*, 1999; accessed Dec 2007; available from http://dsp-psd.communication.gc.ca/Collection/H46-2-99-235-3E-9.pdf. p. F8.

> this and similar cases because the grounds, however suggestive, are not conclusive?
>
> In the light of such difficulties … it will often be desirable to act on the basis of high, or even moderate probabilities, on what has been called 'a burden of prudence' rather than 'a burden of proof.' [.… I]t should be recognized that conclusive evidence of harm or benefit to health is often an unrealistic requirement.[323]

The "precautionary principle," which is used by Health Canada, is an example of the government's commitment to incorporate uncertainty into decision making. UNESCO defines the precautionary principle as "an anticipatory model to protect humans and the environment against uncertain risks of human action."[324] Ian Shugart notes that "[i]n public health, the precautionary principle is a well-established tenet and a core value."[325] It is founded in the Rio Declaration of 1992 and, in Canada, is legislated under the Canadian Environmental Protection Act.[326] Health Canada remarks:

> A key feature of health risk management is that decisions are often made against a backdrop of considerable scientific uncertainty. A precautionary approach to decision-making emphasizes the need to take timely and appropriately preventive action, even in the absence of a full scientific demonstration of cause and effect. This emphasis in decision-making is reflected in the final report of the Krever Commission of Inquiry, which concludes that a lack of full scientific certainty should not be used as a reason not to take preventive measures when reasonable evidence indicates that a situation could cause some significant adverse health effect.[327]

Colin Mathers et al., writing for WHO, suggest that, since mechanisms of causality are only partially known, "[i]t is therefore important to make judgement based on best available science and data and document all assumptions and sources of uncertainty."[328] In costing studies, uncertainty is often expressed as a range of estimates that indicate a confidence interval (CI) of high and low estimates.[329]

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[323] McKeown, T. *The Role of Medicine - Dream, Mirage or Nemesis?*, Princeton, New Jersey: Princeton University Press, 1979. Cited in Health Canada. *Canadian Handbook on Health Impact Assessment. Vol 3: Roles for the Health Practioner*, accessed. p. F8.

[324] World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) Expert Group. *The Precautionary Principle*, Paris: UNESCO, 2005; accessed December 2005; available from http://unesdoc.unesco.org/images/0013/001395/139578e.pdf.

[325] Shugart, Ian. *Summary of Discussion, Science Advisory Board Meeting, June 6-7, 2000 - the Precautionary Approach in Health Canada*, Health Canada, 2000; accessed February 2008; available from http://www.hc-sc.gc.ca/sr-sr/pubs/advice-avis/sab-css/meetings-reunions/june-juin00_e.html#12.

[326] Ibid., accessed.

[327] Health Canada. *Canadian Handbook on Health Impact Assessment - Volume 2: Approaches and Decision-Making, Appendix C: Health Canada's Underlying Principles of Risk Management, Take a "Precautionary" Approach*, 2004; accessed February 2008; available from http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/handbook-guide/vol_2/appendix-annexe-c_e.html. #8.

[328] Mathers, Colin, Theo Vos, Alan Lopez, Josh Salomon, and Majid Ezzati. *National Burden of Disease Studies: A Practical Guide*, Edition 2.0. Global Program on Evidence for Health Policy. Geneva: World Health Organization, 2001; accessed Nov 2007; available from http://www.who.int/healthinfo/nationalburdenofdiseasemanual.pdf. p. 129.

[329] Briggs, Andrew H., Bernie J. O'Brien, and Gordon Blackhouse. "Thinking Outside the Box: Recent Advances in the Analysis and Presentation of Uncertainty in Cost-Effectiveness Studies " *Annual Review of Public Health*, 2002, vol. 23, no. 377-401.

1.6 Basic methodology issues

For the most part, this report reviews studies that use income as the main measure of socioeconomic position and poverty. An environmental scan of research on poverty and health connections previously undertaken by two authors of this review (K. Hayward and R. Colman) with Raphael, Labonte, and others, as well as this literature review, found that very few researchers in Canada consider poverty explicitly when studying health.[330] Others, such as Drewnowski, have also observed that social science research commonly controls for socioeconomic variables such as income, but rarely treats it as a principal variable of interest.[331]

However, many Canadian researchers use household income, adjusted for household size, as the main measure of socioeconomic position. British researchers more often use social class and European researchers most often use education to indicate socioeconomic status. For New Zealand researchers Blakely et al., income is a preferred indicator of socioeconomic position.[332] Blakely et al., who tracked health disparities by mortality trends in New Zealand using income as a measure of socioeconomic disparity, give the following reasons for choosing income as their primary measure:

- Income can be specified in the same way, and with the same inflation-adjusted categories, for [the income-tertile, quartile, or quintile] cohorts.
- The number of income categories can be tuned according to the statistical power required for different analyses. [In the Blakely et al. report they use both a three- and a five-category classification.]
- The categories are clearly hierarchical and behave as ordinal variables, which eases both the analytical and interpretational tasks.
- Income correlates strongly with other measures of SEP [socioeconomic position] such as education and occupation, yet is more rapidly modifiable by redistributive policies—giving this measure particular policy relevance.
- Rising income inequality has been a major feature of New Zealand society in recent decades.[333]

They also give reasons why they did not choose education or occupation—two other widely used indicators of socioeconomic position:

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[330] Raphael, Dennis, Jennifer Macdonald, Ronald Colman, Ronald Labonte, Karen Hayward, and Renee Torgerson. "Researching Income and Income Distribution as Determinants of Health in Canada: Gaps between Theoretical Knowledge, Research Practice, and Policy Implementation " *Health Policy*, 2005, vol. 72: 217–232

[331] Drewnowski, Adam, Session Chair. "The Links between Poverty and Obesity." Paper presented at the Poverty and Obesity: Disparities in Diet and Health Interdisciplinary Forum, Exploratory Center for Obesity Research, Seattle, Washington, University of Washington, March 2, 2007; available from http://depts.washington.edu/uwecor/events/poverty_obesity.htm.

[332] Blakely, T., M. Tobias, J. Atkinson, L-C. Yeh, and K. Huang. *Tracking Disparity: Trends in Ethnic and Socioeconomic Inequalities in Mortality, 1981–2004*, Public Health Intelligence, Occasional Bulletin No. 38. Wellington: New Zealand Ministry of Health, 2007; accessed Nov 2007; available from http://www.moh.govt.nz/moh.nsf/pagesmh/6689/$File/tracking-disparity-inequalities-in-mortality-1981-2004.pdf.

[333] Ibid., accessed. p.2.

> Both social (occupational) class and educational status (qualifications) are also central to sociological theories of stratification, and some analyses included in this report employ these measures (along with others) as markers of SEP. Yet both educational status and occupational class pose measurement challenges. Changes in the classification of educational qualifications, together with changing patterns of participation in post-compulsory education and in the income returns to education, generate cohort and period effects that complicate the analysis of trends. Occupational class is only assignable in the NZCMS [New Zealand Census Mortality Study] to people who are currently employed, thereby excluding a substantial and varying proportion of the adult population and generating severe health selection effects.[334]

In order to determine the health costs of poverty in Canada, data need to be collected from a broad range of categories—income, health, economic costs, specific vulnerable populations, other social issues, and issues related to the social determinants of health pathways that might be included. The extent of the data needed depends on the priorities and the indicators chosen bythe commissioners of the report. As discussed below, previous reports that have attempted to estimate the costs of poverty have used very few indicators and data. These reports have been useful in terms of understanding the methodologies used for calculating costs, but a cost of poverty study for Canada could potentially be much more comprehensive.

Generally, some of the data that would be required for a comprehensive report include those for poverty levels and the prevalence of low-income in the population, as well as a multitude of health indicators ranging from self-rated health to chronic disease prevalence, mental health status, injuries, and mortality patterns. In addition, data on relative risks and population attributable fractions, which estimate the proportion of poor health that can be attributed to poverty, must be collected and/or calculated. These data needs are similar to those required for summary measures of health, about which William Flanagan et al. of Statistics Canada note:

> Estimating summary measures of health requires a wide variety of data including: population counts; incidence and mortality rates; life expectancies; cause-specific and observed survival; distributions, durations, and preference scores across a multitude of health states; and risk factor data to estimate population attributable fractions (PAF). Disaggregating by age group and sex further explodes the quantity of data.[335]

For a comprehensive cost of poverty report, we could also add "poverty" to the risk factor data, "by low-income measures" to the disaggregating step, economic costing data, and data for a number of years to assess trends for all of the indicators.

Presently there are no health disparity indicators commonly reported in Canada, and data collection is complicated by the fact that many of the data are available at the province level and

[334] Ibid., accessed. p. 2.
[335] Flanagan, William, Jane Boswell-Purdy, Christel Le Petit, and Jean-Marie Berthelot. "Estimating Summary Measures of Health: A Structured Workbook Approach," *Population Health Metrics*, 2005, vol. 3, no. 5: 1-12. accessed Dec 2007; available from http://www.pophealthmetrics.com/content/pdf/1478-7954-3-5.pdf (open access). p. 2.

are not centrally located. We have relied on previous reports that have used data collected by linking various databases such as mortality and health surveillance databases, and provincial, census, postal code, and health survey data. Data in this review are reported as they are in the original source. For a full-report on the health costs of poverty, however, economic data will need to be adjusted for inflation using the Consumers Price Index, and translated into constant dollars. Also, where data are not available, as is the case for some provinces, extrapolations will need to be made from existing data.

In addition to focusing on methodologies used in previous cost of poverty reports, this review has concentrated on finding relative risk ratios that associate poverty/low income with health outcomes. Many of the important relative risk ratios found are now over 10 years old, and for these to be useful, an assumption will have to be made that these ratios have remained stable in the intervening years. There is some evidence that this is indeed the case.

The review has also examined the evidence and methods associated with assessing the poverty-attributable fractions (PAF) of particular outcomes associated with poverty, and the degree to which the evidence points to causal links and quantitative assessments of the influence of poverty on each defined outcome. For a full cost of poverty study the population attributable fractions reported here will need to be recalculated based on updated prevalence data. This methodology is reviewed below. Population attributable fractions, relative risk ratios, and odds ratios are reported within the studies reviewed. Due to time and resource constraints, these ratios have not been collected into summary tables.

For the most part, this review has collected limited poverty and health status prevalence data, since these data are readily available and would need to be updated, in any case, in a cost of poverty study. As well, poverty reduction interventions and other policy strategies for reducing health disparities was beyond the scope of this report, and thus only a few key strategies are briefly mentioned. The Public Health Agency of Canada has recently called for proposals to review health disparity indicators in use internationally, as a precursor to developing similar indicators in Canada. Therefore, this review has not highlighted potential indicators that may be developed in a later phase of this project.

1.7 Structure of the literature review

This literature review is divided into four parts, with the main focus being on the first two. It also includes appendices with additional figures and tables and a list of references cited. Part 1 discusses the methods needed to assess the costs of poverty on a national level. It consists of the introduction, a detailed review of four major cost of poverty studies—one from Calgary, two from the United States, and one from the European Union. It also includes a review of methodologies used to assess the distribution of health risk by socioeconomic position, especially as employed in New Zealand, and other methodologies commonly used in cost of illness studies.

Part 2 includes a section on poverty measurements used in Canada, and a major section that reviews studies that associate various health indicators with poverty. Behavioural risk factors for chronic disease, self-rated health, specific chronic diseases, unintentional injuries, mental health, mortality, life expectancy, two health summary measures, and health service use are reviewed.

Because of time and resource limitations, Parts 3 and 4 are not as comprehensive as the previous two parts. Part 3 involves a brief review of several vulnerable populations and social issues other than health that are important to understanding the impacts of poverty. Part 4 concludes the report and provides recommendations for next steps towards completing a full cost of poverty report.

2. Examples of methodologies used in cost of poverty studies

2.1 Economic costs of poverty in the United States

Harry Holzer, of Georgetown University and the Urban Institute, et al. presented a report in January 2007 to the United States House of Representatives Ways and Means Committee Hearing on the Economic and Societal Costs of Poverty.[336] They calculate the economic costs of poverty in the U.S. by focusing on how childhood poverty affects outcomes for adults later in life and how these outcomes affect the society as a whole.[337] Holzer et al. view expenditures on poverty reduction as social or public investments that generate returns to society over time in a variety of ways including reduced expenditures on health, higher GDP, and improvements in the overall quality of life of the population. They estimated that the costs associated with childhood poverty equal nearly 4% of the GDP, or about $500 billion per year. In other words, if child poverty were eliminated in the U.S., $500 billion would be saved annually and could be used in other ways to increase the quality of life of the entire population.

Holzer et al. use only three categories in order to calculate costs, which are all associated with adults who grew up in low income (or poverty) households—lost earnings, or reduction in the annual aggregate production of goods and services, crime, and health. They note that, although crime and health are not the only costs associated with poverty, they are likely to be the largest and most easily quantifiable. In addition, they reason that costs associated with low levels of education, except for benefits of education that go beyond higher wages and are difficult to quantify, should be captured by costs associated with lost earnings. Holzer et al. use both public and private costs as well as intangible social costs, such as reduced safety and wellbeing, in their calculations of extra crime and health expenditures, but all costs are expressed as a share of the GDP, summarized as:

Forgone earnings:	1.3 percent GDP
Crime:	1.3 percent GDP
Health:	1.2 percent GDP
Total:	3.8 percent GDP[338]

Rather than examining the relationships between adult poverty and earnings, health, or crime, the authors reviewed a range of studies that estimate "the average statistical relationships between

[336] United States House of Representatives. *Hearing on the Economic and Societal Costs of Poverty*, Committee on Ways and Means, 2007; accessed October 2007; available from http://waysandmeans.house.gov/hearings.asp?formmode=detail&hearing=508.
[337] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.
[338] Ibid., accessed. p. 22.

growing up in poverty, on the one hand; and earnings, propensity to commit crime and quality of health later in life, on the other."[339] They explain that this is because it is difficult to determine whether adult poverty is caused by or produces ill health or crime, for example. Therefore, by examining poverty in childhood and its later effects, they can confidently state that the poverty came before the effect and can be considered as a cause of the effect. In this case, "cause" is synonymous with "statistically associated with."[340]

The authors also note other difficulties with the issue of causation. For instance, many of the costs of poverty may not be primarily financial and therefore cannot be captured by income measures, e.g., in addition to low income, quality of family life, community forces, schools, etc. may contribute to the experience of poverty. Nevertheless, low income is the bottom line and what all people living in poverty are faced with. Therefore, and because researchers have been unable to disentangle the effects of income *per se* from other potential effects, the authors chose to define poverty broadly to include:

> *not only the effects of low parental incomes, but also of the entire range of environmental factors associated with poverty in the U.S., and all of the personal characteristics imparted by parents, schools, and neighborhoods to children who grow up with or in them.* … Of course, in defining poverty this way, we also assume that the entire range of negative influences associated with low family incomes would ultimately be eliminated if all poor children were instead raised in nonpoor households.[341] [emphasis original]

Adapting such a broad definition of poverty allows the authors to use fairly simple estimates of the statistical relationships between child poverty and adult outcomes, rather than needing to adjust for or isolate effects of variables such as parental education or race. Thus, the authors explain their basic methology:

> As for our actual methodology, we measure the effects of poverty on these outcomes using estimates of the statistical association between childhood poverty (or low family income) and such outcomes as adult earnings, participation in crime, or poor health.[342] ….
>
> These estimates come from regressions that take the following form: $Y_i = a + bPOVERTY_i + u_i$, where Y represents one of the outcomes affected for person i—either adult earnings, participation in crime, or poor health—and POVERTY is a dichotomous (or dummy) variable for whether or not he/she spent at least a certain number of years as a child in a poor household. The coefficient b then represents the average (presumably negative) effect of childhood poverty on his/her earnings, or its (positive) effect on their likelihood of engaging in crime or having poor health.[343] ….
>
> The annual costs of crime and poor health associated with poverty are then the

[339] Ibid., accessed. p. 5.
[340] Ibid., accessed. p. 5.
[341] Ibid., accessed. p. 6.
[342] Ibid., accessed. p. 4.
[343] Ibid., accessed. p. 4. The explanation of the formula given here is the extent of the explanation given by Holzer et al. For example, the coefficients a and u are not explained.

> magnitudes of each that appear to be "caused" by (or at lease statistically associated with) childhood poverty, multiplied by our estimates of the annual cost per "unit" of crime or poor health to the U.S. economy…. In all cases, these social costs per individual who was poor as a child need to be aggregated across the number (or percent) of all children who grow up in poverty, and then calculated as portions of GDP.[344]

These calculations, then, represent "the *average* likelihood of lower earnings, participation in crime or poor health among adults who grew up in poverty."[345] They do not imply that all children who grew up poor remain poor as adults, or that children who did not grow up poor escape poverty as adults.

Choice of a reference group for the poor—the group with which to compare the poor—is also an important factor in the calculations. The authors generally use *"those with family incomes at twice the poverty line"* as their reference group since they find a consensus among researchers that that is where a true "poverty line" might be constructed and is a realistic goal for policy efforts.[346] [emphasis original]

Holzer et al. recognize that their study has limitations and, if anything, likely underestimates the costs of poverty. For instance, they did not try to capture the costs associated with poor adults who did not grow up poor, which might be considerable. Also, excluded were many tangible and nontangible costs on the poor themselves.

The authors suggest that the dynamic effects of poverty are also dependant on the time spent in poverty, the depth of poverty, and in what phase of the lifecourse the poverty took place, and that these dynamics are not always accounted for. However, most studies use the number of years spent in poverty, or a family's average income over the years of childhood, as one of the primary determinants of the effects of poverty. Less often considered is the fact that the timing of poverty is also important—a shorter time spent in poverty in the early years may have as damaging effect as a longer time spent in poverty later in the adolescent years. These factors are not captured by the authors who explain that research attempts that try to separate the effects of permanent from transitory income changes have not been conclusive.[347]

The authors also note that most studies of this kind are based on absolute measures of poverty, rather than the income inequality effects that also influence poverty and outcomes, but which are difficult to calculate and interpret and often show inconclusive effects on outcomes. In addition, most studies often emphasize the effects by looking at productivity, individual skills, and behaviour—an economic *supply-side* argument, rather than also considering the *demand-side* associated with eliminating child poverty, e.g., the quality of jobs, structure of wages, or the benefits to all of an improved quality of life.

[344] Ibid., accessed. p. 5.
[345] Ibid., accessed. p. 4.
[346] Ibid., accessed. p. 9.
[347] Ibid., accessed. p. 14.

2.1.1 Cost related to forgone productivity and earnings

To calculate the cost of forgone productivity and earnings of adults who had grown up in poverty situations, the authors relied on studies that link the earnings of children to their parents' income. Studies show that "*doubling the incomes of families below or at the poverty line raises the earnings of their [children] by 30 – 40 percent*."[348] [emphasis added] The authors calculate forgone earnings using "intergenerational elasticities" that relate years of parent and adult offspring earnings and are expressed in "log points." For this the authors use the following methodology:

> To calculate the aggregate effects of childhood poverty on the earnings of adults, we use an average intergenerational elasticity estimate of 0.5; and a difference in family income of 0.98 log points, which represents the difference between the average incomes for poor families (about $14,500) and twice the poverty line for a family of four (about $38,800) in 2005. This implies a reduction of 0.49 log points in earnings for those who grew up in poverty relative to the median household. Since median adult earnings was about $30,500 in 2005, a reduction of 0.49 log points associated with poverty reduces average adult earnings to about $18,770, or by 39 percent relative to median earnings.[349]

Based on the facts that:

- Earnings represent 65% of GDP, which is currently measured at approximately $13.2 trillion dollars per year by the U.S. Department of Commerce),
- Median earnings ($30,000) in the U.S. is about 60% of mean earnings ($50,000),
- 9.6% of all children grew up in families with incomes below the official poverty line for over half of all years from 1979 – 94, which implies an annual reduction of GDP of 1.5%,
- 8% of all children grew up in families with incomes below the poverty line for one fourth of the years from 1979 – 94, with half as large an effect on their earnings, which implies an additional annual reduction of GDP of 0.6%,
- The total reduction in earnings is 2.1% of the GDP.

The authors then cite a study of twins which suggested that 40% of "intergenerational transmission of inequality" is hereditary rather than environmental.[350] Calling this percentage the "hereditary component," they then reduced their calculations by 40% to account for this component. Holzer et al. did not explain the "intergenerational transmission of inequality" further. U.K. researcher Kate Bird recently reviewed the evidence on the intergenerational transmission of poverty and found the conceptualization and research around this topic to be contentious.[351] She did find evidence of environmental and contextual systematic inequalities

[348] Ibid., accessed. p. 10.

[349] Ibid., accessed. p. 12. Estimates of the median annual earnings are based on weighted averages for full-time and part-time workers in 2005, aged 25 years and over.

[350] Jencks, Christopher, and Laura Tach. "Would Equal Opportunity Mean More Mobility?" in *Mobility and Inequality: Frontiers of Research from Sociology and Economics*, ed. Morgan, S., D. Grusky and G. Field. Stanford, CA: Stanford University Press, 2006. Cited in Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed. p. 13.

[351] Bird, Kate. *The Intergenerational Transmission of Poverty: An Overview*, London, U.K.: Chronic Poverty Research Centre 2007; accessed March 2008; available from http://www.chronicpoverty.org/pdfs/99Bird.pdf.

within and between households that led to intergenerational poverty. However, genes and heredity were not listed as important contributing factors, per se. Although it is beyond the scope of this report to investigate this topic further, we did not find that other costing studies accounted for this category, and therefore would not recommend its inclusion in further cost of poverty studies.

Holzer et al. come to the following conclusion:

> *[T]he experience of growing up in poverty or near poverty for about 17 percent of our nation's children reduces the nation's aggregate output by about 1.3 percent, or about $170 billion per year*.[352] [emphasis original]

The authors also note that these calculations only include those who report positive earnings. Those who are not part of the labour force and have no earnings are excluded from the calculations. Therefore, the actual estimates could be much higher if those who are incarcerated, or who rely on social assistance or disability payments were included.

2.1.2 Costs related to crime

According to the literature, youth who grow up in the bottom quintile (20%) of the income distribution range are from 1.3 to 4 times as likely to commit violent crimes compared with youth from the second or third income quintiles. From this, Holzer et al. infer:

- Low income during childhood doubles the likelihood that individuals will commit violent crimes, relative to children growing up in families with incomes around twice the poverty line.
- The annual incidence of crime attributable to poverty is then 0.2*(100 percent),[353] or 20%, with 20% representing the fact that 20% of children are in the bottom quintile of income distribution.[354]

These calculations are then adjusted for "survey bias," which is based on research that shows self-reported crimes to be understated in surveys by a factor of from two to four. The authors use the lower end of the range and adjust their estimates by a factor of two, and find:

- The incidence of annual crime and its costs attributable to poverty after adjusting for survey reporting problems is on the order of 40 percent (i.e., 2*20 percent).

The calculations were also adjusted for the same hereditary portion used in the lost productivity estimate. Therefore,

- Heredity is estimated to account for 40% of the effects of poverty and the environmental

[352] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.p. 13.
[353] The * is used in the Holzer et. al. report and it represents a multiplication sign.
[354] Ibid., accessed. p. 17.

effects of poverty per se are estimated to be 60%.

In order to estimate the costs of crime, the authors use victimization costs of “street crime” and exclude protective measures of crime such as spending on policing, prisons, and private security, which they note are essentially unchanged with marginal changes in crime rates. They assume that poverty only matters for street crime, although they admit that, “this is surely not the case in practice.”[355]

- The overall victimization costs of street crime are estimated to be $700 billion per year.

These victimization costs were not itemized in the report.

Holzer et al. conclude:

> Overall, these figures suggest that poverty raises the costs of crime by at least 0.6*0.4*$700 billion, or about $170 billion annually. This figure represents about 1.3 percent of GDP today, and is still likely a lower bound to the true effect of poverty and crime on the economy.[356]

2.1.3 Costs related to health

The following steps were used by Holzer et al. to compute estimates of the effects of child poverty on the incidence of poor health in adulthood, and the economic costs associated with poor health. Unfortunately, all of the data used to make these estimates were not reported. The economic costs include two dimensions:

- additional expenditures on health care, and
- the value of lost quantity and quality of life associated with early mortality and morbidity.[357]

Health care estimates

The estimates for additional expenditures on health care involve the following steps:

1. Estimate the impacts of income on self-reported health.
2. Use these estimates to predict the health effects if family income of those currently living in poverty were to rise to twice the poverty line.
3. Use data on health expenditures by age group and health status in order to predict how child poverty affects health expenditure by age group.
4. Convert the age-specific estimates to aggregated annual health costs by discounting the value of additional health costs for all children born in poverty in a year (for four million births per year, 15% child poverty rate) by 3% discount rate and 3% inflation rate in

[355] Ibid., accessed. p. 18.
[356] Ibid., accessed. p. 19.
[357] Ibid., accessed. p. 19.

medical costs.

As noted, details of these estimates were not provided in the report. For example, Holzer et al. note that they used two papers by Case et al. to estimate the impacts of income on self-reported health, but that they inflated the reported coefficients by 1.5 to account for controlled variables. However, they do not report the estimates used and it was not possible to establish these estimates by reviewing the Case et al. papers.[358]

Holzer et al. report that based on the above steps, they found that poverty raises direct expenditures on health care by about $22 billion per year. In addition, they added another $4 billion to estimate the impact of poverty on special education. The special education estimate was derived from a U.S. Department of Education report and Holzer et al. note:

> *[E]lementary and middle-school students are 4 percentage points more likely to be in special education if they live in poverty compared to those in a middle-income group. High school students in poverty are 5 points more likely to be in special education.* These increased rates are multiplied by the additional $12,600 spent on special education students, on average, per year.[359] [emphasis added]

In conclusion, the authors found that the increased expenditures for health care and special education account for about 0.20% of the GDP.

Quantity and quality of life estimates associated with early mortality and morbidity

The value of lost quantity and quality of life associated with the early mortality and morbidity of those living in poverty are estimated using the "health capital" at birth approach, which represents the total value of lifetime health for individuals born into poor families. Health capital estimates are the "present discounted values of the expected numbers of 'quality-adjusted-life years' (QALYs) for different groups."[360] Because QALYs are life expectancies that are adjusted for various illnesses on self-reported quality of health they include the effects of both mortality

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358 Case, Anne, Darren Lubotsky, and Christina Paxson. "Economic Status and Health in Childhood: The Origins of the Gradient," *American Economic Review*, 2002, vol. 92, no. 5: 1308–1334. Case, Anne, Angela Fertig, and Christina Paxson. "The Lasting Impact of Childhood Health and Circumstance," *Journal of Health Economics*, 2005, vol. 24, no. 2: 365 – 389. Case, Fertig, and Paxson note: "Several measures of socioeconomic status in childhood are also related to adult health. Family income at age 16 becomes a larger and more significant predictor of health status with age in adulthood. At age 23, family income at 16 takes a coefficient of -0.069 and is not significantly different from zero. However, the effect increases in absolute value and significance with age, so that by age 33 it is -0.135 and by age 42 it is -0.143." p. 375. Using British longitudinal data, they also find that children with unskilled fathers are "8.3 percentage points more likely to be in fair or poor health at age 42 than children of professionals. Collectively, father's education and social status represent an incremental contribution of nearly 20% to [fair or poor] health at age 42." p. 377.

359 Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.citing United States Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. *25th Annual (2003) Report to Congress on the Implementation of the Individuals with Disabilities Education Act*, Volume 1, Washington, DC., 2005.

360 Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.p. 20.

and morbidity in one measure. A "value of statistical life" is used to value each year of life and is typically used in cost-effectiveness studies of medical procedures and health risks.

Holzer et al. found that the value of life estimates in the literature ranged from $100,000 per year to about $350,000 (US$2007). Therefore, they chose a middle value, or $200,000 per year as the value of a statistical life, on which to base their estimates. Also based on the literature, they estimate that poverty reduces the discounted (at 3%) health capital per child living in poverty by $248,000 over the lifetime of the child.

Therefore, in the U.S. with four million children born per year and 15% of these born into poverty, the lost health capital of $248,000 per child equals approximately $149 billion per year, which is about 1.1% of GDP.

Combining the heath cost estimates with those for QALYs represents 1.3% of the GDP. The authors then reduce this percentage by 7% to account for the contribution of hereditary factors on the socioeconomic impacts of health, which they note has been recently found to be quite small.[361] The final estimate of the impact of poverty on health costs was found to be 1.2% of the GDP per year, or about $162 billion.

In conclusion, Holzer et al. note that any estimate on the costs of poverty is bound to be uncertain because the range of estimates found in the literature is very large or does not exist. Consequently the authors must rely on their best judgments when choosing from the range, or make a number of assumptions that may not always be accurate. In addition, only a small fraction of the total impact of poverty on social and economic costs to society can be captured in these studies, mainly because it is not possible to consider all of the factors that may be important. Major limitations of this study in particular were mentioned above.

[361] Referring to their use of 7% as the "hereditary factor," Holzer et al. note, "Case and her colleagues estimate that it might be as little as seven percent in their data, since controlling for parental health status only reduces the relationship between child poverty and health by that amount." P. 22.

2.2 The external costs of poverty in Calgary

In a 2004 report for the United Way of Calgary and Area, Alan Shiell and Jenny Zhang used an explicit economic approach to estimate the external costs of poverty in Calgary.[362] They define "external costs" as costs that are incurred by society as a whole, separate from the costs incurred by people living in poverty, and note that these costs represent potential savings that could be realized if poverty was reduced.[363] These costs are regarded as "forgone resources," or resources that must be used to address the consequences of poverty and, therefore, cannot be used for other activities that may be beneficial. In addition, Shiell and Zhang note that the costs of poverty are also associated with inequality in income and that living at the low end of the income distribution can be regarded as living in poverty or as living with low income.

The authors argue that if external costs of poverty exceed the costs of reducing poverty, a case can be made for doing so, although they note that estimating the costs of reducing poverty are not addressed in the report. Only those costs deemed to be caused by poverty and result in a net loss of resources are considered. Therefore, unemployment is not considered to be a cost of poverty since the authors consider poverty to be a *result* of unemployment, not a cause. Thus, lost production because of unemployment is not considered to be a cost of poverty. Social assistance payments to those living in poverty are considered to be transfers of income from one sector of society to another, are not a payment for resources, do not change the aggregate amount of resources available to citizens, and are, therefore, not considered to be costs of poverty.

Shiell and Zhang make a distinction between "bad consequences"—or the adverse social consequences associated with poverty—and resources, which they define as being the additional economic needs required to support those in poverty. For example, the increased incidence of low birth weight babies or the increased burden of illness incurred by people living in poverty would not be considered a cost according to Shiell and Zhang, only a bad consequence. But the additional economic burden on the health care system would be a resource cost of poverty. The resources affected by poverty and used in the report include those involved in health care, education, criminal justice, social support, and income support. Specifically, these resources include:

- the additional burden on the health care system
- resources forgone because of lack of educational attainment
- increased costs associated with policing and the judicial system
- costs associated with providing programmatic support for people living in poverty.

Table 1 below shows both the conservative and speculative costs of poverty that Shiell and Zhang identified for the city of Calgary. The speculative list includes a number of somewhat arbitrary assumptions that the authors made in order to generate data that was unobtainable. Therefore, they estimate that between $8.25 million and $56.8 million could be saved annually if

[362] Shiell, Alan, and Jenny Zhang. *The External Costs of Poverty: A Conservative Assessment*, Centre for Health and Policy Studies, University of Calgary, and Institute of Health Economics, 2004; accessed November 2007; available from http://tamarackcommunity.ca/downloads/vc/cal_costsofpoverty04.pdf.
[363] Ibid., accessed. p. i.

poverty were eliminated in Calgary. Below, we look at the methodology used to calculate the costs in each of these areas.

Table 1. Summary of the external costs of poverty in Calgary (Shiell and Zhang, $2000)

Component	Conservative estimate of annual cost	Speculative assessment of annual cost
Health care	$3.35 million	$16.3 million
Education		
- high school completion	$4.5 million	$7.5 million
- special education	$0.4 million	$0.4 million
- socioeconomic deprivation	-	$1.2 million - $12 million
Criminal justice	-	$2 million
Social support / services	-	$0.6 million
Income support	-	$18 million
TOTAL	$8.25 million	$46 million - $56.8 million

Source: Shiell, Alan, and Jenny Zhang. *The External Costs of Poverty: A Conservative Assessment*, Centre for Health and Policy Studies, University of Calgary, and Institute of Health Economics 2004; accessed November 2007; available from http://tamarackcommunity.ca/downloads/vc/cal_costsofpoverty04.pdf.

2.2.1 Costs of health service use

After reviewing the literature on income and physician and hospital service use, including that by Kephart et al.,[364] who found that those with lower income tend to use physician services more than do those with higher income, Shiell and Zhang found only two studies that they could use to estimate the additional costs of health care associated with low income—a 1997 study by Roos and Mustard on health service use in Winnipeg,[365] and a 1998 study by Mustard et al. on health service use in Manitoba.[366]

In order to use these data, Shiell and Zhang made a number of assumptions including:

- that the data from other places (i.e., Winnipeg and Manitoba) would likely be similar to that for Calgary, and therefore the outcomes could be applied to Calgary. For example, if those in the lowest income decile in Manitoba account for 12% of the acute hospital care costs, then that percentage could be applied to the lowest income decile in Calgary.

- that the bottom quintile of neighbourhoods also contained the bottom quintile of individuals—an assumption they admit is unlikely, but one that probably understates the

[364] Kephart, G., V. Thomas, and D. MacLean. "Socioeconomic Differences in the Use of Physician Services in Nova Scotia," *American Journal of Public Health*, 1998, vol. 88, no. 5: 800-803.
[365] Roos, N.P., and C.A. Mustard. "Variation in Health Care Use by Socioeconomic Status in Winnipeg, Canada: Does the System Work Well? Yes and No," *Millbank Quarterly*, 1997, vol. 75, no. 1: 89-111.
[366] Mustard, C.A., M. Shanahan, S. Derksen, J. Horne, and R. Evans. "Use of Insured Health Care Services in Relation to Household Income in a Canadian Province," in *Health, Health Care and Health Economics*, ed. Barer, M.L., T.E. Getzen and G. Stoddart. Chichester, West Sussex, England: John Wiley & Sons, Inc., 1998.

effect of income on health care costs. This assumption is important and necessary because the data refer to neighbourhoods sorted by income quintile rather than to people sorted by individual income. Therefore, the authors needed to make an assumption about the income of the *individuals* who live in the lowest income quintile neighbourhoods.

- that if the incomes of those in the lowest quintile were equal to those in the second quintile, then the differences in health care utilization between the two groups would be eliminated with a corresponding cost saving. Therefore, the *reference group* in this study is the second income quintile population.

The Roos and Mustard study uses neighbourhood data in Winnipeg from 1992 sorted by income quintile to show the number of family practitioner consultations per resident, and the number of days in hospital per 1,000 residents.

Therefore, consultations with family physicians would fall from 5.8 per person (lowest quintile) to 5.2 per person (second quintile)—a difference of 0.6— and days spent in hospital would fall from 937 to 711 per 1,000 people—a difference of 226 days. Costs were calculated as follows:

1. The rate of people living in the lowest income quintile in Calgary is 20%, or 160,500 people.
2. Therefore, there would be 96,300 fewer consultations with family doctors (160,500 x 0.6) and 36,270 fewer days in hospital (160,500/1,000 x 226).
3. In Alberta, the standard cost of a consultation with a family doctor is $28 and the average cost of a day in the hospital in Calgary is $900.
4. Potential savings for physician services would equal $2.7 million (96,300 x $28). Savings for hospital costs would equal $32.6 million per year (36,270 x $900).
5. In order to be conservative, Shiell and Zhang assumed that the difference in utization would only halve if the difference in income between the first and second quintiles was eliminated, or that only half of the health care cost would be made available for other use following the reduction. They then reduced the more than $35 million total to $16.3 million per year to arrive at the "speculative assessment of health care cost."

Shiell and Zhang use the Mustard et al. study in order to estimate the conservative health care cost. This study uses household income for Manitoba in 1986/1987 adjusted for age, sex, and family size, rather than neighbourhood income. Since this study found no relationship between income and physician use, Shiell and Zhang only use the acute hospital service data, which does show the expected gradient between low income and increased use of services.

1. Costs of acute hospital care in Calgary are estimated using 2003 data for inpatient acute services and for emergency and outpatient services. This represents 70% of all direct service related expenditures. (The remaining 30% of expenditures is for non-acute services, which are not counted). Seventy percent (70%) of all diagnostic costs are added to the acute services costs for a total of $885.9 million acute hospital costs.
2. The Manitoba hospital data in the Mustard et al. study shows the share of acute hospital costs for ten income deciles. For example, in Manitoba, those in the lowest income decile account for 12% of the acute hospital care costs, those in the second lowest decile

account for 15%, and those in the third decile account for 13%.

3. Shiell and Zhang assume that these percentages are comparable to the situation in Calgary and use them to find the percentage shares of the acute hospital costs attributable to each income decile in Calgary: Total cost—$885,940 million; first (lowest) decile (12%)—$106,076 million; second decile (15%)—$132,652 million; third decile (13%)—$116,018 million.
4. Using the same logic as above, the authors then calculate the difference between the lowest and next to lowest decile to find the excess costs. However, since according to the Mustard et. al. report, use of hospital services is actually higher in the second decile than in the lowest decile (which was considered an anomaly), the authors first used the difference in costs between the second and third deciles, which resulted in a cost of about $16.6 million per year—or what would be saved if everyone in the second decile had as much income as those in the third decile, and therefore used acute hospital services less often. ($132.6 million minus $116.0 million)
5. Then the authors repeated the exercise using the lowest decile costs. They assumed that the lower percentage of costs in the lowest decile was the result of lack of access to services. They also assumed that hospital costs for the lowest decile would *increase* to the level of the third decile, since the people in the lowest decile would then use more services when their income is equivalent to those in the third decile. Therefore, the costs of hospital care provided to people in the lowest decile would go up by approximately $10 million per year—from $106 million (cost for lowest decile) to $116 million (cost for third decile). The net result is still a savings to the health system of $6.7 million per year.
6. To arrive at the conservate cost of $3.35 million, the authors again assumed that only half of the cost would be recovered from a reduction in utilization and so reduced the $6.7 million savings by half.
7. Including both studies led to a range of health care costs—or savings from poverty reduction—to between $3.35 million and $16.3 million per year.

2.2.2 Education costs

High school completion

In an attempt to assess the education costs of poverty, Shiell and Zhang turn first to high school drop out rates and note that the poverty related cost is the cost per drop out times the number of children living in poverty who drop out of school. They note that the costs of dropping out of high school are mainly private costs to the individual since the largest part of these costs is borne by the individual— 66% of the total cost per high school drop out is incurred by the individual who drops out, and 44% represents the public or external cost. This is based on costs and benefits "computed for each year over the expected lifetime of the representative individual and then discounted so that it can be expressed as a *net present value.*"[367]

However, in this case, the authors include both private and public costs in their calculations because the available evidence does not make a distinction between these costs, and because the students who drop out do not make a rational decision to do so in the sense of weighing the costs

[367] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed. p. 21.

and benefits before dropping out, which is a criteria in a typical economic model.

Therefore, the per capita cost of dropping out of high school includes lifetime external (public) and private costs and benefits of both market (direct) and non-market (indirect) costs and benefits. External direct costs include public spending on education and private direct costs include the private costs of education including forgone earnings while in school. Public benefits include extra income taxes that result from the higher earnings associated with higher education, and private benefits include higher earnings (net of taxes paid), again, which are associated with having higher education. Indirect benefits include lower crime, greater social cohesion, greater personal life satisfaction, and better health. Social costs include both private and public costs and benefits. An actual breakdown of these costs was not provided.

The calculations for estimating education costs associated with drop out rates among the poor involve the following steps:

1. Calculate the percentage of students living in poverty:
   In 1995, 135,600 children between 6–17 years of age lived in Calgary and 27,700, or 20.4% of these lived below the Low Income Cut Off (LICO). The authors then took the number of grade 10 students in Calgary (7,500) and calculated that 20.4% of them were living in poverty (1,530).

2. Estimate the high school drop out rate for students living above and below the poverty line:
   The authors used 1991 data for drop out rates for Canada from the calculations made by Ross et al.[368] that *5.1% of students not living in poverty drop out and 12.9% of students living in poverty drop out*.[369] They applied these rates to estimate the number of Calgary children in grade 10 living in poverty expected to drop out of school and found a total drop out rate for grade 10 students in Calgary to be 6.7%.

3. Estimate the expected number of drop outs if the drop out rate of students from poor households (12.9% or 197 students) was the same as the drop out rate for students from non-poor households (5.1% or 78 students). The difference (119 students)) represents the number of students who could be expected to finish high school if they were not living in poverty.

4. Adjust the number of drop outs in order to make the drop out rate more consistent with provincial rates.
   Data from Alberta show that by ages 25–34 years, 89% of people have the equivalent of a high school diploma. In order to adjust the 6.7% drop out rate used above to the actual drop out rate in Alberta (11%) as reported by Alberta Learning (which is different from the Statistics Canada rate), the authors adjust the number of drop outs by the fraction 11/6.7.

[368] Ross, D.P., E.R. Shillington, and C. Lochhead. *The Canadian Fact Book on Poverty 1994*, Canadian Council on Social Development (CCSD), 1994; accessed http://www.cfc-efc.ca/docs/ccsd/00000328.htm.
[369] Ross, D. P. , E. R. Shillington, and C. Lochhead. *The Canadian Fact Book on Poverty 1994*, Ottawa, Canada: Canadian Council on Social Development (CCSD), 1994.

After making the adjustments and depending on the approach used, the authors concluded that alleviating poverty could result in an additional 120 (rounded from 119) to 200 (based on adjustments for provincial rates) students living in poverty finishing high school each year.

5. Translate the rates into costs.
   Shiell and Zhang use a 1992 report from the Conference Board of Canada (CBC)[370] that was criticized for using a drop out rate that was too high (30%), but they note that although the higher rate exaggerates the total cost, it does not change the per capita cost of each drop out, which the CBC estimated to be $24,840 in 1989 dollars, or $37,560 in 2000 dollars.

   The authors also cite a 2000 report from Human Resources and Development Canada that has much higher per capita costs.[371] For example, it found a male dropping out in grade 10 would forgo an income of $120,770 over the course of his working lifetime. However, Shiell and Zhang were not able to reconcile the two studies so they decided to take the most conservative approach and use the per capita social costs from the CBC.

6. Therefore, with 120 to 200 youth failing to complete high school at a cost of $37,560 per capita, the total cost to Calgary is between $4.5 million and $7.5 million (in $2000 dollars).

Costs of special education services

The authors base the calculation of the cost of early childhood services on the 2000 edition of the *Canadian Fact Book on Poverty*, which finds that *low income children are 1.8 times as likely to be enrolled in remedial or special education classes than are children with adequate income.*[372] They exclude from the calculation children who have severe needs, speculating that poverty reduction might not reduce severe disability, and they assume that the need for special education is equally distributed in the quintiles above the lowest quintile. Thus, out of a total special needs enrollment of 1,325 students with mild and moderate disabilities, they assigned 411 students to the lowest quintile, and 228 students to each of the remaining four quintiles. Therefore, they conclude that poverty *per se*, leads to an additional 183 children requiring special support each year. In Alberta the cost of special education per student is $2,155, which suggests that Calgary could save $394,365 in these costs if poverty were to be eliminated.[373]

[370] LeFleur, Brenda. *Dropping Out: The Cost to Canada*, Ottawa, ON: The Conference Board of Canada, 1992.
[371] Applied Research Branch. *Dropping out of High School: Definitions and Costs*, Strategic Policy, Human Resources Development Canada, MP32-29/01-1E, 2000; accessed November 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/hrsd/prc/publications/research/2000-000063/r-01-01e.pdf.
[372] Ross, D. P. , K. Scott, and P. Smith. *The Canadian Fact Book on Poverty 2000*, Ottawa, Canada: Canadian Council on Social Development (CCSD), 2000.
[373] The authors actually said that the savings would be $394,250. However, they did not explain the discrepancy with the results of 183 students times $2,155 per student, which is $394,365.

Costs of schooling associated with socioeconomic deprivation

In Alberta, school boards receive money to reflect additional costs associated with children who experience socioeconomic deprivation. These additional costs are allocated based on five measures, one of which is the percentage of families living below the LICO threshold. The authors could not disaggregate the measure but noted that if low income is only 10% of the formula, then eliminating poverty in Calgary could save $1.2 million in this budget.

2.2.3 Criminal justice system costs

The costs to the criminal justice system theoretically should be estimated by calculating the cost of policing and the number of criminal events, and then linking the result to the estimates of the share of costs that could be attributed to poverty. However, the authors could find no way of estimating the poverty share of costs. They note that reports show that poorer people are not more likely to engage in illegal activities, although they may be arrested and charged by the police more often than those not living in poverty. Therefore, the authors arbitrarily chose 1% to represent the cost savings to the judicial system if poverty were reduced. They calculated the costs in the following way:

1. Total cost of policing (based on population of 2.8 million in 1997)—$465.7 million.
2. Cost of policing in Alberta per capita ($166 in 1997 dollars)
3. Policing represents 63% of the total costs incurred by the provincial justice system.
4. Total cost of Alberta criminal justice system in 1997—$739.2 million, or $779.1 million in $2000.
5. Crime rate in Alberta in 1997—91.27 per 1,000 population, or more than 255,000 events.
6. Cost per criminal event in $2000—$3,050.
7. Crime rate in Calgary in 1997—77.96 criminal events per 1,000 population, or 63,250 per year.
8. Total cost of the criminal justice system in Calgary, based on $3,050 per event—nearly $195 million in $2000.
9. One percent (1%) of total cost of criminal justice system costs attributed to poverty—approximately $2 million.

2.2.4 Costs of social support

According to Shiell and Zhang, based on United Way of Calgary and Area information, there are over 300 distinct programs in Calgary aimed at alleviating poverty in the city. However, the authors found no way to determine what the avoidable costs would be if poverty were eliminated, especially since costs associated with necessities such as food, clothing, and shelter would still be necessary and not avoidable. Avoidable costs are items such as staff time, vehicle costs, and possibly the capital costs associated with the programs that are specifically aimed at alleviating poverty. Therefore, in order to capture a portion of these costs, based on Family and Community Support Services of the City of Calgary information, the authors identified 50 programs in existence to help people on low incomes. Combined, these programs receive approximately $12 million per year from Family and /Community Support Services of the City of Calgary. The authors arbitrarily assigned $600,000 as the avoidable cost, or saving, if poverty were eliminated.

2.2.5 Costs of income support: social assistance payments

Social assistance payments including family benefits, child health benefits, disability payments, and payments to seniors are all considered to be transfer payments from taxpayers to those on low incomes. Therefore, since no resources are used or gained, these payments are not considered to be a cost in the economic model used by the authors. However, the authors did estimate the costs of raising the funds needed to support the transfers by using the following data:

1. One report suggests that *for every $1.00 raised in public finance, it costs an additional 40 cents in changes that happen elsewhere in the economy*.[374]
2. Thus, a “10% [arbitrary number] reduction in the numbers of people needing income support would lead to beneficial changes in the economy…”[375]
3. Welfare payments in Alberta total $1.2 billion per year. Forty percent of low-income households live in Calgary. Cost of welfare payments in Calgary are more than $450 million per year.
4. A 10% reduction in the $450 million paid to those living in low income times 40% costs of finance that happens elsewhere in the economy equals $18 million that could be saved from income support financing costs.

2.2.6 Other costs associated with poverty

The authors mention other costs that they have not been able to quantify in monetary terms. These include social isolation and lack of participation in community life, which leads to social exclusion, a loss of social capital, and a loss of economic growth.

[374] Dahlby, B. "The Distortionary Effect of Rising Taxes," in *Deficit Reduction: What Pain? What Gain?* , ed. Robson, W. and W. Scarth. CD Howe Institute, Policy Study 23, 1994. Cited in Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed. p. 11.
[375] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed. p. 27.

2.3 The Economics of poverty: How investments to eliminate poverty benefit all Americans

In January 2007, Jerrold Oppenheim and Theo MacGregor, legal and energy consultants, presented their findings on the costs of poverty to the U.S. House of Representatives Committee on Ways and Means Hearing on the Economic and Societal Costs of Poverty.[376] Entergy Corporation, an electrical power production company based in the southern U.S., had commissioned the report to provide a "business case for investing in low-income programs."[377] The report calculates avoidable annual costs of poverty using 2005 data for four broad categories: crime, health, unemployment/underemployment, and current anti-poverty investments.

The authors include direct and indirect costs to society as a whole that are caused by the existence of poverty. In what the authors call the "direct" cost category, they include, for example, health care costs, homeless shelters, food subsidy progams, and costs incurred by victims of crime. Costs included in the "indirect" category are, in part, costs for policing, for the judicial system, and education costs. The report includes factors that are traditionally not considered to be "costs" in some economic models such as transfers from government programs, direct costs to victims of crime, and some unemployment costs. Therefore, it is interesting to note that Oppenheim and MacGregor take a considerably different approach than do Holzer et al. and Shiell and Zhang, the two reports discussed earlier in this Chapter. As will be explained below, Oppenheim and MacGregor in general did not explain all of the costs included in the estimations or exactly what methodology was used.

After calculating the total avoidable costs of poverty, Oppenheim and MacGregor used these estimates to calculate the costs per non-low-income household, which indicates the amount of increased resources per household that would be available if poverty were eliminated. Finally, they briefly review a few return rates for poverty investment programs and calculate the maximum investment needed to bring every low-income household to 60% of the median income—the amount needed to rise above the poverty level. They note that this would result in a benefit:cost ratio of investment in poverty eradication of 3:75. In other words, by eliminating the avoidable costs of poverty, the benefit would return nearly four times the cost of the investment. In this section, we detail the factors and calculations used by Oppenheim and MacGregor, which are summarized in Table 2 below.

[376] United States House of Representatives. *Hearing on the Economic and Societal Costs of Poverty*, accessed.
[377] Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf.

Table 2. Summary of avoidable costs of poverty (United States, 2005)

Category	Cost (Billions)	Percentage of total
Crime	660.8	44
Healthcare	335.8	15
Unemployment / Underemployment	222.5	23
Current anti-poverty social service investments (including housing, food, education, and utilities, and other)	270.1	18
Total	1.49 trillion	100
Total amount needed to lift all Americans out of poverty	397.2	

Source: Adapted from Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf. Appendix B.

2.3.1 Crime

Oppenheim and MacGregor state that the total net burden of crime in the United States is estimated to be $1 trillion per year. They attribute 50% of these costs to poverty, and calculate the total cost of crime caused by poverty to be $660.8 billion. However, this figure is more than 50% of $1 trillion, and it is not clear exactly what is included in this estimate, although property losses, costs of judicial and correctional systems, security costs, and costs to victims of crime are mentioned.

The authors calculate the sum of the costs of crime using data from various agencies, as shown in Table 3 below. But the total for the costs shown equal $611.5 billion, while the authors state the cost of crime attributable to poverty is nearly $661 billion. Although the aggregate costs of "arson and assault costs per victim" were not given, these costs were listed as being included in the total. However, it is not clear what these costs include or how they are calculated. As a result, the total derived from adding the component costs is lower that the total costs cited by the authors. Intangible costs to victims were by far the largest expense category.

Table 3. Costs of crime (United States, 2005)

Cost of crime (billions)	Expenses included	Source of original calculation
$105.0	Cost to victims: medical expenses, lost earnings, and costs for victim services	National Center for Victims of Crime
$345.0	Cost to victims: intangible costs such as pain and suffering, and reduced quality of life	U.S. National Institute of Justice
$ 4.9	Burglaries and larceny	(not given)
$ 8.6	Value of stolen motor vehicles	Federal Bureau of Investigation
$ 38.0	Incarceration costs	National Center for Victims of Crime
$110.0	Police and judicial system, federal, state, and local levels	U.S. Office of Justice
Total not given	Arson and assault costs per victim- Arson-$54,000 per victim; assault-$31,000 per victim.	National Center for Policy Analysis
Total: $611. 5 / Total net burden of crime given by Oppenheim and MacGregor: $1 trillion		
Total cost of crime attributed to poverty: $660.8 billion		

Note: Arson costs per victim ($54,000) and assault costs per victim ($31,000) were included, but neither the total cost nor the number of victims was given.

Source: Adapted from Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf. p. 2–4.

It is also not clear how much of the costs of crime can be attributed to poverty. Oppenheim and MacGregor note that "poverty contributes a substantial portion of the criminal population," and "the vast majority of prisoners are poor," and arbitrarily assign 50% of the costs of crime as being caused by poverty.[378] They also cite a reference that they state reports an increase in income inequality has been shown to increase the crime rate by nearly 60 percent.[379] However, the original source for this statement actually reported that the increase in income inequality between 1980 and 1996 increased the *property* crime rate, not the overall crime rate, by 59%, and it did not give details such as how much the inequality increased, or how much a specific increase in the inequality rate in one year (or averaged) would increase the annual crime rate, which is important information if annual costs are being considered.

At any rate, the authors concluded that the annual cost of crime attributed to poverty in the U.S. is **$660.8 billion**, which is more than half of the total cost of crime.

[378] Ibid., accessed. p. 3, 4.
[379] Ibid., accessed. p. 3. citing: Merlo, Antonio. "The Research Agenda: Dynamic Models of Crime and Punishment," *Economic Dynamics Newsletter*, 2001, vol. 2, no. 2. accessed December 2007; available from http://wwweconomicdynamics.org/N41p.htm.

2.3.2 Healthcare

Many of the reports on healthcare costs in the U.S., including the Oppenheim and MacGregor report, are concerned with the costs associated with the lack of health insurance or of underinsurance, which make their usefulness in the Canadian context limited since Canada has a universal healthcare system. Uninsured individuals tend to avoid using the health care system when they are ill, and often wait until their illness is severe before seeing a doctor. As a result, uninsured individuals tend to require long-term, expensive care, and have higher mortality and morbidity rates than the insured.[380]

To calculate healthcare costs attributable to poverty, Oppenheim and MacGregor used a 2004 Kaiser Commission study that found the total cost spent on healthcare for the uninsured population by uninsured hospital services and other programs was $125 billion.[381] Information on how this figure was derived was not given. The authors then assumed that all low-income individuals (28.7% of the population) were uninsured, and multiplied this percentage by the total healthcare cost of the uninsured to get a total cost of uninsured healthcare resulting from poverty to be $35.8 billion. To this they added $180 billion for Medicaid paid by the federal government and the $120 billion for Medicaid paid by the state governments for a total of **$335.8 billion**. Total healthcare costs are shown in Table 4 below.

The authors speculated that preventive care would be increased if poverty were reduced, which would result in a reduction of medical costs. This is based on the assumption that if poverty were reduced, many more people would be insured and would take advantage of preventive services. However, they noted that 30% of medical services in the U.S. are unnecessary, result in increased patient complication, and add costs to the system. Therefore, the authors reasoned that "it is difficult to determine whether the increased access to medical care will also increase waste sufficiently to erase financial benefit."[382] Because of this uncertainty, Oppenheim and MacGregor "simply counted the actual cost of medical care for low-income people."[383]

Despite the reason given above, it is not clear why the authors chose to include all Medicaid payments. They had previously stated that more than eight in ten low-income, uninsured adults *did not quality* for Medicaid, and that in 42 states they did not qualify for Medicaid regardless of income unless they were severely disabled, and that most Medicaid goes to seriously disabled people or to low-income seniors. Therefore, it seems difficult to make a case that Medicaid payments are avoidable costs of poverty, especially when these payments go to relatively few low-income people.

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[380] Oppenheim, and MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, accessed.
[381] Gralla, Joan. "U.S. Uninsured Health Care Cost Put at $125 Billion." *Common Dreams News Center*: Reuters, May 11, 2004. This is the reference for the Kaiser Commission report given by Oppenheim and MacGregor. It is a short newspaper article that gives very little detail. The reference for the actual Kaiser Commission report was not Cited.
[382] Oppenheim, and MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, accessed. p. 7.
[383] Ibid., accessed. p. 7.

Table 4. Healthcare costs (United States, 2005)

Cost of healthcare (billions)	Expenses included	Original calculation
$ 35.8	Healthcare for low-income uninsured	$125 billion [Kaiser Commission uninsured] *28.67 [% low-income]
$180.0	Amount paid for Medicaid by federal government	Not attributed
$120.0	Amount paid for Medicaid by the state goverments	Not attributed
Total:	**$335.8 billion - healthcare costs of poverty**	

Source: Adapted from Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf. p. 4–7.

2.3.3 Unemployment and underemployment

Oppenheim and MacGregor calculated the costs of underemployment, which includes unemployment, to be $222.5 billion in 2005. They define underemployment as consisting of those who are officially unemployed, discouraged workers who are no longer looking for work, and part-time workers who would prefer to work full time if they could find the employment. Although they did not disaggregate these costs, they did give a rudimentary explanation of the methods used, which they note produced a conservative estimate. However, they did report that some of the costs that could be avoided by reducing underemployment include taxpayer-financed social supports such as unemployment compensation, job training and retraining programs, loss of taxes from unearned income of the unemployed, and loss of spending by the unemployed on job-producing goods and services (the multiplier effect).

The authors relied on the cost of underemployment calculated by Clifford Cobb, Gary Sue Goodman, and Mathis Wackernagel in a genuine progress indicator (GPI) report, which found the cost of underemployment in 1999 to be $112 billion.[384]

Oppenheim and MacGregor explain their methodology as follows:

- Number of unemployed workers, including discouraged workers, adjusted by subtracting a "natural" or "full employment rate" of 4%.
- Lost wages assumed to be at the minimum wage per hour ($5.15) for 2000 hours per year.
    - Cobb et al. used an hourly wage of $11.20 per hour, which Oppenheim and MacGregor reduced to $5.15 per hour.

[384] Cobb, Clifford, Gary Sue Goodman, and Mathis Wackernagel. *Why Bigger Isn't Better: The Genuine Progress Indicator 1999 Update*, Redefining Progress, 1999; accessed December 2007; available from http://www.rprogress.org/publications/1999/gpi1999.pdf. This is a summary report that does not explain the factors used to calculate the total costs of underemployment.

- Cost of underemployment given by Cobb et al. converted from $1999 to $2005.
- Use of a spending multiplier of 2.0 that assumes all of the income would be spent (increasing the multiplier effect). Thus, the impact of an increase in income would be doubled throughout the economy.
- Transfer payments to or on behalf of the underemployed, such as unemployment insurance and job training, were estimated.
    - The cost of unemployment insurance was reduced by 4% to account for the "natural" unemployment rate.
    - The average weekly benefit of $263.25 was used for 26 weeks and extended pay periods were not included, in order to be conservative in the estimate.

The final estimate for the unemployment costs attributable to poverty is $222.5 billion ($2005). However, as noted, it is not clear exactly what these costs include or exactly how they were calculated. The methodology also raises some questions. For instance, even assuming, as the authors do, that all unemployed persons were in the low-income category, using a salary as low as the minimum wage will not lift them out of poverty enough for the costs of unemployment to be avoidable—$5.15 per hour for 2000 hours per year yields an annual wage of $10,300. The poverty line in the U.S. in 2005, cited by Oppenheim and MacGregor, was $26,640 per household, which is 60% of the median household income ($44,400).[385] The number of individuals in the household was not specified, but the authors point out that it would take two full-time salaries at one-and-a-half times the minimum wage to reach this poverty cut-off level. Therefore, it would appear that basing the estimate for lost wages on the minimum wage would produce an estimate for avoidable costs of unemployment that is much lower than the actual costs.

2.3.4 Current anti-poverty investments

Oppenheim and MacGreagor define "current anti-poverty investments" as "investments made by the rest of us, through taxes or other social service supports, to mitigate or alleviate the high costs … to society."[386] They note that amounts allocated for these supports make "a small dent in the overall cost to society," and do not "come close to meeting true needs."[387] Cost estimates of public and private, such as from charities, financial support for those who lack sufficient shelter, food, education, or money to pay for home utilities are included in this category. A summary of these costs is shown in Table 5 below.

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[385] Oppenheim, and MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, accessed. p. 8.
[386] Ibid., accessed. p. 11.
[387] Ibid., accessed. p. 11.

Table 5. Summary of current anti-poverty investments (United States, 2005)

Condition	Current investment (billions)	Costs included
Housing and homelessness	$ 69.1	homeless shelters, public housing, and public subsidies to private housing (including tax expenditures)
Hunger	46.9	direct food subsidies
Education	31.5	federal and state education subsidies for schools with a high percentage of students living in poverty
Utilities	6.0	utility company, government, and social service agency assistance programs
Other	116.6	various programs (see below)
Total investment:	**$270.1**	

Source: Adapted from Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf. pp. 11–17.

Housing and homelessness

According to Oppenheim and MacGregor, a certain percentage of homelessness in the United States is due to mental illness, drug and alcohol related illness, and general ill health. They note that many people eligible for social assistance do not receive it. For example, over 40% of homeless people are eligible for disability benefits, but only 11% receive them; "most" homeless people are eligible for food stamps and welfare benefits, but only 37% and 52%, respectively, receive them.

The authors explain that anti-poverty investments in housing and homelessness includes costs associated with homeless shelters, public housing, and public subsidies to private housing (including tax expenditures), which amount to **$69.1 billion (**year not given). They do not explain their calculations.

Hunger

The authors estimate that the cost of providing direct food subsidies to those living in poverty amounts to **$46.9 billion** per year—a "gross understatement of need."[388] This estimate is broken down as follows:

- Food grants from non-governmental food pantries – $2.3 billion
- Federal Women, Infants and Children (WIC) Program – $5.2 billion
- Food Stamps – $27.2 billion ($2004) (years for other programs not given)
- School and other child nutrition programs – $11.9 billion

[388] Ibid., accessed. p. 13.

- Other food assistance – $300 million

Education

Anti-poverty investments for education are estimated to be **$31.5 billion**, which includes the following:

- Title 1– Federal program given to public or private schools with a high percentage of poor children – $12.7 billion ($2005)
- Additional State education funding based on levels of poverty – $8.7 billion (based on a 2002 study)
- Head Start Program – $9.5 billion ($2005)
- Income tax expenditures – $0.6 billion ($year not given)

Utilities

According to Oppenheim and MacGregor, there are a number of assistance programs through utility companies, governments, and social service agencies, which are designed to help low-income individuals pay their utility bills. They state that the cost associated with unpaid utility billsamounts to about $1 billion per year. They estimate that the cost of these utility assistance programs is nearly **$6 billion ($**year unknown) per year and note:

> If all Americans lived in weatherized and energy efficient homes, and had the income to pay their full share of utility bills, all other ratepayers would save nearly $6 billion in poverty costs, including fuel assistance, lifeline and other rate assistance; weatherization and efficiency costs; and the costs of late and unmade payments, such as service disconnections.[389]

Other anti-poverty investments

The authors list eight other costs that they included in the anti-poverty investment estimate of the cost of poverty. However, they make no further comment concerning the programs in the list.

- Legal Services and other civil legal aid – $0.6 billion
- Transitional Aid to Needy Families (TANF) (federal & state) – $27.5 billion
- Supplementary Security Income (SSI) – $42.6 billion
- Earned Income Tax Credit (EITC) – $36.7 billion
- Services to low-income seniors – $1.8 billion
- Other social services – $2.7 billion
- Community Services Block Grants – $0.6 billion
- Community Development Block Grants – $4.1 billion

[389] Ibid., accessed. p. 16. Four organizations are Cited as sources for this statement, although the exact sources are not specified: Low-Income Home Energy Assistance Program (LIHEAP) Clearinghouse, National Energy Assistance Directors' Association (NEADA), National Center for Appropriate Technology (NCAT), and National Community Action Foundation (NCAF).

TOTAL – $116.6 billion ($year not given)

According to Oppenheim and MacGregor, this is a conservative estimate because many other avoidable costs were left out such as:

- many State expenditures,
- most non-governmental expenditures,
- increased risks of damage from fire caused by inadequate housing,
- increased pressure on energy prices caused by energy waste in leaky homes,
- increased property tax receipts caused by needed property improvements,
- increased borrowing costs caused by unpaid debt and slow re-payments of low-income consumers, and
- increased vulnerability to disasters such as hurricanes, causing additional requirements for disaster relief.[390]

2.3.5 Estimate of amount needed to lift all Americans out of poverty

The amount of investment needed to lift all Americans out of poverty in 2005 was estimated to be **$397.2 billion,** calculated as follows:

- 32,974,198 low-income households.
- minimum income needed to escape poverty—60% of median household income—$26,640.
- current low-income median income—$14,593.
- difference per low-income household—$12,047 needed per household.
- Total $397.2 billion (maximum needed to close income gap).
- Avoidable cost of poverty—$1.49 trillion (from crime, health, underemploment, and anti-poverty investments)
- Ratio: Avoidable cost (benefit) / investment (cost)—3.75.

2.3.6 Avoidable costs of poverty per non low-income household

Considering that the costs of poverty are shared by all non-low-income households, Oppenheim and MacGregor calculated the annual per-household burden of poverty as follows:

- Avoidable cost of poverty – $1.49 trillion
- Number of non-low-income households – 82,026,714 households
- Avoidable cost per non-low-income household – $18,155
- Median income of non-low-income household – $60,262

[390] Ibid., accessed. p. 24.

2.3.7 Returns on investments

Oppenheim and MacGregor note that investments in low-income individuals are "among the most cost-effective investments we can make."[391] They suggest that, in many cases, all that is needed is to adequately fund programs that are already in place. They briefly review returns on investment in poverty reduction, giving the following rates:

- Simple cash payments sufficient to lift everyone out of poverty would immediately be returned nearly fourfold. [Oppenheim and MacGregor do not recommended this as the most cost-effective solution.]
- Investing in weatherization and installing efficient appliances in low-income homes returns seven times the investment.
- Investing in the education of three-and-four-year-olds returns nine times the investment.[392]

391 Ibid., accessed. p. 17.
392 Ibid., accessed. p. 17.

2.4 Economic implications of socioeconomic inequalities in health in the European Union

In a 2007 report written for the European Commission, Dutch researchers Johan Mackenbach, Willem Jan Meerding, and Anton Kunst use data from the European Community Household Panel (ECHP) to identify the economic costs associated with socioeconomic inequalities in health for 25 European countries.[393] The authors were also interested in clarifying potential economic benefits of reducing the health inequalities experienced by those with lower levels of income, occupation, or education, who consistently have higher mortality and morbidity rates than socioeconomic groups with higher incomes.[394]

Although socioeconomic inequalities in health have been recognized as an important public health issue and the subject of research in Europe for the past two decades, Mackenbach et al. note that their report is "the first exploratory study" of these important economic issues.[395] They also point out that their report represents only a part of the full range of economic costs associated with socioeconomic inequalities on health and that further research will be needed for more definitive and complete estimates. They specifically recommend that systematic reviews or meta-analyses are needed to assess causal effects of socioeconomic inequalities on health.

Unlike the other reports summarized in this literature review, the Mackenback et al. report specifically and more thoroughly considers the health costs of poverty and therefore the methodologies and approach taken will be presented in some detail below. The authors' approach is closest to that used by GPI*Atlantic* in its cost of illness reports, and its framework is closest to one that we would recommend for a full cost of poverty study.

However, as is often the case in Europe, socioeconomic status is indicated by education level, rather than by income or by occupational or class status, which is most often used in the United Kingdom. In the Canadian context, income is most often used as a more direct indicator of low socioeconomic status or poverty.[396] Two education levels are used, which are divided into a lower group—lower secondary education and lower—and a higher group—completion of upper secondary education and higher. The rationale that Mackenbach et al. use for the choice of education as an indicator is similar to the causal argument used by Holzer et al. when choosing child poverty as an indicator. That is that education level is established before adulthood and therefore is a precursor to health and economic outcomes later in life.

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393 Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf. In Canada and the United States "health inequalities" are more often referred to as "health disparities."

394 Ibid.

395 Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 6.

396 Raphael, Macdonald, Colman, Labonte, Hayward, and Torgerson. "Researching Income and Income Distribution as Determinants of Health in Canada: Gaps between Theoretical Knowledge, Research Practice, and Policy Implementation ".

Mackenbach et al. note that education levels emphasize the cultural and cognitive aspects of socioeconomic position (SEP), while income emphasizes the role of poverty and living conditions. Education is more stable than income, which is subject to change. However, they also note that, "health differences in relationship to income level are of the same order of magnitude as health differences by educational level or occupational class. Health and current income are associated across the entire life course."[397] In Europe as a whole, poverty is defined as those having an income less than 60% of the national average, and the proportion of the population at risk of poverty in 2001 was 15%. Income as a measure of SEP, though, has been criticized for not measuring long-term income or the potential wealth that may have accumulated over the life course. On the other hand, according to Mackenbach et al., "income and measures of wealth appear to be complementary predictors of ill health."[398]

The Mackenbach et al. report addresses four main questions, which the authors again emphasize is the "first analysis dealing with such questions."[399] The questions relate to information that is needed in order to estimate the costs of poverty.

1. How should the economic impact of socioeconomic inequalities in health be conceptualized and measured?
2. How large are socioeconomic inequalities in health in the European Union, and how large is the burden of ill health and premature mortality associated with inequalities in health?
3. What is the economic impact of socioeconomic inequalities in health in the European Union?
4. What actions can reasonably be taken to reduce socioeconomic inequalities in health, and what would be the economic benefits of investing in these strategies?[400]

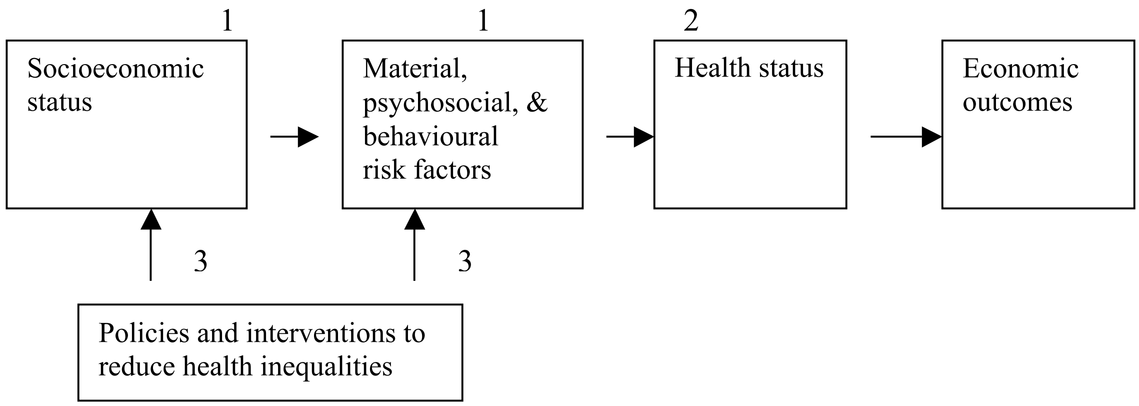
The report begins with the perspective that an unequal distribution of risk factors and health risks in lower socioeconomic groups leads to health inequalities in the population as a whole. It approaches estimating the economic costs of poverty, or low socioeconomic levels, through the use of three steps, which correspond to the questions above:

Step 1: assess socioeconomic status, risk factors, and health status (questions 1 and 2)
Step 2: assess economic costs (question 3)
Step 3: assess economic benefits of policy interventions (question 4)

The conceptual overview of these steps is shown in Table 6 below:

[397] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 77.
[398] Ibid., accessed. p. 79.
[399] Ibid., accessed. p. 8.
[400] Ibid., accessed. p. 8.

Table 6. Conceptual overview of the interrelationships assessed in the three steps of the report



Source. Adapted from Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of S Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, Europ Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf. p. 11.

2.4.1 Measurement of the magnitude of socioeconomic inequalities in health

The health indicators that Mackenbach et al. use to measure socioeconomic inequalities in health are:

- mortality rates in numbers of deaths per 1,000 persons per year, and
- self-assessed health to indicate morbidity rates.

They chose these outcomes since they are the ones—along with functional impairments and disability (captured in self-assessed health)—that may directly determine economic productivity, and so did not focus on disease-specific outcomes such as mortality rates by cause of death or morbidity rates by type of disease. For the same reason, the authors also focus on health inequalities at working ages (approximately ages 25 – 65), which they note is because these ages are most relevant for estimating macroeconomic impacts of health inequalities.

The report uses health indicators to calculate relative risks and the proportion of the total burden of ill health that can be attributed to low socioeconomic status. It uses the epidemiology method most often used in cost of illness studies to estimate the burden of ill health and premature mortality associated with socioeconomic status and specific risk factors such as smoking and obesity. This approach is based on the concept of Population Attributable Risk (PAR)—also called the Population Attributable Fraction (PAF). Basically, the PAR compares the current situation of ill health with a hypothetical reference situation in which everyone in the population would have the same health status as those with a high SEP. The difference between the current and hypothetical situations represents the potential costs of low SEP.

In this case, a simple dichotomy is used to measure socioeconomic status—high and low socioeconomic status are defined as the upper and lower 50% of the population distributed by SEP. Thus, the authors note: "Using the PAR approach, we thus assess the burden of ill health that is attributable to the fact that about half of the population has (the poorer health status corresponding to) a lower SES than the upper half of the population."[401] This method produces a very rough estimate and is not precise enough to measure the costs of poverty, which affects less than half the population, but the basic methodology is useful in both cases.

Mortality rates

Mackenbach et al. list mortality rates and the ratio of the mortality rate in the lower socioeconomic groups to the higher socioeconomic groups for 21 European countries for the periods ranging from 1979 – 1982 to 2002. The rates are based on socioeconomic measures used in the country of origin, which are education, occupation, or housing tenure (rental vs. ownership).

The authors note that relative inequalities begin at the start of life and gradually decrease with age, while absolute inequalities consistently increase with age and are highest among those over 90 years. Mortality rates are consistently higher in lower socioeconomic groups than in higher socioeconomic groups—in other words, those in the lowest socioeconomic groups have a 25% to 50% greater risk of dying prematurely than those in the highest socioeconomic groups. According to Mackenbach et al. other studies of Western European populations have found the excess risk of mortality in people with lower education compared to those with higher education ranges between 22% and 43% in men, and 20% and 32% in women. An example of rate ratios for selected countries is shown in Table 7 below. However, even though this range may be considered large, the authors argue that they do not believe "that the evidence is strong enough to warrant separate calculations … for different parts of Europe."[402] Therefore, they chose a mortality rate ratio—comparing lower to higher socioeconomic groups for all of the European countries together—of 1.36. This ratio was adjusted from a ratio of 1.307 for Western European countries to account for the fact that health inequalities in Eastern Europe are approximately double that of the Western European countries.

Although the authors do not calculate ratios for separate causes of death, they do note that socioeconomic variations are seen in patterns related to the cause of death. For instance, in all the European countries examined, deaths caused by specific diseases of the cardiovascular system were higher among both men and women in lower socioeconomic groups. These include ischemic heart disease (myocardial infarction) and cerebrovascular disease (stroke). In fact, Machenbach et al. note that cardiovascular diseases account for nearly 40% of the difference in the mortality rate between higher and lower SEPs among men, and 60% among women.

Inequalities in cancer deaths are smaller than those for cardiovascular disease, especially among women. In fact, women with a higher socioeconomic status often have higher mortality rates from all cancers combined than do women in lower socioeconomic groups. For men, this is not the case as higher mortality rates due to cancers and most other diseases are found among lower socioeconomic groups. However, cancer still accounts for 24% of the differences in health

[401] Ibid., accessed. p. 12.
[402] Ibid., accessed. p. 26.

inequalities among men, and for 11% among women. Inequalities in mental heath morbidity is seen in higher rates of suicide among those with a lower SEP.

Morbidity rates

Morbidity rates—the rates of illness or disease—are determined by self-assessed health questions on surveys that typically ask respondents to assess their health as either excellent, very good, good, fair, poor, or very poor. The odds ratios for morbidity shown in Table 7 below represent respondent answers to the self-assessed health question that represented their own health as less-than-'good,' and include responses that state their health is 'fair,' 'poor', and 'very poor.'

Again, although not calculated separately, Mackenbach et al. report that large disparities are seen in the prevalence of self-reported chronic diseases. The largest disparities were in the prevalence of stroke, diseases of the nervous system, diabetes mellitus, and arthritis. Somewhat smaller differences (but still significant) were observed for the prevalence of heart disease, asthma, and chronic obstructive pulmonary disease. The findings also show that allergies, high cholesterol levels, and some forms of cancer (e.g., breast cancer) occur at higher rates among those with a higher SEP. Some mental health problems such as depression are more concentrated in those with lower SEP.

The average prevalence rate for "less than good" self-assessed health in a select group of 12 European countries, which represented different regions, was 43.7% for men with low SEP, 28.9% for men with high SEP, 50.6% for women with low SEP, and 33.9% for women with high SEP. Mackenbach et al. calculated that in 2000 the average morbidity odds ratio for both men and women combined was 1.50. However, this ratio was based on surveys that did not include children or seniors. Therefore, the authors estimated that inclusion of these age groups would reduce the magnitude of health inequalities by about 10%, and they adjusted the ratio downwards to 1.45. (see Table 7 below).

Table 7. Rate ratios for mortality and prevalence odds ratios for morbidity between high and low socioeconomic position in European countries

Country	Mortality Rate Ratio 1991 – 1995		Morbidity Odds Ratio (self-assessed health), 2000	
	Men	Women	Men	Women
Estimated summary ratios for all European countries	1.36 (men and women combined)		1.45 (men, women, seniors and children combined)	
Estimated summary ratio for Western European countries, before adjustments	1.307 (men and women combined)		1.50 (men and women combined)	
Austria	1.43	1.32	3.22	2.67
Belgium	1.34	1.29	2.55	2.36
England / Wales	1.35	1.22	*3.88	*3.92
Finland	1.33	1.24	*3.09	*2.43
Norway	1.36	1.27	2.30	2.84
Spain	1.24	1.27	2.58	3.10
Switzerland	1.33	1.27	2.12	n.a.

Notes: Rate ratio socioeconomic position is determined by level of education. Odds ratio socioeconomic position is determined by education, income (*), or occupation in the case of Switzerland.
Rate ratio: Ratio of mortality rate in lower socioeconomic groups as compared to that in higher socioeconomic groups. Rate ratio ages: 45+.
Odds ratio: Ratio of odds (a measure of risk) of less-than-'good' self-assessed health in lower socioeconomic groups as compared to that in higher socioeconomic groups. Odds ratio is for all ages, including children.

Source: Adapted from Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.

Population Attributable Risk

Table 8 below shows the results of calculations made for the population attributable risks associated with low socioeconomic status, which use 2004 educational levels as the main socioeconomic indicator. The PAR is estimated for mortality rates or deaths averted, morbidity rates or cases of ill-health averted (self-assessed health), life expectancy or years of life gained, and morbidity-free life expectancy or the number of morbidity-free years gained. Mackenbach et al. define life expectancy as "the number of years that an average person could expect to live if he or she were to experience these age-specific risks of dying throughout his or her life."[403] The table shows the absolute number of deaths that occur each year and the losses in terms of years of life lost. According to Mackenbach et al., the PAR calculations probably underestimate inequality-related losses in the EU because they "conservatively" used the upper half of the education distribution as the reference category, rather than a higher educational category that would have lower rates of mortality and morbidity. As an example, they note that the PAR for average life expectancy at birth was estimated as 1.84 years, which would have been 3 years if they had used a higher education level as the reference group.

[403] Ibid., accessed. p. 27.

In Table 8 below, all absolute numbers were calculated by multiplying the rates or years per person by the total population size of the EU-25 countries in 2004 (459 million).

Calculation of mortality rates for the higher educated (0.00855) used the high/low ratio of 1.36 (discussed above) expressed in relation to the average national mortality rate. In this case, since 1.36 represents half of the population, the high/average ratio is estimated to be 0.847 or 1/1.18 (half of 1.36). Therefore, the hypothetical total estimate of absolute number of deaths that would occur if everyone had the mortality rate of the upper half of the population who have a high education level is 3.926 million (4633 * 0.847). The mortality rate is then calculated as [3926 / 4633] / 100 (=0.00855).[404]

The difference in the number of deaths that occurred in Europe in 2004 (4.633 million) and the 3.926 million deaths that would have occurred in the hypothetical situation is 707,000 deaths, which is the number of deaths that can be attributed to low SEP and the number that would be averted if everyone had a high SEP.

The total years of life lost due to inequality is 11.364 million years. This was calculated by multiplying the number of deaths due to inequalities (707,000) times the average number of years of life lost per death, which was estimated to be 16.06 years, which also represents the lives gained per death if these deaths were averted. The years of life lost per death was obtained from European life tables and adjusted for age.

In terms of morbidity, 33.468 million cases of ill health per year can be attributed to health inequalities, which represents the "number of person-years-lived-with-health-problems" that can be attributed to health inequalities. The prevalence rate for those in the population who have fair/poor health is 0.397 percent of the population or 182,212 persons who have fair/poor health. If everyone in the population had a high SEP, the prevalence rate of ill health would be 0.324. This percentage was calculated as follows: As described above, the high/low morbidity odds ratio was estimated to be 1.45, which expresses the fact that those with a low SEP are 45% more likely to report their health as less than good than those with a high SEP. Those with a high SEP represent half the population so a high/average ratio is half of 1.45 or 1.225, which translates to a high/average ratio of 0.816 (1 / 1.225). The absolute number of hypothetical cases would be 148,745 (182,212 * 0.816), and the morbidity rate would be 0.324 ([148,745 / 182,212] / 100).

The life expectancy at birth, which comes from life table measures, shows that those with lower SEP live 1.84 fewer years than those with higher SEP. The expectancy of life in poor health or morbidity (31.22 years for total population and 26.09 years if everyone in the population had a high SEP) is calculated by multiplying the life expectancy rates at birth (78.65 and 80.49) times the prevalence of fair/poor health in the population (0.397 and 0.324). The expectancy of life in poor health is 5.14 years lower for those in lower SEPs than for those in higher SEPs.

Mackenbach et al. note that by combining the 1.84 years of life lost with the 5.14 years lived in poor health results in a total of 6.98 years loss of (healthy) life for lower SEP, which shows "the

[404] The results of these calculations presented in the report are slightly different than the results obtained when making these calculations here and are due to rounding.

extent to which health inequalities have reduced the expectancy of life in good health in the total population."[405]

Table 8. Population health impact of educational differences in mortality and morbidity, EU-25 countries, 2004

	Total EU-25 population: rates and numbers	Total EU-25: estimates assuming rates of higher educated	Impact of health inequalities
Total population size (* 1000)	458,973		
Mortality rate	0.01009	0.00855	0.00154
Absolute number of deaths (* 1000)	4,633	3,926	707
Total years of life lost (* 1000)	n.a.	n.a.	11,364
Prevalence rate of "fair/poor" health, related to SEP	0.397	0.324	0.073
Absolute number of cases (1000)	182,212	148,745	33,468
-in "fair" health	126,857	45,188	10,167
-in "poor" health	55,356	103,556	23,300
Life expectancy at birth	78.65	80.49	-1.84
Expectancy of life in poor health (prevalence of fair/poor health in the population)	31.22	26.09	5.14

Note: Mortality and morbidity rates represent one year in terms of either incidence (mortality rates) or prevalence (morbidity rates). Life expectancy counts the effects of all events that might occur throughout the life course of about 75 years. Therefore, this perspective yields estimates that are approximately 75 times years higher than the rates based on one year only. Mortality, self-assessed morbidity, and life expectancy rates were obtained from readily available data on the Eurostat website: http://epp.eurostat.ec.europa.eu.

Source: Adapted from Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.

2.4.2 Economic costs of socioeconomic inequalities in health

In order to estimate economic costs, Mackenbach et al. value health both as a "capital good" and as a "consumption good." These values correspond to those calculated with a human capital

[405] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 32.

approach and a quality of life approach, respectively. According to the authors, "capital good" represents health as an important component of "human capital," which the authors note is "economic language for the value of human beings as means of production."[406] "Consumption good" is "economic language for 'happiness' or 'satisfaction,'" which is referred to in economic models as an individual's "utility."[407] In addition to these costs, the authors also do separate calculations for the total costs of social security benefits and health care utilization that are associated with the ill health of those in a low SEP.

The impact of inequalities-related health losses is expressed in relation to the Gross Domestic Product (GDP). The authors note that this is possible since they use the same income definitions that are used in GDP earnings calculations. In this approach the GDP consists of three components:

1. compensation of employees (gross earnings + employers' social contributions);
2. gross operating surplus and mixed income (among which firm profits, earnings from self-employed persons, and depreciation of capital goods) and
3. taxes less subsidies on production and imports.[408]

Health as a capital good

To estimate the monetary value of health as a "capital good" the authors use measures of labour supply and productivity estimated through the effect of health on wages. They recognize the limitations of this approach including that it is based on a partially true assumption that "in a perfect labour market wages will reflect the value of a person's labour output, i.e. labour supply times labour productivity," and the fact that non-market goods such as informal labour are not accounted for in this system.[409] However, they state that, "we believe that an approximation of the value of health through its effects on wages is reasonable."[410]

Mackenbach et al. first calculated the monetary value of inequalities-related losses to health as a *capital good*, which involves estimating the effect of ill-health on labour supply and labour productivity, particularly for those in lower socioeconomic groups. These calculations were necessary in order to provide input to the model used for estimating the impact of health inequalities.

In order to derive these estimates, the authors analyzed data from the 1997 European Community Household Panel (ECHP), which includes population ages 16 – 64 years in households in 11 out of 25 EU states, by conducting regression analyses.[411] These analyses included quantification of the effect of self-assessed health on outcome measures for the population as a whole, controlling

[406] Ibid., accessed. p. 16.
[407] Ibid., accessed. p. 16.
[408] Ibid., accessed. p. 19.
[409] Ibid., accessed. p. 18.
[410] Ibid., accessed. p. 19.
[411] The 11 countries included are U.K., Ireland, Denmark, Germany, Netherlands, Belgium, France, Italy, Spain, Portugal, and Greece. Excluded are students, self-employed workers, unpaid family workers, and those with zero incomes.

confounding factors such as age, sex, marital status, and country.[412] The key outcome measures used were:

- gross monthy personal income (including wages and salaries of employees and excluding employer's social contributions, transfer payments and capital returns),
- rate of labour force participation (including those who worked 8 or more hours per week, which excludes housewives, long-term unemployed, work-disabled, and retired)
- number of hours worked (including those working 8 or more hours per week), and
- hourly income

The first outcome measure was the main outcome used to compute costs relative to the GDP, while the last three were used in the calculations. Next the authors determined quantitative estimates of the impact of self-assessed health on the key outcomes by level of general health within each group, as measured by their education level.

Finally, using the PAR approach, they estimated the extent that elimination of socioeconomic inequalities in health would increase national levels of earnings and its components of labour force participation, number of hours worked, and hourly income. Because of considerable discrepancies between the ECHP data and official government statistics, the authors used the ECHP data only to estimate health impacts in *relative* terms, and then multiplied the relative estimates by the absolute values given in the official statistics to give estimates of the absolute macroeconomic impact of health inequalities that were consistent with official statistics.

This analysis was then used to estimate the impact of inequality-related health losses on the GDP in the E.U. in 2004. Although not stated, it is assumed that the costs are expressed in 2004 European euros. Table 9 at the end of this section below shows the results of this calculation. The authors found that average personal income in the E.U. would increase by 2.77% if people in the lower educational groups were to have the same level of health as those in the higher educational groups and their income increased correspondingly. Wages and salaries account for 39% of the GDP. When income is increased by 2.77%, the GDP would increase by 1.08%, which is €113 billion for the 25 E.U. states combined.

To this the authors then added the effect of health inequalities on firm profits and mixed income, but it is not clear how they derived these results. It was assumed by the authors that the effect of health inequalities on this category is 0.69%, or one-quarter of the 2.77% effect on wages and salaries. The share of firm profits is 38.5% of the GDP, and the impact on the total GDP is 0.27%. Total income represents 77.4% of GDP and the share of the impact of health inequalities is 1.74%. The combined effect of health inequalities on total income amounts to 1.35% of the GDP, or €141 billion. The authors note that relative to the GDP, these amounts are modest, but the results are significant in absolute terms (€141 billion).[413]

[412] Self-assessed health was measured with five levels: very poor, poor, fair, good, and very good. In addition two other questions were used: whether respondents had any long standing health problem that restricted their daily activities (with yes or no answers), and whether in the past 14 days they had to cut down their daily activities due to health problems (with yes or no answers).

[413] According to the Bank of Canada (http://www.bankofcanada.ca/en/rates/converter.html), €141 billion was the equivalent of $230 billion in CA$2004. One European euro was the equivalent of $1.58 in CA$2007 on 3.23.08.

Health as a consumption good

According to Mackenbach et al., because the GDP only calculates market goods and services, it is necessary to also value health as a "utility" or consumption good, which, as noted above, implies "satisfaction" or "happiness." This indicator includes estimates of costs for mortality and morbidity (self-assessed health) inequalities.

The *mortality estimate* involves the calculation of the value of life for which there are three general approaches, although there is no consensus on this value and the range of values tends to be large:

1. *Values proposed by individuals or institutions*
    - Disability-Adjusted Life-Year (DALY): The World Health Organization Commission on Macroeconomics and Health proposed three times GDP per capita as a reasonable upper limit to the cost per DALY averted to be used in health care investment decisions.
    - The Dutch National Council for Public Health and Health Care proposed an upper limit of €80,000 per Quality-Adjusted Life-Year (QALY) gained for health care resource allocation.

2. *Willingness to pay (WTP) studies:*
   These studies attempt to estimate individual preferences through contingent valuation studies (artificial choice experiments) or revealed preference studies (observed trade-offs between risks and wages). The following results (later adjusted by Mackenbach et al.) are based on a systematic review of WTP studies (in U.S. dollars):[414]
    - Average monetary value per QALY (contingent valuation) – $161,000
    - Average monetary value per revealed preference studies of non-occupational safety – $93,000
    - Average monetary value per revealed preference studies of job risks – $428,000

3. *Past allocation decisions of health authorities*
    - Upper limits to cost per life year gained – €27,000 to €50,000 (for reimbursement decisions on pharmaceuticals – Australia)
    - Upper limits per QALY – €30,000 to €45,000 (UK)

Mackenbach et al. calculate their estimates on willingness to pay figures proposed by the American economist, William D. Nordhaus of Yale University:[415]

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[414] Hirth, R.A., M.E. Chernew, E. Miller, A.M. Fendrick, and W.G. Weissert. "Willingness to Pay for a Quality-Adjusted Life Year: In Search of a Standard," *Medical Decision Making* 2000, vol. 20: 332-342.Cited in Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 20.

[415] Nordhaus, William D. *The Health of Nations: The Contribution of Improved Health to Living Standards*, Yale University, 2002; accessed Nov 2007; available from http://www.econ.yale.edu/~nordhaus/homepage/health_nber_1.doc. Cited in Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 20.

- $3.0 million per life saved (€2.3 million) (can be used to indicate value of avoidance of death). Adjusted to €862,500 by Mackenbach et al.
- Value of one current life-year – $100,000 (approximately €77,000) (can be used to indicate value of an additional year of life lived now)

Mackenbach et al. adjusted the first figure, which they note is based on death at working age, to reflect the loss of life due to health inequalities. They estimated *a loss of 15 years per death due to inequalities*, and a loss of 40 years per death at working age for the general population. After adjusting the €2.3 million by a factor of 15/40, the resulting estimate is €862,500 per death avoided. However, because of the uncertainty of these figures, the authors note that they used them for illustrative purposes only. Results are shown in Table 9 below. Calculations were made as follows:

Value of avoidance of death – mortality reduction:

- Yearly number of inequalities-related deaths in EU – 707,000 (See Table 8 above)
- Life saved, valued at €862,500 per life
- Total value of mortality reduction – €610 billion

Value of life-years gained:

- Number of life-years gained by saved individuals – 11.4 million years (See Table 8 above)
- Value of one current life-year – €77,000
- Discounted by 1.5% per year for an average of 16 years (to account for the fact that these life-years would not be gained immediately
- Total value of life gained – €778 billion

The above two approaches to estimate the economic impact of mortality inequality range from €610 billion to €778 billion. The authors consider a reasonable estimate to be €700 billion, which is about 6.7% of the current GDP in Europe.

- Total value of mortality inequality – €700 billion

The *morbidity* (self-assessed health) estimate is calculated as follows:

- Total impact of inequalities in self-assessed health (See Table 8 above) – 23 million people in "fair" health, and 10 million people in "poor health".
- These numbers were given a monetary value by converting them into numbers of years of life-in-good-health lost, using disability weights (ranging from 1 = perfect health to 0 = death) or health utility functions.
- Disability weights for fair health – 0.90
- Disability weights for poor health – 0.80
- Disability weights imply –
    - 23 million person-years in fair health = 2.3 million years of life-in-good-health lost.
    - 10 million person-years in poor health = 2.0 million years of life-in-good-health

lost.

- Total – 4.3 million years of life-in-good-health lost = 40% of mortality effect of 11.4 million years (€700 billion mortality inequality cost, as above)
- Total cost of morbidity inequalities – €280 billion (.40 * 700 billion)

The mortality (€700 billion) and morbidity (€280 billion) inequality costs together give an estimate that in health as a consumption good cost the European economy €980 billion in 2004, or 9.4% of the GDP of the EU-25.

Social security benefits

Social security benefits and health care utilization costs are dealt with separately because these costs overlap with health as both a capital and a consumption good. Mackenbach et al. suggest that since social security benefits are transfer payments, there are no opportunity costs to society, and these benefits should not be added to the costs of ill health through its effects on wages and the GDP. However, social security benefits may have indirect effects on the economy. Only unemployment and disability benefits were considered in their study. According to Mackenbach et al., people with "very poor" health receive an average of 20 times more in disability benefits than those with "very good" health, and the same association exists for both higher and lower educational groups. Similar patterns were found for both men and women in all E.U. countries. However, the association between health status and unemployment benefits was much weaker.

Results of the costs of social security benefits associated with inequalities in health are shown in Table 9 below. The estimates for the decrease in benefits if all persons had the same health status of those with high educational levels—based on the ECHP data analysis—were:

- Unemployment benefits – would decrease by 2.7% in EU as a whole, representing about €5 billion per year in social security costs.
- Disability benefits – would decrease by 24.7%, representing €55 billion per year
- Total – €60 billion represents 14.9% of the total costs of social security systems.

Health care utilization

Health care costs are included in the GDP as part of the total production of goods and services, so Mackenbach et al. deal with them separately as "repair costs." In these costs they included physician services and hospital services defined as the number of nights in hospital, and then adjusted them upward to reflect the fact that these costs represent almost half of total health care costs according to OECD data. Results are shown in Table 9 below. The estimates used were:

- Physician services – In both higher and lower educational groups, people with "very poor" health had 6 times more visits to a physician and about 9 times more specialist visits than those with "very good" health. The number of general physician and specialist visits would decrease by 16.4%, if all persons had the health corresponding to high education levels and "very good" health, which would translate to €26 billion.
- Hospital services (number of nights in hospital) – These would be reduced by 22.1% in all persons aged 16 years and older, which translates to €59 billion.

- Total cost – The total cost of physician and hospital services was doubled to reflect the fact that these costs represent half of the total costs of health care services, which translate to €177 billion (adjusted by €7 billion to include children).
- Impact of health inequalities on health costs – nearly 20% of total costs to the health care system.

Table 9. Economic impact of socioeconomic inequalities in health, EU-25 member states, 2004

	Total value		**Impact of health inequalities**		
	In billion euro (2004)	**As % of GDP**	**Population Attributable Risk (PAR), Share of total (%)**	**In billion euro (2004)**	**As % of GDP**
GDP of EU-25, 2004	10,451	100.0			
Health as a capital good: GDP income components					
-wages and salaries	4,071	39.0	2.77	113	1.08
-firm profits, mixed income, etc	4,021	38.5	0.69	28	0.27
-Total income	8,092	77.4	1.74	141	1.35
Health as a consumption good					
-mortality	n.a.	n.a.	n.a.	700	6.70
-morbidity (40% of mortality)	n.a.	n.a.	n.a.	280	2.68
-Total health	n.a.	n.a.	n.a.	980	9.38
Health care costs					
-physician services	157	1.5	16.38	26	0.25
-hospital services	267	2.6	22.07	59	0.56
-Total health services	888	8.5	19.96	177	1.70
Social security benefits					
-unemployment benefits	178	1.7	2.71	5	0.05
-disability benefits	222	2.1	24.71	55	0.53
-Total benefits	401	3.8	14.91	60	0.57

Notes: All data are from the Eurostat website except for health care data which are from OECD, 2003, for 18 countries. PAR calculations use all persons with at least upper secondary education as the reference group. The values in column 1 are multiplied by the percentages in column 3 to obtain the estimates in columns 4 and 5.

Source: Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.

2.4.3 Potential benefits of actions taken to reduce socioeconomic inequalities in health

Mackenbach et al. note that, considering the present state of knowledge, the quantitative benefits of policy options to reduce socioeconomic inequalities in health are not known. They use two approaches that might illustrate potential benefits—achievement of policies to reduce inequalities in smoking and achievement of quantitative targets for reducing health inequalities set by some national strategies.

Mackenbach et al. calculate costs for a current baseline situation and for two policy scenarios—a 25% reduction of smoking prevalence in all groups, and a 25% reduction in higher socioeconomic groups with a 33% reduction in lower socioeconomic groups. Data used to estimate the impact of smoking include the following for higher and lower socioeconomic groups and the total population:

- Prevalence of smoking (%)
- Smoking-related deaths per 1,000 persons
- Cases of smoking-related "fair/poor" health per 1,000 persons
- Years of healthy life lost due to smoking in the total population
    - Through mortality
    - Through prevalence of "fair/poor" health
- Potential gain in healthy life years compared to baseline (calculated as the difference between two policy scenarios as compared to the current baseline situation)
    - Through mortality reductions
    - Through reduction in "fair/poor" health

GPI*Atlantic* has recently estimated costs of smoking in another report based on Nova Scotia and Canadian contexts.[416] Therefore, we will only look briefly here at the second policy illustration.

According to Mackenbach et al., Britain, Sweden, and the Netherlands are the main European countries that have developed comprehensive policies to reduce socioeconomic inequalities in health, and Britain and the Netherlands have set quantitative targets.[417] These targets are as follows:

Britain:

- to reduce the gap in infant mortality between lower occupational classes and the population average by 10% by the year 2010, and
- to reduce the gap in life expectancy between the most deprived areas and the national average by 10% by the year 2010.

The Netherlands:

- to reduce the difference in healthy life expectancy between people with a low and high socioeconomic status by 25% by the year 2020, by differentially raising health life

[416] Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.
[417] Mackenbach, Meerding, and Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, accessed. p. 49.

expectancy in the lower socioeconomic group.

The authors suggest that if these targets were achieved they would reduce the economic impact of health inequalities by 10% in Britain and 25% in the Netherlands. And if the EU could reduce all health inequalities by 10% or 25%, this would result in gains through health as a capital good of €14 billion or €35 billion, through gains in health as a consumption good of €70 billion or €175 billion, to €18 or €44 billion gains in reduced health care costs, and to €6 or €15 billion in gains through reduced social security costs. However, these gains would need to be adjusted by the costs of implementing the policy targets, and these costs are unknown.

3. Methodologies used in socioeconomic health disparity studies

3.1 Poverty: Assessing the distribution of health risks by socioeconomic position

When estimating the health costs of poverty, it is important to know how much each indicator (mortality, morbidity, etc.) overall is costing society, and how much of this cost can be attributed to poverty. In order to determine the proportion of the cost attributable to poverty, health disparities or health inequalities in society need to be measured.[418] Disparities are differences in patterns of health most often associated with gender, race/ethnicity, socioeconomic position, and geography. According to John Lynch and Sam Harper of the University of Michigan, the U.S. National Institutes of Health (NIH) Strategic Plan to Reduce and Ultimately Eliminate Health Disparities—the plan that guides NIH research—defines health disparities as follows:

> [H]ealth disparities are differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups.[419]

Lynch and Harper note that health disparities can be estimated with a variety of measures such as range measures, un-weighted regression-based measures, population-weighted regression-based measures including the Slope Index and Relative Index of Inequality, Index of Disparity, between-group variance and disproportionality measures such as the Concentration Index, Theil Index, Mean Log Deviation, and Gini coefficient.[420]

Although disparities in health exist across all socioeconomic groups, in this case, since we are most interested in poverty, the range measures are most useful. Range measures, which use relative risk and excess risk (absolute) comparisons, are often used in epidemiological literature to estimate the disease burdens at the extremes of socioeconomic groups and are the measures that are most easily calculated and interpreted. Lynch and Harper suggest that the main disadvantage of range measures is that:

- the interpretation depends on the choice of referent group,
- the measures are not sensitive to group size, and
- they ignore data that fall in the middle range rather than the extreme range.[421]

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[418] Lynch, John, and Sam Harper. *Measuring Health Disparities*, Computer-based course MHDID0806. Michigan Public Health Training Center, Prevention Research Center of Michigan, and Center for Social Epidemiology and Population Health, Department of Epidemiology, University of Michigan, 2005; accessed Nov 2007; available from http://www.sitemaker.umich.edu/mhd/home. In Canada and the U.S., the term most often used is "disparities," while in Europe "inequalities" is the term most often used.
[419] Ibid., accessed. p. 17.
[420] Ibid., accessed.
[421] Ibid., accessed. p. 65.

However, range measures are useful for estimating poverty differences in health because poverty is an extreme condition and can be compared with the other extreme—groups that are not living in poverty, which are usually the groups with the best health. If necessary, group size and middle range data can be included in the data interpretations. It is beyond the scope of this report to delve more deeply into the other disparity measurements, which require more sophisticated measurement techniques.

As noted, the association between poverty and health must be established before the health costs of poverty can be estimated. Epidemiological studies use regression-based measures to find associations between dependant and independent variables that can model causal relationships or correlations between variables. These associations—in this case between poverty and health—can be found in the epidemiological literature and used in range measurements. Once this association and the distribution of risk factor or health outcome levels in the populations living in poverty are known, then the actual costs of poverty can be estimated.

Writing for the World Health Organization (WHO), New Zealand researchers Tony Blakely, Simon Hales, and Alistair Woodward present the basic approach to assessing the impact of socioeconomic position on health risk factors and health status, and describe methods to measure these associations.[422] Their report uses income as the main indicator of socioeconomic position and, therefore, is directly relevant to methods needed to assess costs of poverty. The steps for estimating the prevalence of risk factors or health status by income poverty level, which will be briefly described below, use methods based on burden of disease studies and include:

1. Determine the population distribution of the socioeconomic factor
2. Determine the relative risks for the association between socioeconomic position and risk factors and/or health status
3. Determine the current distribution of risk factor/health status levels within the population by poverty levels
4. Calculate the population attributable risks
5. Estimate uncertainties

To this list we can add a sixth step, which is to use the above calculations to estimate economic costs.

Although the methods presented are generic and can be used for affluent as well as for poor countries, the examples given in the report refer specifically to countries where the majority of the population has absolute incomes of less than US$2 per day. Therefore, specific calculations made in the report are not relevant for Canada. Data used to calculate risk assessment estimates came, in part, from the WHO Comparative Risk Assessment Project, which mapped relative risk factors by poverty level for developing countries.[423] Wealthy countries—including Canada,

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[422] Blakely, Hales, Kieft, Wilson, and Woodward. "Distribution of Risk Factors by Poverty." See also: Blakely, Tony, Simon Hales, Charlotte Kieft, Nick Wilson, and Alistair Woodward. "The Global Distribution of Risk Factors by Poverty Level," *Bulletin of the World Health Organization*, 2005, vol. 83, no. 2. accessed Nov 2007; available from http://www.who.int/bulletin/volumes/83/2/118.pdf.
[423] Ezzati, M., A. Lopez, A. Rodgers, S. Vander Hoorn, C. Murray, and Comparative Risk Assessment Collaborating

which had negligible levels of absolute poverty, defined as having an income of less than $2 US per day—were not included in the WHO analyses.[424]

In the report, relative risk factors, which the authors also call "proximal exposures" and "pathway variables," are mapped by socioeconomic position (SEP). In this case, risk factors are defined by lifestyle behaviours (e.g., tobacco and alcohol use, diet, and physical exercise), as well as environmental risk factors (e.g., air pollutants), access to health services, and psychosocial factors (e.g., stress). These risk factors are seen as intermediate variables in the pathway from SEP to health and are considered to be closer to health outcomes than the more distal factors associated with SEP, such as poverty. In other words, poverty can lead to risk behaviours (such as smoking or substance abuse) or risk exposures (as in the case of food poverty or environmental factors), which can then lead to ill health.

The report does not examine the associations between health status and specific diseases by SEP, although it does briefly mention health status. The authors note that relative risks can be calculated separately for health status and then combined with the relative risk factor estimates. One way to do this would be to make a two-step link from SEP to health status—e.g., to estimate SEP to a risk factor model and a risk factor to health state model. Or a direct link between SEP and health outcomes could be calculated without the additional risk factor link. Since the steps for each estimate are identical, we will also refer to health outcomes/status (mortality and morbidity rates) as well as to risk factors in the descriptions below.

3.1.1 Step 1: Population distribution of the socioeconomic factor (e.g., poverty)

Data must first be obtained on the distribution of the socioeconomic factor, which in this case is poverty, in the population. Poverty rates, or rates of low income, are available through the national census, and can be disaggregated by age and gender. If possible, poverty rates for various vulnerable populations, such as children, Aboriginal people, and the homeless, should also be gathered.

3.1.2 Step 2: Relative risks for the association between socioeconomic position and risk factors / health status

Step 2 includes four sub-steps:

1. Determine the association between poverty and risk factors and/or health outcomes.
2. Choose which indicators to assess.
3. Determine the prevalence of the risk factors and/or health status in the population.
4. Calculate relative risks

The associations between poverty and risk factors or health status come from either survey or

Group (WHO). "Selected Major Risk Factors and Global and Regional Burden of Disease," *Lancet*, 2002, vol. 360: 1347-1360.

[424] These regions were classified as: the Americas, stratum A, Europe, stratum A, and Western Pacific, stratum A.

administrative/surveillance data or from epidemiological studies that use techniques such as regression analyses. A review of the epidemiological literature can identify specific associations or relative risks, which is useful if prevalence data are also reported. When epidemiological studies have identified the relative risks that people living in poverty have for specific risk factors or diseases, administrative or survey data are needed to estimate the population distribution of the risk factor/health status.

The authors note that "the relative risks of disease states are often comparable for different socioeconomic factors," because similar associations are found between a range of socioeconomic factors and health, especially in affluent countries. Therefore, if specific associations between poverty and health are not available, it might be possible to use a different socioeconomic factor, such as education, social class, or occupation, as a proxy for poverty.[425] This is the approach taken in many reports, such as the report by Mackenbach et al. described above. Education is often used in Europe, especially the Netherlands, and social class and occupation are often used in the United Kingdom as indicators of SEP or as proxies for poverty.

Next, in order to estimate the extent of these associations in the population, it is obviously necessary to choose specific risk factor and/or health indicators that will best demonstrate the associations with poverty. In part, this depends on the purpose of the project, availability of data on poverty and risk factor/health outcome distributions and risk-factor/disease relationships, and the research time and resource constraints. Blakely et al. define risk factors as including "behaviours and conditions or states of individuals that are causally associated with the incidence of disease."[426] Examples given include "malnutrition, indoor air pollution, unsafe water and sanitation, unsafe sex, tobacco and alcohol consumption, exercise, diet, blood pressure, weight, and cholesterol."[427]

Health status outcomes include indicators of infant or adult mortality—by general mortality rates, which include all causes, by specific diseases, or by other causes such as injury or suicide—and/or morbidity rates such as the prevalence of specific diseases associated with poverty, as well as indicators of hospitalization and other measures of health service use. Incidence of disease is used less often as an indicator because of lack of data or uncertainty concerning time-lines and causality.

The key words in the above definition of risk factors are "causally associated." As Blakely et al. note, one of the underlying assumptions in the process of calculating the burden of disease is that associations between SEP, risk factors, and disease are causal, i.e. that poverty *causes* increased risk and disease. Blakely et al. note that *theoretically* this may be true, but in practice, causality is difficult to prove since the associations are most likely confounded by other variables, e.g., socioeconomic variables such as education, demographic variables, such as age and ethnicity, and so on. Although confounding variables are often controlled for in epidemiological studies, it is not always possible to reach definitive conclusions. Therefore, causality is often assumed, and conclusions must be considered to be estimates or approximations.

[425] Blakely, Hales, and Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, accessed. p. 16.
[426] Ibid., accessed. p. 9.
[427] Ibid., accessed. p. 9.

Once the risk factor or health outcome indicators have been selected, the prevalence of these indicators in the population needs to be determined in order to estimate relative risks for people living in poverty. Relative risks are generally calculated by dividing the prevalence of a risk factor or heath outcome in a given category, such as people living in poverty (a), by the prevalence in a reference category of people having the lowest risk, such as people not living in poverty (b), or:

$$RR = a / b$$

For example, if 49% of the population living in poverty has malnutrition (the risk factor), and 19% of the population not living in poverty has malnutrition, the relative risk for people living in poverty would be 2.58 (49 / 19). Since "people not living in poverty" is the reference group in this case, the relative risk for that group (b) would be 1.00.

The relative risk can also be calculated as:

$$RR = (a / M1) / (b / M2)$$

where a is the percentage exposed to the risk factor (malnourished) in the poverty group, M1 is the percent of the population living in poverty, b is the percentage exposed to the risk factor (malnourished) in the group not living in poverty, and M2 is the percentage of the population not living in poverty.

In addition, the authors also suggest that, ideally, relative risk estimates for the association of poverty and health should be calculated separately for each country. However, if these estimates are not available, then proxy information from other countries can be used if the two countries have similar characteristics.

3.1.3 Step 3: Distribution of risk factor / health status levels within the population

The distribution of the risk factor/health outcome level in the population depends on the relative risk for the risk factor/health outcome within the population living in poverty and the prevalence of poverty. Step 2 above would be used when the prevalence of the risk factor or health outcome is known for income groups, such as when one data source (e.g., survey) contains all of the information or when data sources are linked, such as in the case of mortality data being linked with census data. However, when relative risks have been determined by epidemiological studies and are known, but the distribution within the population is not known, and/or when the known parameters are from different data sources, step 3 can be used to determine the distribution of the risk factor in the population.

In the example given below, known parameters are the relative risk percentages, the overall prevalence of the risk factor in the population, and the percentages of people living in poverty. The risk factor is the overall prevalence (P) of child malnutrition in Pakistan (40.4% of the total population). Data on child malnutrition came from the WHO Global Burden of Disease Project.

Estimates of the percentage of people (children) living in each level of income poverty in Pakistan came from the World Bank, and relative risk estimates were calculated by the authors using regression analyses. The example uses three levels of poverty (M1–3) and their relative risks for child malnutrition:

- M1 = % of population living on less than US$ 1 per day = 31%
  Relative risk 1 (for malnutrition) = 2.58
- M2 = % of population living on US$ 1–2 per day = 53.7%
  Relative risk 2 = 1.95
- M3 = % of population living on more than US$ 2 per day = 15.4%
  Relative risk 3 = 1.00 (reference group)

- P = overall prevalence of child malnutrition in Pakistan = 40.4% of total population

The formula for finding the percentage of children who are malnourished and living in households with less than US$ 1 per day (a) is:

- a = RR1 * M1 * P / [(RR2 * M2 + M3) + (RR1 * M1)]

- 16.2 = 2.58 * 31 * 40.4 / [(1.95 * 53.7 + 15.4) + (2.58 * 31)]

Table 10 below summarizes the distribution of results based on the above data and formula.

Table 10. Example of the joint distribution for income poverty and child malnutrition (Pakistan)

Poverty level (US$ per day)	M– % population in each income category	Malnourished %	Not malnourished %	Relative risk
< 1	M1 = 31.0	16.2	14.8	2.58
1– 2	M2 = 53.7	21.1	32.6	1.95
> 2	M3 = 15.4	3.1	12.3	1.00
	Total = 100.0	P = total malnourished 40.4	Q = total not malnourished 59.6	

Note: >2 is the reference group.

Source: Adapted from Blakely, Tony, Simon Hales, and Alistair Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, Environmental Burden of Disease Series No. 10, World Health Organization, 2004; accessed Nov 2007; available from http://www.who.int/quantifying_ehimpacts/publications/en/ebd10.pdf.

3.1.4 Step 4: Population attributable risk percentages

Population attributable risk fractions (PAF) are used to estimate the potential changes in population health from altering or eliminating the risk—(in this case) poverty itself as a risk factor for ill health—relative to other risks.[428] According to WHO:

> The standard approach in epidemiology for estimating the health effects of a risk factor is to calculate the attributable fraction of a disease or injury due to the risk factor as a function of the prevalence of exposure (P) and the relative-risk (RR) compared to the non-exposed group. The basic statistic in such an "exposure- based" assessment is the *attributable fraction* (AF), defined as the percentage reduction in disease or death that would occur if exposure to the risk factor was reduced to zero….[429]

One goal of estimating the burden of disease or risk associated with poverty is to estimate the percentage of disease that is *avoidable* in the future, which is based on time lags between exposure to the risk factor and the onset of disease. However, Blakely et al. argue that "there is no clear understanding of the time lag between socioeconomic position and exposure to risk factors, nor between socioeconomic position and disease outcomes."[430] Therefore, it is only possible to estimate the attributable, rather than avoidable, burden of risk factors. Blakely et al. note:

> It is critical to realize that any such estimated population attributable risks are not necessarily accurate predictors of the avoidable burden of the risk factors. Changing only poverty within a population, for example, would not necessarily immediately reduce the risk-factor burden by a commensurate amount. This is because it is likely that the population distribution of relative risks by socioeconomic factor are confounded by other factors, and because time lags are uncertain. Nevertheless, it is possible to state that: 'If people with socioeconomic level X had the same risk-factor prevalence as people with socioeconomic level Y, then the overall risk-factor prevalence would be decreased/increased by Z.'[431]

The authors also note that this scenario *assumes* "that changing the poverty level will change the levels of risk factors in the population," but the extent of this change can only be estimated.[432]

Calculations of population attributable risks, in this case, can estimate the risk factor or disease prevalence that would be the case in the population as a whole if all of the people living in poverty had the same prevalence of risk factors/disease as those not living in poverty. The standard equation used to calculate the PAF is:[433]

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[428] Population attributable risk percentages are referred to in various ways in the literature. Examples include Population Attributable Risk (PAR), Population Attributable Fraction (PAF), Impact Fraction (IF), and Attributable Fraction (AF). Rockhill et al. argue that using the work "risk" in attributable risk is technically incorrect because it is more correct to speak of a proportion or fraction of risk. They suggest that the terms "population attributable risk proportion" or "population attributable fraction" are more accurate. See: Rockhill, Beverly, Beth Newman, and Clarice Weinberg. "Use and Misuse of Population Attributable Fractions," *American Journal of Public Health*, 1998, vol. 88, no. 1: 15-19.
[429] Mathers, Vos, Lopez, and Ezzatti. *National Burden of Disease Studies: A Practical Guide*, accessed.
[430] Blakely, Hales, and Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, accessed. p. 6.
[431] Ibid., accessed. pp. 11–12.
[432] Ibid., accessed. p. 11.
[433] Mathers, Vos, Lopez, and Ezzatti. *National Burden of Disease Studies: A Practical Guide*, accessed.

$$PAF = [P(RR–1)] / [P(RR–1)] + 1$$

Where P is the prevalence of the risk factor and RR is the relative risk.

A second way to calculate the PAF is to compare the exposure or prevalence of the risk factor/health outcome in one population (those in poverty) with that of another population (those not in poverty), which has an exposure/prevalence level that is higher than zero. In this case, it is first necessary to choose a reference group—or "counterfactual"— with which to compare those living in poverty. The counterfactual is defined as "a hypothetical 'target' distribution in which the risk factor is removed or reduced."[434] In their example, Blakely et al. first calculated the distributions of risk factors in the poor population by absolute income poverty (people living on less than US$ 2 per day), and then they chose a reference group, or counterfactual, of people having the risk factor profile of those living on greater than US$ 2 per day.

Having chosen the reference group, the data gathered in steps one through three are then used to estimate the population attributable fraction (PAF) by using the standard formula:

$$PAF = \frac{(P_i * RR_i) - (P_i' * RR_i)}{(P_i * RR_i)}$$

where:
RR_i = relative risk by exposure strata "i".
P_i = proportion of population in exposure strata "i" before counterfactual change.
P_i' = proportion of population in exposure strata "i" after counterfactual change.
Note: the calculation should include the unexposed populations (i.e. with RR = 1), both before and after the counterfactual change.[435]

The following example uses the same child malnutrition data used in the example above, with the counterfactual scenario being that those people living on less that US$ 2 per day have the same risk-factor profile of those living on more than US$ 2 per day. This example takes into account all of the levels of income, rather than only the two extreme levels:

$$PAF = \frac{[(0.310 * 2.58 + 0.537 * 1.95 + 0.154 * 1.0) - (1.0 * 1.0)]}{(0.310 * 2.58 + 0.537 * 1.95 + 0.154 * 1.0)}$$

$$PAF = 50\%$$

Therefore, under this counterfactual scenario, 50% of child malnutrition is attributable to poverty. In other words, if people with poverty levels M1 and M2 had the same risk-factor prevalence as people with poverty level M3, then the overall risk-factor prevalence would theoretically be decreased by 50%. This percentage, or fraction of the burden—here, of malnutrition attributed to poverty—can be multiplied by the total burden (B)—37.3% of children

[434] Blakely, Hales, and Woodward. *Poverty: Assessing the Distribution of Health Risks by Socioeconomic Position at National and Local Levels*, accessed. p. 11.
[435] Ibid., accessed.

living in poverty who are malnourished—to obtain the attributable burden (AB)—the burden of malnutrition attributable to poverty, i.e., AB = PAF * B. In the example, the attributable burden of poverty is 50% of 37.3%—or 18.65%—which is the percentage of malnutrition that could be reduced if poverty (based on <US$ 2 per day) were eliminated.

If the counterfactual situation had been different—for example, if the counterfactual situation had been that those people living on less than US$1 per day (M1) had the same risk-factor profile of those living on more than US$1 per day (M2 + M3), the PAF would have been 13% of child malnutrition attributable to poverty, and the overall risk-factor prevalence would theoretically be decreased by 13%.

3.1.5 Step 5: Uncertainties

Uncertainties are generally factors that cannot be calculated quantitatively but that may have an effect on the outcome. For example, in the example given above, if everyone living on less than US$2 per day were lifted out of poverty, child malnutrition might decrease by less than 50% as indicated by the PAF calculation, because other factors such as lack of education might prevent all of the benefits from being realized. However, as the authors note, the PAF points out "the importance of income poverty as a determinant of risk factor prevalence and, consequently, health."[436]

Blakely et al. note that uncertainties are often caused by limited data, confounders that cannot be assessed independently, unknown time lags such as the length of time it takes for an improvement in income to manifest as a change in risk factors or disease, and other contextual factors. The example given for contextual factors is that "in a poor rural community with no infrastructure for safe water and sanitation, an improvement in income will not inevitably result in safe water and sanitation. Political commitment [… is] needed in order to implement infrastructure changes."[437] Uncertainties can often be partially accounted for by calculating a range of high and low estimates.

3.1.6 Step 6: Cost estimates

Step 6 is listed here to illustrate the final step in the estimation process, although it is not included in the Blakely et al. report. This step will be discussed in the following Section 3.2, which describes the cost of illness approach. Basically, the total economic cost equals the PAF for each indicator multiplied by the total cost of that indicator.

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[436] Ibid., accessed. p. 22.
[437] Ibid., accessed. p. 13.

3.2 Cost-of-illness approach

In order to estimate the health costs of poverty it is necessary to know the costs of the illnesses attributable to poverty. Cost of illness studies have been conducted since 1950 when B. Malzberg reported the indirect costs of mental illness in what is generally believed to be the first formal cost of illness study.[438] In the late 1960's, Dorothy Rice, former director of the U.S. National Center for Health Statistics, and her colleagues first developed the basic framework and procedures for estimating direct and indirect costs of illness.[439] As Hodgson and Meiners note, subsequent studies range from very comprehensive studies that attempt to estimate all possible costs associated with a broad spectrum of diseases to the more prevalent studies that report only a few costs for a specific disease in a limited geographic area.[440]

Cost of illness studies provide a measure of social costs by estimating the economic burden of mortality or morbidity and the amount of money that could potentially be saved if the burden was eliminated.[441] GPI*Atlantic* has used this basic approach in health costing reports conducted over the past ten years in areas such as tobacco use, obesity, physical activity, and chronic disease.[442] The following section briefly reviews the methodology used in cost of illness studies. More exhaustive and detailed accounts of this methodology can be found elsewhere.[443]

Cost of illness studies can be either prevalence-based or incidence-based. Prevalence-based estimates are cross-sectional and measure costs that occur during a specific time period such as one year and are not dependant on the first occurrence of the illness.[444] Incidence-based estimates, on the other hand, are based on the number of new cases arising in a period of time, and the present value of lifetime costs that result from all conditions beginning during the particular time period.[445]

Here we are mainly concerned with prevalence-based costs since these can be directly connected

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[438] Malzberg, B. "Mental Illness and the Economic Value of Man," *Mental Hygiene*, 1950, vol. 34: 582-591. Cited in Hodgson, T.A., and M.R. Meiners. "Cost of Illness Methodology: A Guide to Current Practices and Procedures," *Milbank Memorial Fund Quarterly*, 1982, vol. 60, no. 3: 429-462. p. 436.
[439] Rice, Dorothy P. "Estimating the Cost-of-Illness," *American Journal of Public Health*, 1967, vol. 57: 424-440.
[440] Hodgson, and Meiners. "Cost of Illness Methodology: A Guide to Current Practices and Procedures."
[441] Kuchler, Fred, and Elise Golan. *Assigning Values to Life: Comparing Methods for Valuing Health Risks*, Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture, Agricultural Economic Report No. 784, 1999; accessed Nov 2007; available from http://www.ers.usda.gov/publications/aer784/aer784.pdf.
[442] See publications at: GPI Atlantic. *Publications Website*, Genuine Progress Index for Atlantic Canada (GPI Atlantic), accessed October 2007; available from http://www.gpiatlantic.org/publications/pubs.htm.
[443] See: Health Canada. *Economic Burden of Illness in Canada, 1998*, 2002; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/publicat/ebic-femc98/pdf/ebic1998.pdf.; Hodgson, and Meiners. "Cost of Illness Methodology: A Guide to Current Practices and Procedures."; Segel, Joel E. *Cost of Illness Studies: A Primer*, RTI-UNC [Research Triangle Institute-University of North Carolina at Chapel Hill] Center of Excellence in Health Promotion Economics, 2006; accessed Nov 2007; available from http://www.rti.org/pubs/COI_Primer.pdf.; and Tarricone, Rosanna. "Cost-of-Illness Analysis: What Room in Health Economics?" *Health Policy*, 2006, vol. 77: 51-63.
[444] Finkelstein, Eric, and Phaedra Corso. "Cost-of-Illness Analyses for Policy Making: A Cautionary Tale of Use and Misuse," *Expert Review of Pharmacoeconomics Outcomes Research*, 2003, vol. 3, no. 4: 367-369.
[445] Ibid.

with costs calculated by Health Canada in its *Economic Burden of Illness in Canada* (EBIC) estimates.[446] EBIC supplies information on the magnitude of the economic burden of illness in Canada based on standard reporting units and methods. For most of the burden of disease, except for mortality costs, EBIC used a prevalence-based approach to estimate costs in 1998. However, for mortality costs, an incidence-based human capital approach was used. Health Canada notes: "Mortality cost estimates are based on the discounted value of current and future costs of premature deaths occurring in 1998, rather than a prevalence-based approach in which estimates would be based on the 1998 dollar value of premature deaths that occurred prior to 1998."[447]

Comprehensive costs of illness studies include both direct and indirect costs, although the factors that are included depend on the perspective of the study, that is whether the purpose of the study is to estimate costs to society overall, or to the health care system, government, business, or to patients and their families.[448] Basically, direct costs measure medical expenses that result from an illness or injury, and indirect costs measure the value of lost productivity because of the illness, injury, or premature mortality. Items typically included in the various perspectives are listed in Table 11 below.

Table 11. Costs included in cost of illness studies, by perspective

Perspective	Medical costs	Morbidity costs	Mortality costs	Transportation/ Nonmedical costs	Transfer payments
Societal	All costs	All costs	All costs	All costs	—
Health care system	All costs	—	—	—	—
Third-party payer	Covered costs	—	Covered costs	—	—
Business	Covered costs (self-insured)	Lost productivity (presenteeism/ absenteeism	Lost productivity	—	—
Government	Covered costs	—	—	Criminal justice costs	Attributable to illness
Participants (patients) and families	Out-of-pocket costs	Lost wages/ household production	Lost wages/ household production	Out-of-pocket costs	Amount received

Source: Segel, Joel E. *Cost of Illness Studies: A Primer*, RTI-UNC [Research Triangle Institute-University of North Carolina at Chapel Hill] Center of Excellence in Health Promotion Economics, 2006; accessed Nov 2007; available from http://www.rti.org/pubs/COI_Primer.pdf.

Most cost of illness studies take the perspective of overall costs to society—the most comprehensive perspective—and, therefore, can include all medical, morbidity, mortality, and nonmedical costs as well as transfer payments attributable to illness. Studies that includea large range of costs, of course, generally result in higher cost estimates than those that include a

[446] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed.
[447] Ibid., accessed. p. 1.
[448] Segel. *Cost of Illness Studies: A Primer*, accessed.

smaller range of costs.[449] Transfer payments to individuals are generally not included in economic costing models since they represent a shift in resources, rather than a use of resources. However, Finkelstein and Corso note that the inclusion of transfer payments may depend on the perspective of the study, because although the estimate may represent a transfer from one entity to another, "to the payer they are actual expenses."[450] They give an example from a previous obesity study they had conducted:

> For example, in the obesity study, the authors quantified expenditures to specific payers, including Medicare and Medicaid. This allowed quantifying of the financial burden associated with obesity that falls to taxpayers. Whether or not these taxes represent actual costs or transfers is likely to be of little importance to those who were unaware that they were financing these expenditures in the first place.[451]

In the EBIC report, total, direct, and indirect costs are allocated by cost component, standard diagnostic categories, age group, gender, and province/territory.[452] Unfortunately, these costs are not disaggregated by socioeconomic position or by groups that may be experiencing health disparities. Standard diagnostic categories are from the World Health Organization International Classification of Diseases, 9th and 10th Revisions.[453]

3.2.1 Direct costs

Direct costs measure "opportunity costs," which are defined by Health Canada as "the value of opportunities forgone because of an intervention, action, or health outcome (i.e., the direct and indirect costs of illness and injury.)"[454] Hodgson and Meiners define opportunity costs as "the value of the forgone opportunity to use in a different way those resources that are used or lost due to illness."[455] Direct costs in EBIC are defined as "the value of goods and services for which payment was made and resources used in treatment, care, and rehabilitation related to illness or injury."[456] EBIC measures the following five direct cost components:

1. hospital care expenditures,
2. drug expenditures,
3. physician care expenditures,
4. expenditures for care in other institutions, and
5. additional direct health care expenditures (including other professionals, capital, public

[449] Ibid., accessed.
[450] Finkelstein, and Corso. "Cost-of-Illness Analyses for Policy Making: A Cautionary Tale of Use and Misuse." p. 369.
[451] Ibid., p. 369.
[452] Age groups are children (0 – 14 years), and individuals ages 15 – 34 years, ages 35 – 64 years, and seniors (65 years and over).
[453] World Health Organization. *Website: International Classification of Diseases (ICD)*, 2007; accessed Nov 2007; available from http://www.who.int/classifications/icd/en/.
[454] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed.
[455] Hodgson, and Meiners. "Cost of Illness Methodology: A Guide to Current Practices and Procedures." p. 431.
[456] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 1.

health, prepayment administration, health research, etc.)[457]

Costs borne by participants (patients) and their families are not included.

Expenditures for all five components of direct costs in EBIC are taken from the Canadian Institute for Health Information's (CIHI) *National Expenditure Trends1975 – 2000.* (NHEX) This source has recently been updated to include data through 2007.[458]

Hospital care expenditures include operating and maintaining both inpatient and emergency rooms in general hospitals, and in other outpatient acute-care hospitals, chronic/rehabilitation hospitals, and psychiatric hospitals. Expenditures include items such as wages and salaries, laboratory and other diagnostic procedures, drugs administered in the hospitals, operating and case room costs, anaesthetic, radiotherapy, and physiotherapy facilities, and accommodation and meals. Acute care hospital care costs (both inpatient and outpatient) represent 92% of health care costs, and chronic/rehabilitation and psychiatric hospitals each represent 4% of health care costs.[459]

Drug expenditures include drugs purchased outside the hospital—prescription drugs and non-prescribed, over-the-counter drugs. Only expenditures for prescribed drugs are allocated by disease categories, gender, age group, and province/territory. Approximately 40% of total prescription drug expenditures are allocated to three diagnostic categories—cardiovascular diseases, respiratory diseases, and mental disorders.[460]

Physician care expenditures include fee-for-service (FFS) physician care outside of hospitals that represent payments made by provincial/territorial medical care insurance plans to physicians in private practice, and payments made through alternative payment plans (APP). Only FFS are broken down by diagnostic categories. APP represents professional incomes paid through alternative payment plans such as fee payments by workers' compensation boards, direct payments by federal agencies, and private sector payments. Almost 84% of physician care expenditures were based on FFS expenditures. According to EBIC, at the national level, mental disorders accounted for the highest expense (8%), followed by nervous system diseases (7.1%), cardiovascular diseases (7%), and respiratory diseases (6.6%).[461]

Expenditure for care in other institutions includes costs of operating and maintaining public and private residential care facilities that are approved, funded, or licensed by provinces or territories for level 2 care.[462] These include nursing homes and other homes for the aged, and residential facilities for the physically and mentally handicapped, those with alcohol and drug problems, and

[457] Ibid., accessed. p. 1.
[458] Canadian Institute for Health Information (CIHI). *National Health Expenditure Trends, 1975 - 2007*, 2007; accessed Nov 20007; available from http://secure.cihi.ca/cihiweb/products/NHET_1975_2007_e.pdf.
[459] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed.p. 14.
[460] Ibid., accessed. p. 21.
[461] Ibid., accessed. p. 27.
[462] Level 2 care requires at least 1.5 hours total care in a 24-hour day for people who have a chronic physical or mental disease or functional disability that is not likely to change in the near future and who do not need the diagnostic and therapeutic services given in a hospital. Facilities for self-sufficient people requiring minor supervision and for those needing Level 1 care (less than 90 minutes per day) are not included.

emotionally disturbed children. Gross salaries—including employee benefits, supplies, and expenses—and drugs prescribed in the institutions are also included in this category. Non-health expenditures in the facilities are excluded. Expenditure for health care in other institutions accounts for 10% of the total direct costs—senior care accounts for 94.7% of these expenditures with female residents accounting for 70% of the costs. Nervous system disorders (e.g., Alzheimer's disease), mental disorders (e.g., schizophrenia), and circulatory system diseases (e.g., cerebrovascular diseases, especially stroke) contributed to most of the activity limitations in residential care.[463]

Additional direct health care expenditures are expenditures on other professionals (42.3% of this category), other health spending (48.7%), and capital expenditures (9%). *Other professionals* include the services of privately practicing dentists, denturists, chiropractors, massage therapists, orthopedists, optometrists, osteopaths, podiatrists, psychologists, naturopaths, private duty nurses, and physiotherapists. Dentists (62%) and vision care (22.6%) account for almost 85% of this category.

Other health spending includes *public health expenditures* (e.g., food and drug safety, prevention of communicable disease, health inspections, health promotion activities, community mental health programs, public health nursing, and infrastructure costs to operate health departments); *prepayment administration* (e.g., costs of providing governmental or private health insurance programs); *home care expenditures* (e.g., the health professional component of health care; home support is provided through social service expenditures); *health research expenditures* (e.g., research on determinants of health, health status, health care methods, and program evaluations; not including research by hospitals or drug companies in product development); and *other expenditures* (e.g., for medical transportation-ambulances, hearing aids and other appliances, health worker training, voluntary health associations, occupational health to promote health and safety in the workplace). Public health expenditures account for 41.5% of this category, prepayment administration for 13.3%, home care for 12.6%, health research for 9.1%, ambulances for 8.6%, and the remainder of the "other" category for 14.8%.

Capital expenditures include those on construction, machinery and equipment of hospitals, clinics, first-aid stations, and residential care facilities.[464]

3.2.2 Approaches to measuring direct costs

The main approach to determining the background information needed to estimate direct costs uses the epidemiological approach, which includes risk ratio, odds ratio, and population attributable fraction measures.[465] This approach is discussed in section 3.3 below. In addition, two other approaches are often used—the bottom-up approach and the econometric approach.

[463] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 33.
[464] Ibid., accessed.
[465] Tu, Shihfen. "Developmental Epidemiology: A Review of Three Key Measures of Effect " *Journal of Clinical Child and Adolescent Psychology*, 2003, vol. 32, no. 2: 187-192.

Bottom-up approach

In addition to the epidemiological approach, a second approach to estimating direct costs is referred to in the economic literature as the "bottom-up approach."[466] The method combines the unit cost with utilization and simply multiplies the average cost of treatment of a disease by the prevalence of the disease in the population. However, this approach does not take co-morbidities into account, i.e., it does not consider what percentage of the disease can be attributable to a third factor, such as a risk condition or risk factor.

Econometric approach

The third or econometric method estimates the difference in costs between a cohort of the population with the disease with a cohort of the population without the disease.[467] These cohorts are matched by demographic characteristics such as sex, age, income, or geographic location and the presence of the chronic condition. According to Segel, this approach is useful if all of the data needed is contained in one dataset.[468]

3.2.3 Indirect costs – the human capital approach

Indirect costs of illness, which can be substantially greater than direct costs, are costs of resources for which no payment is made but for which there is a forgone benefit or opportunity lost because of morbidity or mortality.[469] Indirect costs measured in EBIC are defined as "the value of economic output lost because of illness, injury-related work disability, or premature death."[470] To estimate indirect costs many cost of illness studies use the human capital approach—which assumes that earnings reflect productivity and that changes in health status are reflected in changes in national income, and that national income is an accurate indicator of societal wellbeing.[471] The human capital approach is widely used but also widely criticized because of these assumptions. For example, Hodgson and Meiners note:

> Relying as it does on existing earning patterns, the human capital approach tends to give greater weight to working-age men compared to women, the young, minorities, and older persons…. The human capital approach has also often been criticized as, at best, an incomplete measure of the value of life and, at worst, an irrelevant calculation without appropriate conceptual foundation. Indeed, it does not measure the value of life. Psychosocial costs are one component of the burden of illness omitted from the human capital computation of indirect costs. These affect the quality of life…. The justification for the human capital methodology is not that it measures the value of life, but that it does provide a measure of a cost of disease. Further, its validity as a measure of certain costs of disease does not require the acceptance of maximizing the GNP as the goal of

[466] Segel. *Cost of Illness Studies: A Primer*, accessed.
[467] Ibid., accessed.
[468] Ibid., accessed.
[469] Jacobs, Philip, and Konrad Fassbender. *Indirect Costs in the Health Economics Evaluation Literature: A Survey Article*, Edmonton, Alberta: Working Papaer 97-4, Institute of Pharmaco-Economics, University of Alberta, 1997.
[470] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 1.
[471] Kuchler, and Golan. *Assigning Values to Life: Comparing Methods for Valuing Health Risks*, accessed.

economic or social policy.[472]

Despite the considerable criticisms leveled against the human capital approach, Kuchler and Golan note that the approach traces "economic flows associated with an adverse health outcome" and can provide "useful information to economists and policymakers interested in gauging the pure economic impact of government policy to reduce adverse health outcomes."[473] Tarricone, who provides an overview of critiques of the human capital approach, concurs that while the human capital approach does not actually provide an economic value of human life, it does value "a certain component of the cost of disease."[474]

EBIC estimates indirect costs based on the three following components:

- Mortality costs – the value of years of life lost due to premature death,
- Morbidity costs – the value of activity days lost due to short-term disability, and
- Morbidity costs – the value of activity days lost due to long-term disability.[475]

Not included are other indirect costs such as the value of time lost from work, the value of lost leisure time of family members or friends who care for the patient as well as of the patient, and intangible costs due to pain and suffering.

Mortality costs

Mortality costs are associated with premature deaths caused by illness or injury. These losses in EBIC are estimated by using an incidence-based human capital approach, which calculates the discounted present value of future production lost because of the mortality. Future earnings are based on average annual earnings in 1998. A 5% discount rate and an annual labour productivity growth rate of 1.1% were used. Lost production was calculated by 5-year age groupings to age 85 and by gender.

The EBIC report notes that "the method accounts for age- and sex-specific rates of life expectancy, average annual earnings, workforce participation rates, values of unpaid work, as well as labour productivity growth and the discounting of future production."[476] The value is the sum of:

- the estimated value of paid labour for all persons in the workforce (the annual mean earnings for all persons by sex and age * average workforce participation rate by sex and age * probability of survival rate by sex and age),
- the estimated value of unpaid labour for all persons in the workforce (annual mean imputed value of housekeeping services * average workforce participation rate by sex and age * probability of survival rate by sex and age), and
- the estimated value of unpaid labour for all persons not in the workforce (annual mean

472 Hodgson, and Meiners. "Cost of Illness Methodology: A Guide to Current Practices and Procedures." p. 438.
473 Kuchler, and Golan. *Assigning Values to Life: Comparing Methods for Valuing Health Risks*, accessed. p. 14.
474 Tarricone. "Cost-of-Illness Analysis: What Room in Health Economics?."
475 Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 1.
476 Ibid., accessed. p. 37.

imputed value of housekeeping services * average housekeeping participate rate by sex and age * probability of survival rate by sex and age)

Adjusted by:

- rate of growth of labour productivity, and
- discount rate

Almost three-quarters of the total mortality costs are accounted for by cancer (31.7% of total mortality costs), cardiovascular diseases (24.6%), and injuries 17.7%). Lung cancer accounts for 26.1% of all cancer deaths, suicide accounts for 36.6% of injury deaths, and motor vehicle accidents account for 26.3% of injury deaths.[477]

Morbidity costs: long-term disability

Both long- and short-term morbidity costs are incurred from disability caused by injury or disease that results in a loss of major activities such as paid and unpaid work. The long-term morbidity costs for 1998, for ages 15 – 85 years, were calculated in the EBIC for both the hospitalized/institutionalized population and the household population with a disability that has lasted or is expected to last at least 6 months. Self-assessed disability counts came from the 1996-1997 National Population Health Survey. Weights, used to adjust the disability counts, were assigned for different levels of disability—for household: very severe, somewhat severe, somewhat major, and minor; and for institutions: very severe and minor.[478] The adjusted disability estimates were then multiplied by average values of paid and unpaid labour, by sex and age, derived from average annual earnings of all earners, average supplementary income rate (14.05% ± 1.9% by province / territory—assumed to be the same for all age, sex, and geographic groups), and an average value of unpaid work in 1998, then adjusted for the distribution of labour force and housekeeping participation rates.

EBIC estimated the value of production lost due to long-term disability in 1998 to be $32.2 billion. Diseases accounting for disabilities were musculoskeletal diseases (39% of long-term disability costs, with arthritis accounting for 26.8% of this category), nervous system diseases (12.9%, with hearing and sight disorders accounting for 30%), cardiovascular diseases (9.8%, with stoke accounting for 13.2%), mental disorders (7.0%, with depressive disorder accounting for 18.9%), respiratory diseases (3.1%, with asthma accounting for 69%), and endocrine diseases (2.5%, with diabetes accounting for 64.9%).[479]

Morbidity costs: short-term disability

Morbidity costs for short-term disability—defined as an activity restriction that lasted or is expected to last less than 6 months—represent the value of production lost due to this disability for individuals living in households only in 1998. The number of individuals was based on responses given to two questions in the 1996-97 National Population Health Survey—number of

[477] Ibid., accessed. p. 38.
[478] For definitions see EBIC, Appendix 5, p. 77.
[479] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. p. 45.

"days spent in bed" and "days cut down on things" during the previous 2-week period. The distribution of short-term disability was then imputed over the year based on these responses, which were weighted for both questions. The resulting distributions of disability-adjusted days of reduced activity were multiplied by the average daily paid labour of all earners, adjusted for wage supplements, and average daily value of unpaid labour, by sex and age (15 – 85 years).

In all morbidity costs, the costs of lost schooling, and the costs associated with reduced production during work hours (presenteeism) are not included.

EBIC estimated the value of production lost due to short-term disability in 1998 to be $9.8 billion. The leading causes of short-term disability, which accounted for more than half of the total costs, were respiratory diseases (24.8% of short-term disability costs, with pneumonia and influenza accounting for 72.3% of this category), injuries (17.9%), and musculoskeletal diseases (10.3%, with arthritis accounting for 10.4%).[480]

Psychosocial costs

Using only the above three components to estimate the indirect costs of illness generally produces a fairly high but conservative estimate. Not captured in these components are the costs to the healthcare system as well as to society in general that are associated with the psychological pain and suffering caused by the illness. However, these costs are often difficult to evaluate and are rarely used in costing studies using the human capital approach.[481]

Alternative method for estimating indirect costs

A simple method for estimating indirect costs, if it is not possible to break down these costs by specific component, is to use the overall ratio of direct to indirect costs given in EBIC. For example, EBIC estimates that productivity losses due to mortality to be 18.7% of the total cost of illness in Canada, and productivity losses due to long-term and short-term disability to be 24.4% and 11.2%, respectively, of the total. These losses represent 54.3% of the total cost of illness to the economy, while direct costs represent 45.7%. If the total costs of the illness are known, this ratio can be used to attribute 54.3% of the total cost to indirect costs.[482]

3.3 Epidemiological measures

Before costs can be estimated, information must be gathered or calculated on the prevalence of the risk in the population, the relative risk ratio for the outcome in question, and the proportion of the outcome that can be attributed to the risk. According to U.S. researchers Keith Scott et al.,

[480] Ibid., accessed. p. 52.
[481] Rice, Dorothy P. " Cost of Illness Studies: What Is Good About Them?" *Injury Prevention*, 2000, vol. 6: 177-179.
[482] Colman, Ronald. *Cost of Obesity in Nova Scotia*, GPI Atlantic and Cancer Care Nova Scotia, 2000; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/obesity/ns-obesity.pdf. These percentages are based on EBIC 1993 and, if this method is used, the percentages would need to be updated.

epidemiological measures have direct relevance to public policy and action since these measures focus on differences in *proportions* in the population—rather than the focus on *means* and *variance* that regression-based measures of effect supply—and have the ability to separate risk to the population from risk to the individual.[483] The most commonly used epidemiological measures of relative risk are the risk ratio, the odds ratio, and the population attributable fraction. These measures were briefly discussed in Section 3.1, and are presented below in more detail.

3.3.1 Risk ratio

Risk ratio is a relative measure of effect and is defined as "the increase in the probability of an outcome given one situation, relative to the probability of an outcome given some other situation."[484] The ratio consists of that between one group that is experiencing the risk factor and has the probability of developing a particular outcome, compared with a reference group that is not experiencing the risk factor. In most cases the increased risk of experiencing a negative outcome is compared between the groups. A value of 1.0 indicates no effect, or that both groups are equally at risk. If the risk ratio is greater than one, it indicates that one of the groups is at greater risk, relative to the reference group, and if the value is less than one, the group is less at risk. Risk ratios can be calculated when there is a representative sample, such as when the entire population is included in the sample, or when there is a cohort designed study, consisting of two subgroups with one exposed to the risk and the other not exposed, where valid probabilities can be calculated.

The risk ratio formula is based on Table 12 below.

Table 12. Relative risk groups

	Develop outcome	Not develop outcome	Probability
Experience risk factor	a	b	a / (a + b)
Not experience risk factor	c	d	c / (c + d)

Source: Tu, Shihfen. "Developmental Epidemiology: A Review of Three Key Measures of Effect," *Journal of Clinical Child and Adolescent Psychology*, 2003, vol. 32, no. 2: 187-192.

Based on the Table 12 above, the formula for a risk ratio is:

RR = a/(a + b) / c/(c + d) = P *(outcome-exposure)* / P *(outcome-no exposure)*[485]

Tu gives the following example, shown in Table 13 of the relative risk of elementary school

[483] Scott, Keith G., Craig A. Mason, and Derek A. Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy," *Child Development*, 1999, vol. 70, no. 5: 1263-1272.
[484] Tu. "Developmental Epidemiology: A Review of Three Key Measures of Effect. ". p. 187.
[485] Ibid.

youth who were Severely Emotionally Disturbed (SED) in 1994 being involved in a juvenile court case five years later. In the example provided, the RR is 8.02, which indicates that the youth identified as having SED in elementary school were 8.02 times more likely to be involved in a juvenile court case than were youth who did not have SED.[486]

Table 13. Relative risk study

	Develop outcome: court case	Not develop outcome: no court case	Total	Probability	Relative Risk
Experience risk factor – SED	a – 230	b – 1,564	1,794	a /(a + b) = 230 / (230 + 1,564) 0.128	0.128 / 0.016 = 8.02
Not experience risk factor – no SED (reference group)	c – 2,271	d – 139,802	142,073	c / (c + d) = 2,271 / (2,271 + 13! = 0.016	1.0 (reference group)

Source: Adapted from: Tu, Shihfen. "Developmental Epidemiology: A Review of Three Key Measures of Effect," *Journal of Clinical Child and Adolescent Psychology*, 2003, vol. 32, no. 2: 187-192.

3.3.2 Odds ratio

Odds ratio is defined as "the increase in the odds of an outcome given one situation relative to the odds of the outcome given some other situation."[487] Whereas risk ratios estimate "differences in the *relative probability of an outcome,*" odds ratios estimate "differences in the *relative odds of an outcome*."[488] According to Tu, the risk ratio is generally preferred over the odds ratio, but an odds ratio can be calculated in retrospective, case-control studies when the outcome is known. Therefore, while a probability cannot be calculated, it is possible to determine whether the group previously experienced the risk factor. In the words of Scott, et al.:

> The *odds* are the probability that an event, typically an undesired or negative outcome, will occur, divided by the probability that it will not occur. The *odds-ratio* is the ratio of two odds obtained under different circumstances, or, in simpler terms, it is the relative increase in the odds of a given outcome when one, rather than another, condition is true.[489]

Holcomb et al. explain that both the risk and odds ratios have the same numerator—the number of cases with the outcome.[490] However, the denominator is different in the two measures. The

[486] Ibid.
[487] Tu. "Developmental Epidemiology: A Review of Three Key Measures of Effect. ". p. 188.
[488] Scott, Mason, and Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy." p. 1267.
[489] Scott, Mason, and Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy." p. 1266.
[490] Holcomb Jr., William L. , Tinnakorn Chaiworapongsa, Douglas A. Luke, and Kevin D. Burgdorf. "An Odd

risk ratio compares the number of cases with the outcome to the number of total cases, whereas the odds ratio compares the number of cases with the outcome to the number of cases without the outcome. According to Zhang et al., the two measures are not interchangeable because they produce different results, although for outcomes that are rare, the results may be similar.[491]

As in the case of risk ratio, an odds ratio of 1.00 indicates no effect, and a ratio greater than 1.00 indicates increased risk.

The formula for odds ratio (OR), in reference to Table 12 above, is:

$$OR = (a / c) / (b / d) = ad / bc$$

In the example given below, the number of court cases was known, and the odds ratio is retrospective. Based on the data in Table 14 below, the odds ratio is 9.20, which indicates "the odds of having a juvenile court case for youth identified as SED was 9.2 times the odds of having a juvenile court case among youth not identified as SED."[492] According to Tu this is the same as "the increased odds of previously having SED given a youth had a court case," but the odds ratio is not typically expressed this way since "researchers uniformly prefer to discuss their findings in terms of the increased odds of an outcome, given exposure to a risk factor."[493]

Table 14. Odds ratio study

	Court case	No court case	Calculation	Odds ratio
Identified as SED	a – 17	b – 2	(a-17 / c-183) / (b-2 198) = .092 / .010	9.2
Not identified as SED (reference group)	c – 183	d – 198	—	1.0
Total	200	200		

Source: Adapted from: Tu, Shihfen. "Developmental Epidemiology: A Review of Three Key Measures of Effect," *Journal of Clinical Child and Adolescent Psychology*, 2003, vol. 32, no. 2: 187-192.

Tu notes that odds ratios and risk ratios are not often distinguished in the literature. However, odds ratios result "in a value more extreme than the risk ratio" and "it is not correct to discuss an odds ratio as reflecting the increased probability of an outcome."[494] Rather, Tu argues it should be discussed as an increase in the odds of the outcome, based on experiencing the risk factor, or as an increase in the odds of the risk factor, given the outcome, which are equivalent measures.

Measure of Risk: Use and Misuse of the Odds Ratio," *Obstetrics and Gynecology*, 2001, vol. 98, no. 4: 685-688.
491 Zhang, Jun, and Kai F. Yu. "What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes," *JAMA (Journal of the American Medical Association)*, 1998, vol. 280, no. 19: 1690-1691.
492 Tu. "Developmental Epidemiology: A Review of Three Key Measures of Effect."
493 Ibid. p. 189.
494 Ibid. p. 189.

Odds ratios are also used when multiple risk factors are examined using logistic regression, which "allows one to calculate a type of odds ratio after a single risk factor, after controlling for the effect of other risk factors…. [O]ne can assess the increased odds of the outcome for a unit increase in the predictor variable."[495] Scott, et al. note that in this case, since there is no reference group, odds *factor* might be a better term than odds ratio.

Logistic regression yields an odds ratio rather than a risk ratio, and the odds ratio can be used to estimate the risk ratio if the occurrence in the unexposed group—the group without the factor—is known.[496] Zhang et al. recommend following this correction procedure if the incidence of the outcome is more than 10% and the odds ratio is more than 2.5 or less than 0.5. The formula to estimate the risk ratio from the odds ratio is:

RR = OR/[(1 – Po) + (Po x OR)]

where RR is the estimated risk ratio, OR is the odds ratio, and Po is the proportion of nonexposed individuals who experience the outcome.

3.3.3 Population attributable fractions

Risk ratios and odds ratios both reflect the degree of risk for an individual. However, attributable risk ratios reflect the effect of a risk factor upon the community as a whole, and are therefore important for public health policy.[497] As Scott et al. note, uncommon risk factors that have a large effect on individuals may have a small impact on rates of a disorder in the community, and a common risk factor that has a small effect on individuals may have a large impact on disorder rates in the community.[498]

Attributable risk ratios refer to the proportion of risk that can be attributed to causal effects of a risk factor or condition. Basically, the risk ratio differences are adjusted by the prevalence of the risk factor in the population, which results in an "estimate of the percentage of cases of the disorder in the entire community that is related to the risk factor."[499] This method involves the assessment of relative risks (RR) for known diseases, risk factors (e.g. obesity or tobacco use), or risk conditions (e.g., poverty[500]), and calculation of the population attributable fraction (PAF or PAR–population attributable risk) due to exposure to the disease, risk factor, or risk condition, according to the relative risk and the probability of a person having an outcome in a particular jurisdiction.

[495] Ibid. p. 190.
[496] Zhang, Jun, and Kai F. Yu. "What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes."
[497] Scott, Mason, and Chapman. "The Use of Epidemiological Methodology as a Means of Influencing Public Policy."
[498] Ibid.
[499] Ibid. p. 1267.
[500] Scott et al. refer to "poverty" as a "risk factor," while other authors consider "poverty" to be a "risk condition" in order to distinguish it from lifestyle risk factors such as smoking or obesity.

This method is especially useful when there are co-morbidity or lifestyle risk factors involved.[501] Population attributable factors (PAF) were previously discussed in Section 3.1.4 above. Here we briefly review the basic information. Tu defines PAF as follows:

> The PAF weighs the risk ratio by the prevalence of the risk factor itself, to assess the strength of the relation between the risk factor and the overall number of cases of the outcome in the community. Specifically, it is the degree to which the total number of cases in a community would be reduced if the frequency of the outcome among those exposed to the risk factor was the same as those not exposed to the outcome.[502]

Risk factors, such as obesity or tobacco use, have few directly attributable costs because the costs are usually estimated for the diseases that are caused by the risk factor. For example, obesity has well-established co-morbidity with at least ten illnesses such as type 2 diabetes, hypertension, and coronary artery disease.[503] However, medical costs attributable to obesity, for example, can be derived by multiplying the total cost for each disease that is attributable to obesity (e.g., from EBIC) by the PAF, or the proportion of the disease attributable to obesity.[504]

As noted in Section 3.1.4 above, the basic formula for calculating the PAF is:

$$PAF = [P\,(RR - 1) / P\,(RR - 1) + 1] \; * \; 100\%$$

where P is the proportion of the population that experiences the risk, and RR is the relative risk. Referring back to Table 12 above, the formula used to calculate the proportion (P) is:

$$P = (a + b) / (a + b + c + d)$$

For example, using the same data as above, the PAF can be calculated as follows:

$$P = (230 + 1564) / (230 + 1564 + 2271 + 139802) = .012$$

$$PAF = .012\,(8.02 - 1) / .012\,(8.02 - 1) + 1 = .0805\ (* \ 100\% = 8.05\%)$$ [505]

The PAF—.0805—for the example given above, indicates that 8.05% of the court cases in the population are related to SED status. Tu concludes:

> In other words, among the 142,073 youth who were not identified as SED, the probability of a court case was .016. In contrast, among the 1,794 youth identified as SED, the probability of a court case was .128. If, through prevention or early intervention programs the future rates of court cases among youth identified as SED could be reduced to the point that their probability was also .016 (the same as the non-SED youth), the overall

[501] Rockhill, Newman, and Weinberg. "Use and Misuse of Population Attributable Fractions."
[502] Tu. "Developmental Epidemiology: A Review of Three Key Measures of Effect. ". p. 190.
[503] Colman. *Cost of Obesity in Nova Scotia*, accessed.
[504] Ibid., accessed.
[505] Tu. "Developmental Epidemiology: A Review of Three Key Measures of Effect. ". p. 190.

number of court cases would be reduced by 8.05%.[506]

Tu presents another example of using the PAF in cases where the risk factor is categorical or multilevel, rather than just comparing dichotomous risks (e.g., identified as SED and not SED). In Tu's example, a community type was a four-level risk factor, i.e, there were four types of at-risk community types—urban, suburban, rural, and town. (There can be more than four levels.) One of these groups would need to be identified as the reference group, e.g., town. Then PAFs could be calculated for each of the other three at-risk community types. This calculation uses the following formula:

$$PAF_1 = \frac{P_{E1}\,(RR_1 - 1)}{P_{E1}\,(RR_1 - 1) + P_{E2}\,(RR_2 - 1) + P_{E3}\,(RR_3 - 1) + 1}$$

Where:

PAF_1 – is the proportion of the cases in the population that are related to the first of the three at-risk community-types (urban in the example)

P_{E1} – is the proportion of the total population in that specific group (e.g., proportion living in urban communities)

RR_1 – is the risk ratio comparing rates of the outcome in that specific group with rates of the outcome in the reference group (e.g., rates living in urban communities compared with rates living in towns)

P_{E2} – P_{E3} and **RR_2 – RR_3** – reflect the same estimates in the other groups.

PAFs for the remaining groups can be stratified and estimated by modifying the numerator so that it reflects the P_E and RR for each of the groups.

Each of the PAF's estimate the effect associated with a single specific category or level of the risk factor. The total community-level effect of all of the groups (category or level) combined relative to the reference group is represented by the sum of all of the calculated PAFs for the groups. Tu notes that if there is a causal relation between the risk factor and outcome, the PAF can estimate the potential impact that eliminating the risk factor could have on the outcome rates. However, even if the causal connection cannot be established, the PAF can still be useful:

> [E]ven if a causal connection cannot be established, the PAF can still be used as a means of identifying those groups within the population that can be targeted with prevention or early intervention programs to have the maximum impact on the community as a whole.[507]

[506] Ibid. pp. 190-191.
[507] Ibid. p. 191.

3.4 Guidelines for Monitoring Socioeconomic Health Disparities

Anton Kunst et al. of Erasmus University in The Netherlands, working with the E.U. Working Group on the Socio-economic Inequalities in Health, have developed guidelines for monitoring socioeconomic inequalities in health at the national level.[508] In order to estimate the costs of poverty, it is important to understand the magnitude of these inequalities, which are referred to more often in Canada as health disparities. The monitoring process developed by Kunst et al. for use in the E.U. involves five steps:

1. identification of data sources,
2 measurement of socioeconomic variables,
3. tabulation of health indicators by socioeconomic status,
4. measurement of the magnitude of health inequalities, and
5. evaluation and interpretation of the results.[509]

Below we briefly review these steps and how they relate to the costs of poverty.

3.4.1 Identification of data sources

Data sources will be discussed in the following sections on poverty measures and health indicators.

Kunst et al. suggest that data can generally be obtained from the following sources:

- Mortality data – nationally representative, individual-level data on mortality according to socioeconomic indicators, if available.
- Morbidity – self-reported data from health surveys.
- Specific diseases – disease registers and surveillance systems.
- Regional or local individual- or household-level data can be used if national data are not available and if the restriction to the specific region or area is explicitly recognized.
- Unlinked data—e.g., for mortality, where socioeconomic data on the deceased and on the living population are derived from two different sources, such as the death registry and census—alternative sources of data are unlinked cross-sectional data. Kunst et al. note that in this type of study, "the number of deaths during a time interval is related to the number of persons who during that same time interval were exposed to the risk of dying."[510] Cross-sectional data can be used to obtain approximate estimates of

[508] Kunst, Anton E., Vivian Bos, Johan P. Mackenbach, and EU Working Group on Socio-economic Inequalities in Health. *Monitoring Socio-Economic Inequalities in Health in the European Union: Guidelines and Illustrations. A Report for the Health Monitoring Program of the European Commission*, Rotterdam, The Netherlands: Erasmus University, 2001; accessed Nov 2007; available from http://ec.europa.eu/health/ph_projects/1998/monitoring fp_monitoring_1998_frep_06_a_en.pdf.
[509] Ibid., accessed. p. 11.
[510] Ibid., accessed. p. 141.

inequalities for one point in time. However, Kunst et al. also suggest that cross-sectional data can be used to determine trends over time if they are used with caution since the data may be subject to biases that result in over- or under-estimation.[511]

3.4.2 Measurement of socioeconomic variables

Three core and complementary indicators of socioeconomic position (SEP) are recommended—education, occupation, and income—to be measured in relation to health indicators. Kunst et al. note that one of these indicators is not better than the other, but that they do relate to the purpose of their use and one may be preferred over another. According to Kunst et al., education is the indicator of SEP used most often in Europe because it has several advantages including that it isn't hindered by problems with confounding. Occupation is most useful when nearly all of the persons are employed. Income is useful when the purpose of a report is to monitor the poverty – health connection.

Kunst et al. note that because of difficulties in empirically proving causation in terms of SEP, "Socio-economic indicators should therefore not be judged for their ability to provide evidence on the causal mechanisms, but they should be selected rather because of their descriptive value."[512]

Sociodemographic measures like ethnicity or urban/rural residency are not considered socioeconomic measures but they can be relevant to the extent that they are related to socioeconomic disparity. In other words, they can be used to identify specific disadvantaged groups and used in combination with the main socioeconomic indicator.

Kunst et al. suggest that income has an advantage over occupation as an indicator because it can be measured for a broader range of age groups. They also suggest that income and education are complementary in many respects:

> (a) income emphasises material rather than cultural resources,
> (b) income is measured at the household level instead of the individual level, and
> (c) income is able to reflect changes in socio-economic position over the life course whereas a person's educational level is highly stable during the entire adult life.
>
> Given their complementary nature, the use of both educational level and income level would give a comprehensive picture of socio-economic inequalities in mortality or morbidity.[513]

According to Kunst et al., when income is used, standard of living can be best expressed by classifying the population according to household equivalent income, adjusted for household size, and preferably divided into income quintile groups. Also, poverty lines should be established.

[511] Ibid., accessed.
[512] Ibid., accessed. p. 22.
[513] Ibid., accessed. p. 37.

Household income can be adjusted for household size by dividing the total family income by the square root of the household size. Income is most often measured as net income, i.e. after deductions of taxes and social security premiums.

3.4.3 Tabulation of health indicators by socioeconomic status

Kunst et al. recommend that people should be divided into groups or levels by the socioeconomic indicator, with data presented on the population size of the groups, the occurrence of health problems by absolute occurrence rates or probabilities or by relative ratios, and the relative and absolute magnitudes of the health differences, preferably for at least three periods of time.

Other recommendations include:

- The health indicator should generally be expressed as the rate, probability, and/or absolute numbers of the occurrence of "negative" health problems.

- Health indicators should be standardized for age, if possible, since age is a confounder associated with SEP and health.

- Mortality levels should be expressed as incidence mortality rates by gender, age group, and, ideally, by main cause of death. Mortality incidence rates can be calculated by "dividing the observed number of deaths by the corresponding number of person-years (the number of people times the average number of years per person) of being exposed to the risk of dying. In longitudinal studies, the number of person-years at risk can be calculated accurately from the available data. In unlinked cross-sectional studies, it is customary to estimate this number as the number of people in the middle of the study period times the number of years covered by the study period."[514] Mortality rates can also be summarized in terms of disability-free life expectancy and health expectancy, which combine mortality and morbidity data.

- Self-reported morbidity can be measured by indicators on general health, chronic disease prevalence, disability and functional limitations, and the prevalence of long-standing health problems. It is preferable to use the prevalence of fair/poor general health rather than excellent/good health in morbidity indicators.

3.4.4 Measurement of the magnitude of health inequalities

The magnitude of health inequalities can be estimated on the basis of the data collected in the previous steps. Kunst et al. suggest that estimates should be easy to calculate, interpret, and communicate. *Rate ratios*, which compare two contrasting groups, and *rate differences*, which measure absolute difference, as well as *impact measures* such as population attributable fractions

[514] Ibid., accessed. p. 49.

are basic summary measures that are recommended. More sophisticated measures such as regression-based measures may be used to complement the rate ratio and rate differences, and may be used to check the validity of the basic measures.

The authors note that a comparison of extreme groups such as the lowest 20% (1st income quintile) versus the highest 20% (5th income quintile) is preferred "because this usually gives a good impression of the real magnitude of socio-economic inequalities in mortality and morbidity."[515] In addition, both absolute and relative measures should be used, if possible.

3.4.5 Evaluation and interpretation of the results

The last step involves a description of health inequalities, the evaluation of possible data problems, and the search for substantial explanations of the inequalities. Potential explanations could include an estimation of the extent to which intermediate variables contributed to these inequalities. Intermediate variables can include behavioural risk factors such as smoking, material factors such as housing conditions, and psychosocial factors such as coping with stress. However, according to Kunst et al. socioeconomic variables are considered to be "upstream" determinants of health, while intermediate variables are considered to be "downstream determinants." The effect on health of upstream determinants "only runs through these downstream determinants," although the different mechanisms "are usually highly complex and intertwined."[516]

[515] Ibid., accessed. p. 60.
[516] Ibid., accessed. p. 21.

PART 2: POVERTY AND HEALTH: MEASURES, DATA, AND INDICATORS

4. Poverty Measures

While many countries have an official poverty measure, Canada does not. Instead, several measures are published periodically by different organizations, and there is little comparability among these measures. Below is a description of the most common low income and poverty measures used in Canada. Following this, there are brief discussions on economic inequality measures, international poverty measures, and common critiques of current measures used in Canada. Tables showing the extent and depth of poverty in Canada using Statistics Canada's Low Income Cut-Off (LICO), which is the most frequent method of measuring poverty in Canada, are also presented below.

4.1 Relative poverty measures

A relative measure of poverty or low income demonstrates that some Canadians are less well off than others. The relatively less well off can be defined as poor. Statistics Canada publishes two relative measures of low income annually—the Low Income Cut-Off (LICO) and the Low Income Measure (LIM).

4.1.1 Low Income Cut-Off (LICO)

Statistics Canada asserts that the Low Income Cut-Off (LICO) is a measure of low income and not of poverty.[517] However, in the absence of an official poverty measure, many organizations and researchers use it as a proxy measure for poverty.[518] The first LICO was produced in 1967 based on the 1959 Family Expenditure Survey (FAMEX).[519] The developers of the LICO measure looked at what Canadians spent on food, clothing, and shelter on average, which was roughly 50% of their household income in 1959, and decided that families spending 70% of their household income (an additional 20 percentage points) on these necessary items would be in "straitened circumstances"—or low income.[520] Therefore, the first LICO thresholds reflected the 70% cut-off line for different types of families.

The FAMEX was updated in 1969, 1978, 1986, and 1992, and the LICO was re-calculated after each new survey.[521] The last survey was in 1992, which is the most recent year available on

[517] Fellegi, Ivan P. *On Poverty and Low Income*, Statistics Canada, Catalogue no. 13F0027XIE, 1997; accessed November 2007; available from http://www.statcan.ca/english/research/13F0027XIE/13F0027XIE1999001.htm.
[518] See, for example, Canadian Council on Social Development (CCSD). *Economic Security Factsheet #2: Poverty*, 2007; accessed November 2007; available from http://www.ccsd.ca/factsheets/economic_security/poverty/index.htm.
[519] Statistics Canada, Income Statistics Division. *Low Income Cut-Offs for 2006 and Low Income Measures for 2005*, Catalogue no. 75F0002MIE, 2007; accessed November 2007; available from http://www.statcan.ca/english/research/75F0002MIE/75F0002MIE2007004.pdf.
[520] Ibid., accessed. p. 7.
[521] Ibid., accessed.

which the LICO can be based.[522] New annual cut-offs use the Consumer Price Index (CPI) to account for inflation since 1992, but they do not account for any changes in spending patterns for average Canadians since 1992. Each subsequent FAMEX gave a slightly different percentage of average spending on necessities, and the 1992 survey showed that Canadians spend 43% of their income on these items on average. Therefore, the current cut-off is set at 63% of household income by adding 20 percentage points to the average proportion of income spent on necessities.[523]

The LICO was originally calculated for five different family sizes (from one to five members) and are now calculated for seven different family sizes and five different community sizes, ranging from rural areas to urban areas with populations of at least 500,000 people.[524] The latter reflects some of the variation in the cost of living experienced by people in rural areas versus small or large cities. In order to calculate the different low-income thresholds for a family type, the proportion of income spent by this type of family on food, clothing, and shelter is plotted. A regression curve is fitted to this distribution, and the intersection of this curve with the 63% line gives the cut-off.[525]

The LICO thresholds are compared to income data in order to calculate the percentage of people living in low income. Statistics Canada produces LICOs for income before tax (IBT) and income after tax (IAT).[526] The IBT includes government transfers, giving a total income before the deduction of income taxes. The IAT uses net income after taxes to calculate the cut-offs. While both measures are published annually, Statistics Canada highlights the LICO-IAT for two reasons. First, before-tax income only partly reflects Canada's income redistribution system because it includes government transfers but not the effect of income taxes. Second, families must pay for food, clothing, and shelter from their after-tax income, so it is logical to compare relative income based on the LICO-IAT.[527] Table 15 below illustrates the most recent low-income cut-offs provided by Statistics Canada.

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[522] Statistics Canada notes that FAMEX was replaced with the Survey of Household Spending in 1997, which has been updated annually. Therefore, the LICOs could also be re-based annually, although they have not been updated since 1992.
[523] Statistics Canada. *Low Income Cut-Offs for 2006 and Low Income Measures for 2005*, accessed.
[524] Ibid., accessed. An economic family includes all members of the same dwelling that are related by blood, marriage, adoption, or common-law relationship. The LICOs do not distinguish between ages of family members.
[525] Ibid., accessed.
[526] Ibid., accessed.
[527] Ibid., accessed.

Table 15. Most recent after-tax LICOs from Statistics Canada, 2006 (1992 base)

		Community size ($)			
		Urban areas			
Size of family unit	Rural areas	Population > 30,000	30,000 to 99,999	100,000 to 499,999	500,000 +
1 person	11,494	13,154	14,674	14,859	17,570
2 persons	13,989	16,010	17,860	18,085	21,384
3 persons	17,420	19,934	22,239	22,519	26,628
4 persons	21,731	24,871	27,745	28,095	33,221
5 persons	24,746	28,321	31,594	31,992	37,828
6 persons	27,444	31,409	35,039	35,480	41,953
7 or more persons	30,142	34,496	38,483	38,967	46,077

Source: Statistics Canada, Income Statistics Division. Low Income Cut-Offs for 2006 and Low Income Measures for 2005, 75F0002MIE, 2007; accessed November 2007; available from http://www.statcan.ca/english/research/75F0002MIE/75F0002MIE2007004.pdf.

4.1.2 Low Income Measure (LIM)

No other country uses Canada's method of calculating Low Income Cut-Offs (LICOs), so it is very hard to make international comparisons using this measure. In order to allow for better international comparability, Statistics Canada began producing a Low Income Measure (LIM) in 1991.[528] Each year, a new LIM is calculated based on an annual income study, so there is no need to update the LIM using the Consumer Price Index. Before 1996, the LIM was based on data from the Survey of Consumer Finances, and since 1996 it has been based on the Survey of Labour and Income Dynamics (SLID).[529]

The LIM is 50% of median adjusted family income, calculated based on three different incomes: market income, before-tax income, and after-tax income.[530] Incomes are adjusted to account for the fact that different family compositions have different needs. For example, a family of four needs more resources than a family of two, and a family of two adults and two children costs more to feed than a family of one adult and three children.

There is no international standard equivalence scale for making adjustments. However, Statistics Canada uses one that has wide acceptance and produces results very similar to the equivalence scale used by the Luxemburg Income Study, particularly for families with less than five

[528] Ibid., accessed. See Section 4.4 for a discussion on international measures of poverty.
[529] Ibid., accessed.
[530] Ibid., accessed. Market income is income from all earnings before any government transfers or income taxes. Before-tax income includes transfers but not income tax. After-tax income is net income after all transfers and taxes.

members.[531] The equivalence scale used by Statistics Canada counts the first person as 1.0 and the second person as 0.4, regardless of age. Any additional adults are counted as 0.4 and any other children younger than 16 years of age as 0.3.[532]

In order to calculate the LIM, Statistics Canada first divides the family income by the adjustment factor for that family (e.g., 1.7 for a family of two adults and one child). Then, the median of this adjusted family income—the point at which half of all families are below and half are above—is determined. The LIM is calculated from this by multiplying the median adjusted income by the adjusted family size (e.g., 1.7). Unattached individuals are assigned a LIM of 50% of this median adjusted family income.[533]

4.2 Absolute poverty measures

Absolute measures of poverty or low income are based on the idea that families are impoverished if they lack the income needed to purchase a pre-set list of necessities. As such, the methodology involved in this type of measure is more involved than that of relative poverty measures. While measuring poverty based on a “basket” of goods and services is considered absolute in the sense that there is no comparison among the population in order to determine who is considered poor, there is still a relative component because the goods included in the basket reflect societal expectations of the norm. For example, one hundred years ago, indoor plumbing and electricity were not regarded as necessities for Canadians, whereas a household lacking these services today would be considered extremely poor.[534] There is also a subjective component because someone has to decide what should be included in the list of necessary goods and services, which is less straightforward than it first appears.

4.2.1 Market Basket Measure (MBM)

The Market Basket Measure (MBM) was developed by the Federal–Provincial–Territorial Working Group on Social Development Research and Information in 1997 in order to provide Canada with an alternative measure of low income to the Low Income Cut-Off (LICO).[535] The

[531] Human Resources and Social Development Canada (HRSDC). *Low Income in Canada: 2000-2002 Using the Market Basket Measure*, Catalogue no. SP-628-05-06E, 2006; accessed November 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/sdc/pkrf/publications/research/2002-000662/SP-628-05-06e.pdf. The Luxemburg Income Study simply uses the square root of the family size.
[532] Statistics Canada. *Low Income Cut-Offs for 2006 and Low Income Measures for 2005*, accessed. Another very common equivalence scale in use internationally is that of the OECD: the first person is counted as 1.0, all other family members 15 or older are counted as 0.5, and all family members younger than 15 are counted as 0.3. Please see Table 1 of this Statistics Canada report for a comparison of all three equivalence scales for different family sizes.
[533] Ibid., accessed.
[534] Phipps, Shelley. *The Impact of Poverty on Health: A Scan of Research Literature*, Canadian Population Health Initiative, 2003; accessed Nov 2007; available from http://dsp-psd.communication.gc.ca/Collection/H118-11-2003-1E.pdf.
[535] Human Resources and Social Development Canada (HRSDC). *Low Income in Canada: 2000-2002 Using the Market Basket Measure*, accessed.

first MBM results were published in 2000, and are updated annually based on Statistics Canada's Survey of Labour and Income Dynamics (SLID),[536] although only the years 2000 through 2002 are currently publicly available. According to Human Resources and Social Development Canada (HRSDC), "the components of the MBM basket have been designed to represent a standard of consumption which is close to median standards of expenditure for food, clothing and footwear and shelter and somewhat below that standard for other categories of expenditure."[537]

In order to calculate the MBM thresholds, the working group created a basket of goods and services that includes food, clothing and footwear, shelter, transportation, and other personal and household needs such as furniture, telephone service, school supplies, and some recreation and entertainment (e.g., newspaper subscriptions, video rentals, or sports events).[538] The cost of obtaining these goods is calculated for a reference family consisting of an adult male and female with a young boy and girl. The amount of disposable income necessary for this reference family to purchase the basket is calculated for 19 specific Census Metropolitan Areas (CMAs) and four different community sizes in each province.[539] The MBM thresholds for all other types of families in each of the different geographical variations are calculated using Statistics Canada's LIM equivalence scale.[540]

The food component of the market basket is a modified version of Health Canada's "National Nutritious Food Basket 1998," which included input from nutritionists across Canada.[541] The list of foods has been updated to comply with Health Canada's nutrition recommendations and to include current guidelines for saturated fat intake. Additionally, the final list represents community standards of food purchasing found in Statistics Canada's 1996 Survey of Family Food Expenditure in Canada. This was done so that the food basket would be socially acceptable and reflect what Canadians really eat.[542] The annual cost of food based on this detailed list for the reference family is calculated for each of the CMAs and community sizes using food prices gathered by Statistics Canada from 40 urban centres.

During the first four years of the MBM, the clothing and footwear component was estimated using a 1997 clothing and footwear basket, and replacement schedule for the items, created by the Winnipeg Social Planning Council for their Acceptable Level of Living budget guide.[543] It includes clothing and footwear necessary for common work, school, and social functions, which is the aim of the MBM as well. The cost for the reference family was calculated using prices in Winnipeg and this was extrapolated to at least one major urban area in each province using the

[536] The SLID still does not collect data in the Territories, although Statistics Canada is working towards including them.
[537] Human Resources and Social Development Canada (HRSDC). *Low Income in Canada: 2000-2002 Using the Market Basket Measure*, accessed. p. 5.
[538] Ibid., accessed.
[539] The chosen CMAs include at least one major city from every province. The four different community sizes are: rural; <30,000; 30,000–99,999; and 100,000–499,999; the smaller two are included for each province, and the larger two are included where appropriate, for a total of 29 different community sizes in Canada.
[540] Human Resources and Social Development Canada (HRSDC). *Low Income in Canada: 2000-2002 Using the Market Basket Measure*, accessed.
[541] Ibid., accessed.
[542] Ibid., accessed.
[543] Ibid., accessed.

CPI. A new clothing and footwear basket has been developed for the MBM that is more specific and uses a different replacement schedule; as of 2004, Statistics Canada has begun to collect the necessary data.[544]

The shelter component is derived from the median rent for two- and three-bedroom apartments for each of the CMAs and community sizes where data are available.[545] It includes water, heat, and electricity, as well as a fridge, a stove, and the use of a washer and dryer. Every province has some percentage of rental units that do not supply these items, so Statistics Canada makes an adjustment to the proportion of rents that do not include these items in order to account for them.[546] This component used the 2001 Census to find 2000 median rent levels, which have been updated for 2001 and 2002 using the CPI. Statistics Canada's Labour Force Survey and Survey of Household Spending (SHS) are used to make adjustments for missing utilities.[547]

The transportation component includes either public transit passes or the cost of purchasing and maintaining a used car.[548] In most urban centres with a population of at least 30,000, a public transit system is available. Therefore, for these size CMAs or communities, two adult monthly public transit passes are included in the basket. Additionally, the basket allows for one taxi ride per month, to account for large purchases that cannot be carried by hand. The taxi was priced at $16 in 2000 and is updated using the CPI. For communities where no public transit is available, the basket includes the purchase of a five-year-old Chevrolet Cavalier through a 36-month loan program. Along with the car, the basket accounts for annual driver's license and registration fees, insurance, 1500 litres of gas, and two oil changes and one tune-up annually. The costs are calculated for each province.[549]

The "other goods and services" component takes into account a long list of items from Statistics Canada's SHS.[550] However, the working group decided that this component was too individual to be able to compile a standard basket. Instead, the working group opted to "approximate the cost of these goods and services using a multiplier representing expenditures on them as a proportion of average spending on food and clothing and footwear by the second decile of the reference family."[551] Thus, it is the only component in the MBM that uses a relative methodology rather than actual prices of goods and services. The multiplier is calculated annually for 11 urban centres across the country using micro data from the SHS.[552]

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[544] Ibid., accessed.
[545] Ibid., accessed. These two types of apartments were chosen because roughly half of Canadian renting families with two adults and two children live in either type. The basket includes rents that are subsidized but not units that are rent-free or require major repairs.
[546] Ibid., accessed.
[547] Ibid., accessed.
[548] Ibid., accessed.
[549] Ibid., accessed.
[550] Ibid., accessed.
[551] Ibid., accessed. p. 60. The multiplier is based only on food, clothing, and footwear expenditures because the working group found that shelter and transportation expenses were much more volatile across Canada than they were for the other two components. Spending patterns of the second decile were used because "since 1980, the low income rate for families of 4 persons using Statistics Canada's 1992 base pre-income tax Low Income Cut-offs has never exceeded 15%, the mid-point of the second decile." (p. 60, footnote 37).
[552] Ibid., accessed.

In order to calculate the percentage of people across Canada who live on low income, a measure of household income must be compared to the MBM thresholds, just as income data are compared to the LICO thresholds. However, the MBM defines disposable income much more stringently than does the LICO in an attempt to reflect the actual disposable income available to families, rather than purely after-tax income.[553]

Income is defined in the MBM as the amount of money that remains after both income tax and several other mandatory expenses have been subtracted.[554] These include payroll taxes and deductions, such as contributions to employer-sponsored pension plans or supplementary health plans; child support and alimony payments for another family; out-of-pocket child care expenses; and medically prescribed health-related expenses, such as dental and vision care or aids for persons with disabilities, that are not included in health insurance. The latter two costs are not included in the basket of goods and services because the working group determined that child and health care needs are too individual and that there is no way to determine a standard basket for them. However, the working group did consider these costs to be basic necessities, so they are included by subtracting any out-of-pocket child or health care costs from after-tax income.[555]

4.2.2 Basic Needs Poverty Line (BNPL)

The Basic Needs Poverty Line (BNPL) was developed in 1992 by Christopher Sarlo of The Fraser Institute.[556] At the time, no governmental organizations were producing an "absolute" or "basket" approach to measuring poverty. Additionally, while researchers have used the LICO as a poverty line for years, Statistics Canada continually notes that it is not a *poverty* cut-off.[557] Therefore, Sarlo produced the BNPL as an alternative poverty measure to the LICO. In 1999, he revised his methods to produce a more inclusive line by including such things as out-of-pocket health care costs and revising laundry schedules.[558]

The Basic Needs basket consists of food, shelter, clothing, and other necessities, including public transportation, household furniture and insurance, laundry, personal care, and health care. The BNPL is designed to illuminate those people who are "genuinely deprived… more likely to be hungry, ill-housed, or uncomfortable than people living above the line."[559] This is in contrast to the MBM, which aims to find those people who cannot meet a given level of social comfort, as well as basic needs, by including such items as attendance at sporting events in the basket.[560]

For each province, a reference family of an adult male and female with one boy and one girl is used to calculate the threshold, and all other family types are calculated by adjusting this value

553 Ibid., accessed.
554 Ibid., accessed.
555 Ibid., accessed.
556 Sarlo, Christopher A. *Measuring Poverty in Canada*, The Fraser Institute, 2001; accessed November 2007; available from http://www.fraserinstitute.org/commerce.web/publication_details.aspx?pubID=2558.
557 Fellegi. *On Poverty and Low Income*, accessed.
558 Sarlo. *Measuring Poverty in Canada*, accessed.
559 Ibid., accessed. p. 12.
560 Human Resources and Social Development Canada (HRSDC). *Low Income in Canada: 2000-2002 Using the Market Basket Measure*, accessed.

using an equivalence scale. Sarlo reviewed several different scales in use and opted for the one recommended by the National Research Council in their proposed poverty line for the United States.[561] This scale counts each adult in the family as 1.0 and each child younger than 18 years of age as 0.7. Further, the scale adds these numbers and then raises the sum by a factor ranging from 0.65 to 0.75 to account for economies of scale—the fact that, as a family gets bigger, the cost per person decreases.[562] Sarlo chose this scale because it produces thresholds similar to those produced if each family type is calculated separately.[563]

The food basket is composed of common foods purchased in Canada and follows the food guidelines from Health Canada and the Canada Food Guide in terms of nutrition and energy requirements.[564] The BNPL uses Ontario prices to optimize the nutrition and variety for the lowest cost. The food costs are then calculated for each other province using Statistics Canada's food price indices.

To calculate shelter costs, the BNPL uses average rents in different communities across Canada, published by the Canadian Mortgage and Housing Corporation (CMHC), and it is assumed that families in low income pay 10% less than this overall average for their shelter.[565] The data set used for the BNPL includes any community with at least 10,000 people and any privately owned rental building with at least three units. It is assumed here that a three-bedroom apartment is most appropriate for the reference family. The costs of other sizes of apartments are calculated based on the equivalence scale. These costs per size of apartment are all divided by 1.1 in order to find a cost that is 10% below the overall average. Then, the populations of each community within a province are used as weights to find the average provincial shelter costs. As well, the Canadian average is calculated by using the populations of each province as weights.[566]

These shelter costs are assumed to include utilities. Even though many rental units do not supply these items, Sarlo found that, on average, families of four from the bottom income decile living in units lacking utilities pay $200 per month less than similar families whose rents include utilities. Therefore, the BNPL assumes utilities are included in the average shelter cost.[567]

The clothing component is based on a list of items compiled by the Montreal Diet Dispensary (MDD).[568] In their *Budgeting for Basic Needs* guide, they include newly purchased clothing appropriate for age, gender, function, and season. Although the list of items has not been updated since 1959, the prices were updated most recently in 1998 using the CPI for Quebec. The final costs also include Federal and Quebec sales taxes. The CPI is then used to calculate clothing costs for other provinces.[569]

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561 Sarlo. *Measuring Poverty in Canada*, accessed.
562 Panel on Poverty and Family Assistance. "Adjusting Poverty Thresholds," in *Measuring Poverty: A New Approach*, ed. Citro, Constance F. and Robert T. Michael, 159-202. Washington, D.C.: National Academy Press, 1995; accessed December 2007; available from http://books.nap.edu/openbook.php?record_id=4759&page=159.
563 Sarlo. *Measuring Poverty in Canada*, accessed.
564 Ibid., accessed.
565 Ibid., accessed.
566 Ibid., accessed.
567 Ibid., accessed.
568 Ibid., accessed.
569 Ibid., accessed.

The "other basic needs" component includes nine sub-categories.[570] Local telephone service and household insurance are based on real costs for each province quoted to Sarlo by different companies. Laundry costs are based on an estimate for a family of four to do five loads of laundry per week at a laundromat. For the transportation sub-category, it is assumed that most low-income people use public transit to get to work and other necessary places. The costs for public transportation are based on the average cost of a variety of scenarios that assume different situations for employment and proximity to basic necessities for the reference family.[571]

Four sub-categories are roughly based on similar categories in Statistics Canada's FAMEX, with informal panels aiding in developing replacement schedules.[572] The cost of cleaning supplies is a real-cost estimate of items such as laundry and dish detergents, bathroom and kitchen cleaners, paper towels, vacuum bags, broom, and mop. The cost of furniture and equipment includes essential items like kitchen, living room, and bedroom basics; radio, lamp, and telephone; and umbrellas, candle, and toolkit. Personal care includes the costs of things like hair-care products, soaps, toilet paper, and oral hygiene products. Out-of-pocket health care costs are taken from the average actual spending by families of four determined by the FAMEX. Almost 90% of these costs are from pharmaceuticals, eye-care, and dental care.[573] There is also a miscellaneous sub-category that accounts for a small number of items, such as postage stamps, photocopies, and school supplies.

The BNPL compares pre-tax income to the poverty thresholds in order to calculate the percentage of people across Canada living in poverty. The justification for using pre-tax income is that those people in the lower end of the income distribution do not make enough money to pay income taxes, so the after-tax income is irrelevant for the purposes of measuring poverty.[574]

While Sarlo and the Fraser Institute provide an alternative to Statistics Canada's measures, and one that is specifically designed to measure absolute poverty as opposed to low income, many researchers believe this measurement is highly inadequate.[575] The BNPL is supposed to reflect a level of genuine deprivation, yet what this actually means is very subjective. For example, Sarlo does not include access to any media, such as television, newspapers, or radio, but this is not a realistic picture of how even very poor people live in Canada.[576] Additionally, the BNPL excludes children's toys, books, and writing materials and assumes that school supplies will be partially paid for by summer student employment.[577] These assumptions reflect Sarlo's opinions about what is and is not necessary for a minimum quality of life in Canada, and they impact directly on equal access to education for all children. What is hidden by the fact that the BNPL is called an "absolute" measure of poverty is precisely these assumptions and biases that reflect Sarlo's views and opinions—essentially making the BNPL a poverty measure *relative* to the

[570] Ibid., accessed.
[571] Ibid., accessed.
[572] Ibid., accessed.
[573] Ibid., accessed.
[574] Ibid., accessed.
[575] Osberg, Lars. *The Evolution of Poverty Measurement—with Special Reference to Canada*. September, 2007.
[576] Shillington, Richard. *Some Critique of the Fraser Institute / Sarlo Poverty Lines*, 1998; accessed March 2008; available from http://www.shillington.ca/poverty/cit_0728.htm.
[577] Ibid., accessed.

Fraser Institute's definition of poverty.

Additionally, what the BNPL does include is considered by many to be inadequate even for providing basic needs.[578] For example, according to this measure, a single, elderly woman needed only $17.48 per week in 1988 to cover food costs—including 14 servings of fruit for only $2.11.[579] While people living in low income tend to practice saving strategies such as using coupons or buying sale items, it is still very hard to believe that anyone could understand how to survive on such a small amount. Other aspects of the BNPL are based on informal replacement schedules and extremely outdated lists—necessary clothing items have not been updated since 1959—which adds to the inaccuracy of this poverty measure. When these issues are taken together, the BNPL does not accurately reflect the consumption patterns of even the most impoverished Canadians.[580] Therefore, it should be used with extreme caution, especially when in conjunction with policy recommendations.

4.3 Economic inequality

4.3.1 Income inequality

While most studies of poverty use income as a measure, a household's income is only part of the problem. Many studies suggest that the gap between richest and poorest—the extent of income inequality—also has important consequences for the costs of poverty. For example, higher income inequality has been correlated with higher rates of mortality,[581] lower self-rated health,[582] and greater prevalence of obesity.[583]

There are several popular measures of income inequality, which are discussed briefly here. Some simple measures use decile shares and ratios, where each decile represents 10% of all households. Decile shares are estimated by calculating the share of total income received by individuals in each segment.[584] Decile ratios are estimated by comparing these shares: average incomes of individuals in the top deciles are compared with those in the bottom of the distribution. For example, a 90:10 ratio compares the average incomes of the richest 10% and the poorest 10% of the population.[585] It is also possible to compare the proportions of total income

[578] Ibid., accessed.
[579] Ibid., accessed.
[580] Canadian Council on Social Development (CCSD). "Defining and Re-defining Poverty: A CCSD Perspective" accessed December 2007, available from http://www.ccsd.cs/pubs/2001/povertypp/htm.
[581] Kennedy, Bruce P., Ichiro Kawachi, Roberta Glass, and Deborah Prothrow-Stith. "Income Distribution, Socioeconomic Status, and Self-Rated Health: A U.S. Multi-Level Analysis," *British Medical Journal*, 1996, vol. 317: 917-921. accessed December 2007; available from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=28675.
[582] Ibid.
[583] Kahn, Henry S., Lilith M. Tatham, Elsie R. Pamuk, and Clark W. Heath Jr. "Are Geographic Regions with High Income Inequality Associated with Risk of Abdominal Weight Gain?," *Social Science & Medicine*, 1998, vol. 47: 1-6.
[584] Phipps. *The Impact of Poverty on Health: A Scan of Research Literature*, accessed.
[585] Ibid., accessed.

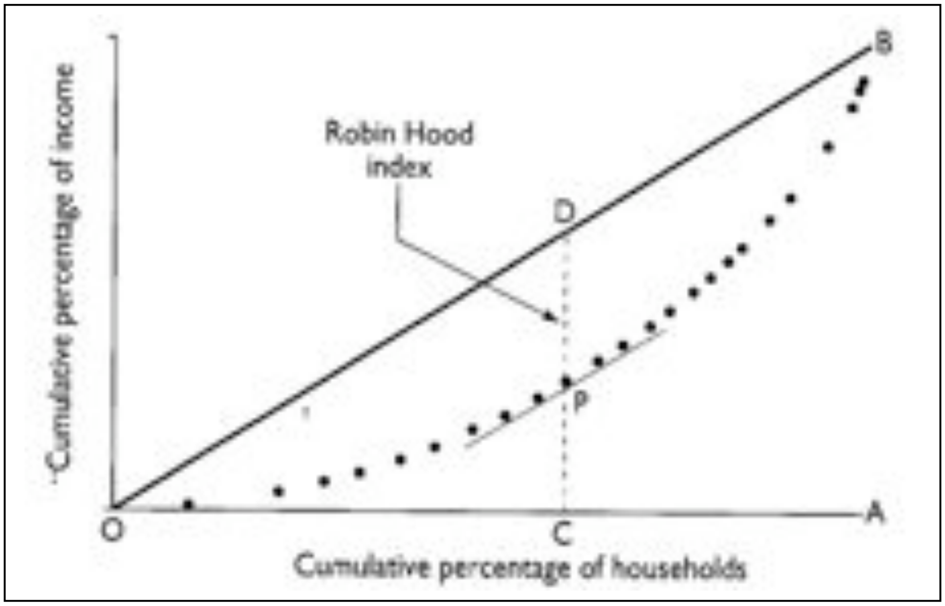
received by the bottom 50%, 60%, or 70% of all households.[586]

In particular, two measures are commonly used for studies of income inequality and health: the Gini coefficient and the Robin Hood index. Both are derived from a plot with the cumulative percentage of households on the horizontal axis and the cumulative share of income earned on the vertical axis—known as a Lorenz curve.[587] As Figure 2 below shows, the proportion of the total income accrued within each segment of households is plotted to form a curve. If income distribution is perfectly equal—if each decile of households receives 10% of total income—the Lorenz curve will match the 45° line. As the distribution becomes more unequal, the curve becomes more concave.[588]

The Gini coefficient is calculated as the ratio of the area between the curve and the 45° line to the entire area under the 45° line.[589] Thus, if income is perfectly distributed, the Gini is 0, whereas if it is perfectly unequal (i.e., one person has all the income), the Gini is 1.0.[590] As Figure 2 illustrates, the Robin Hood index is calculated as the maximum vertical distance between the Lorenz curve and the 45° line. It roughly represents the share of total income that must be transferred from households above the mean to those below the mean in order for the income distribution to become equal.[591]

[586] Kawachi, Ichiro. *Income Inequality*, John D. and Catherine T. MacArthur Research Network on Socioeconomic Status and Health, 2000; accessed December 2007; available from www.macses.ucsf.edu/Research/Social%20Environment/notebook/inequality.html.
[587] Ibid., accessed.
[588] Ibid., accessed.
[589] Ibid., accessed.
[590] Phipps. *The Impact of Poverty on Health: A Scan of Research Literature*, accessed.
[591] Kawachi. *Income Inequality*, accessed.

Figure 2. Derivation of the Gini coefficient and the Robin Hood index using a Lorenz curve



Notes: The Gini coefficient is calculated as Area ODBP divided by Area ODBAC. The Robin Hood index is equal to the length of line DP.

Source: Kawachi, Ichiro. "Income Inequality." In John D. and Catherine T. MacArthur Research Network on Socioeconomic Status and Health. *Notebook on the Social and Physical Environment*. Updated June 2000; accessed December 2007; available from http://www.macses.ucsf.edu/Research/Social%20Environment/notebook/inequality.html.

There is no one right method of calculating income inequality.[592] Each method has its own merits and is sensitive to different aspects of inequality; for example, the Robin Hood index is less sensitive to income transfers if they occur on the same side of the mean as opposed to if the transfers cross from one side of the mean to the other.[593] According to Hans Messinger of Statistics Canada, while the Gini coefficient is a well recognized overall measure of of income inequality it does not necessarily register changes in the gap between the rich and poor or the shares of income held by various quintile groups. For instance, the Gini coefficient can stay the same while the gap between rich and poor increases.[594] Therefore, it is important to understand the research question before choosing the type of inequality measure used in each particular study.[595]

[592] Kennedy, Kawachi, Glass, and Prothrow-Stith. "Income Distribution, Socioeconomic Status, and Self-Rated Health: A U.S. Multi-Level Analysis."
[593] Kawachi. *Income Inequality*, accessed.
[594] Hans Messinger in a personal communication with Linda Pannozzo, Cited in Pannozzo, Linda, and Ronald Colman. *Working Time and the Future of Work in Canada. A Nova Scotia GPI Case Study*, Genuine Progress Index (GPI) Atlantic, 2004; accessed March 2008; available from http://www.gpiatlantic.org/pdf/workhours/workhours.pdf. p. 266.
[595] Ibid., accessed.

4.3.2 Wealth inequality

Another way to measure economic inequality is through the distribution of wealth—personal assets minus personal debts. Measuring wealth illustrates a level of financial security not captured by measuring household income alone because it accounts for a family's ability to manage financially during a crisis such as losing a job or coping with disability.[596]

There are very few surveys that measure wealth in Canada. Statistics Canada's most recent survey of this kind is the 1999 Survey of Financial Security (SFS), which included 16,000 family units across all 10 provinces.[597] Statistics Canada also conducted similar surveys in 1970, 1977, and 1984. In 2002, Steve Kerstetter used these four surveys to produce a report on wealth distribution in Canada for the Canadian Centre for Policy Alternatives (CCPA). The 1999 survey has also been used in the cross-national Luxembourg Wealth Study (LWS), released in late 2007.[598]

The SFS is focused on net worth, including equity from a business and any savings plans or investments, as well as liquid assets.[599] It also includes data about employer-sponsored pension plans, although Kerstetter observes that these cannot be cashed in or borrowed against in an emergency, so they are not exactly the same as accumulated wealth. As a supplement to these four surveys, the CCPA commissioned Statistics Canada to tabulate further numbers for five regions across Canada because these surveys were too small to produce reliable results on wealth distribution for the smaller provinces.[600]

4.3.3 The working poor

It is worth noting that there is a distinction between the unemployed, the poor, and the working poor. Not all people who are unemployed can be considered poor. For example, many people live off of large inheritances that keep families well above the poverty threshold, even if the household members are not engaged in the work force.

Additionally, those living in poverty include both the employed and the unemployed. For example, the National Council of Welfare reported that, in 2003, the major income earner in 26% of poor families and 18% of poor individuals worked full-time.[601] This demonstrates clearly that

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[596] Kerstetter, Steve. *Rags and Riches: Wealth Inequality in Canada*, Canadian Centre for Policy Alternatives, 2002; accessed December 2007; available from http://www.policyalternatives.ca/documents/National_Office_Pubs/rags_riches.pdf.

[597] Ibid., accessed. A family unit consists of all members of a household that are related by blood, marriage, adoption, or common-law relationship. The Survey of Financial Security does not include anyone in the three territories, as well as those people living on Aboriginal reserves, on military bases, in prison, or in institutions such as a seniors' home or mental hospital.

[598] LWS is available from http://www.lisproject.org/lwstechdoc.htm and currently includes data from Canada, the U.S., and eight European countries.

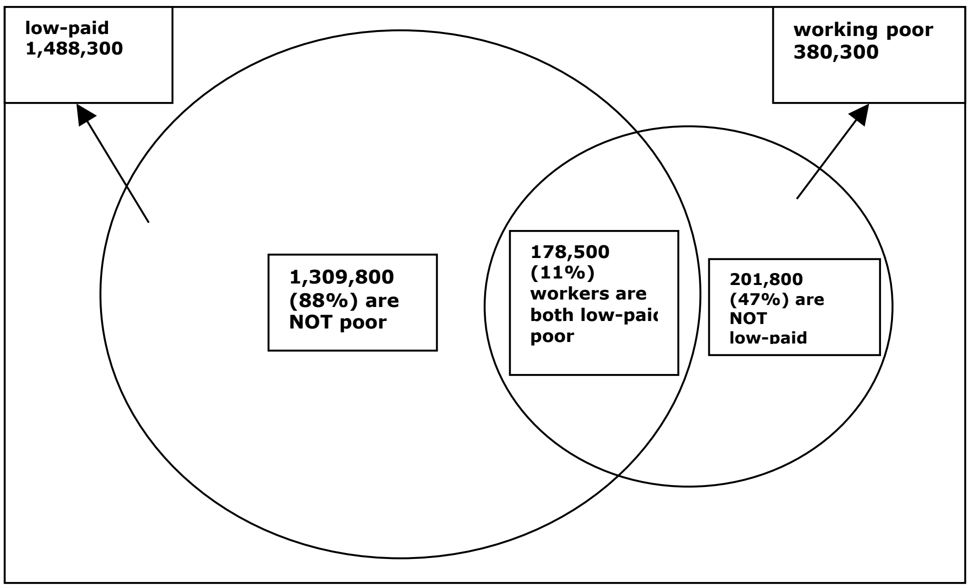
[599] Kerstetter. *Rags and Riches: Wealth Inequality in Canada*, accessed.

[600] Ibid., accessed. The five regions are Atlantic, Quebec, Ontario, Prairies, and British Columbia.

[601] National Council of Welfare. *Poverty Facts 2003*, 2006; accessed January 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/PovertyProfile/2002-03Report_Summer2006/FactSheets/PovertyFacts2003.pdf.

there is a difference between being poor and being unemployed. Furthermore, an individual may be considered low-paid (e.g., working full-time for minimum wage) but may not be living in poverty.[602] This could happen if his or her individual income is pooled with other family members' incomes so that the household income is above the poverty threshold. The reverse may also occur: an individual's income is not considered low, but it is inadequate to cover all household expenses so that the household is living in poverty.[603] Figure 3 below demonstrates the difference between those who are low-paid and those who are poor.

Figure 3. Proportion of salaried workers who are low-paid versus poor, 2001



Notes: "Low-paid" follows the OECD definition and refers to those who earn less than two-thirds of the country's hourly median wage ($10 per hour in Canada in 2001). HRSDC defines "workers" as individuals aged 18 to 64 years who are not full-time students and who accumulated at least 910 hours of paid work in the reference year (i.e., 2001). "Poor" includes those families whose household income falls below the Market Basket Measure threshold. This figure excludes those who are self-employed or working on a contract basis; only those with standard salaried jobs with no end date are included.

Source: Adapted from Human Resources and Social Development Canada (HRSDC). When Working is Not Enough to Escape Poverty: An Analysis of Canada's Working Poor, SP-630-06-06E, 2006, p. 16; accessed December 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/sdc/pkrf/publications/research/SP-630-06-06/page00.shtml.

[602] Human Resources and Social Development Canada (HRSDC). *When Working Is Not Enough to Escape Poverty: An Analysis of Canada's Working Poor*, Catalogue no. SP-630-06-06E, 2006; accessed December 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/sdc/pkrf/publications/research/SP-630-06-06/page00.shtml.
[603] Ibid., accessed.

4.4 International measures

4.4.1 United States

In thehe U.S., the official poverty threshold methodology was originally developed in 1963 by Mollie Orshansky of the Social Security Administration.[604] Rather than creating an entire "market basket," for which there was no accepted standard, she based the thresholds on the U.S. Department of Agriculture's food plan for an economy budget—"designed for temporary or emergency use when funds are low."[605] These thresholds have been the official thresholds used by the U.S. government since 1965 and are used for statistical purposes, such as calculating the number of Americans living in poverty. A simplified version of the poverty thresholds is published annually by the Department of Health and Human Services (HHS) for administrative purposes, such as determining eligibility in federal aid programs.[606]

In order to calculate the poverty thresholds, Orshansky first used the Department of Agriculture's 1955 Household Food Consumption Survey to determine that a reference family of three spent about one-third of their after-tax income on food.[607] She then multiplied the dollar value of the economy food plan for all families of three or more by a factor of three to find the poverty thresholds. She multiplied the food cost for two-person families by a factor of 3.7, also based on the 1955 survey,[608] and she counted the poverty threshold for unattached individuals as 80% of the two-person threshold.[609] Orshansky calculated 124 separate thresholds, broken down by family size, farm/non-farm status, sex of the household head, number of family members who were children (younger than 18 years of age), and—for childless families only—whether or not members were older than 65 years of age.[610]

Although the thresholds were calculated based on an after-tax food budget, they were compared to before-tax incomes reported by the Census Bureau.[611] While this was less than ideal, there was no reliable measure of after-tax income, and Orshansky noted that this would produce a conservative estimate of poverty. She also noted that it was much more difficult to calculate how

[604] Fisher, Gordon M. *The Development of the Orshansky Poverty Thresholds and Their Subsequent History as the Official U.S. Poverty Measure*, 1992; accessed December 2007; available from http://www.census.gov/hhes/www/povmeas/papers/orshansky.html.
[605] Peterkin, Betty. "Family Food Plans, Revised 1964." *Family Economics Review*, October 1964, 12. Cited in Fisher. *The Development of the Orshansky Poverty Thresholds and Their Subsequent History as the Official U.S. Poverty Measure*, accessed.
[606] United States Department of Health and Human Services. *The 2007 HHS Poverty Guidelines: One Version of the U.S. Federal Poverty Measure*, 2007; accessed December 2007; available from http://aspe.hhs.gov/poverty/07poverty.shtml.
[607] Fisher, Gordon M. "The Development and History of the U.S. Poverty Thresholds: A Brief Overview." *Newsletter of the Government Statistics Section and the Social Section of the American Statistical Association*, Winter, 1997, 6-7 accessed December 2007; available from http://aspe.os.dhhs.gov/poverty/papers/hptgssiv.htm.
[608] Ibid.
[609] Fisher. *The Development of the Orshansky Poverty Thresholds and Their Subsequent History as the Official U.S. Poverty Measure*, accessed.
[610] Ibid., accessed.
[611] ________. "The Development and History of the U.S. Poverty Thresholds: A Brief Overview."

much income would be enough, so her poverty thresholds were meant to illustrate how much was too little.[612]

Several small changes were made to the thresholds in 1981.[613] The farm status was eliminated and the non-farm thresholds were applied to the remaining farm households. The gender differentiation of the household heads was eliminated by averaging the male and female categories. There was also an increase in the largest family sizes calculated from "seven or more" to "nine or more." These changes reduced the number of household thresholds from 124 to 48. Although the poverty thresholds have never been rebased using a more recent expenditure survey, they are updated annually by the Census Bureau using the CPI.[614]

Table 16 below demonstrates the most recent poverty guidelines provided by the U.S. HHS. Although these thresholds are similar in range to the 2006 Low-Income Cut-Offs shown in Table 15, they are lower than the Canadian thresholds. Furthermore, there is just one cut-off for the whole of the contiguous states, whereas the Canadian thresholds are provided for both size of household and size of community.

Table 16. U.S. Department of Health and Human Services (HHS) poverty guidelines for 2007, $2007

Persons in Household	48 Contiguous States and D.C.	Alaska	Hawaii
1	$10,210	$12,770	$11,750
2	13,690	17,120	15,750
3	17,170	21,470	19,750
4	20,650	25,820	23,750
5	24,130	30,170	27,750
6	27,610	34,520	31,750
7	31,090	28,870	35,750
8	34,570	43,220	39,750
For each additional person, add:	3,480	4,350	4,000

Source: United States Department of Health and Human Services (HHS). The 2007 HHS Poverty Guidelines: One Version of the U.S. Federal Poverty Measure, 2007; accessed December 2007; available from http://aspe.hhs.gov/poverty/07poverty.shtml.

4.4.2 Great Britain

The Department for Work and Pensions (DWP) publishes an annual report on the Households

[612] Ibid.
[613] Ibid.
[614] Ibid.

Below Average Income (HBAI) across Great Britain, based on the Family Resources Survey.[615] The HBAI uses adjusted household disposable income as an indirect measure of the living standards of individuals within each household. Any individual living in a household whose total income is less than 60% of the median income is considered to be living on low income.[616] This is similar to Statistics Canada's Low Income Measure, which uses 50% of the adjusted median income, as noted above.

The measure of disposable income includes wages minus any mandatory deductions, such as income tax, pension payments, or child support; all social security benefits and tax credits; cash value of in-kind payments, such as school lunches; and income from self-employment, pensions, scholarships, and investments.[617] The household income is adjusted for family size and composition using the OECD equivalence scale, where the first adult is counted as 0.67, all subsequent family members aged 14 years of age or older are counted as 0.33, and any children younger than 14 years are counted as 0.20.[618]

The DWP produces results for the HBAI based on income before housing costs (BHC) and after housing costs (AHC).[619] This is done to account for variations in housing costs that may not be directly related to the quality of housing. For example, households living in very poor housing in London may be paying a lot more than households in equivalent housing in rural areas. Income AHC is calculated by subtracting from the disposable income any rent, mortgage payments, ground rents, water rates, and insurance premiums.[620]

4.4.3 European Union

The European Union measures income poverty by a relative measure wherein an individual is considered to live in poverty if his or her adjusted household income is below 60% of the national median adjusted income, which is the same percentage used in Great Britain and 10% higher than Statistics Canada's Low Income Measure.[621] Total household income is adjusted by dividing by the equivalence factor to account for differences in family size and composition. The equivalence scale used is a modified version of the OECD scale: the first adult is counted as 1.0, all subsequent family members aged 14 years of age or older are counted as 0.5, and any children younger than 14 years are counted as 0.3.[622]

Eurostat, the statistical division of the European Union, has published several surveys that collect data on income distribution in the member states.[623] For example, the European Community

[615] Department for Work and Pensions (DWP). *Households Below Average Income (HBAI) 1994/95 to 2005/06 (Revised)*, 2007; accessed December 2007; available from http://www.dwp.gov.uk/asd/hbai/hbai2006/contents.asp.
[616] Ibid., accessed.
[617] Ibid., accessed.
[618] Ibid., accessed.
[619] Ibid., accessed.
[620] Ibid., accessed.
[621] Trinczek, Rainer. *Income Poverty in the European Union*, European Foundation for the Improvement of Living and Working Conditions (Eurofound), 2007; accessed December 2007; available from http://www.eurofound.europa.eu/ewco/surveyreports/EU0703019D/EU0703019D.htm.
[622] Ibid., accessed.
[623] Ibid., accessed.

Household Panel (ECHP) ran annually from 1994 to 2001 and collected data on living conditions through personal interviews. In 2003, a new, more comprehensive and inclusive survey began—the annual European Union Statistics on Income and Living Conditions (EU-SILC). This is the survey from which all future data on income distribution will be taken.[624]

4.4.4 Australia and New Zealand

Neither Australia nor New Zealand has an official poverty measure. However, studies in both countries often use 50% or 60% of adjusted median income as a threshold.[625, 626] Statistics New Zealand, the statistical division of the New Zealand government, also defines low income as those households in the bottom income quintile—or lowest 20% of the income distribution.[627] Studies in Australia have often relied on the Henderson poverty line, which was developed in the early 1970s and is a methodology that estimates amount of income necessary to cover basic needs.[628]

4.5 Critiques of existing poverty measures

As noted above, the most common measure of low income used in Canada is Statistics Canada's Low Income Cut-Off (LICO). This is considered a "relative" measure of low income because it compares average incomes of households against the low-income thresholds to determine who is less well off than others. While the thresholds are based on what Canadians actually spend on the necessities of food, clothing, and shelter, some researchers criticize the actual method of calculating the threshold because it is based on an arbitrary number decided on by researchers in 1959—the choice that those families spending 20 percentage points more than the average on these necessary items are in low income.[629] Additionally, while food, clothing, and shelter are considered basic needs by everyone, there are many expenditures, such as health care and child care, that are also considered basic by several social organizations but that are not included in the LICO.[630] Furthermore, even though the LICO is calculated for five different community sizes, it is not calculated at the provincial or municipal level, so important geographical variations in cost of living are not reflected in the LICO thresholds. This means that poverty rates are probably underestimated in areas with higher costs, such as Toronto or Vancouver; as well, the differences between provinces are not made clear using the LICO.[631]

The Low-Income Measure (LIM) is a purely relative measure of low income—one that is not

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624 Ibid., accessed.
625 Scott, John. *Income Distribution in New Zealand*, 1999; accessed December 2007; available from http://www.stats.govt.nz/products-and-services/Articles/income-distrib-May99.htm.
626 Daniels, Dale. *The Poor in Australia: Who Are They and How Many Are There?*, 2002; accessed December 2007; available from http://www.aph.gov.au/library/intguide/SP/poverty.htm.
627 Scott. *Income Distribution in New Zealand*, accessed.
628 Daniels. *The Poor in Australia: Who Are They and How Many Are There?*, accessed.
629 Sarlo. *Measuring Poverty in Canada*, accessed.
630 Canadian Council on Social Development (CCSD). *Defining and Re-Defining Poverty: A CCSD Perspective*, 2001; accessed December 2007; available from http://www.ccsd.ca/pubs/2001/povertypp.htm.
631 Ibid., accessed.

calculated through the actual costs of, or spending patterns on, any goods or services. While this eliminates the difficulty of deciding what is a basic need, it does not illuminate directly what can be purchased in a low-income household.[632] Additionally, it does not increase during recessions, when logically more families are suffering from low income, because recessions affect the median income rather than just low-income families. In other words, the number of families below the median income does not change, so a recession does not appear to affect families abnormally using the LIM.[633]

A different approach to measuring low income is to attempt an "absolute" measure—or a market basket. One concern with these measures of poverty is that they are thought of as objective but they are always implicitly tied to social norms and expectations.[634] For example, some researchers may include in the basket eating at restaurants occasionally, while others may decide that this does not count as a necessary good. However, since this link to societal norms is not made explicit, it is done haphazardly and reflects the values of the researchers who create the market baskets.[635] The gap between the two most common absolute poverty measures in Canada was almost $3000 in 2000: the Market Basket Measure (MBM) threshold for a family of four was $22,779 whereas the equivalent Basic Needs Poverty Line threshold derived by the Fraser Institute was $19,962.[636] Additionally, the researchers who make the decisions about what belongs in the basket are not poor themselves, and there is generally no input from poor people or community organizations regarding what should be included.[637]

Another issue with regards to absolute measures is that there is no clear way of revising them over time to account for changes in prices, commodity availability, and consumption patterns.[638] This, too, is subject to the individual choices of the given researchers. If the basket is not revised periodically, it can eventually fall very short of reflecting actual consumption patterns among those people with low incomes.[639] This is a major critique of the U.S. official poverty line. It is based on a measure of what was spent on averageon food in 1955, and it has never been revised, other than to update prices using the CPI.[640] This is also a problem with the clothing component of the Fraser Institute's Basic Needs Poverty Line, which is based on a list of necessary clothing items, which has not been revised since 1959.[641] In fact, Lars Osberg of Dalhousie University suggests that the Basic Needs line defines poverty differently than most researchers of poverty and that it is more a measure of extreme deprivation than of poverty overall.[642]

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[632] Ibid., accessed.
[633] Ibid., accessed.
[634] Osberg, Lars. *Poverty in Canada and the USA: Measurement, Trends and Implications*, 2000; accessed December 2007; available from http://www.lisproject.org/publications/liswps/236.pdf.
[635] Ibid., accessed.
[636] Sarlo. *Measuring Poverty in Canada*, accessed.
[637] Canadian Council on Social Development (CCSD). *Defining and Re-Defining Poverty: A CCSD Perspective*, accessed.
[638] Osberg. *Poverty in Canada and the USA: Measurement, Trends and Implications*, accessed.
[639] Canadian Council on Social Development (CCSD). *Defining and Re-Defining Poverty: A CCSD Perspective*, accessed.
[640] Kaufman, Leslie. "Bloomberg Seeks New Way to Decide Who Is Poor." *New York Times*, New York City: December 30, 2007; available from http://www.nytimes.com/2007/12/30/nyregion/30poverty.html?_r=1&oref=slogin.
[641] Sarlo. *Measuring Poverty in Canada*, accessed.
[642] Osberg, Lars. "The Evolution of Poverty Measurement - with Special Reference to Canada." 2007.

All of these measures of poverty rely on income as the indicator. However, this in itself is seen to be a contentious issue by many researchers for several reasons. First, focusing on income or consumption patterns only indirectly highlights the desired outcomes—e.g., good health, education, or dignity.[643] In fact, people differ in their ability to transform income into these desired outcomes because of social, environmental, and personal factors. Achieving these desired outcomes also depends on non-monetary services such as food stamps or mentoring programs, and the values of these are generally not included in measures of income and even if they are included, are hard to calculate.[644]

Second, income is subject to large fluctuations over time, and this is especially true for people suffering from poverty.[645] Therefore, measuring poverty as a snapshot of a particular point in time does not portray a very accurate picture of the lives of many individuals. This is further exacerbated because surveys rely on the ability of people to recall incomes accurately, often with long delays before being surveyed.[646] Third, almost all measures of low income assume that household incomes are shared equally among all members.[647] However, this is not necessarily the case, and intra-household variations in income can make a significant difference in some cases.[648] Finally, the main Statistics Canada surveys, such as the Survey of Labour Income and Dynamics (SLID), do not contain data from several key groups; for example, Aboriginals living on reserves, people living in institutions such as prisons or hospitals, and people that are homeless are all excluded from Statistics Canada's surveys, which means that poverty is almost certainly underestimated.[649]

[643] Hulme, David, and Andy McKay. "Identifying and Measuring Chronic Poverty: Beyond Monetary Measures." Paper presented at the CPRC-IIPA Seminar on "Chronic Poverty: Emerging Policy Options and Issues", New Delhi, September 29-30, 2005, Chronic Poverty Research Centre; available from http://www.chronicpoverty.org/pdfs/IIPA-CPRC2005Seminar/Hulme_Mckay(BeyondMonetary)Final.pdf.
[644] Ibid.
[645] Ibid.
[646] Ibid.
[647] Ibid.
[648] Phipps, Shelley A., and Peter S. Burton. "Sharing within Families: Implications for the Measurement of Poverty among Individuals in Canada," *The Canadian Journal of Economics*, 1995, vol. 28, no. 1: 177-204.
[649] Kerstetter. *Rags and Riches: Wealth Inequality in Canada*, accessed.

4.6 Prevalence, depth, and duration of poverty using LICO thresholds

4.6.1 Prevalence of poverty

Table 17 below demonstrates the number and percentage of Canadians living in low income using Statistics Canada's Low-Income Cut-Offs (LICOs) for 2003 to 2005.

Table 17. Percentage of households in low income, Canada, 2003–2005 (using after-tax LICOs, 1992 base)

Demographic	2003 Percentage in low income	2003 Number in low income (000s)	2004 Percentage in low income	2004 Number in low income (000s)	2005 Percentage in low income	2005 Number in low income (000s)
Total	**11.6**	**3,587**	**11.4**	**3,545**	**10.8**	**3,409**
Males	11.0	1,689	10.8	1,678	10.5	1,637
Females	12.2	1,898	11.9	1,866	11.2	1,772
Under age 18	12.5	850	13.0	877	11.7	788
18 to 64	12.2	2,478	11.9	2,448	11.4	2,379
65 or older	6.8	259	5.6	219	6.1	242
Families of 2 or more	**8.6**	**2,294**	**8.2**	**2,203**	**7.5**	**2,021**
Persons 65 or older	2.2	58	1.6 E	45 E	1.2 E	34 E
Persons 18 to 64	8.1	1,386	7.5	1,280	6.9	1,198
Children in two-parent families	7.9	436	8.4	457	7.8	420
Children in female lone-parent families	41.2	367	40.4	371	33.4	320
Unattached individuals	**29.6**	**1,293**	**30.1**	**1,342**	**30.4**	**1,389**
Elderly men	14.7	46	11.5	36	13.4	41
Elderly women	18.9	155	16.9	137	20.3	167
Non-elderly men	30.7	575	32.0	627	32.3	646
Non-elderly women	38.0	517	39.3	541	37.1	535

Notes: A family is defined as a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common law, or adoption. Children in families are those persons under age 18. Elderly people are those 65 or older. An assumption is that intra-household sharing of income is equal among all family members. An unattached individual is a person who lives alone or with others to whom they are not related, such as a roommate or lodger. "E" = use with caution.

Sources: Statistics Canada. Persons in Low Income After Tax, by Prevalence in Percent (2001 to 2005); accessed January 2008; available from http://www40.statcan.ca/l01/cst01/famil19a.htm; and Statistics Canada. Persons in Low Income After Tax, by Number (2001 to 2005); accessed January 2008; available from http://www40.statcan.ca/l01/cst01/famil19b.htm.

Overall, the percentage of Canadians living in low income decreased slightly over the three years, from 11.6% to 10.8%. Some demographics saw a larger decrease over the same period: the percentage of poor children living in female lone-parent families decreased from 41.2% to 33.4%. In contrast, other demographics saw almost no change: the percentage of poor unattached individuals actually increased by 0.8% from 29.6% to 30.4%.

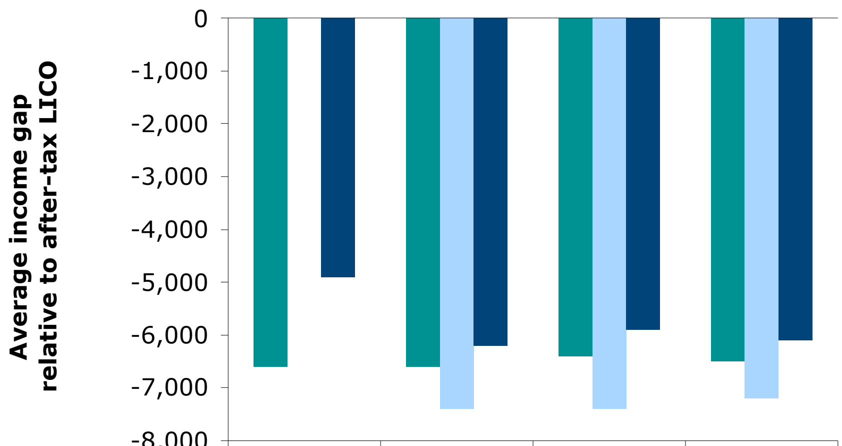
4.6.2 Depth of poverty

Being impoverished depends not only on whether a household's income is below a certain level, but also on how far below that level it is.[650] For example, if the LICO for a four-person family is $33,221, then a household earning $30,000 and a household earning $20,000 would both be considered in low income, even though it is clear that the latter household would be struggling more than the former household. Therefore, it is important also to look at the depth of poverty—the gap between the average household income and the relevant LICO—in order to better understand the extent of poverty.

Figure 4 below illustrates that the overall depth of poverty did not change significantly between 1998 and 2004. In 1998, the average gap for all family units between a household's income and the relevant LICO was $6,600, and in 2004 the gap was $6,500 ($2004). However, for unattached individuals this gap grew by $1,200 during the same time period, increasing from $4,900 to $6,100.

[650] Canadian Council on Social Development (CCSD). *Economic Security Factsheet #2: Poverty*, accessed.

Figure 4. Depth of poverty in Canada, by family type, 1998–2004 (using after-tax LICOs, 1992 base) ($2004)



	1998	2000	2002	2004
All family units	-6,600	-6,600	-6,400	-6,500
Economic families of two or more		-7,400	-7,400	-7,200
Unattached individuals	-4,900	-6,200	-5,900	-6,100

Notes: An economic family is defined as a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common law, or adoption. An unattached individual is a person who lives alone or with others to whom they are not related, such as a roommate or lodger. The depth of poverty for economic families of two or more was not available for 1998.

Sources: 1998: Jackson, Andrew. Low Income Trends in the 1990s, 2001; accessed January 2008; available from http://www.ccsd.ca/pubs/2000/lit. 2000–2004: Canadian Council on Social Development (CCSD). Economic Security Factsheet #2: Poverty, 2007; accessed November 2007; available from http://www.ccsd.ca/factsheets/economic_security/poverty/index.htm.

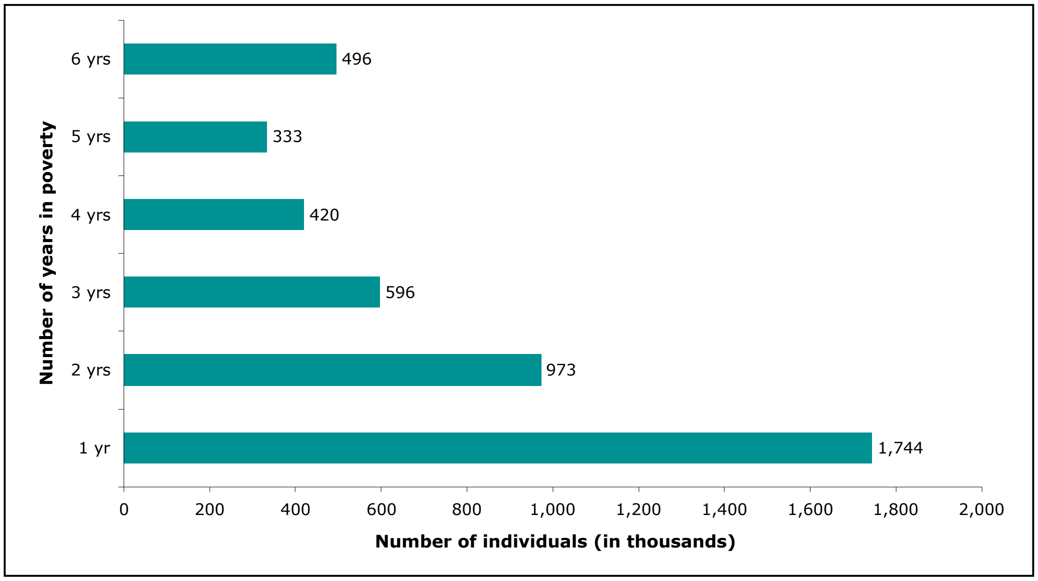
4.6.3 Duration of poverty

The longer a household or individual remains in low income, the harder it is for that family to escape from poverty.[651] This is due to several factors, one of which is based on the relationship between income and wealth. The longer a family is impoverished, the more likely it is that their assets will be diminished, that they will have less resources at their disposal, and that they will experience greater deprivation. There is also a psycho-social aspect to the duration of poverty. An individual's ability to participate in social norms decreases the longer he or she remains in poverty, and the stereotypes associated with low income increase the longer the individual remains in poverty.[652] Combined, these elements contribute to the individual becoming more entrenched in poverty over time. Therefore, it is important to consider the duration of poverty as well as its prevalence and depth.

[651] Osberg. *Poverty in Canada and the USA: Measurement, Trends and Implications*, accessed.
[652] Ibid., accessed.

Figure 5 below shows that between 1999 and 2004, 1,744,000 Canadians were in low income for one year, and 496,000 Canadians were in low income for all six years. In addition, the Canadian Council on Social Development (CCSD) reports that there was a gender difference among those who were in low income for all six years: 2.5% of women lived in low income during this time period, compared to 1.8% of all men.[653]

Figure 5. Duration of poverty in Canada, by number of individuals in poverty, 1999–2004 (using after-tax LICOs, 1992 base)



Source: Canadian Council on Social Development (CCSD). Economic Security Factsheet #2: Poverty, 2007; accessed November 2007; available from http://www.ccsd.ca/factsheets/economic_security/poverty/index.htm.

[653] Canadian Council on Social Development (CCSD). *Economic Security Factsheet #2: Poverty*, accessed.

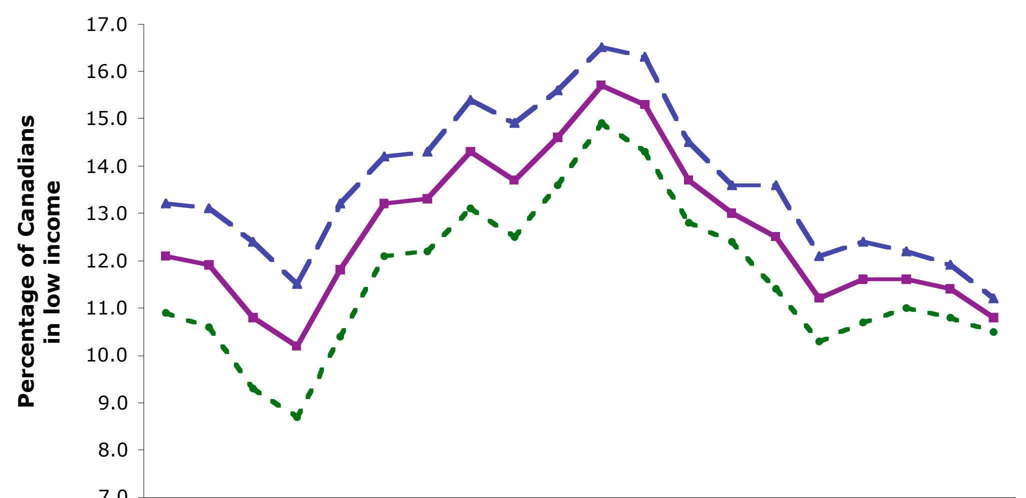
4.7 Poverty trends

4.7.1 Low-income trends

Figures 6–9 demonstrate the percentage of Canadians from different demographic groups who were living in poverty in the years 1986 through 2005. Figure 6 below shows that there was a sharp increase in poverty during the early to mid 1990s—from 10.2% in 1989 to 15.7% in 1996. The percentage of poor Canadians subsequently declined to 10.8% in 2005.

In addition, the percentage of poor women has been consistently above the Canadian average during this time period, and the percentage of poor men has been consistently below the Canadian average for the time period. However, this gap appears to be narrowing on the whole.

Figure 6. Percentage of Canadians in low income, total and by gender, 1986–2005 (using after-tax LICOs, 1986 or 1992 base)



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	12.1	11.9	10.8	10.2	11.8	13.2	13.3	14.3	13.7	14.6	15.7	15.3	13.7	13.0	12.5	11.2	11.6	11.6	11.4	10.8
Men	10.9	10.6	9.3	8.7	10.4	12.1	12.2	13.1	12.5	13.6	14.9	14.3	12.8	12.4	11.4	10.3	10.7	11.0	10.8	10.5
Women	13.2	13.1	12.4	11.5	13.2	14.2	14.3	15.4	14.9	15.6	16.5	16.3	14.5	13.6	13.6	12.1	12.4	12.2	11.9	11.2

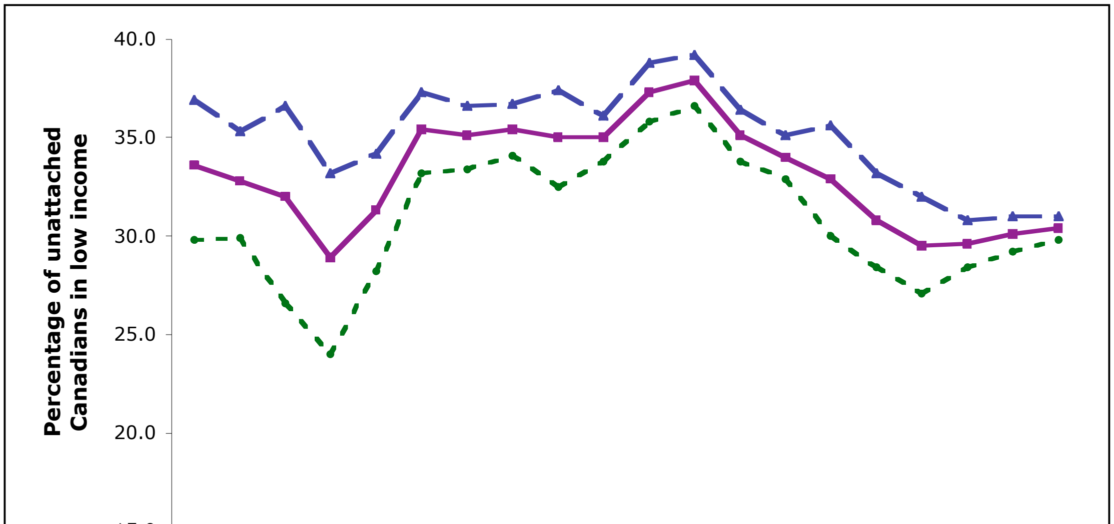
Note: An assumption is that intra-household sharing of income is equal among all family members.

Source: Statistics Canada. Persons in Low Income After Tax, by Prevalence in Percent; accessed January 2008; available from 1986–1990: http://www40.statcan.ca/l01/cst01/famil19g.htm; 1991–1995: http://www40.statcan.ca/l01/cst01/famil19e.htm; 1996–2000: http://www40.statcan.ca/l01/cst01/famil19c.htm; 2001–2005: http://www40.statcan.ca/l01/cst01/famil19a.htm.

Figure 7 below illustrates the percentage of unattached Canadians who were not living with any family members and were living below the LICOs for the years 1986 through to 2005. As in Figure 6 above, there is a spike in poverty—from 28.9% in 1989 to 37.9% in 1997—and a subsequent decline—to 30.4% in 2005.

Additionally, the percentage of poor unattached women is always above average and the percentage of poor unattached men is always below average. However, while the gender gap was 7.1 percentage points in 1986, it was only 1.2 percentage points in 2005. This is solely due to the percentage of poor unattached women declining from 36.9% in 1986 to 31.0% in 2005, as the percentage of poor unattached men was 29.8% in both 1986 and 2005.

Figure 7. Percentage of Canadian unattached individuals in low income, total and by gender, 1986–2005 (using after-tax LICOs, 1986 or 1992 base)



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	33.6	32.8	32.0	28.9	31.3	35.4	35.1	35.4	35.0	35.0	37.3	37.9	35.1	34.0	32.9	30.8	29.5	29.6	30.1	30.4
Men	29.8	29.9	26.6	24.0	28.2	33.2	33.4	34.1	32.5	33.8	35.8	36.6	33.8	32.9	30.0	28.4	27.1	28.4	29.2	29.8
Women	36.9	35.3	36.6	33.2	34.2	37.3	36.6	36.7	37.4	36.1	38.8	39.2	36.4	35.1	35.6	33.2	32.0	30.8	31.0	31.0

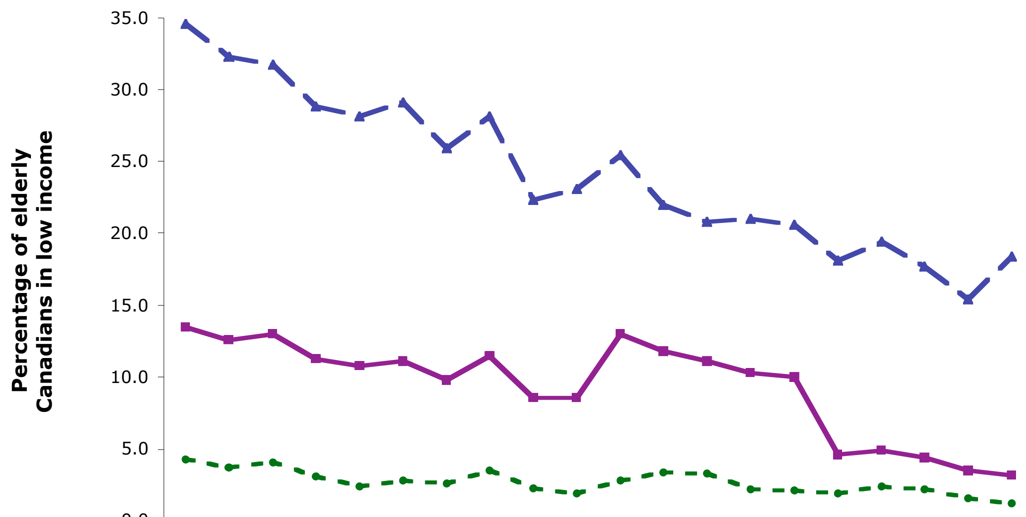
Notes: An unattached individual is a person who lives alone or with others to whom they are not related, such as a roommate or lodger.

Source: Statistics Canada. Persons in Low Income After Tax, by Prevalence in Percent; accessed January 2008; available from 198 6–1990: http://www40.statcan.ca/l01/cst01/famil19g.htm; 1991–1995: http://www40.statcan.ca/l01/cst01/famil19e.htm; 1996–2000: http://www40.statcan.ca/l01/cst01/famil19c.htm; 2001–2005: http://www40.statcan.ca/l01/cst01/famil19a.htm.

Figure 8 below highlights the percentage of elderly Canadians in low income in the years 1986 through 2005. Overall, there has been a steady decline in the total percentage of low-income elderly Canadians, from 13.5% in 1986 to 3.2% in 2005. However, there was an abrupt increase between 1995 and 1996, from 8.6% to 13.0%. This was followed by a sharp decrease between 2000 and 2001, from 10.0% to 4.6%.

While there has been a decrease in low-income elderly Canadians in all family types since 1986, there is a huge gap between those living with family members and those who are unattached. In 1986, 34.6% of unattached seniors were poor, whereas only 4.3% of seniors in families were considered poor—a gap of 30.3 percentage points. This gap had decreased somewhat by 2005 to 17.2 percentage points, or 18.4% and 1.2% of seniors, respectively.

Figure 8. Percentage of elderly Canadians in low income, total and by family type, 1986–2005 (using after-tax LICOs, 1986 or 1992 base)



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	13.5	12.6	13.0	11.3	10.8	11.1	9.8	11.5	8.6	8.6	13.0	11.8	11.1	10.3	10.0	4.6	4.9	4.4	3.5	3.2
In families	4.3	3.7	4.1	3.1	2.4	2.8	2.6	3.5	2.3	1.9	2.8	3.4	3.3	2.2	2.1	1.9	2.4	2.2	1.6	1.2
Unattached	34.6	32.3	31.7	28.8	28.1	29.1	25.9	28.1	22.3	23.1	25.4	22.0	20.8	21.0	20.6	18.1	19.4	17.7	15.4	18.4

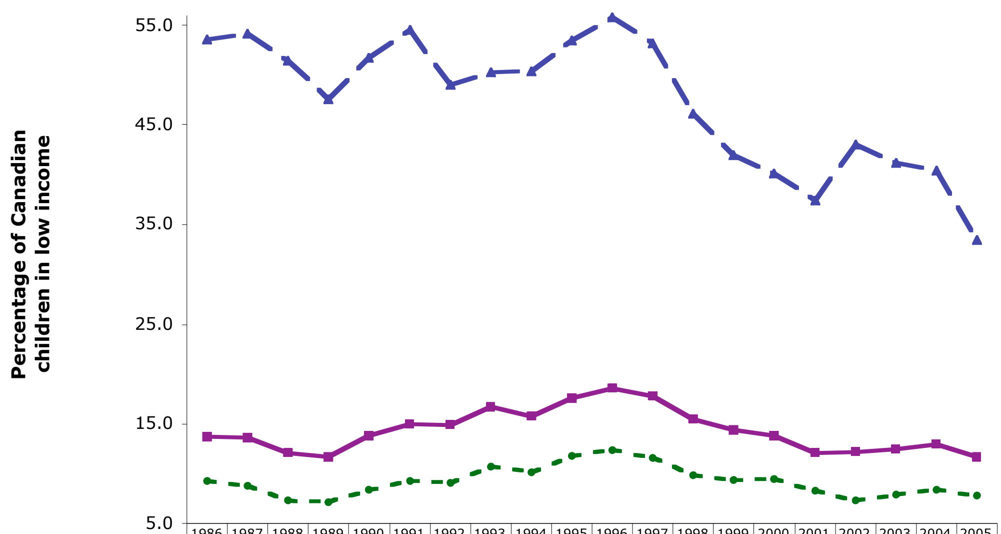
Notes: Elderly people are defined as those aged 65 years or older. A family is defined as a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common law, or adoption. An assumption is that intra-household sharing of income is equal among all family members. An unattached individual is a person who lives alone or with others to whom they are not related, such as a roommate or lodger. "Elderly in families" from 1996-2001 and 2004-2005 should be used with caution.

Source: Statistics Canada. Persons in Low Income After Tax, by Prevalence in Percent; accessed January 2008; available from 198 6–1990: http://www40.statcan.ca/l01/cst01/famil19g.htm; 1991–1995: http://www40.statcan.ca/l01/cst01/famil19e.htm; 1996–2000: http://www40.statcan.ca/l01/cst01/famil19c.htm; 2001–2005: http://www40.statcan.ca/l01/cst01/famil19a.htm.

Figure 9 below shows the percentage of Canadian children in low income in the years 1986 through 2005. Overall, child poverty has declined by only 2 percentage points—from 13.7% in 1986 to 11.7% in 2005. However, there was an increase in the mid-1990s, which peaked in 1996 at 18.6% of all children.

What is most disturbing about the trend in child poverty is the sizable gap between the percentages of children living in poverty with different family types. For instance, in 1986, 53.6% of children with female lone-parents were poor, whereas only 9.3% of children in two-parent families were considered poor—a gap of 44.3 percentage points. While this gap had narrowed somewhat by 2005, it was still very large: 33.4% of children in female lone-parent families were poor compared with only 7.8% of children in two-parent families—a gap of 25.6 percentage points (Figure 9).

Figure 9. Percentage of Canadians under age 18 in low income, total and by family type, 1986–2005 (using after-tax LICOs, 1986 or 1992 base)



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Children	13.7	13.6	12.1	11.7	13.8	15.0	14.9	16.7	15.8	17.6	18.6	17.8	15.5	14.4	13.8	12.1	12.2	12.5	13.0	11.7
Two parents	9.3	8.8	7.3	7.2	8.4	9.3	9.1	10.7	10.2	11.8	12.4	11.6	9.9	9.4	9.5	8.3	7.3	7.9	8.4	7.8
Female only	53.6	54.1	51.4	47.6	51.7	54.5	49.0	50.3	50.4	53.5	55.8	53.2	46.1	41.9	40.1	37.4	43.0	41.2	40.4	33.4

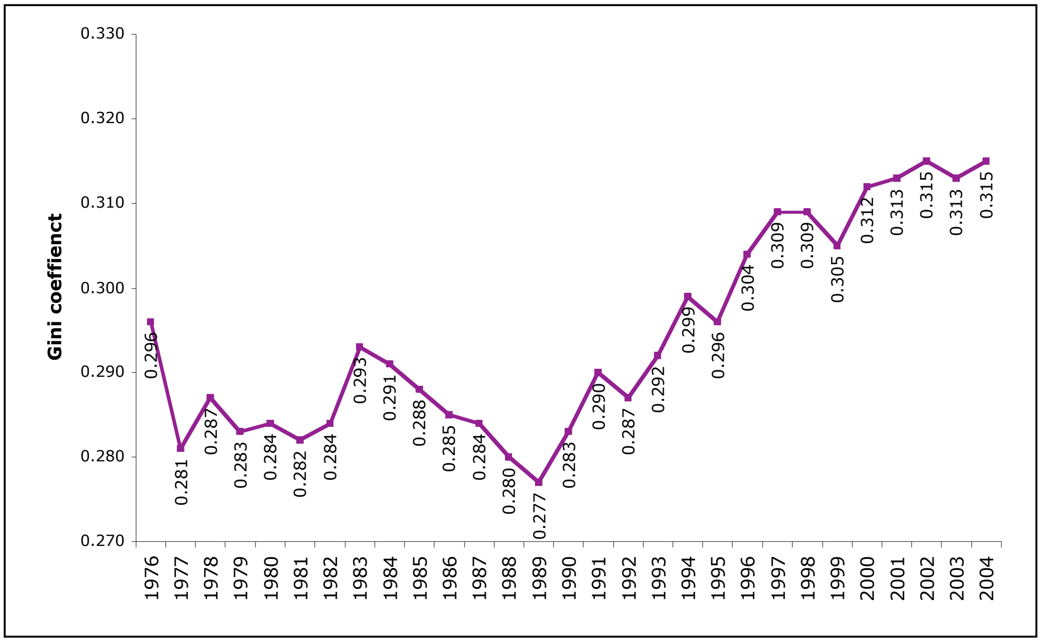
Notes: "Female only" refers to those children in female lone-parent households. An assumption is that intra-household sharing of income is equal among all family members.

Source: Statistics Canada. Persons in Low Income After Tax, by Prevalence in Percent; accessed January 2008; available from 198 6–1990: http://www40.statcan.ca/l01/cst01/famil19g.htm; 1991–1995: http://www40.statcan.ca/l01/cst01/famil19e.htm; 1996–2000: http://www40.statcan.ca/l01/cst01/famil19c.htm; 2001–2005: http://www40.statcan.ca/l01/cst01/famil19a.htm.

4.7.2 Income inequality trend

Figure 10 below illustrates the extent of income inequality as defined by the Gini coefficient.[654] Income inequality has increased overall since 1976, although there was a steady narrowing of the gap during the 1980s. However, since 1990, the gap in income inequality has widened steadily, with only fleeting reductions in the early, mid, and late 1990s.

Figure 10. After-tax income inequality in Canada, based on the Gini coefficient, 1976–2004



Notes: 1976–1992 based on the Survey of Consumer Finances; 1993–2004 based on the Survey of Labour and Income Dynamics. The higher the number, the greater the income gap between rich and poor.

Source: Heisz, Andrew. Income Inequality and Redistribution in Canada: 1976 to 2004, Statistics Canada, 11F0019MIE – No. 298, 2007; accessed January 2008; available from http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2007298.htm.

[654] See Section 4.3.1 for an explanation of how the Gini coefficient is derived.

5. Associations between Poverty and Health

As an important determinant of health, poverty is strongly and inversely related to almost every health indicator, including general, self-reported health status, mortality and morbidity rates associated with various diseases, health-related "lifestyle" behaviours, and health care access and use.[655]

This section primarily reviews literature that associates poverty with indicators of morbidity, mortality, and behavioural risk factors as precursors to chronic disease. The focus is on the proportion of morbidity and mortality that can be attributed to poverty or low income, and specifically on relative risk ratios and population attributable fractions where these are available. This is somewhat challenging. Proximal risk factors for chronic disease and mortality, such as tobacco use, obesity, alcohol and other substance abuse, and physical inactivity, are often the focus of chronic disease prevalence and health promotion reports. These risk factors are largely preventable and are estimated to be responsible for 25% of direct medical costs.[656] However, distal risk factors or conditions such as poverty and other socioeconomic factors also play a large role in chronic disease incidence, prevalence, and mortality but are discussed less often. As Jayadeep Patra et al. note, there is a lack of information on the social determinants of health in general:

> [D]istal factors such as air, water and land environments, working conditions and social determinants of health should be the foci of future cost studies. The methodology is no doubt challenging for all risk factors, but particularly for the latter."[657]

In addition to information on the proportion of morbidity and mortality that can be attributable to poverty, a cost of poverty study also needs total population prevalence data for selected health indicators. Prevalence data for the general population is readily available through Statistics Canada, Health Canada, and other disease surveillance sources in Canada. Therefore, because of time and resource constraints prevalence data are presented for behaviour risk factors but are limited for morbidity and mortality in the rest of this section.

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[655] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
[656] Colman, Ronald. *The Cost of Chronic Disease in Nova Scotia*, GPI Atlantic, Dalhousie University, and Atlantic Region Population and Public Health Branch, Health Canada, 2002; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chronic.pdf.
[657] Patra, Jayadeep, Svetlana Popova, Ju_rgen Rehm, Susan Bondy, Robynne Flint, and Norman Giesbrecht. *Economic Cost of Chronic Disease in Canada, 1995-2003*, Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association, 2007; accessed Dec 2007; available from http://www.ocdpa.on.ca/docs/OCDPA_EconomicCosts.pdf.

5.1 Behavioural risk factors for chronic disease

Behavioural risk factors are often identified as mediators leading from poverty to chronic disease.[658] The World Health Organization (WHO) has identified the risk factors that most often contribute to the burden of disease in developed countries as tobacco use, obesity (high body mass index–BMI), alcohol consumption, low consumption of fruits and vegetables, high cholesterol, physical inactivity, and high blood pressure.[659] Although these risk factors affect the entire population, they are especially associated with poverty in high-income countries. For example, those in the lowest-income category are two and a half times more likely to smoke than those in the highest income category, and are more likely to be obese, have a poor diet, and exercise less than those with higher incomes.[660] As well, several of these risk factors are often clustered together in high-risk individuals, and may have synergistic effects on the potential for disease.

Tobacco use is associated with heart disease, cancers, and respiratory disease; obesity is associated with hypertension, type 2 diabetes, heart disease, stroke, and some cancers; alcohol is associated with liver cirrhosis (long term), vehicle collisions (acute), fetal alcohol syndrome, and alcohol-attributed suicides; and illegal drug use, including cocaine and crack, and opioids such as heroin and other injection drugs, are associated with premature mortality due to overdose, especially among younger people, drug-attributable suicide, drug-attributable hepatitis C infection, and HIV infection.[661] Physical inactivity is associated with heart disease, hypertension, some cancers (especially colon cancer), type 2 diabetes, and osteoporosis.[662] Rehm notes that alcohol is unique among the substances because it is associated with benefits as well as costs—evidence shows that moderate drinking by older people can give some protection against coronary heart disease.[663]

According to Ronald Colman, excess risk factors for a small number of behaviours or factors, such as smoking, obesity, lack of physical exercise, and poor nutrition, account for 40% of chronic disease, 50% of chronic disease mortality, 25% of medical care costs, and 38% of the total direct and indirect costs of illness in Canada.[664] In Australia, the percentage of economic burden of disease that can be attributed to excess behavioural risk factors has been found to be: tobacco – 9.7%, physical inactivity – 6.7%, obesity – 4.3%, and alcohol consumption – 2.1%.[665] Jürgen Rehm et al. calculated the overall cost of substance abuse resulting in premature death

[658] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
[659] World Health Organization, Cited in Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[660] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[661] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.
[662] Walker, Sally, and Ronald Colman. *The Cost of Physical Inactivity in Halifax Regional Municipality*, GPI Atlantic, 2004; accessed July 2007; available from http://www.gpiatlantic.org/pdf/health/inactivity-hrm.pdf.
[663] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed.
[664] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
[665] Ibid., accessed.

and disability in Canada in 2002 to be $39.8 billion.[666] This includes direct health care costs (22%), productivity losses (61%), direct law enforcement costs (14%), and other direct costs (3%). The substances contributing to these costs were tobacco (42%), alcohol (36.6%), and illegal drugs (20.7%).[667]

As noted, risk factors tend to cluster in individuals and groups with many people having more than one risk factor. The 2000 Canadian Community Health Survey (CCHS) found that only 19.8% of the population between the ages of 20 and 59 years have no risk factor, and 80.2% have at least one risk factor.[668] Risk factors are different for men and women—men tend to smoke more and are more often overweight than women, but women tend to be more physically inactive.[669] In addition, risk factor prevalence varies by region with Newfoundland and Labrador having the highest rates in the country and British Columbia having the lowest.[670]

Health promotion efforts to reduce risk factors and conditions have focused on changing lifestyle behaviours.[671] However, these efforts have had limited success among those living in poverty, and may even contribute to health disparities. Lifestyle behaviour risk factors have decreased at a much lower rate among the poor than among higher socioeconomic groups.[672]

Recent evidence shows that lifestyle behavioural factors account for only a portion of the association of these risk factors with disease.[673] Paula Lantz et al. report that behavioural risk factors play a small role in understanding poverty impacts on health,[674] and Michaela Benzeval et al. note that an emphasis on behavioural factors does not address the underlying reasons why people living in poverty adopt these behaviours.[675] Raphael argues that, "an emphasis on behavioural risks diverts attention from poverty including its causes, its health effects, and the need for societal action to reduce and eliminate it."[676] He quotes Ronald Labonte who was writing in 1994:

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[666] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

[667] Ibid., accessed. Other direct costs include substance-related research and prevention, fire damage, vehicle collision damage, and costs to the workplace associated with providing employee assistance programs and drug testing.

[668] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

[669] Ibid., accessed.

[670] Ibid., accessed.

[671] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.

[672] Lyons, Renee, and Lynn Langille. *Healthy Lifestyle: Strengthening the Effectiveness of Lifestyle Approaches to Improve Health*, The Atlantic Health Promotion Research Centre (AHPR), Health Canada, Population and Public Health Branch (PPHB), 2000; accessed August 2002; available from http://www.hc-sc.gc.ca/hppb/phdd/pdf/lifestyle.pdf.

[673] Matheson, Flora I., Rahim Moineddin, and Richard H. Glazier. "The Weight of Place: A Multilevel Analysis of Gender, Neighborhood Material Deprivation, and Body Mass Index among Canadian Adults," *Social Science & Medicine*, 2008, vol. 66: 675–690.

[674] Lantz, Paula M., James S. House, James M. Lepkowski, David R. Williams, Richard P. Mero, and Jieming Chen. "Socioeconomic Factors, Health Behaviors, and Mortality," *Journal of the American Medical Association*, 1998, vol. 279, no. 21: 1703-1708.

[675] Benzeval, Michaela, Ken Judge, and Margaret Whitehead. *Tackling Inequalities in Health: An Agenda for Action*, London: King's Fund Centre, 1995.

[676] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*. p. 224.

> The argument was simple. The health of oppressed people (poor, women, persons from minority cultures, workers, and others) was determined at least as much, if not more, by structural conditions (poverty hazards, powerlessness, pollution, and so on) than by personal lifestyles. Moreover personal lifestyles were not freely determined by individual choice, but existed within social and cultural structures that conditioned and constrained behaviour. Behavioural health education, social marketing, or wellness approaches to health promotion fostered victim blaming by assuming that individuals were entirely responsible for their choices and behaviour. They also blamed the victim indirectly by ignoring the structural determinants of health, those causes that are embedded within economic, class- and gender-based patterns of social relationships.[677]

Therefore, in discussing behaviour risk factors in association with poverty, it is very important to realize that these behaviours are not always the "choice" of people living in poverty, that other social and economic factors play a large role in health status, and that it is not appropriate to "blame the victim."

The eight major preventable risk factors for cardiovascular diseases, cancer, chronic obstructive pulmonary disease (COPD), and diabetes—the most prevalent chronic diseases—are listed in Table 18 below. In the following two sections, tobacco use, obesity, and alcohol/illegal drug abuse—the leading risk factors that affect the most outcomes, will be discussed in greater detail. While time and resource constraints did not allow for a discussion about all of the risk factors listed in the Table below, tobacco use and obesity have been identified as two key factors that contribute the most to the costs generated by chronic disease and mortality.[678] While alcohol and illegal drug abuse affect relatively fewer people than do tobacco use and obesity, they frequently account for more deaths at younger ages and for relatively more preventable years of life lost before the age of 65.

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[677] Labonte, Ronald. "Death of a Program: Birth of a Metapor," in *Health Promotion in Canada: Provincial, National and International Perspectives*, ed. Rootman, I., A. Pederson and M. O'Neill, 72-90. Toronto: Saunders, 1994. p. 79, Cited in Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*. p. 224.
[678] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.

Table 18. The 8 major modifiable risk factors for leading non-communicable, chronic diseases, 2000

CONDITION	Cardio-vasclar diseases*	Diabetes	Cancer	Chronic obstructive pulmonary disease	Proportion of the population aged 20–59 years %
RISK FACTOR					
Smoking	√	√	√	√	(daily) 25.7
Alcohol	√		√		–
Physical inactivity	√	√	√		55.5
Nutrition (Low consumption of fruit and vegetables)	√	√	√		64.7
Obesity	√	√	√	√	(overweight, BMI ≥ 25.0) 47.5
Raised blood pressure	√	√			8.3
Dietary fat / blood lipids	√	√	√		–
Blood glucose	√	√	√		–

Note: *Includes heart disease, stroke, and hypertension; – percentage not given in source; proportion of the population from 2000 Canadian Community Health Survey in source below.

Source: Adapted from Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

5.1.1 Tobacco use

Smoking is the leading cause of preventable mortality in Canada.[679] The most important causes of premature death associated with smoking are coronary heart disease and cancer, with lung cancer being the leading cause of cancer death.[680] According to Parviz Ghadirian, writing for Health Canada, premature deaths (before age 70) among lifelong smokers are about twice that of those who have never smoked for both men (2.3) and women (1.9).[681] Tobacco causes about half of all cancer deaths among middle-aged men, one-third among older men, and one-third of all deaths among middle-aged women.[682]

[679] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[680] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[681] Ghadirian, Parviz. *Sleeping with a Killer: The Effects of Smoking on Human Health*, Health Canada, 2002; accessed Nov 2007; available from http://www.hc-sc.gc.ca/hl-vs/alt_formats/hecs-sesc/pdf/pubs/tobac-tabac/swk-dat/swk-dat_e.pdf.
[682] Ibid., accessed.

Tobacco use is also considered to be a preventable "risk factor" for chronic disease and has been identified as the direct proximal cause of certain cancers—especially cancers of the lung, oral cavity, esophagus, stomach, pancreas, larynx, bladder and kidney, as well as certain types of leukemia—and of cardiovascular diseases, e.g., acute myocardial infarction (heart attack) and stroke, and chronic obstructive pulmonary disease (COPD), among others.[683] In North America, smokers are three times more likely to develop cancer than non-smokers. However, Blakely warns that, although a large body of evidence has found an inverse association between lung cancer and socioeconomic status, in general, "the SES patterning of lung cancer cannot be fully explained by SES patterns of tobacco use (given some likely additional role for various dietary and occupational risk factors and access to health care)."[684] U.S. CDC disease classifications (ICD–9 and ICD–10) of diseases known to be attributable to smoking are shown in Table 50 in the Appendices.

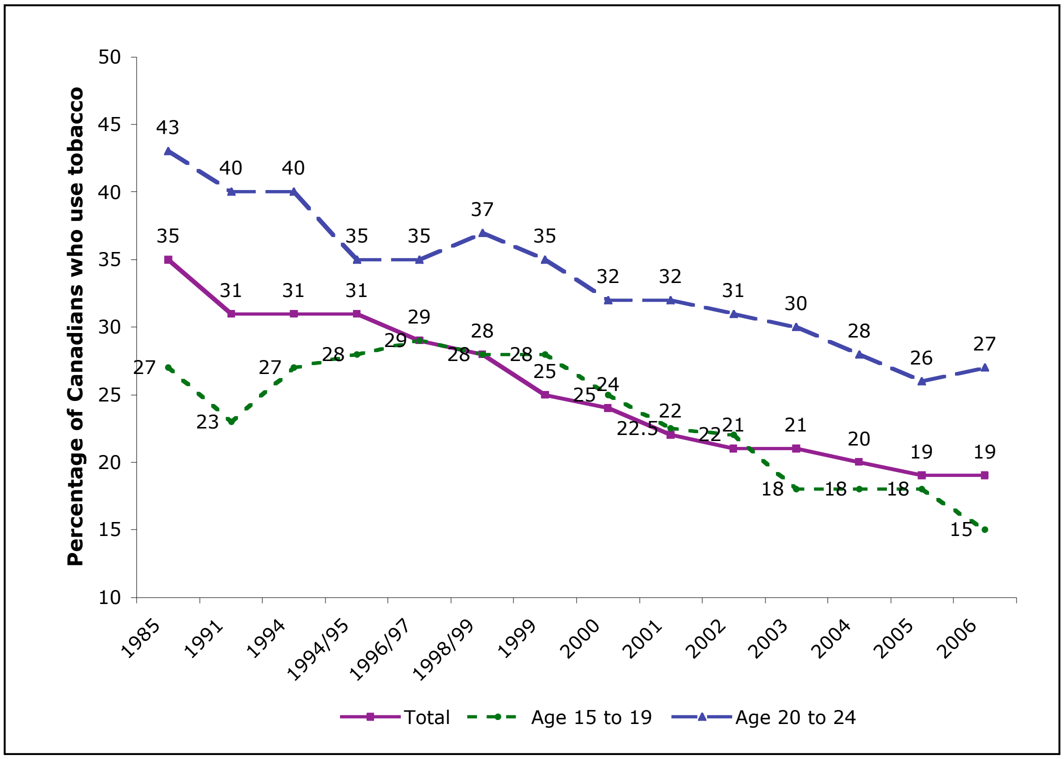
Prevalence in the general population

Canadian tobacco use prevalence rates by age groups 15–19 years and 20–24 years and by total population are shown in Figure 11 below. Additional Tables showing prevalence rates in Canada and the provinces for age groups 15 and over for the 1999–2005 time period are shown in Tables 45 and 46 in the Appendices.

According to the Canadian Tobacco Use Monitoring Survey (CTUMS), in 2006 approximately 19% of the Canadian population 15 years of age and older smoked tobacco compared with 35% in 1985—a 46% decline in prevalence.[685] However, these rates have changed very little since 2002 when the prevalence of daily smokers was 21% of the population. The prevalence of male smokers dropped from 27% in 1999 to 20% in 2006, and of female smokers from 23% to 17% in the same time period. The prevalence of smoking among young adults (aged 20–24 years) dropped by 37% from 43% in 1985 to 27% in 2006, and teenagers (aged 15–19 years) reduced their smoking rates by 44%—from 27% in 1985 to 15% in 2006.

[683] Ibid., accessed.
[684] Blakely, Hales, Kieft, Wilson, and Woodward. "Distribution of Risk Factors by Poverty." p. 2036.
[685] Health Canada. *Canadian Tobacco Use Monitoring Survey (CTUMS) Annual Results 1985 - 2006*, 2006; accessed July 2007; available from http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/ctums-esutc/prevalence/index_e.html. Cited in Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.

Figure 11. Tobacco use prevalence in Canada, population aged 15 – 24 years, 1985–2006



Sources: Health Canada (2006). Canadian Tobacco Use Monitoring Survey (CTUMS) Annual Results 1985 – 2006, accessed July 2007; available from http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/ctums-esutc/prevalence/index_e.html. CTUMS notes the 1994 Survey on Smoking in Canada (SOSIC) results are calculated from rebased population estimates and exclude missing values. 1985 to 1998 sources include: 1994/95-1998/99 - National Population Health Survey; May 1994–Survey on Smoking in Canada (SOSIC); 1985/91 - General Social Surveys. Cited in Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.

Even though the data show a decline in the prevalence of smoking, negative health effects still affect former smokers as risks associated with smoking only gradually diminish over time, with some reports estimating the mortality from tobacco use lags behind trends in tobacco use by 30 to 60 years.[686] However, as noted by Ghadirian, a decline in smoking greatly reduces the risks of disease. For example, a year after quitting smoking, the risk of heart disease is reduced by nearly 50% compared to someone who continues to smoke. After 10 to 15 years of not smoking, the health status of former smokers is not significantly different from that of a lifelong non-smoker.[687] According to Eva Makomaski Iling and Murray Kaiserman current high mortality and morbidity rates caused by smoking-related diseases reflect prior rates of smoking prevalence rather than current rates because it is the behaviour of the population two or three decades earlier

[686] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[687] Ghadirian. *Sleeping with a Killer: The Effects of Smoking on Human Health*, accessed.

that is now reflected in the current rates of disease.[688]

Prevalence in the low-income population

In high-income countries, the poor are more likely to smoke than the rich and, therefore, the risk of smoking-related and premature death among the poor is also greater. Ghadirian notes, "In high- and middle-income countries, men in the lowest socio-economic groups are up to twice as likely to die in middle age as men in the highest socio-economic groups, and smoking accounts for at least half their excess risk."[689] Smoking and mortality rates for tobacco-specific diseases such as lung cancer and COPD are also highest among the poorest populations.[690] For example, the evidence indicates lung cancer rates decline as median income increases.

A review conducted by Stellman and Resnicow of high-income countries found that the prevalence of smoking and smoking-attributable disease rates were higher in low-income groups in the United Kingdom, Denmark, Italy, Australia, New Zealand, and the United States.[691] In that particular review Canada was not considered. However, in a review of smoking among adolescents, Tyas and Pederson found the same pattern in Canada, Finland, New Zealand, and Norway.[692]

Martin Bobak et al. find that low-income women in the U.K. are three times as likely to smoke as those in the highest socioeconomic group, and "the situation is similar in most high-income countries."[693] They also found a gap in mortality risk between high and low income groups in Canada:

> In addition to cross-sectional differences in mortality, smoking is also partly responsible for the widening of socio-economic differences over time. In Canada, the risk of death in middle age for men in the poorest income group fell from 46% in 1971 to 35% in 1996—a decline of about 24%. The risk of death from smoking-attributable causes fell from 17% in 1971 to 15% in 1996—a decline of only 12%. In contrast, in the richest income group, the risk of death in men fell from 32% to 20%, a decline of 38%; and the risk of death from smoking-attributable disease fell from 9% to 6%, a decline of about one-third. In Canada, in relative terms, the gap in mortality risk between poorest and richest income group increased from 1.4 for total risk and 1.9 for smoking-attributable risk in 1971, to 1.8 for total risk and 3 for smoking-attributable risk in 1991.[694]

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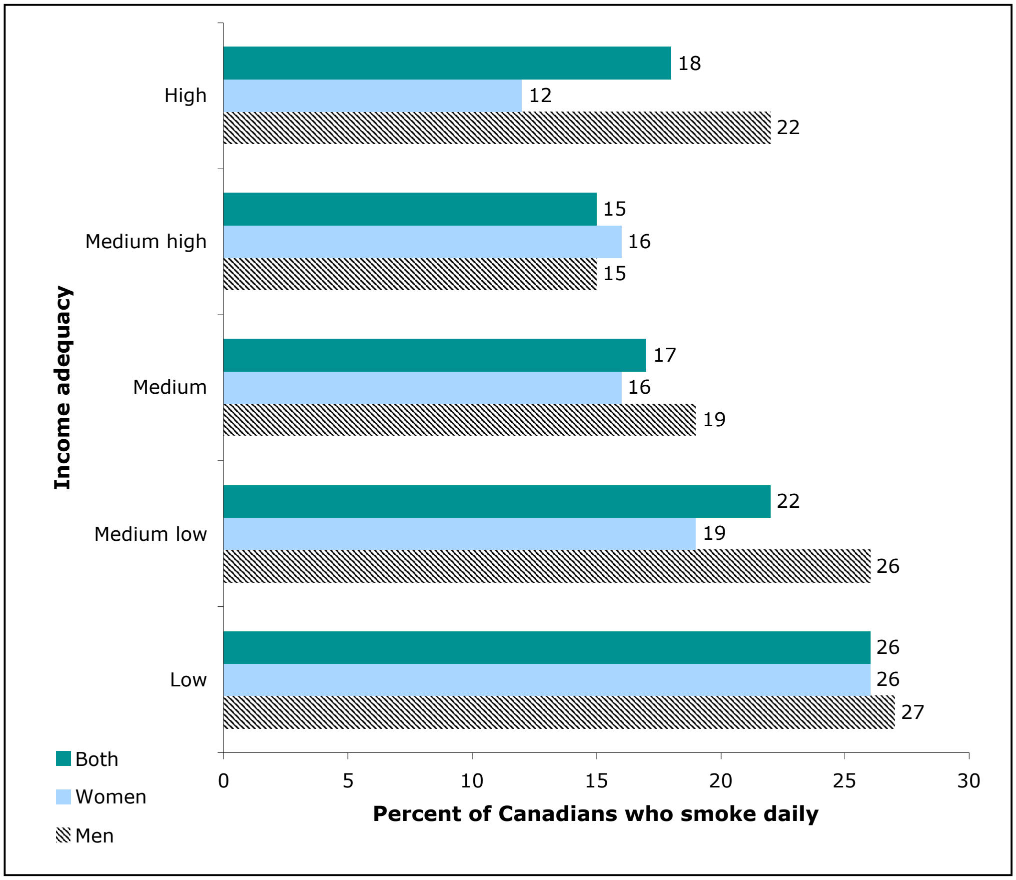
[688] Makomaski Illing, Eva M., and Murray J. Kaiserman. "Mortality Attributable to Tobacco Use in Canada and Its Regions, 1998," *Canadian Journal of Public Health*, 2004, vol. 95, no. 1: 38-44.
[689] Ghadirian. *Sleeping with a Killer: The Effects of Smoking on Human Health*, accessed. p. 8.
[690] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[691] Stellman, S.D., and K. Resnicow. "Tobacco Smoking, Cancer and Social Class," *IARC Scientific Publications*, 1997, vol. 138: 229-250. Cited in Blakely, Hales, Kieft, Wilson, and Woodward. "Distribution of Risk Factors by Poverty."
[692] Tyas, S.L., and L.L. Pederson. "Psychosocial Factors Related to Adolescent Smoking: A Critical Review of the Literature," *Tobacco Control*, 1998, vol. 7: 409–420.
[693] Bobak, Martin, Prabhat Jha, Son Nguyen, and Martin Jarvis. "Poverty and Smoking," in *Tobacco Control in Developing Countries*, ed. Jha, P. and F.J. Chaloupka, 41-61. Oxford: Oxford University Press, 2000. p. 46.
[694] Ibid. p. 55.

Using 1990 data from the Ontario Health Survey, Joceline Pomerleau et al. calculated the likelihood of smoking by socioeconomic status. Compared to those with a high-income, those with a low income had an odds ratio (OR) of 1.84 and those with an intermediate income had an OR of 1.33, after adjustment for gender, age, and marital status.[695]

In the 1996/1997 National Population Health Survey smoking rates among women and men in the lowest income quintile were 36% and 40% respectively, compared to rates of 13% and 16% respectively in the highest income quintile.[696] By 2001, as shown in Figure 12 below, the CCHS found smoking rates in the lowest quintile had declined to 26% for women and 27% for men, compared to rates of 12% and 22% respectively in the highest quintile.[697] In 2001, the highest percentage of women smokers was in the low-income category, and the highest percentage of men smokers was in the low and medium low-income categories.

[695] Pomerleau, Joceline, Linda L. Pederson, Truls Østbye, Mark Speechley, and Kathy N. Speechley. "Health Behaviours and Socio-Economic Status in Ontario, Canada " *European Journal of Epidemiology*, 1997, vol. 13: 613-622.
[696] Health Canada. *Tobacco. A National Strategy*, 1999; accessed Dec 2007; available from http://www.hc-sc.gc.ca/hl-vs/pubs/tobac-tabac/ns-sn/index_e.html.
[697] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

Figure 12. Percentage of the general population aged 15+ years who were daily smokers by income adequacy and gender, Canada, 2001



Notes: Due to small sample size, data points for 1) women medium high income, 2) women high income, and 3) men medium high income should be interpreted with caution. Individuals are considered to be daily smokers if they regularly smoke at least one cigarette per day.

Source: Data source from Canadian Tobacco Use Monitoring Survey (CTUMS), Health Canada. Cited in Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

Cora Lynn Craig et al. used 2000/2001 CCHS data to look at socio-demographic and lifestyle factors.[698] As shown in Table 19 below, those living in households in the lowest income quintile had higher rates of smoking than those living in households with higher incomes. This pattern showed a gradient across income levels with each level showing a greater smoking prevalence than the income above it. Household income was the reported total income before taxes, including income from all sources adjusted for household size. A low-income variable was also calculated based on household income and the number of individuals living in the household—less than $15,000 if one or two people, less than $20,000 if three or four people or less than $30,000 if five or more people. Results showed almost 18% of the population living in low income and 32% of those being daily smokers, compared with 22% in the higher income population being daily smokers.

Table 19. Smoking patterns of adults aged 20 years and older by income quintile, Canada, 2000-2001

		Total			**Men**			**Women**		
	Number	Daily	Occa-sional	Not at all	Daily	Occa-sional	Not at all	Daily	Occa-sional	Not at all
Total, adults (20+)	**11,3,219**	**23%**	**4%**	**73%**	**25%**	**4%**	**70%**	**20%**	**4%**	**76%**
Household income										
<$15,000	13,011	34	5	62	41	5	55	29	5	66
$15,000-$29,999	20,707	26	4	70	29	4	66	24	4	73
$30,000-$49,999	24,011	25	4	71	28	4	69	23	4	73
$50,000-$79,999	24,762	22	4	74	25	5	71	19	4	77
>$80,000	18,515	17	5	79	19	5	77	15	5	81
Income Categorization										
Low income	15,809	32	5	63	38	5	57	29	5	67
Middle or high income	88,023	22	4	74	24	4	72	19	4	76

Note: Based on data from Statistics Canada's 2000-2001 Canadian Community Health Survey.

Source: Craig, Cora Lynn, Christine Cameron, and Adrian Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, Canadian Fitness and Lifestyle Research Institute, Canadian Population Health Initiative, 2005; accessed Nov 2007; available from http://secure.cihi.ca/cihiweb/products/Sociodemographic_Lifestyle_e.pdf.

The 1997 First Nations and Inuit Regional Health Survey (RHS) found that Aboriginal peoples have the highest rates of smoking in Canada. The survey reported the smoking rates to be 62% for the First Nations people and 72% for the Inuit.[699] Data from the 2003 survey indicates that

[698] Craig, Cora Lynn, Christine Cameron, and Adrian Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, Canadian Fitness and Lifestyle Research Institute, Canadian Population Health Initiative, 2005; accessed Nov 2007; available from http://secure.cihi.ca/cihiweb/products/Sociodemographic_Lifestyle_e.pdf.
[699] Health Canada. *Tobacco. A National Strategy*, accessed.

the smoking rate of First Nations people has decreased to 59%, but this is still about three times the rate for the general Canadian population.[700] Among 15–17 year olds, 47% of boys and 61% of girls were current smokers—also about three times the national rate. Approximately 70% of Inuit ages 18–45 years are current smokers.

A recent report commissioned by the Canadian Population Health Initiative on the differences in health between rural and urban residents found that rural residents report an income in the lowest or lower-middle income categories more frequently than urban residents do.[701] The report also found that risk factors such as smoking and obesity are reported more frequently by rural residents, which could contribute to their higher risk of dying prematurely from circulatory disease.

Relative Risks and Smoking Attributable Fractions

In 2007, Ronald Colman and Janet Rhymes updated Colman's 2000 *GPIAtlantic* report on the costs of tobacco use in Nova Scotia.[702] They found that smoking accounts for 21% of all deaths in the province, which is approximately 1,700 deaths per year. In addition, in Nova Scotia, tobacco use costs $171.3 million in direct health care costs, and $526 in indirect productivity loss costs due to long- and short-term disability and premature mortality. When additional costs are added—such as on-the-job productivity losses (incurred through smoking breaks), prevention and research costs, and losses due to fires—smoking costs the Nova Scotia economy approximately $943.8 million per year ($2005). Using cost data from the Canadian Centre on Substance Abuse, the authors also examined the benefits of a hypothetical reduction in the number of current smokers in Nova Scotia from 22% to 16%—a 27% reduction bringing Nova Scotia in line with the 2002 smoking rate in British Columbia. They found that this reduction would save Nova Scotia approximately $206.50 per capita ($2006), or a total of $193 million.[703]

Although the GPI report is for Nova Scotia, the approach and calculations used can be used as a template in national studies. It relies heavily on three data sources:

- *Canadian Tobacco Use Monitoring Survey* (CTUMS), which contains data on the prevalence of tobacco use,[704]
- *Canadian Community Health Survey* (CCHS) (2000-01, 2003 and 2005), which includes statistics on daily smoking,[705] and

[700] First Nations and Inuit Health Committee, Canadian Paediatric Society. "Use and Misuse of Tobacco among Aboriginal Peoples. An Update," *Paediatrics & Child Health*, 2006, vol. 11, no. 10: 681-685.
[701] DesMeules, Marie, Raymond Pong, Claudia Lagace, Denis Heng, Doug Manuel, Roger Pitblado, Ray Bollman, Judy Guernsey, Arminee Kazanjian, and Irene Koren. *How Healthy Are Rural Canadians? An Assessment of Their Health Status and Health Determinants*, Canadian Population Health Initiative, 2006; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/publicat/rural06/pdf/rural_canadians_2006_report_e.pdf.
[702] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[703] Ibid., accessed. This calculation does not take into account the fact that British Columbia has a lower percentage of former smokers than does Nova Scotia. Total cost saving based on a population estimate of 934,405.
[704] Health Canada. *Canadian Tobacco Use Monitoring Survey (CTUMS) Annual Results 1985 - 2006*, accessed.
[705] Statistics Canada. *Canadian Community Health Survey*, Health Canada, Statistics Canada, and the Canadian Institute for Health Information (CIHI), 2007; accessed Nov 2007; available from http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/index_e.html. The CCHS began in September 2000, in order to provide regular cross-sectional estimates of health determinants, health status and health system utilization for 136 Canadian health regions. It is conducted in two-year collection cycles using two different surveys: a general health region-level

- *The Cost of Substance Abuse in Canada 2002* by Rehm et al., which provides "rigorous and reliable" cost estimates.[706]

Statistics Canada collects annual data for tobacco users age 15 years and older through the CTUMS for Health Canada.[707]

Referring to the 2006 report from the Canadian Centre on Substance Abuse (CCSA), *The Cost of Substance Abuse in Canada 2002,* Colman and Rhymes note:

> An investigation of several methodologies and potential sources and estimation methods revealed that the CCSA cost estimates are the most rigorous and reliable currently available for direct health care, prevention, and research cost estimates and for indirect productivity loss estimates.[708]

Colman and Rhymes estimate the number of deaths in Nova Scotia that can be attributed annually to tobacco use using the smoking-attributable mortality (SAM) approach, which is a variation of the population attributable fraction (PAF) approach. The SAM approach estimates the number of deaths that could be theoretically prevented if tobacco use were reduced or eliminated. As noted by the authors, the SAM method has limitations since it calculates the smoking attributable deaths for a given year. However, most deaths attributable to smoking are the result of smoking in previous decades when smoking rates could have been higher or lower. Therefore, when smoking rates are declining, the SAM approach may underestimate the number of deaths caused by smoking. Conversely, when rates are increasing, the SAM approach may overestimate smoking attributable deaths.

Smoking attributable mortality (SAM) rates were estimated by multiplying the smoking attributable fraction (SAF) for a range of smoking attributable diseases by mortality data for those diseases. Smoking attributable fractions (SAF) were calculated for 19 smoking-related diseases, identified by the U.S. Centers for Disease Control International Classification of Disease (ICD) list of smoking-related diseases, shown in Table 50 in the Appendices. These calculations multiplied tobacco use prevalence rates, obtained from the Canadian Community Health Survey[709] by relative risk (RR) ratios for current and former adult tobacco users, aged 35 years and older.

Relative risk ratios express the relative risk to the smoker of developing a specific disease compared with those who do not smoke. Age-adjusted RR ratios for adults aged 35 years and

survey in the first year with a total sample of 130,000 and a specific topic, provincial-level survey in the second year with a total sample of 30,000. The target population includes household residents in all provinces and territories, ages 12 and over, and excludes populations on Aboriginal Reserves, Canadian Forces Bases, and some remote areas.

[706] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

[707] Health Canada. *Website: Tobacco Use Statistics - Canadian Tobacco Use Monitoring Survey (CTUMS)*, 2007; accessed Dec 2007; available from http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/index_e.html.

[708] Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed. p. 44.

[709] Statistics Canada. *Canadian Community Health Survey (Cycle 3.1)*, CANSIM Table no. 105-0456, 105-0457, 105-0327, 2005; accessed June 2007; available from http://www.cansim2.statcan.ca/cgi-win/cnsmcgi.pgm.

older, which link tobacco use with various illnesses, were derived from epidemiological evidence from the second wave of the American Cancer Society's (ACS) Cancer Prevention Study (CPS II) six year follow-up.[710] This was a four-year study with 1.2 million participants. According to Colman and Rhymes:

> Although the data are American, there is a consensus among researchers that the Canadian and American populations are similar enough with respect to overall health, longevity, disease incidence, and socio-demographic variables that the American RR measures can reasonably be applied to Canada.[711]

Colman and Rhymes listed RR ratios for Nova Scotia only. Another study by Makomaski Illing and Kaiserman, "*Mortality Attributable to Tobacco Use in Canada and its Regions*," uses RRs from the same ACS–CPS II mentioned above*,* for ICD-9 codes, and is widely used to estimate mortality due to tobacco use in Canada.[712] Peter Tanuseputro et al. also used RR estimates from the ACS–CPS II to calculate SAM for all Canadian provinces.[713] As well, they calculated smoking attributable cardiovascular and all-cause mortality estimates for each health region in Canada. In 2006, using the new ICD-10 codes, Rehm et al. use smoking prevalence rates by age and sex from the 2003 CCHS to calculate RR ratios. They also calculate SAFs for various diseases for both mortality and morbidity by sex and age. These RR ratios and SAFs are listed in Tables 53 and 54 in the Appendices.

As noted, the SAFs are calculated by multiplying sex-specific tobacco use prevalence rates for smoking attributable diseases (from Statistics Canada's summary list of mortality causes) by RR ratios for current and former adult (aged 35 years and older) tobacco users.[714] SAFs for each disease and sex were derived using the following formula:

$SAF = [P_n + P_c\,(RR_c) + P_f\,(RR_f)] - 1$
$[P_n + P_c\,(RR_c) + P_f\,(RR_f)]$

Where:
P_n = Percentage of adult never-smokers in study group
P_c = Percentage of adult current smokers in study group

[710] Source: US CDC Relative Risk Data, CPS–II (82-88) Unpublished estimates provided by American Cancer Society (ACS). See Thun M., Day-Lally C., Myers D., et al. Trends in tobacco smoking and mortality from cigarette use in Cancer Prevention Studies I (1959 through 1965) and II (1982 through 1988). In Changes in cigarette-related disease risks and their implication for prevention and control. Smoking and Tobacco Control Monograph 8. Bethesda, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute 1997; 305–382. NIH Publication no. 97–1213 Cited in Colman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed.
[711] Ibid., accessed. p. 38.
[712] Makomaski Illing, and Kaiserman. "Mortality Attributable to Tobacco Use in Canada and Its Regions, 1998."
[713] Tanuseputro, Peter, Douglas G Manuel, Mark Leung, Kathy Nguyen, and Helen Johansen. "Risk Factors for Cardiovascular Disease in Canada," *Canadian Journal of Cardiology*, 2003, vol. 19, no. 11: 1249-1259.
[714] Statistics Canada. *Mortality, Summary List of Causes*, Table 84F0209XWE, Table 1-4 Deaths by selected grouped causes, sex and geography, Statistics Canada, 2003; accessed August 2007; available from http://www.statcan.ca/english/freepub/84F0209XIE. Cited inColman, and Rhymes. *The Cost of Tobacco Use in Nova Scotia*, accessed. Colman and Rhymes note that since mortality rates for chronic diseases tend not to fluctuate significantly on a year-to-year basis, it is reasonable to use this 2003 data source as a basis for current estimates.

P_f = Percentage of adult former smokers in study group
RR_c = Relative risk for adult current smokers relative to adult never-smokers
RR_f = Relative risk for adult former smokers relative to adult never-smokers

RRs for current and former smokers and SAF estimates by sex and age for disease categories from ICD-10 are provided in Table 53 in the Appendices.

5.1.2 Obesity

The World Health Organization (WHO) defines the state of being *overweight* among individuals between the ages of 18 and 64 years as having a body mass index (BMI) of 25.0–29.9 and *obesity* as having a BMI of 30.0 and up.[715] In Canada, obesity is often defined as having a BMI of 27 or greater,[716] although Health Canada uses a BMI of 30 to indicate obesity.[717] BMI is defined as weight in kilograms divided by the square of the height in metres (kg/m^2). Biological, behavioural, and environmental factors all interact to produce obesity. Behavioural factors include an increase in energy/caloric consumption and a lack of physical exercise, which often results in insulin resistence and is linked to type 2 diabetes. Obesity is a modifiable risk factor for type 2 diabetes, coronary artery diseases, osteoarthritis, gallbladder disease, hypertension, and some types of cancer such as endometrial and colon cancer.[718] The three largest contributors to health costs associated with obesity are from hypertension, type 2 diabetes, and coronary artery disease.[719]

Both a healthy diet and regular physical exercise can reduce obesity. However, obesity is not only a growing health problem, it is also an economic issue related to poverty and cannot be solely attributed to metabolic diseases or personal health and lifestyle choices.[720] Eric Finkelstein et al. remark that obesity may result from living in "an increasingly obesogenic environment," which is partly the result of technological change.[721] By "obesogenic environment," they are referring to the environment that promotes high-caloric and non-nutritious foods, especially in television advertisements, and the tendency of young people to sit in front of the computer, rather than participate in more physical activities. Matheson et al. note that "technological advancements that have enabled widespread availability of low-cost, energy-dense foods is a recipe for increasing girth," and that "socioeconomic disparities have an impact on diet

[715] World Health Organization, Cited in Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[716] Birmingham, C. Laird, Jennifer L. Muller, Anita Palepu, John J. Spinelli, and Aslam H. Anis. "The Cost of Obesity in Canada," *Canadian Medical Association Journal*, 1999, vol. 160, no. 4: 483-488.
[717] Health Canada. *Healthy Canadians. A Federal Report on Comparable Health Indicators 2006*, 2006; accessed Dec 2007; available from http://www.hc-sc.gc.ca/hcs-sss/alt_formats/hpb-dgps/pdf/pubs/2006-fed-comp-indicat/2006-fed-comp-indicat_e.pdf. pp. 37-38
[718] Luo, Wei, Howard Morrison, Margaret de Groh, Chris Waters, Marie DesMeules, Elaine Jones-McLean, Anne-Marie Ugnat, Sylvie Desjardins, Morgan Lim, and Yang Mao. "The Burden of Adult Obesity in Canada," *Chronic Diseases in Canada*, 2007, vol. 27, no. 4: 135-144.
[719] Birmingham, Muller, Palepu, Spinelli, and Anis. "The Cost of Obesity in Canada."
[720] Drewnowski. "The Links between Poverty and Obesity."
[721] Finkelstein, Eric A., Christopher J. Ruhm, and Katherine M. Kosa. "Economic Causes and Consequences of Obesity," *Annual Review of Public Health*, 2005, vol. 26: 239-257.

quality."[722] Christel LePetit and Jean-Marie Berthelot note environmental factors that may make the "choice" of a healthy diet difficult:

> The relationship between household income and obesity may result from the cost of food, as foods high in fat and sugar are often cheaper. Low-income families must balance grocery expenditures with those on other necessities such as housing and clothing. As well, food costs have been shown to be higher in low-income neighborhoods, and travelling to shop in areas where prices are lower may not be feasible.[723]

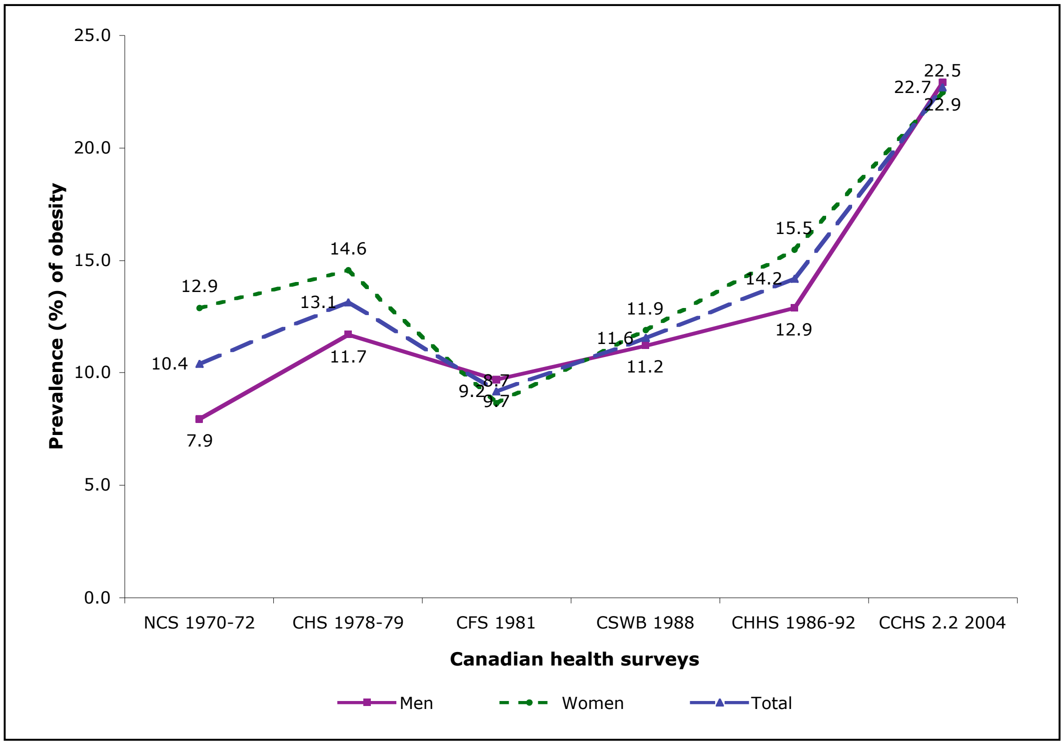
Obesity can be costly because it often results in chronic diseases that require frequent use of health care resources. Laird Birmingham et al. estimated the total 1997 direct cost of obesity in Canada to be more than $1.8 billion or 2.4% of the total health care expenditure. Peter Katzmarzyk and Ian Janssen estimated the total direct health care costs associated with obesity in Canada in 2004 to be more than $1.6 billion or 2.2% of the total health care expenditures for all diseases.[724] Colman estimated direct health care costs due to obesity attributable to Nova Scotia alone in 1997 to be between $68.2 million and $120 million, depending on which diseases and costs are included in the estimate.[725] And when indirect productivity losses of $140 million per year were added, it was possible to conclude that obesity in Nova Scotia cost more than $250 million per year.[726]

Prevalence in the general population

Obesity has increased in the population so much in the past two decades that it is now referred to as an "epidemic."[727] Luo et al. examined six Canadian health surveys between 1970 and 2004 that measured height and weight of the the survey respondents and found that obesity prevalence increased from 10% of the population in 1970 to 23% in 2004—in men from 8% to 23%, and in women from 13% to 22%.[728] The authors observed an increase in obesity rates for all age groups from aged 20 years and older. Age-standardized prevalence of obesity between 1970 to 2004 is shown in Figure 13 below.

[722] Matheson, Moineddin, and Glazier. "The Weight of Place: A Multilevel Analysis of Gender, Neighborhood Material Deprivation, and Body Mass Index among Canadian Adults." p. 676.
[723] LePetit, Christel, and Jean-Marie Berthelot. *Obesity: A Growing Issue*, Statistics Canada, Catalogue No. 82-618-MWE2005003, 2005; accessed Dec 2007; available from http://www.statcan.ca/english/research/82-618-MIE/2005003/pdf/82-618-MIE2005003.pdf. p. 5.
[724] Katzmarzyk, Peter T., and Ian Janssen. "The Economic Costs Associated with Physical Inactivity and Obesity in Canada: An Update," *Canadian Journal of Applied Physiology*, 2004, vol. 29, no. 1: 90-115.
[725] Colman. *Cost of Obesity in Nova Scotia*, accessed.
[726] Ibid., accessed.
[727] Luo, Morrison, Groh, Waters, DesMeules, Elaine Jones-McLean, Ugnat, Desjardins, Lim, and Mao. "The Burden of Adult Obesity in Canada."
[728] Ibid.

Figure 13. Age-standardized prevalence of obesity in Canada, aged 20 years and older, 1970 – 2004, (%)



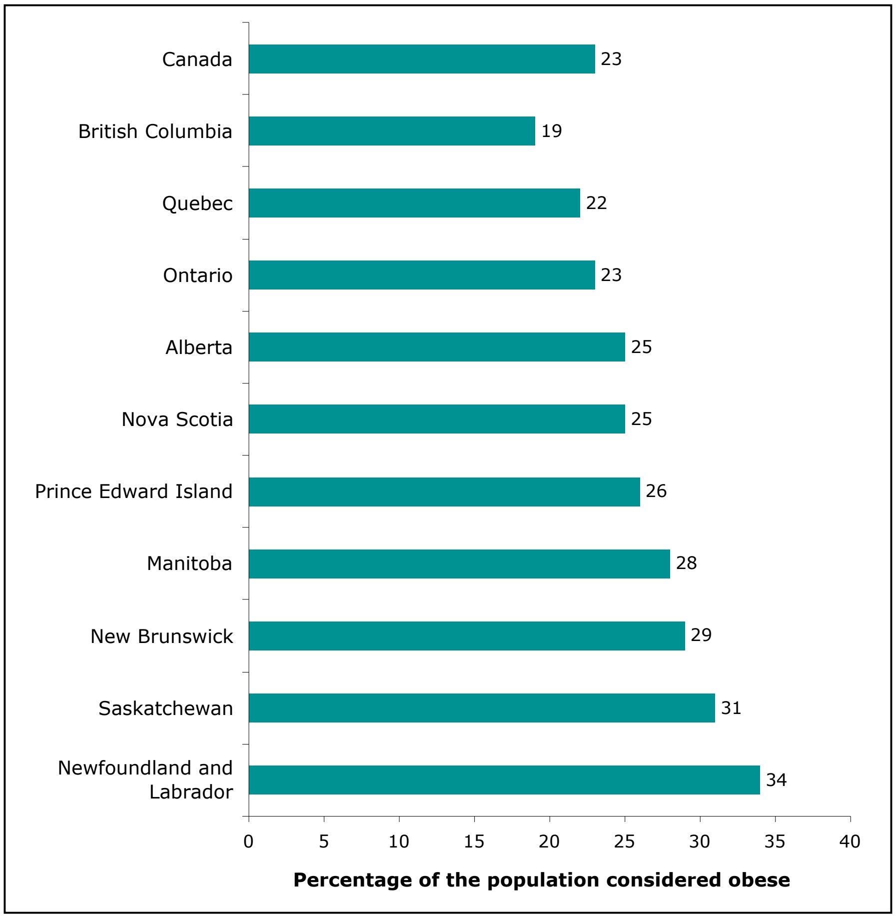
Notes: Obese = BMI ≥ 30.0, derived from the height and weight measured in the surveys.
NCS = National Canada Survey; CHS = Canada Health Survey; CFS = Canada Fitness Survey; CSWB = Campbell's Survey on Well-being in Canada; CHHS = Canadian Heart Health Surveys; and CCHS 2.2 = Cycle 2.2 of the Canadian Community Health Survey.

Source: Luo, Wei, Howard Morrison, Margaret de Groh, Chris Waters, Marie DesMeules, Elaine Jones-McLean, Anne-Marie Ugnat, Sylvie Desjardins, Morgan Lim, and Yang Mao. "The Burden of Adult Obesity in Canada," *Chronic Diseases in Canada*, 2007, vol. 27, no. 4: 135-144.

Figure 14 below uses data from the 2004 CCHS Cycle 2.2 to show obesity rates by province for respondents aged 18 years and older. In Canada overall, 23% are obese, while the lowest obesity rate is found in British Columbia (19%), and the highest rate is in Newfoundland and Labrador (34%).[729] The previous east–west divide, where eastern provinces had higher obesity rates that the western provinces, is no longer applicable here—Nova Scotia (25%) and Prince Edward Island (26%) have lower rates than Saskatchewan (31%), and Manitoba (28%).

[729] Shields, Margot, and Michael Tjepkema. "Regional Differences in Obesity, " *Health Reports*, Statistics Canada, Catalogue no. 82-003-XIE, 2006, vol. 17, no. 3: 61-70. accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-003-XIE/82-003-XIE2005003.pdf.

Figure 14. Obesity rates by province, excluding the territories, aged 18 years and over, Canada, 2004

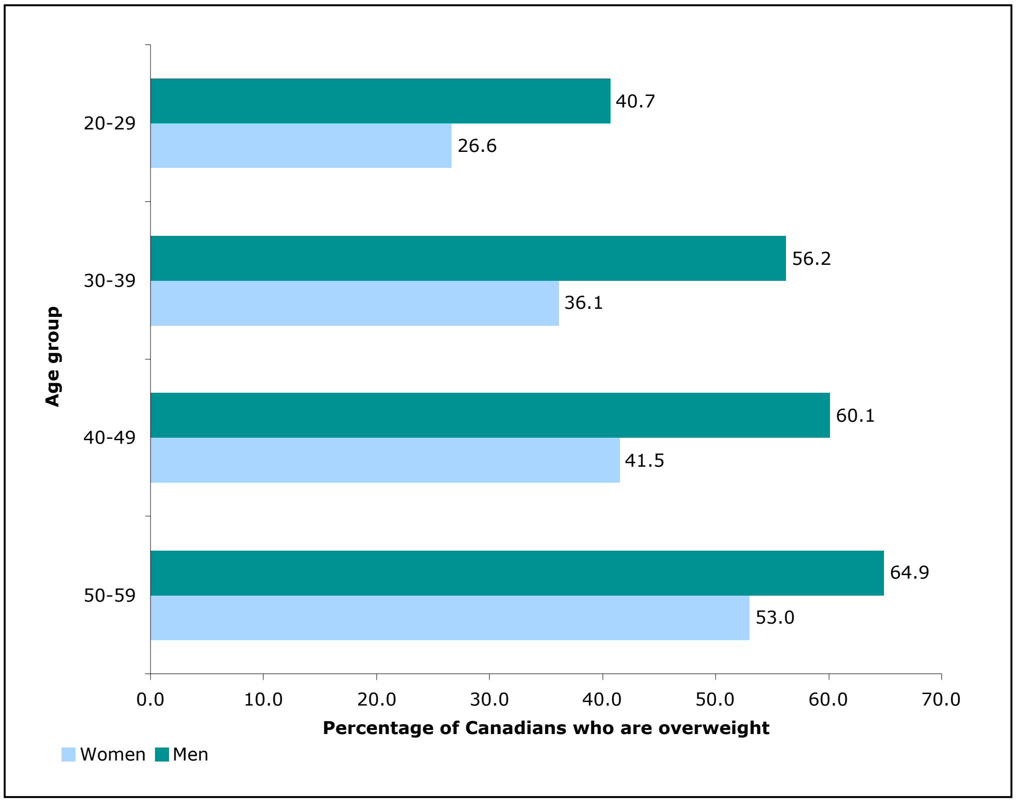


Source: Shields, Margot, and Michael Tjepkema. "Regional Differences in Obesity ," *Health Reports*, 2006, vol. 17, no. 3: 61-70. accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-003-XIE/82-003-XIE2005003.pdf.

The percentage who are considered overweight in the population increases with age. For example, as shown in Figure 15 below, in 2000 the percentage of women who were overweight doubled— 26.6% of women between the ages of 20–29 years were overweight compared to 53% of women between the ages of 50–59 years. Older men were 1.6 times more likely (64.9%) to be overweight than younger men were (40.7%).[730]

[730] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

Figure 15. Percentage of adults aged 20–59 years in the general population who were overweight by age group and gender, Canada, 2000



Note: Overweight = self-reported BMI ≥ 25.0

Source: Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

It is not clear which BMI levels are associated with health risks at younger ages. However, the International Obesity Task Force (IOTF) has created a new approach to measuring overweight and obesity among children and adolescents by extrapolating the adult BMI cut-points of 25 and 30 to create gender- and age-specific values.[731] In Canada, the 1998/1999 National Longitudinal Survey of Children and Youth (NLSCY) found that, of children aged 2 to 11 years, 37% were overweight and 18% were obese, which was an increase from the 1994/1995 findings of 34% of children being overweight and 16% being obese.[732] Using the 1978/1979 Canadian Health Survey and the 2004 CCHS for children aged 2 to 17 years (height and weight measured directly), Shields found lower prevalence rates—12% of the children were overweight and 3%

[731] Shields, Margot. "Overweight and Obesity among Children and Youth," *Health Reports*, Statistics Canada, Catalogue no. 82-003-XIE, 2006, vol. 17, no. 3: 27-42. accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-003-XIE/82-003-XIE2005003.pdf.

[732] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

obese in 1978/1979, rising to 18% being overweight and 8% obese in 2004.[733]

Prevalence in the low-income population

LePetit and Berthelot, writing for Statistics Canada, used the National Population Health Survey (NPHS), which is a longitudinal survey that interviewed the same individuals every two years from 1994/1995 to 2002/2003, to estimate obesity patterns in Canada. Table 20 below shows the results of adjusted risk ratios for overweight men and women aged 20 to 56 years becoming obese by income quintiles. However, the income quintiles they used are not standard, and in particular, the income in the highest quintile is quite low ($40,414 and above).

Household income quintiles, adjusted for household size (household income divided by the square root of household size) were as follows:

Quintile	**Household income**
Lowest	Less than $12,500
Middle-low	$12,500 to $20,207
Middle	$20,208 to $27,500
Middle-high	$27,501 to $40,414
High	More than $40,414

Overweight individuals in low-income households were more than twice as likely to become obese than individuals in high-income households. Referring to the Table below, which uses the lowest income group as the reference group, the authors explain how to interpret the results:

If the adjusted risk ratio is less than 1, substract its value from 1 and multiply by 100%. This will give how much less likely is a person in that group is to become obese than a person in the reference group. For example, men in the middle-high income quintile were (1 - 0.60)*100% = 40% less likely to become obese than men in the lowest income quintile.[734]

Matheson et al. combined data from the 2000/2001 and 2003/2004 CCHSs Cycles 1.1 and 2.1 with 2001 census tract-level neighbourhood data.735 They found that for women a higher BMI was associated with living in a neighbourhood with high material deprivation than one with less deprivation—women living in deprived neighbourhoods had a BMI 1.8 points higher than women living in the most affluent neighbourhoods. However, for men the reverse was true—men living in the most affluent neighbourhoods had higher BMI relative to men living in deprived neighbourhoods.

[733] Shields. "Overweight and Obesity among Children and Youth."
[734] LePetit, and Berthelot. *Obesity: A Growing Issue*, accessed. p. 4.
[735] Matheson, Moineddin, and Glazier. "The Weight of Place: A Multilevel Analysis of Gender, Neighborhood Material Deprivation, and Body Mass Index among Canadian Adults."

Table 20. Adjusted risk ratios for overweight men and women becoming obese by household income quintile, aged 20 – 56 years, Canada, excluding territories, 1994/95 to 2002/03

Household income quintile	Men		Women	
	Adjusted risk ratio	95% confidence interval	Adjusted risk ratio	95% confidence interval
Lowest	1.00	–	1.00	–
Low-middle	0.77	0.49-1.23	0.79	0.52-1.20
Middle	0.67	0.41-1.09	0.60	0.37-0.97
Middle-high	0.60	0.37-0.97	0.60	0.38-0.92
Highest	0.54	0.34-0.85	0.63	0.39-1.01

Note: 1994/95 to 2002/03 National Population Health Survey, longitudinal file; lowest household quintile is the reference group.

Source. Adapted from LePetit, Christel, and Jean-Marie Berthelot. *Obesity: A Growing Issue*, Statistics Canada, Catalogue No. 82-618-MWE2005003, 2005; accessed Dec 2007; available from http://www.statcan.ca/english/research/82-618-MIE/2005003/pdf/82-618-MIE2005003.pdf.

Relative Risks and Population Attributable Fractions

A 2007 study by Luo et al. in *Chronic Diseases in Canada* reports relative risks (RR) and population attributable fractions (PAF) for nine chronic diseases and mortality associated with obesity in Canada.[736] Obese individuals are 2.2 to 5.7 times more likely to become hypertensive than non-obese individuals; RRs for type 2 diabetes can vary dramatically from 1.4 to 47.1; and RR for coronary heart disease ranges from 1.3 to 3.6.[737]

To calculate PAFs, Luo et al. used chronic disease RR estimates from a meta-analysis by Katzmarzyk and Janssen.[738] RRs for risk of death due to obesity came from a study by Flegal et al., and are based on the follow-up of the U.S. National Health and Nutrition Examination Survey I, II, and III cohorts adjusted for confounding factors (e.g., gender, race, smoking status).[739] The Canadian Mortality Database was used to calculate the number of deaths for three age groups—25–59, 60–69, and 70+—in 2002 (the latest data available at the time),[740] and the

[736] Luo, Morrison, Groh, Waters, DesMeules, Elaine Jones-McLean, Ugnat, Desjardins, Lim, and Mao. "The Burden of Adult Obesity in Canada."
[737] Ibid.
[738738]Katzmarzyk, and Janssen. "The Economic Costs Associated with Physical Inactivity and Obesity in Canada: An Update." Cited in Luo, Morrison, Groh, Waters, DesMeules, Elaine Jones-McLean, Ugnat, Desjardins, Lim, and Mao. "The Burden of Adult Obesity in Canada." See also Katzmarzyk, Peter T., and Christopher I. Ardern. "Overweight and Obesity Mortality Trends in Canada," *Canadian Journal of Public Health*, 2004, vol. 95, no. 1: 16-20.
[739] Flegal, K.M., B.I. Graubard, D.F. Williamson, and M.H. Gail. "Excess Deaths Associated with Underweight, Overweight, and Obesity," *JAMA*, 2005, vol. 293, no. 5: 1861-1867. Cited in Luo, Morrison, Groh, Waters, DesMeules, Elaine Jones-McLean, Ugnat, Desjardins, Lim, and Mao. "The Burden of Adult Obesity in Canada."
[740] The data are now available from CHMD through 2004. See *Canadian Human Mortality Database*. University of Montreal, 2007; accessed January 2008; available from http://www.bdlc.umontreal.ca/CHMD/index.htm. Also,

2002 mortality rate was applied to the 2004 Canadian population. Lower and upper ranges of the PAF for mortality were calculated using the lower and upper boundaries of 95% CI (confidence interval) of age-gender-specific prevalence of obesity in 2004.

The RR of the association between obesity and chronic disease for nine diseases as reported by Luo et al. are shown in Table 21 below. In 2004 overall, 45% of hypertension, 39% of type 2 diabetes, 35% of gallbladder disease, 23% of coronary artery disease, 19% of osteoarthritis, 11% of stroke, 10% of colon cancer, 22% of endometrial cancer, and 12% of postmenopausal breast cancer were attributable to obesity.

Table 21. Relative Risk (RR) of obesity and major chronic diseases and Population Attributable Fraction (PAF) (%) by gender, Canada, 2004

Disease	RR of obesity and chronic disease	Population Attributable Fraction (PAF) (%)		PAF increase (%) from 1970 to 2004	
		Men	Women	Men	Women
Hypertension	4.50	44.97	45.46	102.24	43.10
Type 2 diabetes	3.73	38.93	38.93	113.47	47.89
Gallbladder disease	3.30	35.24	35.68	120.33	50.83
Coronary artery disease	2.24	22.45	22.79	144.08	610.1
Osteoarthritis	1.99	18.79	19.08	150.92	63.95
Stroke	1.50	10.45	10.64	166.38	70.62
Colon cancer	1.45	9.51	9.68	168.14	71.38
Endometrial cancer	2.52	n/a	22.08	n/a	61.58
Breast cancer (postmenopause)	1.47	n/a	12.09	n/a	71.07

Source. Adapted from Luo, Wei, Howard Morrison, Margaret de Groh, Chris Waters, Marie DesMeules, Elaine Jones-McLean, Anne-Marie Ugnat, Sylvie Desjardins, Morgan Lim, and Yang Mao. "The Burden of Adult Obesity in Canada," *Chronic Diseases in Canada*, 2007, vol. 27, no. 4: 135-144.

Table 22 below shows the deaths in Canada attributable to obesity in 2004—approximately 8,400 deaths, with the 95% CI ranging from 6,900 – 9,900 deaths, which is about 4% of total deaths in 2004.[741]

mortality data through 2005 are available from Statistics Canada. See Statistics Canada. *Deaths 2005*, Catalogue no. 84F0211X, 2008; accessed January 2008; available from http://www.statcan.ca/english/freepub/84F0211XIE/84F0211XIE2005000.pdf.

[741] Luo, Morrison, Groh, Waters, DesMeules, Elaine Jones-McLean, Ugnat, Desjardins, Lim, and Mao. "The Burden of Adult Obesity in Canada."

Table 22. Deaths attributable to obesity, Canada, 2004 (95% confidence intervals)

Age in years	BMI (kg/m2) 30 to < 35	BMI (kg/m2) 35 or greater	BMI (kg/m2) 30 or greater
25 to 59			
prevalence %	15.7 (13.9-17.4)	8.9 (7.6-10.2)	–
RR*	1.2	1.83	–
PAF**	3.0 (2.7-3.4)	6.9 (5.9-7.8)	–
# deaths attributable	1,027 (914-1,139)	2,323 (2,008-2,634)	3,350 (2,922-3,773)
60 to 69			
prevalence %	19.7 (16.3-23.0)	8.3 (6.3-10.3)	–
RR*	1.13	1.63	–
PAF**	2.5 (2.1-2.9)	5.0 (3.8-6.1)	–
# deaths attributable	782 (651-912)	1,557 (1,190-1,914)	2,339 (1,841-2,826)
70 or older			
prevalence %	18.2 (15.6-20.7)	6.5 (4.8-8.3)	–
RR*	1.03	1.17	–
PAF**	0.54 (0.47-0.62)	1.1 (0.8-1.4)	–
# deaths attributable	900 (775-1,026)	1,825 (1,343-2,302)	2,725 (2,118-3,328)
Total # deaths attributable	**2,709 (2,340-3,077)**	**5,705 (4,541-6,850)**	**8,414 (6,881-9,927)**

Notes: * RR = relative risk obtained from Flegal et al. **PAF = population attributable fraction,
– blank cell in source.

Source. Luo, Wei, Howard Morrison, Margaret de Groh, Chris Waters, Marie DesMeules, Elaine Jones-McLean, Anne-Marie Ugnat, Sylvie Desjardins, Morgan Lim, and Yang Mao. "The Burden of Adult Obesity in Canada," *Chronic Diseases in Canada*, 2007, vol. 27, no. 4: 135-144.

5.1.3 Alcohol and illicit drug use and misuse

In 2006, the Canadian Centre on Substance Abuse (CCSA), in collaboration with over ten organizations including federal, provincial, and territorial agencies and Health Canada, produced a major report on the costs of tobacco, alcohol, and illegal drug use in Canada in 2002.[742] The report, which was authored by Rehm et al., provides the most comprehensive and up-to-date information on this subject available in Canada. The study, which took three years to complete and cost approximately $500,000, began in 2003 and used 2002 data because of the time required to compile the information and complete the analysis. The study builds on an earlier 1996 CCSA study by Single et al., but according to Rehm et al. the two cost estimates are not strictly comparable because of the different methodologies used.[743] However, the underlying epidemiological figures show that, when adjusted for increases in population, alcohol and illegal drug use have increased (while tobacco use, the other substance studied, has decreased).

The authors note that they decided to use the terms "use and misuse," rather than "abuse," because these terms:

> cover costs attributable to all consequences associated with the use of psychoactive substances, rather than just those costs associated with physical dependence or heavy use, or with substance-use disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders.[744]

Rehm et al. used prevalence data on levels of alcohol consumption from the 2003/2004 Canadian Addiction Survey (CAS). The CAS was conducted by the Canadian Centre on Substance Abuse (CCSA) in collaboration with Health Canada and the Canadian Executive Council on Addictions. In the survey, alcohol consumption levels were based on four drinking categories based on the average volume of alcohol consumed. Data on the prevalence of illegal drug use came from a variety of Canadian federal and provincial institutions. The authors note that "[m]ost of the disease conditions included under illegal drugs were 100% attributable fractions by definition, so no information about exposure is necessary."[745] These are diseases that would not exist without the substance so there is no need to calculate the proportion of the disease related to the substance. The authors also note that where required, "prevalence information on number of injection drug users (estimated as 83,800 in Canada 2003) was taken from Popova (2006)."[746]

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[742] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

[743] Single, Eric, Linda Robson, Xiaodi Xie, and Jurgen Rehm. *The Costs of Substance Abuse in Canada. Highlights*, Ottawa: Canadian Centre on Substance Abuse, 1996; accessed Feb 2008; available from http://www.ccsa.ca/NR/rdonlyres/A6B92C8C-4EFB-42DD-8AE2-566B602C2B61/0/ccsa0062771996.pdf.

[744] Rehm, Jurgen, William Gnam, Svetlana Popova, Dolly Baliunas, Serge Brochu, Benedikt Fischer, Jayadeep Patra, Anna Sarnocinska-Hart, and Benjamin Taylor. "The Costs of Alcohol, Illegal Drugs, and Tobacco in Canada, 2002," *Journal of Studies on Alcohol and Drugs*, 2007, vol. 68, no. 6: 886-895. p. 887.

[745] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed. p. 19.

[746] Ibid., accessed. citing Popova, S., J. Rehm, and B. Fischer. "An Overview of Illegal Opioid Use and Health Services Utilization in Canada," *Public Health*, 2006, vol. 120, no. 4: 320-328.
Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance*

Data used by Rehm et al. for acute care hospital diagnosis and hospital days attributable to illegal drug use came from the Hospital Morbidity Database from the Canadian Institute for Health Information (CIHI). Psychiatric hospitalizations and days were obtained from CIHI's Hospital Mental Health Database. Specialized inpatient and outpatient admissions and days of treatment for illegal drug dependency were obtained from provincial ministerial officials and drug addiction program coordinators.

The 2003/2004 CAS provides guidelines for low-risk drinking: **"**weekly alcohol intake should not exceed 14 standard drinks for males and 9 drinks for females, and daily consumption should not exceed 2 drinks, among males or females."[747] The CAS defines heavy drinking as "having five drinks or more at a sitting for men, and four or more drinks at a sitting for women."[748] Other drinking volume categories are listed in Table 24 below.

When 2002 data are examined, the main impacts of alcohol include cirrhosis of the liver—the leading cause of death (1,246 deaths) due to alcohol consumption, vehicle collisions (909 deaths), and alcohol-attributed suicides (603 deaths). Individuals who consume an average volume of alcohol, face increased risks for the following chronic diseases: mouth and oropharyngeal cancer; oesophageal cancer; liver cancer; breast cancer; unipolar major depression; epilepsy; alcohol use disorders; hypertensive disease; and hemorrhagic stroke. In addition to the average amount of alcohol consumed, drinking patterns also contributed to coronary heart disease and injury.

The report also discusses the benefits that moderate alcohol consumption can have on health—particularly among older people—as protection against heart disease, diabetes, and cholethiasis (gall stones). The total net deaths attributed to alcohol are then calculated by subtracting the number of deaths *prevented* by low alcohol use from the number of deaths *caused* by alcohol.

Illegal drugs include cannabis, cocaine and crack, and opioids such as heroin and other injection drugs. The authors note that it was not possible to estimate costs associated with the abuse and misuse of pharmaceuticals. The main causes of death linked to illegal drug use in 2002 were overdose (958 deaths, 56.5% of illegal drug deaths), drug-attributable suicide (295 deaths, 17.4%), drug-attributable hepatitis C infection (165 deaths, 9.7%), and HIV infection (87 deaths, 5.1%). About 63% of all illegal drug-attributable diagnoses in acute care hospitals were due to mental and behavioural disorders due to psychoactive substance use.

Death, or mortality—indicated by the number of deaths and potential years of life lost—and illness, or morbidity— indicated by the number of acute care hospital days—attributed to alcohol and illegal drug use are shown in Table 23 below.

Abuse in Canada, 2002, accessed.

[747] Adlaf, E.M., P. Begin, and E. Sawka, eds. *Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report*. Ottawa, Canadian Centre on Substance Abuse 2005. p. 20.

[748] Ibid.

Table 23. Death and illness attributed to alcohol and illegal drug abuse, Canada, 2002

All deaths	**223,603 (100%)**
Deaths attributable to:	
Alcohol (gross numbers-total deaths)	8,103 (3.6%)
Alcohol (net numbers-minus deaths prevented)	4,258 (1.9%)
Illegal drugs	1,695 (0.8%)
All potential years of life lost (PYLL)	**3,091,576 (100%)**
PYLL attributable to:	
Alcohol	191,136 (6.2%)
Illegal drugs	62,110 (2.0%
Acute care hospital days	**21,441,778 (100%)**
Hospital days attributable to:	
Alcohol	1,587,054 (7.4%)
Illegal drugs	352,121 (1.6%)

Note: Gross numbers of deaths attributable to alcohol include all deaths caused by alcohol. Net numbers of deaths for alcohol take into account the health benefits of moderate alcohol consumption and is the result of subtracting the number of deaths prevented by alcohol (3,845 deaths) from the gross number of deaths attributable to alcohol. Net numbers were used to calculate PYLL and hospital days. PYLL = potential years of life lost.

Source: Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

Prevalence of alcohol and illegal drug abuse in the general population

The Canadian Addiction Survey (CAS) found a "significant increase" in the prevalence of alcohol and illicit drug use in Canada between 1994 and 2004.[749] Rates of alcohol consumption increased from 72% of the population in 1994 to 79% in 2004, and high-risk drinking increased from approximately 10% in 1994 to 14% in 2004. Rates of cocaine use increased from less than 1% of the population to almost 2%, and rates of LSD/speed/heroine use increases slightly from 1.1% to 1.3% in the same 10-year period.

Alcohol use

Table 24 below shows the prevalence of alcohol consumption in Canada based on the 2003/2004 CAS and weighted to correspond to the age and gender distribution of the Canadian population. The drinking categories presented are the ones most commonly used in alcohol studies. The Table shows that men generally consume more alcohol than women and that alcohol

[749] Canadian Centre on Substance Abuse (CCSA). *National Framework for Action to Reduce the Harms Associated with Alcohol and Other Drugs and Substances in Canada: First Edition. Answering the Call*, Health Canada and CCSA, 2005; accessed Feb 2008; available from http://www.nationalframework-cadrenational.ca/uploads/files/HOME/NatFRA1steditionEN.pdf.

consumption generally decreases with age.

Table 24. Prevalence of alcohol consumption, by age, gender and drinking category, Canada, 2003/2004

Drinking categories	Overall (all ages)	15–29 years	30–44 years	45–59 years	60–69 years	70–79 years	80+ years
Abstention or very light drinking							
Female	66.9	59.0	62.1	65.3	68.4	70.5	72.6
Male	40.4	30.2	35.1	40.0	45.0	48.3	51.5
Drinking category I							
Female	24.9	34.8	31.0	27.1	23.2	20.7	18.1
Male	46.8	51.6	48.6	45.5	42.4	40.4	38.3
Drinking category II							
Female	6.3	3.2	4.3	5.5	6.6	7.4	8.2
Male	6.5	8.7	8.2	7.6	7.1	6.7	6.4
Drinking category III							
Female	1.9	3.0	2.6	2.2	1.8	1.5	1.1
Male	6.3	9.4	8.1	6.8	5.5	4.6	3.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Drinking categories	Females	Males
Abstainer or very light drinker	0–<0.25 g/day	0–<0.25 g/day
Drinking category I–low	0.25–<20 g/day	0.25–<40 g/day
Drinking category II–hazardous	20–<40 g/day	40–<60 g/day
Drinking category III–harmful	40+ g/day	60+ g/day

Source: Rehm, Jürgen, Jayadeep Patra, and Svetlana Popova. "Alcohol-Attributable Mortality and Potential Years of Life Lost in Canada 2001: Implications for Prevention and Policy," *Addiction*, 2007, vol. 101, no. 3: 373-384. Table APP-1.

Illicit drug use

The use of illicit drugs is difficult to capture in population surveys because people are not always willing to admit to illegal activity. As well, much of illicit drug use is not captured since surveys do not include the most prevalent users or those most likely to be engaged in injecting illicit drugs such as street youth, the homeless, the incarcerated population, and Aboriginal populations living on reserves.[750]

Rehm et al. report that, in general, illicit drug use affected males and females almost equally in terms of morbidity, although illegal drug-attributable suicide and opioid and cocaine poisoning were higher in females than in males.[751] The average age for illegal drug-attributable hospital

[750] Ibid., accessed.
[751] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of*

diagnoses was 38.3 years for males and 39.8 years for females. Sixty-eight percent of hospital diagnoses were for people between the ages of 15 and 44 years of age. In 2002, there were estimated to be 1,695 illegal drug-attributable deaths, which constituted 0.8% of all deaths in Canada.

Using data from the 2002 Canadian Community Health Survey (CCHS): Mental Health and Well-being (CCHS) cycle 1.2, Michael Tjepkema of Statistics Canada estimated that about 13% of the population aged 15 years and over, or 3.1 million people, had used illicit drugs in the past year.[752] Cannabis was the most frequently reported drug with 10% of the population stating they had used it in the past year. The CCHS measured six symptoms of dependence in those who reported using illicit drugs at least once a month, and respondents were considered to be dependent if they reported three or more symptoms. It was estimated that 0.8% of the population (aged 15 years or older), or 194,000 people could be considered dependent on illegal drugs.

Using key-informant survey data, Popova, Rehm, and Fischer estimated that in 2003 between 80,000 and 125,000 people were “injection drug users” (IDUs) in Canada, and between 60,000 and 90,000 individuals used opioids regularly.[753] Heroin was the most frequently used opioid. In 2002 there were 958 overdose deaths. The authors note that, although the illegal drug use is relatively low, the burden to society in the form of health and social harms is high. The authors also found that the rate of HIV infection in injection drug users ranges from 20% to 35%, rates of hepatitis B infection range from 25% to 35%, and rates of hepatitis C infection varies widely from 16% to 88%.

Benedikt Fischer et al. note that “the majority of injection drug users (IDUs) appear to be infected with HCV [hepatitis C virus], and the majority of new HCV infections [— from one half to two thirds—] can be attributed to injection drug use.”[754] They estimate that 0.8%–1.0% of the total Canadian population or 250,000–315,000 persons were infected with HCV in 2003 and the number is increasing by approximately 4,000 new cases per year.

The Canadian Communicable Disease Report estimates that in 2002, approximately 56,000 people in Canada were living with HIV infection (including AIDS), of which 11,000 or 20% of the total were injection drug users.[755]

Using CCHS data, Table 25 below shows the estimated number of illicit drug users “in the past 12 months” for the population aged 15 years and older in 2002, as well as the prevalence of illicit drug dependence.

Substance Abuse in Canada, 2002, accessed.

752 Tjepkema, Michael. "Alcohol and Illicit Drug Dependence," *Health Reports*, Statistics Canada, 2004, vol. 15-Supplement: 9-19.

753 Popova, S., J. Rehm, and B. Fischer. "An Overview of Illegal Opioid Use and Health Services Utilization in Canada," *Public Health*, 2006, vol. 120: 320-328.

754 Fischer, Benedikt, Emma Haydon, Jurgen Rehm, Mel Krajden, and Jens Reimer. "Injection Drug Use and the Hepatitis C Virus: Considerations for a Targeted Treatment Approach—the Case Study of Canada," *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 2004, vol. 81, no. 3: 428-447. p. 428.

755 Geduld, J., M. Gatali, R.S. Remis, and C.P. Archibald. "Estimates of HIV Prevalence and Incidence in Canada, 2002," *Canadian Communicable Disease Report*, Public Health Agency of Canada, 2003, vol. 29: 197-208. accessed February 2008; available from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/03vol29/dr2923ea.html.

Table 25. Illicit drug use and prevalence of dependence, by gender, aged 15 years and older, Canada, 2002

	Both sexes		Males		Females	
	Estimated number-'000	%	Estimated number-'000	%	Estimated number-'000	%
Illicit drug use						
Any illicit drug	3,135	12.6	1,947	15.9	1,188	9.4
Cannabis only	2,538	10.2	1,551	12.7	988	7.8
At least one other drug*	593	2.4	393	3.2	199	1.6
Illicit drug dependence	194	0.8	135	1.1	59	0.5

Note: *other drugs include cocaine, speed, ecstacy, hallucinogens, heroin, and solvents.

Source: Adapted from Tjepkema, Michael. "Alcohol and Illicit Drug Dependence," *Health Reports*, Statistics Canada, 2004, vol. 15-Supplement: 9-19. Original source: 2002 Canadian Community Health Survey.

Association between poverty and alcohol / illicit drug use

Studies reporting associations between poverty or lower socioeconomic status and levels of alcohol and illicit drug use have been mixed. British researchers Martin Frisher et al., who reviewed the literature on predictive factors for illicit drug use among young people, report that some studies have found an association, while other studies have not.[756] However, they also note that lifetime rates of drug dependence do not vary significantly by socioeconomic group.

The Victorian Alcohol and Drug Association in Australia reviewed the literature exploring the link between poverty and levels of alcohol and illicit drug use and, although it found a strong association, it noted that, "research studies have not been able to establish conclusively whether there is a causal link between alcohol and drug use and poverty."[757] However, researchers have been able to establish an association between poverty and alcohol and illicit drug use through barriers and difficulties that users face—alcohol and drug abusers tend to experience barriers and difficulties in the areas of employment, health, housing, legal and financial security (i.e., due to high rates of incarceration). However, a causal link has yet to be established.

Kathleen Kost and Nancy Smyth examined the literature regarding the association between

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[756] Frisher, Martin, Ilana Crome, John Macleod, Roger Bloor, and Matthew Hickman. *Predictive Factors for Illicit Drug Use among Young People: A Literature Review*, U.K. Home Office Online Report 05/07, 2007; accessed Feb 2008; available from http://www.homeoffice.gov.uk/rds/pdfs07/rdsolr0507.pdf.

[757] Victorian Alcohol and Drug Association (VAADA). *The Links between Alcohol and Drug Use and Poverty: Vaada's Submission to the Senate Inquiry into Poverty*, Victoria, Australia, 2003; accessed Feb 2008; available from http://www.vaada.org.au/resources/items/2005/08/16142-upload-00001.pdf.

substance abuse and poverty and found that poverty is a clear risk factor for adolescent substance abuse, but that "there is little research documenting the relationship beyond adolescence."[758] They also looked at 11 years of data from the National Longitudinal Survey of Youth in the U.S. and found that children who had a long history (9 or more years) of living with an alcoholic relative and were poor for 6 or more years were at greater risk of having low income and problems with alcohol as adults than those who had a shorter family history of alcoholism and poverty.

For example, a 23 year old woman who had lived for six or more years in poverty and who lived with an alcoholic relative for 9 or more years had a 9% probability of having four or more alcohol problems, when given a list of potential alcohol-related problems, and an 88% probability of having low income. Men with the same history had a 3% probability of having four or more alcohol problems and a 72% probability of having low income. By contrast, a 23 year old woman with no history of either living with an alcoholic relative or of living in poverty had a 3% chance of having four or more alcohol problems and a 27% chance of having low income. Men with no history of either had a 7% change of having four or more alcohol problems and an 11% chance of having low income. The authors note that the number of years living in poverty influenced poor outcomes more than income measured for a single year, and that "only when family poverty has been long lasting does it appear to increase the likelihood of alcohol problems."[759]

One mitigating factor for alcohol problems was neighbourhood social cohesion. For example, Kost and Smyth note that other researchers have found:

> [I]f a poor neighborhood has well-functioning families, the collective socialization of parents and their children worked in a positive direction. However, when a well-functioning family lived in a poor neighborhood where families could be characterized as dysfunctional, i.e., with a high prevalence of criminal activity and male joblessness, the influence may be negative.[760]

Russell Wilkins et al. found a clear association between males who have cirrhosis of the liver, which is clearly associated with alcohol abuse, and income.[761] In 1996, 16.7% of males in the lowest income category had cirrhosis of the liver compared with 6.7% of males in the highest income category.[762] The relative risk ratio was 2.5. Income did not seem to play a role in the case of women.

[758] Kost, Kathleen A., and Nancy J. Smyth. "Two Strikes against Them? Exploring the Influence of a History of Poverty and Growing up in an Alcoholic Family on Alcohol Problems and Income," *Journal of Social Science Research*, 2002, vol. 28, no. 4: 23-52. p. 24.
[759] Ibid. p. 45.
[760] Ibid.
[761] Wilkins, Russell, Jean-Marie Berthelot, and Edward Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.
[762] Wilkins et al. use the standard quintile definition, i.e., each quintile represents a fifth of the population ranked by neighbourhood income. The lowest quintile has the highest percentage of people living below the LICO, and the highest quintile has the lowest percentage below the LICO. The report does not give the exact incomes used in each quintile.

David Hawkins et al. note that a relatively small proportion of adolescents who use alcohol or drugs are frequent or problem users.[763] However, they also remark that, "the abuse of alcohol and other drugs during adolescence and early adulthood remains a serious public health problem."[764] The authors discuss 17 risk factors for substance abuse among adolescents, four of which are societal and cultural and 13 of which are individual or within interpersonal environments, such as living with an alcoholic relative. Extreme economic deprivation is one of the four societal (or contextual) risk factors for alcoholism and illegal drug use among adults, particularly if they had exihibited highly antisocial behaviour as children. Summarizing their review of the literature, the Hawkins et al. note:

> In summary, whereas there appears to be a negative relationship between socioeconomic status and delinquency, a similar relationship has not been found for the use of drugs by adolescents. Only when poverty is extreme and occurs in conjunction with childhood behaviour problems has it been shown to increase risk for later alcoholism and drug problems.[765]

As noted, the 2003/2004 CAS provides guidelines for low-risk drinking: "weekly alcohol intake should not exceed 14 standard drinks for males and 9 drinks for females, and daily consumption should not exceed 2 drinks, among males or females."[766] It reports that 22.6% of past-year drinkers exceeded the low-risk drinking guidelines during the course of the year, and that exceeding low-risk guidelines is higher among persons with the highest income adequacy.

Heavy drinking has been associated with an increased risk of alcohol-related problems. The CAS defines heavy drinking as "having five drinks or more at a sitting for men, and four or more drinks at a sitting for women."[767] Heavy drinking and drinking in excess is more common among 18 to 24 year olds than it is among older persons, and is higher among males than females. The CAS found that 16% of respondents said they engaged in heavy drinking as part of their usual pattern, 6.2% said they drank heavily at least once a week, and 25.5% said they drank heavily at least once a month.

The CAS did not find heavy drinking to be significantly correlated with income adequacy. However, 18.2% of those with the lowest income adequacy were heavy drinkers, compared with 16.8% in the middle level and 16.1% in the highest level. Among respondents with low income, 8.7% reported weekly heavy drinking and 26.6% reported monthly heavy drinking, compared to 6.7% and 25.5% respectively among those with the highest incomes. Table 26 below shows heavy drinking patterns by income adequacy.

[763] Hawkins, J. David, Richard F. Catalano, and Janet Y. Miller. "Risk and Protective Factors for Alcohol and Other Drug Problems in Adolescence and Early Adulthood: Implications for Substance Abuse Prevention," *Psychological Bulletin*, 1992, vol. 112, no. 1: 64-105.
[764] Ibid. p. 64.
[765] Ibid. p. 81.
[766] Adlaf, E.M., P. Begin, and E. Sawka, eds. *Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report*. Ottawa, Canadian Centre on Substance Abuse 2005. p. 20.
[767] Ibid.

Table 26. Heavy drinking patterns by income adequacy, aged 15 years and over, Canada, 2004

Income adequacy	Heavy drinkers*	Weekly heavy drinking		Monthly heavy drinking	
	% & CI	% & CI	OR	% & CI	OR
Lowest	18.2 [14.7–22.4]	8.7 [6.1–10.7]	–	26.6 [22.1–31.7]	–
Middle	16.8 [14.9–18.9]	6.0 [4.9–7.5]	0.794	26.4 [24.1–28.9]	1.190
Highest	16.1 [13.8–18.7]	6.7 [5.1–8.7]	1.040	25.5 [22.7–28.5]	1.219
Not stated	14.0 [11.8–16.4]	5.2 [4.0–6.8]	0.737	23.7 [20.9–26.8]	1.095

Note: *Heavy drinkers are defined as those who drink five or more drinks on a typical day; 95% confidence interval [CI] is in brackets. OR = adjusted Odds Ratio. OR was adjusted for gender, age, marital status, education, and rural/nonrural household location. Lowest income is used as the comparison group for ORs. “Not stated” refers to not stating or not knowing one’s income.

The 2003/2004 Canadian Addiction Survey divides income adequacy into terciles: lowest–<$20,000 for households with 1–4 people or <$30,000 with 5+ people; middle–<$60,000 with 1–2 people and <$80,000 with 3+ people; and highest–$60,000+ with 1–2 people and $80,000+ with 3+ people.

Source: Adapted from Adlaf, E.M., P. Begin, and E. Sawka, eds. Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report. Ottawa, Canadian Centre on Substance Abuse, 2005.

Illicit drugs included in the CAS are cannabis, heroin and other opiates, cocaine and crack, amphetamines, and hallucinogens. Cannabis use was actually highest in the highest income category. In 2004 the CAS found that lifetime experiences with cannabis increased with income adequacy from 42.9% of those with a low income, 44.6% for those with middle incomes, and 54.8% of those with high incomes.[768]

Excluding cannabis, 16.5% of respondents reported use of illicit drugs during their lifetime, but only 3% reported use of illicit drugs during the past 12 months. However, among past-year users, 42.1% reported symptoms requiring intervention. Rates of drug use vary little by age group, with the exceptions of those aged 18-19 years who show elevated use (especially with “ecstacy”) and those aged 55 years and over who show declines in drug use

As shown in Table 27 below, when use is estimated by income adequacy, the percentage of respondents reporting use of any of the 5 illicit drugs (cocaine, amphetamines, ecstacy, hallucinogens, and heroin) is not consistent between lifetime and past-year use. Of those reporting lifetime use, the percentage of users in the lowest income category (17.9%) is less that the percentage of the highest income users (19.4%). However, among those who report past-year use, the percentage is higher among the lowest income users (4.5%) than among the highest income users (2.8%).

[768] Ibid.

Table 27. Lifetime and past-year use of 5 illicit drugs, by income adequacy, aged 15 years and older, Canada, 2004

Income adequacy	Lifetime use % reporting use		Past-year use % reporting use	
	% & CI	OR	% & CI	OR
Lowest	17.9 [14.8–21.6]	–	4.5 [3.0–6.7]	–
Middle	17.4 [15.7–19.2]	0.943	2.9 [2.2–3.8]	0.847
Highest	19.4 [17.1–22.0]	1.142	3.0 [2.1–4.2]	1.096
Not stated	11.8 [10.0–13.9]	0.761	2.8 [2.0–3.9]	0.772

Note: The 5 illicit drugs are cocaine, amphetamines, ecstacy, hallucinogens, and heroin. 95% confidence interval [CI] is in brackets. OR = adjusted Odds Ratio. OR was adjusted for gender, age, marital status, education, and rural / nonrural household location. Lowest income is used as the comparison group for ORs. "Not stated" refers to not stating or not knowing one's income; data from the 2003/2004 CAS.

Source: Adapted from Adlaf, E.M., P. Begin, and E. Sawka, eds. Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report. Ottawa, Canadian Centre on Substance Abuse, 2005.

The CAS asked respondents whether or not drug use had a harmful effect in areas of: friendships and social life; physical health; home life or marriage; work, studies or employment opportunities; financial position; legal problems; housing; and learning. One or more types of harm were reported by 45.7% of lifetime illicit drug users (excluding cannabis), 23.8% of lifetime illicit drug users (including cannabis), 36.7% of past-year illicit drug users (excluding cannabis), and 17.5% of past-year illicit drug users (including cannabis).

Table 28 below shows the percentages of those reporting one or more types of harm from illicit drug use, and odds ratios for lifetime harm, by income adequacy. Those in the lowest income group have significantly more harm associated with their drug use than those who are in the highest income group. In the lowest income group 18.9% of past-year users and 36.3% of lifetime users reported one or more harms, compared with 13.1% of past-year users and 17.8% of lifetime users in the highest income category.

Table 28. Percentage reporting one or more harms from one's own drug use: lifetime and past-year use, by income adequacy, aged 15 years and over, Canada, 2004

Income adequacy	Lifetime use % reporting harm		Past-year use % reporting harm
	% & CI	OR	% & CI
Lowest	36.3 [30.0–43.0]	–	18.9 [12.2–28.1]
Middle	25.0 [22.1–28.1]	0.682	17.7 [13.5–22.8]
Highest	17.0 [14.9–21.1]	0.494	13.1 [8.9–18.7]
Not stated	24.9 [20.8–29.5]	0.613	22.0 [16.3–29.0]

Notes: The areas of harm include: friendships and social life; physical health; home life or marriage; work, studies or employment opportunities; financial position; legal problems; housing; and learning. 95% confidence interval [CI] is in brackets. OR = adjusted Odds Ratio. OR was adjusted for gender, age, marital status, education, and rural/nonrural household location. Lowest income is used as the comparison group for ORs. ORs were not given for past-year use. "Not stated" refers to not stating or not knowing one's income.

Source: Adapted from Adlaf, E.M., P. Begin, and E. Sawka, eds. Canadian Addiction Survey (CAS): A National Survey of Canadians' Use of Alcohol and Other Drugs: Prevalence of Use and Related Harms: Detailed Report. Ottawa, Canadian Centre on Substance Abuse, 2005.

Relative risk ratios and attributable fractions

Rehm et al. define attributable fraction (AF) as "the fraction of the disease in the population that would not have occurred if the effect associated with the substance under consideration were absent."[769] Relative risk ratios used to calculate the substance-attributable fractions came from the authors' review of the epidemiological literature. However, many the relative risk ratios are the same ratios used by Single et al. in their 1996 study.[770] Rehm et al. note that estimations of relative risks for chronic disease in the epidemiological literature do not take patterns of drinking into account and most of the same relative risks are used for all age groups, which leads to an overestimation of the impacts of alcohol in older age groups. Rehm et al. combine the relative risk ratios with different levels of alcohol consumption for each gender and age group to obtain an AF for each.

After the AFs were calculated they were then applied to respective outcomes such as mortality and hospital days. Specifically, AFs attributable to substance use and misuse were assessed for alcohol and illegal drugs for more than 80 disease categories, deaths, potential years of life lost, hospitalizations, and crimes and charges in the criminal justice system. An AF of 100% was attributed to disease conditions that would not exist without the existence of the substance, such as alcohol dependence, fetal alcohol syndrome, or drug intoxication. The same approach was taken with assigning an AF for the disease conditions caused by illegal drugs.

Located in the Appendices, Table 52 shows the relative risks used to estimate alcohol-

[769] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed. p. 19.
[770] Single, Robson, Xie, and Rehm. *The Costs of Substance Abuse in Canada. Highlights*, accessed.

attributable fractions (AAF) for morbidity and mortality, the AAFs for mortality, and the AAFs for morbidity for the 15–29 and 30–44 age groups. Also in the Appendices, Table 53 shows AAFs for unintentional and intentional injuries, and Table 54 shows the illicit drug-attributable fractions (DAF) for mortality or morbidity by disease category and gender for all ages. Many of the disease categories for illicit drug use have a DAF of 1.00 which indicates that 100% of the condition is attributable to illegal drugs.

Direct and indirect costs of alcohol and illegal drug use and misuse

The Rehm et al. study uses a cost-of-illness approach and calculates direct and indirect costs of substance use and misuse, including alcohol and illegal drug use (as well as tobacco use).[771] Rehm et al. present aggregate costs compared with a hypothetical situation where no substance use or misuse exists. As such, it provides a foundation for other types of studies, such as those measuring avoidable costs, and those assessing specific vulnerable populations such as those living in poverty. Costing data were mostly obtained from the Canadian Institute for Health Information (CIHI).

Direct costs include the burden on health care and law enforcement services, and other direct costs such as substance-related research and prevention, fire damage, vehicle collision damage, workplace employee assistance programs and drug testing, and administrative costs for transfer programs such as social welfare and workers' compensation. Health care costs were approximately 19.5% of total costs (direct and indirect costs combined) related to substance use and misuse, law enforcement costs were approximately 23.7% of the total, prevention and research programs accounted for 0.3%, other direct costs were 4.7% and indirect costs (due to productivity losses) amounted to nearly 52% of total costs.

Crimes and charges data were obtained from the Canadian Centre for Justice Statistics. The proportion of law enforcement services attributable to substance abuse were taken from surveys of the Canadian prison population, because law enforcement agencies do not keep records that differentiate police time spent on drug enforcement activities from other activities. Law enforcement costs associated with both alcohol and illegal drug abuse, include the costs of the court system, costs for policing, and costs associated with incarceration, and as previously noted amount to nearly 24% of the overall costs (direct and indirect costs combined). Crimes and charges that are attributable to alcohol are impaired driving, underage drinking, illegal production or importation of substances and other violations of provincial liquor regulations, and a percentage of violent crimes (e.g., homicide, assault, robbery, etc.). Traffic accidents attributable to alcohol intoxication were 24.4% of all traffic accidents in Canada for the year 2002. In 2002, of the total criminal offences, 30.4% were attributable to alcohol and 22.1% were attributable to illegal drugs. And of the total criminal charges, 25.4% were attributable to alcohol and 21.3% were attributable to illegal drugs.

Indirect costs include the loss of productivity in the workplace or at home from disability or premature death. For illness or injury, the average income levels of those with a substance abuse problem are compared to those without the problem and the difference is defined as a

[771] Rehm, Baliunas, Brochu, Fischer, W. Gnam, Patra, Popova, Sarnocinska-Hart, and Taylor. *The Costs of Substance Abuse in Canada, 2002*, accessed.

productivity cost. For premature mortality or permanent disability, "friction costs" are calculated, which are equivalent to the wages the person would have earned during the time it takes for a replacement to be found (approximately three months). Also, it is assumed that the new worker is no longer providing unpaid services, such as those for childcare or home maintenance, and that someone else would have to be paid to provide those services. The loss of the worker's unpaid services, therefore, becomes a cost to society and is counted in the indirect cost estimates. A 5% discount rate was used in the calculations. As previously stated, the costs of productivity losses accounted for nearly 52% of the total costs (direct and indirect costs combined).

Intangible costs of pain and suffering associated with substance abuse are not included, nor are private costs to individuals such as the cost of purchasing the substances. The lost productivity of people in prison who were convicted of a substance-related crime is also not included.

The direct and indirect costs of alcohol and illegal drugs in Canada for 2002 as presented by Rehm et al. are shown in Table 29 below. The total cost associated with alcohol and illegal drug abuse in 2002 was approximately $22.8 billion—alcohol abuse represents 64% of the total costs of substance abuse (not including tobacco) and 36.6% of the total costs of substance abuse when tobacco costs are included, and illegal drug abuse represented 36% of the total costs. The largest share of economic costs associated with alcohol abuse was from lost productivity (indirect cost) at$7.1 billion. Direct health care costs associated with alcohol abuse were $3.3 billion, and law enforcement costs were $3.1 billion.

The total cost associated with illegal drug abuse was approximately $8.2 billion, which represented 36% of the total costs of substance abuse (not including tobacco). The largest share of economic costs associated with illegal drug abuse was from lost productivity at $4.7 billion (indirect cost). Law enforcement costs were $2.3 billion, and more than $1.1 billion went toward direct health care costs. In 2002, the total per capita cost for substance abuse was estimated to be $463 for alcohol and $262 for illegal drugs.

Table 29. The direct and indirect costs of alcohol and illegal drug use and misuse in Canada, 2002

	Alcohol	Illegal drugs	TOTAL
	(in millions of dollars)		
1. Direct health care costs: total	**3,306.2**	**1,134.6**	**4,440.8**
Morbidity–acute care hospitalization	1,458.6	426.37	1,884.9
–psychiatric hospitalization	19.6	11.5	31.1
Inpatient specialized treatment	754.9	352.1	1,107.1
Outpatient specialized treatment	52.4	56.3	108.7
Ambulatory care: physician fees	80.2	22.6	102.8
Family physician visits	172.8	48.8	221.6
Prescription drugs	767.6	216.8	984.4
2. Direct law enforcement costs	**3,072.2**	**2,335.5**	**5,407.8**
Police	1,898.8	1,432.0	3,330.7
Courts	513.1	330.6	843.7
Corrections (including probation)	660.4	573.0	1,233.4
3. Direct costs for prevention and research	**53.0**	**16.5**	**69.5**
Research	17.3	8.6	25.9
Prevention programs	33.9	7.9	41.8
Salaries and operating funds	1.8	–	1.8
4. Other direct costs	**996.1**	**79.1**	**1,075.2**
Fire damage	156.5	–	156.5
Traffic accident damage	756.9	67.0	823.9
Losses associated with the workplace	17.0	6.6	23.6
EAP & health promotion programs	17.0	4.2	21.2
Drug testing in the workplace	–	2.4	2.4
Administrative costs for transfer programs	65.8	5.4	71.3
Social welfare and other programs	4.3	–	4.3
Workers' compensation	61.5	5.4	66.9
5. Indirect costs: productivity losses	**7,126.4**	**4,678.6**	**11,805.0**
Due to long-term disability	6,163.9	4,408.4	10,572.3
Due to short-term disability (days in bed)	15.9	21.8	37.7
Due to short-term disability (days with reduced activity)	23.6	-0.1	23.5
Due to premature mortality	923.0	248.5	1,171.5
Total	**14,554.0**	**8,244.3**	**22,798.3**
Total per capita (in $)	**463.0**	**262.0**	**725.0**
Total as % of all substance-related costs (alcohol, illegal drugs, and tobacco)	**36.6**	**20.7**	**57.3**

Note: EAP = Employee Assistance Programs. Categories in italics are sub-categories of immediate prior category; per capita refers to the total population in Canada in 2002.
Source: Adapted from Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

In 2006, Australian economists David Collins and Helen Lapsley, with other Canadian and international researchers working in the field of substance abuse, produced the Health Canada commissioned report *International Guidelines for the Estimation of the Avoidable Costs of Substance Abuse*.[772] Rather than focus on the aggregate social costs of substance abuse, the report concentrates on *avoidable* costs of substance abuse, which the authors note is a new area of research for which there is little published literature. Avoidable costs are those that are amenable to public policy initiatives and behavioural changes, and potentially provide benefits to the community as a whole through the prevention or reduction of substance abuse. The authors suggest that avoidable costs represent approximately 50% of aggregate costs, which include current costs that relate to drug abuse in the past and "costs incurred by the proportion of the population whose level of drug consumption will continue to involve costs."[773]

5.2 Physical health status

International studies as well as Canadian studies at the national, provincial and local levels have consistently found an inverse association between socioeconomic status and health outcomes. These studies have explored both individual differences in health status and socioeconomic differences and the effect of low-income neighbourhoods on health status. According to Colman:

> A detailed review of the burden of unnecessary illness by Emory University's Carter Center in the United States found socio-economic level to be a more consistent precursor of health problems than any other cause. Specifically, socio-economic level was identified as a precursor of cancer, cardiovascular diseases, arthritis and musculoskeletal disorders, diabetes mellitus, dental diseases, drug dependence and abuse, and infant mortality and morbidity.[774]

Sean Rogers and Ronald Colman used data from four Newfoundland health surveys (conducted between 1985 and 2001) and two GPI*Atlantic* Community surveys conducted in 2001 in Glace Bay and Kings County, Nova Scotia to examine the socioeconomic disparities in health in Atlantic Canada.[775] The study used a health concentration index methodology to make

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[772] Collins, David, Helen Lapsley, Serge Brochu, Brian Easton, Augusto Perez-Gomez, Jurgen Rehm, and Eric Single. *International Guidelines for the Estimation of the Avoidable Costs of Substance Abuse*, Health Canada, 2006; accessed Dec 2007; available from http://www.hc-sc.gc.ca/hl-vs/alt_formats/hecs-sesc/pdf/pubs/adp-apd/cost-cout-abus/costs-estimation-couts_e.pdf.

[773] Ibid., accessed. p. 12.

[774] Colman, Ronald. *The Cost of Chronic Disease in Nova Scotia*, GPI Atlantic, Dalhousie University, and Atlantic Region Population and Public Health Branch, Health Canada, 2002; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chronic.pdf. Refferring to: Almer, Robert, and Donald Eddins. "Cross-Sectional Analysis: Precursors of Premature Death in the United States," in *Closing the Gap: The Burden of Unnecessary Illness*, ed. Almer, Robert and Bruce Hull. New York and Oxford: Oxford University Press, 1987. Table 1, p. 183.

[775] Rogers, Sean, and Ronald Colman. *The Socioeconomic Gradient in Health in Atlantic Canada: Evidence from Newfoundland and Nova Scotia 1985 - 2001*, GPI Atlantic and Health Canada, 2005; accessed Dec 2007; available from http://gpiatlantic.org/pdf/health/hiec121605.pdf.

comparisons between income groups, and a measure of health status derived from self-rated responses in the health surveys. The authors found that "income is the single most important contributor to socioeconomic inequality in health in Newfoundland and in the two Nova Scotia communities. The contribution of income alone accounts for between one-third and one-half of the measured socioeconomic inequality in the locations studied."[776] Other variables examined in the study include gender, education, employment status, marital status, social support, and stress.

In principle, estimates of the costs of poverty could be constructed for a wide variety of health outcomes, including behavioural risk factors, morbidity measures of self-rated health, the presence of one or more chronic conditions, disability or the number of days not worked due to illness, restrictions on daily activities, and a variety of mortality indicators. The choice of health indicators to use will depend on the purpose of the study. The most important health indicators are reviewed below with reference to their associations to poverty or low income.

5.2.1 Self-rated health

Self-rated health is a general indicator of overall health and a main health indicator reported by Statistics Canada. Statistics Canada reports self-rated health by gender, but special tabulations are needed to access self-rated health data by income. Self-rated health has repeatedly been shown to correspond to objective measures of outcomes such as chronic disease and mortality.[777] The indicator is based on the question, "In general, would you say your health is: excellent, very good, good, fair, or poor?" This question has routinely been asked of individuals over the age of 12 on health surveys such as the National Population Health Survey (NPHS) (1994–1999) and the Canadian Community Health Survey (CCHS) (beginning 2000/2001).[778]

Information on the relationship between self-rated health and income is important and reported here for descriptive purposes because there is a significant income gradient for self-rated health—those with lower incomes are more likely to report poor health than those with higher incomes across all age groups and for both men and women. However, the direct use of this indicator in a cost of poverty study is limited since a costing study requires more specific indicators of health outcomes. It should also be noted that studies examining income gradients are often not directly comparable since researchers do not always use the same definitions of income or the same income categories.

A 2007 study by Heather Orpana et al. examined longitudinal data from NPHS 1994/1995 and 1996/1997 and found that individuals living in households in the two lowest income categories—with less than $20,000 per year—were almost three times more likely to report a

[776] Ibid., accessed. p. iii.
[777] Health Canada. *Statistical Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.hc-sc.gc.ca/hppb/phdd/report/stat/pdf/english/all_english.pdf.
[778] Statistics Canada. *Health Indicators. Health Status. Well-Being: Self-Rated Health*, Catalogue No. 82-221-XIE, 2007; accessed Jan 2008; available from http://www.statcan.ca/english/freepub/82-221-XIE/2004002/defin1.htm#selfrated.

decline in self-rated health than people living in the highest income categories.[779] The study also found that lower income individuals experienced more stressors such as job strain, and marital or financial problems than did higher income individuals, and that these stressors were related to a greater likelihood of experiencing a decline in health over the two-year period.

The report, *Statistical Report on the Health of Canadians,* examines self-rated health status data from the 1996/1997 NPHS and reports results by income.[780] As shown in Table 30 below, 25% of the population over the age of 12 rated its health as excellent, 38% as very good, 27% as good, 7% as fair, and 2% as poor. A definite gradient was seen in responses by income level—21% of low-income individuals rated their health as fair or poor compared with 5% of individuals in the highest income category, and only 19% in the lowest group rated their health as excellent, compared with 33% of those with the highest incomes.

Table 30. Self-rated health status, by income adequacy (age-standardized), aged 12 years and over, Canada, 1996-97

	Population estimate ('000)	Excellent (%)	Very good (%)	Good (%)	Fair (%)	Poor (%)
Total, age 12+	24,595	25	38	27	7	2
Male	12,099	26	39	26	7	2
Female	12,495	24	38	27	8	2
Lowest income	970	19	28	32	16	5
Lower middle income	2,262	18	32	32	14	5
Middle income	6,194	22	39	29	8	2
Upper middle income	7,962	26	41	26	6	1
Highest income	3,107	33	40	22	4	1
Income not stated	4,100	27	37	27	8	3

Note: National Population Health Survey, 1996/1997
Source: Health Canada. *Statistical Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.hc-sc.gc.ca/hppb/phdd/report/stat/pdf/english/all_english.pdf.

Christopher McLeod et al. used NPHS longitudinal data from 1994–1998 for those aged 18 years and over to investigate income inequality, household income and health status and found that "household income, but not income inequality, appears to explain some of the differences in health status among Canadians."[781] Individual household income in the NPHS is defined as

[779] Orpana, Heather M., Louise Lemyre, and Shona Kelly. "Do Stressors Explain the Association between Income and Declines in Self-Rated Health? A Longitudinal Analysis of the National Population Health Survey," *International Journal of Behavioral Medicine*, 2007, vol. 14, no. 1: 40-47.
[780] Health Canada. *Statistical Report on the Health of Canadians*, accessed.
[781] McLeod, Christopher B., John N. Lavis, Cameron A. Mustard, and Greg L. Stoddart. "Income Inequality, Household Income, and Health Status in Canada: A Prospective Cohort Study," *American Journal of Public Health*,

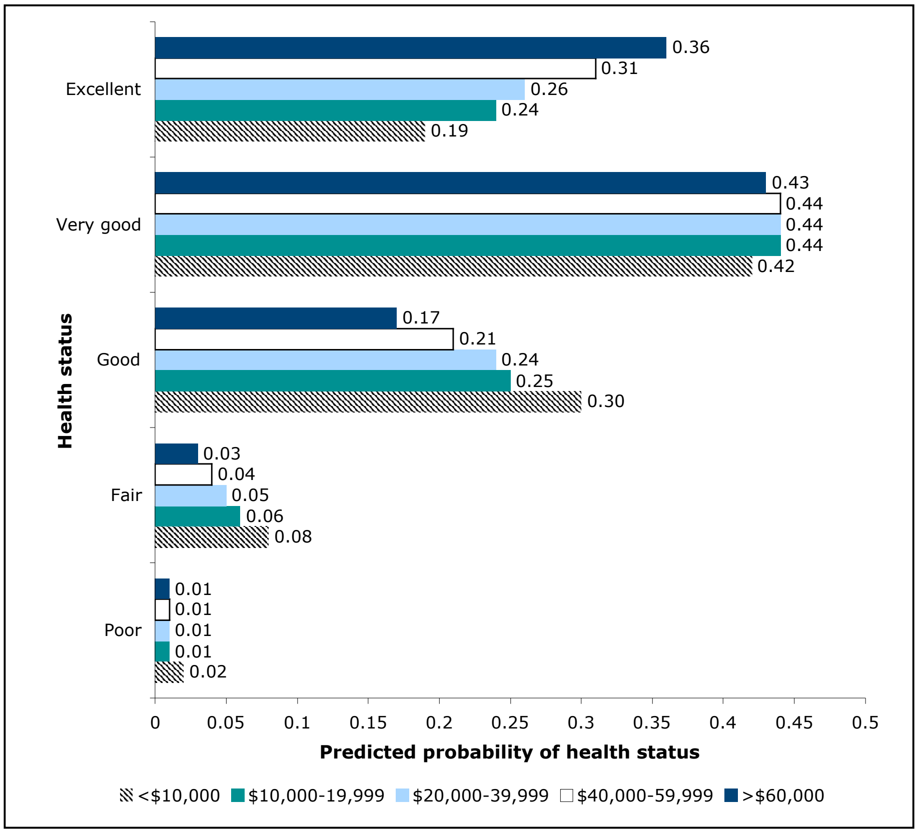
exclusive of taxes but inclusive of government transfers. The variables used in the McLeod et al. study were less than $10,000, $10,000–$19,999, $20,000–$39,999, $40,000–$59,999, and more than $60,000, which, according to the authors "balanced the requirement of a minimum sample size in each income dummy-variable category with the potential nonlinear and diminishing relationship between household income and health."[782] A large number of potentially confounding variables were controlled for such as demographic characteristics, education, health behaviours (smoking status, alcohol consumption, and physical exercise), and social support networks.

As shown in Figure 16 below, although only a small percentage (which represents probabilities) of the population in each income grouping reported fair or poor health compared to those who reported excellent, very good, or good health, for all income categories the relationship between household income and self-rated health status was statistically significant. The authors note that this relationship was significant both before and after the addition of all potential confounders and "as household income decreased, the probability of reports of lower levels of self-reported health status increased."[783] In summary, they note:

> Household income … was strongly and consistently associated with health status over time, across health measures, after adjustment for potential confounders and pathway variables, and after adjustment for baseline health status. Indeed, apart from health status at baseline, household income was the best predictor of future health status.[784]

2003, vol. 93, no. 8: 1287-1293. p. 1287.
[782] Ibid. p. 1288.
[783] Ibid. p. 1290.
[784] Ibid. p. 1291.

Figure 16. Self-reported health states for 5 household income categories, adjusted for all potential confounders, Canada, 1998



Source: McLeod, Christopher B., John N. Lavis, Cameron A. Mustard, and Greg L. Stoddart. "Income Inequality, Household Income, and Health Status in Canada: A Prospective Cohort Study, " *American Journal of Public Health*, 2003, vol. 93, no. 8: 1287-1293.

Stephane Tremblay et al. used data from the 2000/2001 CCHS to examine both individual and regional socioeconomic contexts and health.[785] Household income was grouped into five categories defined by the total annual, before tax, household income from all sources and by the number of people in each household. As shown in Table 31 below, 12.8% of Canadians reported having fair or poor health compared with 87.2% who reported either excellent, very good, or good health.

Of those who reported fair or poor health the highest proportions were in the lowest (27.6%) and lower-middle (26.6%) income categories. In the middle-income category, 18.3% reported fair or poor health and in the upper-middle income category, which is used as the reference category to estimate odds ratios, 10.2% reported fair or poor health. In the highest income category 5.7% reported the same. The odds ratios are the relative odds of reporting fair or poor health for each

[785] Tremblay, Stéphane, Nancy Ross, and Jean-Marie Berthelot. "Regional Socio-Economic Context and Health," *Health Reports*, 2002, vol. 13: 33-44. accessed Nov 2007; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002003.pdf.

income category, adjusted for age, gender, education, smoking status, obesity, and physical activity, as compared to the upper-middle income group. Lower household income and each step down the income categories from highest to next lowest were consistently associated with greater odds of reporting fair or poor health. Those in the lowest income category had a "five-fold greater risk of reporting fair or poor health than those in the top income category."[786] The authors also found that self-rated fair or poor health was only modestly associated with regional contexts.

[786] Ibid. p. 37.

Table 31. Proportion of population reporting fair or poor health, aged 18 years and older, and adjusted odds ratios for fair or poor health, by income, Canada, 2000/01

Income group	Definition		Percentage of total Canadians	Percentage reporting fair or poor health	Odds ratio	95% confidence interval
	People in household	Total household income				
			Fair/ poor health– 12.8 Excellent/very good/good–87.2			
Lowest	1 to 4 5 or more	Less than $10,000 Less than $15,000	3.5	27.6	3.07	2.83-3.34
Lower-middle	1 or 2 3 or 4 5 or more	$10,000 to $14,999 $10,000 to $19,999 $15,000 to $29,999	6.8	26.6	2.38	2.23-2.54
Middle	1 or 2 3 or 4 5 or more	$15,000 to $29,999 $20,000 to $39,999 $30,000 to $59,999	19.8	18.3	1.53	1.45-1.60
Upper-middle	1 or 2 3 or 4 5 or more	$30,000 to $59,999 $40,000 to $79,999 $60,000 to $79,999	32.0	10.2	1.00	–
Highest	1 to 2 3 or more	$60,000 or more $80,000 or more	27.7	5.7	0.65	0.61-0.70
Missing data	–	–		15.2	–	–

Note: Canadian Community Health Survey, cycle 1.1, 2000/01; The upper-middle income group is used as the reference group.

Source: Adapted from Tremblay, Stéphane, Nancy Ross, and Jean-Marie Berthelot. "Regional Socio-Economic Context and Health," *Health Reports*, 2002, vol. 13: 33-44. accessed Nov 2007; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002003.pdf.

5.2.2 Chronic disease: cardiovascular disease, cancer, respiratory disease, diabetes

Chronic diseases—many of which are preventable—contribute a significant portion of health costs for Canadians. These diseases not only cause premature mortality, but they also contribute to adverse effects on the quality of life of the individuals affected by the diseases, as well as that of their friends, relatives, caretakers, and employers. Many of the same social, economic, and psychosocial factors, including poverty, income disparity, and the resulting lack of resources, are associated with the development of almost every chronic disease.[787]

Chronic disease is most often studied in terms of mortality data, which the Heart and Stroke Foundation of Canada notes is primarily due to data availability.[788] Wilkins et al. have calculated the risk ratio and risk difference, by gender and neighbourhood income quintile for mortality in urban Canada between 1971 and 1996 for a number of chronic diseases such as ischemic heart disease, lung, breast and prostate cancer, and diabetes.[789] Table 42 in the Appendices shows these rate ratios, which can also be used to calculate population attributable fractions relating income and chronic disease mortality. The ratios are discussed in more detail below in Section 5.5 on mortality.

Dalstra and 12 other researchers pooled national health surveys conducted in the 1990s in eight European countries to analyze 17 chronic disease groups in relation to socioeconomic status.[790] Although the socioeconomic measure used was educational attainment, the study is an example of one out of only a few that report the association between chronic disease and low socioeconomic status. The survey populations were divided into two socioeconomic groups—a group including the lowest education levels (no education and primary education) and a group including the higher education levels (secondary education, post secondary education, and tertiary education.) The results, which were reported as age-adjusted odds ratios, are shown in Table 32 below.

Socioeconomic disparities in chronic diseases were observed for most diseases for working age groups (aged 25–59 years) and the elderly (aged 60–79 years). Overall, stroke, diseases of the nervous system, diabetes, and arthritis were more prevalent in the lower socioeconomic group, and were especially prominent among the lower educated working group. Cancer was more prevalent in the low education working-age group (OR – 1.64) and in the elderly *higher* educated group (OR – 0.77)—a reversal that was seen in all countries except The Netherlands. Stroke, diabetes, headache/migraine, and chronic respiratory diseases were prominent in the lower educated elderly.

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[787] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed.
[788] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[789] Wilkins, Russell, Jean-Marie Berthelot, and Edward Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.
[790] Dalstra, J.A.A., A.E. Kunst, C. Borrell, E. Breeze, E. Cambois, G. Costa, J.J.M. Geurts, E. Lahelma, H. Van Oyen, N.K. Rasmussen, E. Regidor, T. Spadea, and J.P. Mackenbach. "Socioeconomic Differences in the Prevalence of Common Chronic Diseases: An Overview of Eight European Countries," *International Journal of Epidemiology*, 2005, vol. 34: 316-326. The countries were Finland, Denmark, Great Britain, The Netherlands, Belgium, France, Italy, and Spain.

Table 32. Education differences (low vs. high education) for chronic disease groups in Europe, 1990s

	Odds Ratio (OR) (95% confidence interval–CI)				
Chronic Disease Groups	**Total**	**Men Aged 25–79**	**Women Aged 25–79**	**Men & Women Aged 25–59**	**Men & Women Aged 60–79**
Stroke	1.64 (1.40–4.93)	1.70 (1.35–2.14)	1.56 (1.25–1.96)	1.89 (1.43–2.51)	1.53 (1.27–1.86)
Diseases of the nervous system	1.63 (1.51–1.77)	1.57 (1.40–1.77)	1.57 (1.41–1.75)	1.81 (1.64–1.99)	1.33 (1.17–1.52)
Diabetes mellitus	1.60 (1.43–1.80)	1.30 (1.11–1.51)	2.19 (1.82–2.63)	1.64 (1.38–1.94)	1.57 (1.34–1.84)
Arthritis	1.56 (1.40–1.73)	1.50 (1.27–1.77)	1.46 (1.26–1.68)	2.04 (1.76–2.36)	1.17 (1.01–1.36)
Hypertension	1.42 (1.34–1.50)	1.10 (1.00–1.22)	1.52 (1.42–1.62)	1.55 (1.43–1.67)	1.30(1.20–1.40)
Stomach / duodenum ulcer	1.40 (1.22–1.60)	1.41 (1.19–1.67)	1.56 (1.25–1.95)	1.37 (1.15–1.62)	1.46 (1.16–1.83)
Genitourinary diseases	1.35 (1.24–1.47)	1.29 (1.13–1.48)	1.53 (1.36–1.72)	1.51 (1.35–1.69)	1.15 (1.00–1.31)
Headache / migraine	1.35 (1.27–1.43)	1.18 (1.04–1.34)	1.29 (1.20–1.39)	1.28 (1.20–1.37)	1.62 (1.42–1.84)
Osteoarthrosis	1.34 (1.21–1.49)	1.32 (1.12–1.55)	1.29 (1.12–1.48)	1.51 (1.30–1.75)	1.20 (1.03–1.38)
Liver / gall diseases	1.26 (1.08–1.46)	1.10 (0.87–1.40)	1.30 (1.07–1.58)	1.31 (1.07–1.60)	1.19 (0.95–1.49)
Chronic respiratory diseases	1.24 (1.15–1.33)	1.33 (1.19–1.49)	1.19 (1.07–1.33)	1.13 (1.03–1.25)	1.42 (1.26–1.61)
Heart disease	1.22 (1.10–1.35)	1.18 (1.04–1.34)	1.51 (1.28–1.79)	1.29 (1.09–1.53)	1.18 (1.04–1.33)
Back and spinal cord disorders	1.19 (1.11–1.29)	1.33 (1.19–1.49)	1.05 (0.94–1.16)	1.29 (1.18–1.41)	0.98 (0.86–1.13)
Cancer	1.13 (0.98–1.30)	0.96 (0.78–1.20)	1.22 (1.02–1.46)	1.64 (1.36–1.99)	0.77 (0.64–0.93)
Kidney stones and other kidney diseases	1.11 (0.95–1.31)	1.03 (0.83–1.27)	1.34 (1.04–1.72)	1.17 (0.95–1.45)	1.03 (0.80–1.33)
Skin diseases	0.99 (0.91–1.08)	0.99 (0.86–1.14)	0.98 (0.87–1.11)	0.98 (0.88–1.09)	1.03 (0.86–1.23)
Allergy	0.73 (0.66–0.81)	0.67 (0.57–0.79)	0.72 (0.63–0.82)	0.69 (0.61–0.78)	0.82 (0.68–0.99)

Note: Low education is defined as either having no education or having only primary education (including secondary school drop outs); high education is defined as having secondary education, post secondary education, or tertiary education. CI – confidence interval.

Source: Dalstra, J.A.A., A.E. Kunst, C. Borrell, E. Breeze, E. Cambois, G. Costa, J.J.M. Geurts, E. Lahelma, H. Van Oyen, N.K. Rasmussen, E. Regidor, T. Spadea, and J.P. Mackenbach. "Socioeconomic Differences in the Prevalence of Common Chronic Diseases: An Overview of Eight European Countries," *International Journal of Epidemiology*, 2005, vol. 34: 316-326.

Cost estimates for chronic diseases

According to Health Canada, seven categories of chronic disease account for more than half of the total economic cost of illness in Canada—estimated to be $174.7 billion ($2002), or 9% of GDP.[791] These categories are:

1. cardiovascular diseases (mainly ischemic heart disease—also called coronary heart disease or coronary artery disease—which includes acute myocardial infarction, or heart attack and hypertension, and stroke—also known as cerebrovascular disease)
2. cancers
3. respiratory/chronic obstructive pulmonary diseases (COPD) such as chronic bronchitis, emphysema, asthma
4. endocrine diseases and related disorders (primarily diabetes)
5. musculoskeletal disorders (arthritis and osteoporosis)
6. nervous system and sense organ diseases (Parkinson's disease, multiple sclerosis, cerebral palsy, glaucoma, cataracts, blindness, and hearing loss)
7. neuropsychiatric disorders (mental illnesses such as schizophrenia, clinical depression, and anxiety disorders)[792]

In 2007, Jayadeep Patra et al. reviewed 41 published reports and government documents using data from 1995 to 2003 that provided economic cost estimates for many of the seven categories of non-communicable chronic diseases in Canada and selected provinces and for major behavioural risk factors for chronic diseases—tobacco use, obesity, alcohol consumption, and physical inactivity.[793] Costing categories included those used most often in cost of illness studies—for direct costs: hospital care, specialized treatment, physician care, prescription drugs, and additional direct health expenditures; and for indirect costs: cost of years of life lost due to premature death, and the value of activity days lost due to short and long term disability.

The most extensive information was provided for 1997–98 and 2001–2003, and for Nova Scotia, British Columbia, and Alberta. A summary of the economic costs of chronic disease for Canada (total costs adjusted to $2005) are as follows:

- **neuropsychiatric disorders**—$1,056 per capita in 2003, or $34 billion (direct and indirect costs)
- **cardiovascular diseases**—$640 per capita in 1998, or $20.6 billion ($7.6 billion in direct

[791] Health Canada, *Economic Burden of Illness 1998*, Cited in Mirolla, Michael. *The Cost of Chronic Disease in Canada*, The Chronic Disease Prevention Alliance of Canada, 2004; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chroniccanada.pdf.
[792] Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
[793] Patra, Popova, Rehm, Bondy, Flint, and Giesbrecht. *Economic Cost of Chronic Disease in Canada, 1995-2003*, accessed.

costs, and $13.0 billion in indirect costs)

- **musculoskeletal disease**—$640 per capita in 1998, or $20.6 billion ($4.9 billion total direct and $15.7 billion total indirect costs)
- **cancer**—$571 per capita in 2002, or $17.9 billion ($4.4 billion total direct and $13.5 total indirect costs)
- **diabetes**—$306 per capita in 1999, or $9.9 billion (direct and indirect costs)
- **respiratory disorders**—$295 per capita in 1998, $9.53 billion ($3.87 billion total direct and $5.67 total indirect costs)
- **major risk factors** and their estimated cost vis-à-vis chronic disease:
    - **physical inactivity**—$300 per capita, or $9.16 billion ($9.14 direct and $23 million in indirect costs, disability data not available), 1999
    - **obesity**—$343 per capita, direct cost between $2.1 billion to $11 billion, three largest contributors to co-morbidity—hypertension –$749.2 million, type 2 diabetes–$482.9 million, and coronary artery disease–$394.8 million, 1997.
    - **tobacco use**—$341 per capita, or (all tobacco-related diseases) $17.7 billion ($4.7 billion direct and $13 billion productivity loss costs), 2002
    - **alcohol consumption**—$223 per capita, or $7.3 billion (all alcohol related diseases) ($2.7 billion direct and $4.6 billion productivity loss costs), 2002.[794]

The highest direct heath care costs are due to mental illness ($34 billion) and cardiovascular diseases (nearly $21 billion); the highest losses in premature death result from cancer; and the highest disability costs result from musculoskeletal disorders.[795]

Extensive costing data are provided in the appendices of the Patra et al. report. The authors caution that it is not advisable to add the estimated costs of chronic diseases or risk factors because this would lead to inflated estimates. Individuals often have more than one disease or risk factor, and adding the costs would lead to double counting.[796]

Cardiovascular disease

Cardiovascular diseases contribute the highest direct and indirect health costs of all physical chronic diseases in Canada.[797] The category consists mainly of ischemic heart disease (also called coronary heart disease or coronary artery disease), which includes acute myocardial infarction (also known as heart attack) and hypertension, and stroke or cerebrovascular disease. Overall, 5.7% of the adult population and almost 25% of the population over the age of 70 report having heart problems.[798] While the prevalence of cardiovascular disease increases with age, many develop the condition in their 40s and 50s. Men are more prone to ischemic heart disease and acute myocardial infarction, but women are more prone to congestive heart failure and cerebrovascular disease.[799]

794 Ibid., accessed.
795 Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
796 Patra, Popova, Rehm, Bondy, Flint, and Giesbrecht. *Economic Cost of Chronic Disease in Canada, 1995-2003*, accessed. p. 17.
797 Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
798 Ibid., accessed.
799 Ibid., accessed.

Socioeconomic disparities, biological factors, and behavioral risk factors that generally are accepted as risk factors for cardiovascular disease include, respectively: poverty and low income, low educational attainment, and low occupation or social class; gender, high serum cholesterol levels and low high-density lipoprotein (HDL) levels, hypertension, obesity, and diabetes; and cigarette smoking, diets high in saturated fat and cholesterol, and physical inactivity.[800] Citing two important studies that found strong associations between coronary heart disease (CHD) and low income—the U.S. National Health and Nutrition Examination Survey (1971–1984) and the British Whitehall study of 17,000 office-based civil servants, Terris notes, "It is clear that … most of the social class differences in CHD … could not be explained by effects of known [biological and behavioural] risk factors."[801]

According to Raphael, income disparities contribute to cardiovascular disease independently of risk behaviours such as smoking, diet, and physical exercise, which are often the main risk factors studied in connection with chronic diseases.[802] Raphael notes that cardiovascular disease is the disease that is most associated with low income among Canadians:

> An extensive body of research now indicates that the economic and social conditions under which people live their lives, rather than medical treatments and lifestyle choices, (diets low in fat and cholesterol and rich in vegetables and fruits, regular physical activity, and smoke-free living), are the major factors determining whether they develop cardiovascular disease. One of the most important life conditions that determine whether individuals stay healthy or become ill is their income. In addition, the overall health of a society appears to be more determined by the distribution of income among its members rather than the overall wealth of the society.[803]

Raphael also reports that a review of the literature did not uncover any analysis that calculated direct costs of income-related differences in cardiovascular disease.[804]

Internationally, there is a strong association between poverty and cardiovascular disease. Geraldine Lee and Melinda Carrington note that in Australia there is a large gap in mortality due to heart disease between the indigenous population and the total population, with the key factor being socioeconomic status and deprivation.[805] They report studies that find the same patterns between poverty and cardiovascular disease in the U.K., Scotland, Italy, U.S., New Zealand, and South Africa.[806] In Norway, coronary heart disease risk was found to be two and a half times higher among those with the lowest income compared with those with the highest income.[807]

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[800] Terris. "The Development and Prevention of Cardiovascular Disease Risk Factors: Socioenvironmental Influences."
[801] Ibid. p. 431.
[802] Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.
[803] Ibid., accessed. p. xi.
[804] Ibid., accessed.
[805] Lee, Geraldine, and Melinda Carrington. "Tackling Heart Disease and Poverty, " *Nursing and Health Sciences*, 2007, vol. 9: 290–294.
[806] Ibid.
[807] Kabat-Zinn, Jon. "Psychosocial Factors: Their Importance and Management," in *Prevention of Coronary Heart Disease*, ed. Ockene, Ira and Judity Ockene. Boston: Little, Brown, and Company, 1992. p. 304, Cited in Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.

There have also been small-scale studies in Canada that found the same association between poverty and cardiovascular disease. In 1999, Alter et al. compared median neighbourhood income with the incidence of acute myocardial infarction (heart attack) and presentations at emergency rooms among Ontario patients.[808] Neighbourhoods were sorted by population size and income. Results showed that 113,115 individuals from the lowest neighbourhood income quintile suffered heart attacks during the period studied compared with 4,614 from the neighbourhoods with the highest median income. In addition, this study found that differences in health care quality after the heart attack were not responsible for differences in survival rate across socioeconomic categories. Instead, these differences were attributed to incidence rates across income categories.

Between 1998 and 2000, Sonia Anand et al. of McMaster University conducted a study of 1,227 men and women of South Asian, Chinese, Aboriginal, and European ancestry, between the ages of 35 and 75, living in four communities in Canada—two in Toronto, Hamilton, and Edmonton, as well as the Six Nations Reservation (Ohsweken, Ontario).[809] The purpose of the study was to "quantify the effect of social disadvantage on health outcomes," which the authors noted was "challenging … because social and economic factors are surrogates for the latent construct of social disadvantage."[810] All respondents were given a three-hour medical assessment that included completion of a health questionnaire and an array of medical tests. A social disadvantage index was created as a summary measure of social and economic factors that were significantly associated with cardiovascular disease—with variables of annual household income below $20,000, annual income between $20,000 and $60,000, unemployed status, and unmarried status, which "are valid and reliable proxies of social and economic status in most populations."[811]

Results indicated that cardiovascular disease prevalence increased with each rising level of social disadvantage in every ethnic group studied. The independent predictive value of social disadvantage on cardiovascular disease was expressed as an odds ratio of 1.25 (95% confidence interval – 1.06–1.47), which suggests that the prevalence of cardiovascular disease would increase by 25% for every one-point increase in the social disadvantage index. As might be expected, Aboriginal men and women were more disadvantaged than those with European ancestry, who had the lowest percentage of disadvantaged individuals. Women were more disadvantaged than men in all groups, but Aboriginal men had significantly higher social disadvantage compared with women in all the other ethnic groups examined.

Most importantly, the results found that "the effect of social disadvantage on CVD was

[808] Alter, D.A., C.D Naylor, P. Austin, and J. Tu. "Effects of Socioeconomic Status on Access to Invasive Cardiac Procedures and on Mortality after Acute Myocardial Infarction," *New England Journal of Medicine*, 1999, vol. 341: 1,360-1,367.
[809] Anand, Sonia S., Fahad Razak, A.D. Davis, Ruby Jacobs, Vlad Vuksan, Koon Teo, and Salim Yusuf. "Social Disadvantage and Cardiovascular Disease: Development of an Index and Analysis of Age, Sex, and Ethnicity Effects," *International Journal of Epidemiology*, 2006, vol. 35: 1239–1245. Individuals with chronic debilitating illnesses such as terminal cancer and renal failure were excluded from the study.
[810] Ibid. p. 1,239.
[811] Ibid. p. 1,240.

independent of CV [known biological and behavioural] risk factors, sex, and ethnicity."[812]

The Heart and Stroke Foundation of Canada gives risk ratios for behavioural risk factors for cardiovascular disease by income adequacy but does not give risk ratios for cardiovascular disease per se.[813]

Cancer

Cancer statistics mainly report mortality and incidence data rather than cancer prevalence. According to Statistics Canada, the incidence of cancer in the Canadian population has increased between 2000 and 2004, but age-standardized rates have remained fairly stable.[814] Since 1994, mortality rates for cancer have declined with the exceptions of lung cancer in females and liver cancer in males.[815] Approximately 44% of new cancer cases and 60% of deaths due to cancer occur among those who are at least 70 years of age, and 30% of new cancer cases and 18% of cancer deaths occur in young and middle-aged adults.

Lung cancer, prostate cancer, breast cancer, and colorectal cancer are the leading types of cancer in Canada, and these account for approximately half of all new cases of cancer. Lung and colorectal cancer are the leading causes of cancer mortality.[816] Tobacco use is estimated to be responsible for about 30% of all cancers.[817]

The Canadian Cancer Society, Statistics Canada, and other organizations report annual cancer statistics with a lag time of several years. For example, the 2007 report notes that at that time, 2003 data were the most recent. However, *Canadian Cancer Statistics* last reported cancer rates by income level in 1990.[818] The 2007 report does note, "Lower socio-economic status has been associated with higher cancer mortality in general, and with an increased incidence of certain cancers, such as cervical cancer, but a decreased incidence of breast cancer."[819]

Several epidemiological studies have found an association between low socioeconomic status and cancer. In 1996, Wilkins et al. found that both prostate and breast cancer mortality were higher in the more affluent income groups in urban Canada than in poorer groups.[820] Lung cancer mortality, on the other hand, was more prevalent in lower income groups and its incidence in general is higher than that of prostate and breast cancer.

812 Ibid. p. 1,243.
813 Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
814 Statistics Canada. *Cancer, New Cases, by Selected Primary Site of Cancer, by Sex*, 2007; accessed Jan 2008; available from http://www40.statcan.ca/l01/cst01/hlth61.htm.
815 Canadian Cancer Society. *Canadian Cancer Statistics 2007*, Canadian Cancer Society, National Cancer Institute of Canada, Statistics Canada, Provincial/Territorial Cancer Registries, and Public Health Agency of Canada, 2007; accessed Jan 2008; available from http://www.cancer.ca/vgn/images/portal/cit_86751114/36/15/1816216925cw_2007stats_en.pdf.
816 Ibid., accessed.
817 Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.
818 Canadian Cancer Society. *Canadian Cancer Statistics 2007*, accessed.
819 Ibid., accessed. p. 17.
820 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

Yang Mao et al. of the Health Canada Laboratory Centre for Disease Control cite studies from Sweden, New Zealand, Switzerland, Australia, U.K., Netherlands, Denmark, the U.S., and others that find the incidence and mortality from lung cancer are greater in lower socioeconomic groups than in higher socioeconomic groups.[821] Mao et al. use data collected from lung cancer patients between 1994 and 1997 in eight provinces (minus Quebec and New Brunswick) by the National Enhanced Cancer Surveillance System (NECSS) to examine the impact of socioeconomic status on lung cancer risk in Canada. Odds ratios and population attributable risk (PAR) for lung cancer in relation to income adequacy were calculated. The PAR for income adequacy is defined as the percent of disease reduction if this factor were removed.

Results of the Mao et al. study are shown in Table 33 below. Compared with high-income men and women, low-income men and women had an increased odds of developing lung cancer, or odds ratio of 2.1 and 2.0, respectively when adjusted for age and province, and a ratio of 1.7 and 1.5, respectively when adjusted for 10-year age group, province, pack-years smoking, total years of exposure to residential or occupational passive smoking, and total consumption of vegetables and vegetable juices and of meat. The population attributable risk attributing lung cancer to income adequacy was .24 among men and .14 among women. In other words, low household income was associated with 24% of lung cancer cases for men and 14% of cases for women. The calculation was adjusted for 5-year age group, province, smoking pack-years, variables for interaction of smoking status with age group, and total years of exposure to residential or occupational passive smoking. The authors note:

> [T]he association of SES [socioeconomic status] and lung cancer remained strong even when these major confounders were controlled in multiple logistic regression analyses…. A complex combination of these factors, such as smoking and dietary habits, may contribute to increased risk of lung cancer in subjects of low socioeconomic level…. Socioeconomic status appears to be an independent contributor to health status, as a surrogate for lifestyle, diet, working and living conditions.[822]

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[821] Mao, Yang, Jinfu Hu, Anne-Marie Ugnat, Robert Semenciw, Shirley Fincham, and Canadian Cancer Registries Epidemiology Research Group. "Socioeconomic Status and Lung Cancer Risk," *International Journal of Epidemiology*, 2001, vol. 30: 809-817.
[822] Ibid. p. 815–816.

Table 33. Association between lung cancer risk and income adequacy–odds ratios (OR) and population attributable risk (PAR) of lung cancer, by gender, Canada, 1994–1997

Household income	Men with lung cancer					Women with lung cancer				
	N	%	OR*	Multi-vari. OR[a]	PAR[b] N = 1198	N	%	OR*	Multi-vari. OR[a]	PAR[b] N = 1042
High ≥$50,000, ≤3 people, ≥$100,000, ≥ 4 people	223	13.0	1.0–ref	1.0–ref	0.24	156	10.0	1.0 ref	1.0 ref	0.14
Upper Middle $30,000–<$50,000, ≤3 people; $$50,000–<$100,000, ≥4 people	347	20.2	1.1 (0.9 – 1.4)	1.0 (0.8 – 1.3)	n/a	288	18.5	1.2 (1.0 – 1.6)	1.2 (0.9 – 1.5)	n/a
Lower Middle $20,000–<$30,000, ≤3 people; $30,000–<$50,000, ≥4 people	310	18.0	1.6 (1.2 – 2.0)	1.3 (1.0 – 1.7)	n/a	234	15.0	1.2 (1.0 – 1.6)	1.2 (0.9 – 1.6)	n/a
Low <$20,000 ≤3 people;<$30,000 ≥4 people	368	21.4	2.1 (1.6 – 2.6)	1.7 (1.3 – 2.2)	n/a	398	25.5	2.0 (1.6 – 2.6)	1.5 (1.1 – 2.0)	n/a

Notes: *OR adjusted for age and province. [a] Adjusted for 10-year age group and province, pack-years smoking, total years of exposure to residential or occupational passive smoking, and total consumption of vegetables and vegetable juices and of meat. [b] Adjusted for 5-year age group, province, smoking pack-years, variables for interaction of smoking status with age group, and total years of exposure to residential or occupational passive smoking.
95% confidence interval in parentheses.
Data source: National Enhanced Cancer Surveillance System (NECSS)

Source: Adapted from Mao, Yang, Jinfu Hu, Anne-Marie Ugnat, Robert Semenciw, Shirley Fincham, and Canadian Cancer Registries Epidemiology Research Group. "Socioeconomic Status and Lung Cancer Risk," *International Journal of Epidemiology*, 2001, vol. 30: 809-817.

Respiratory disease–COPD and asthma

Respiratory disease includes chronic obstructive pulmonary diseases (COPD) such as chronic bronchitis, emphysema, and asthma, and excludes acute respiratory infections such as pneumonia and influenza. COPD mainly affects people over the age of 60. Prevalence and mortality rates have declined in all age groups since 1994 with the exception of those over the age of 75, but mortality rates for females have increased. According to Haydon et al., COPD rates are under-diagnosed both because people often do not seek treatment and because COPD often leads to cardiovascular events, which are often the primary diagnosis.[823] Smoking is an attributable factor in 80%–90% of the cases.[824] Other risk factors include environmental tobacco exposure (ETS),

[823] Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.
[824] Ibid., accessed.

exposures to hazardous materials such as asbestos especially in the workplace, outdoor air quality, repeated respiratory infections, and obesity in women.[825]

Asthma is the most common chronic disease of childhood. Although mortality rates for asthma in Canada have declined since 1984, prevalence rates have nearly doubled since at least 1994.[826] In 2003, 8.4% of the population, or approximately 2.2 million people, had asthma.[827] Asthma is highest among children ages 0 to 19 years, although rates increase again after the age of 45. In 2001, asthma was among the top five leading causes of hospitalization, with 5%–7% of people with asthma requiring hospitalization. Krahn et al. estimated the direct and indirect cost of asthma in Canada to be between $504 million and $648 million in 1990 in current dollars.[828]

Research has consistently shown an inverse association between asthma and socioeconomic status. Diane Gold and Rosalind Wright of Harvard Medical School note that asthma disparities have been well-documented in the U.S. in the past two decades, "though the environmental exposures contributing to these disparities are only partially understood."[829] In general, they note that African Americans experience higher rates of asthma,as well as higher rates of hospitalization and mortality due to asthma than do Caucasian children and adults, with mortality rates being the greatest disparity. They also note that hospitalization and mortality rates are higher in the U.S. for those living in the poorest neighbourhoods than for those living in the most affluent neighbourhoods.

In 1988, Lawrence Wissow et al. of the John Hopkins Medical Institution examined hospital discharge data from Maryland, U.S. to examine the relationship between race, poverty, and childhood asthma.[830] They found that the hospital discharge rate for asthma patients was three times greater for black children than for white children—at the time, 26.6% of black families with children below the age of 18 lived below the federal poverty line, compared to 7.0% of white families. When poverty status was measured by Medicaid enrolment, the discharge rate for black children with asthma was about twice the rate of white children. However, when poverty status was measured by household income, black and white children with similar poverty levels had nearly identical asthma discharge rates. Multiple regression analysis found that asthma "had the strongest independent association of poverty with discharge rates" when compared with pneumonia, gastroenteritis, tonsillectomy, and inguinal hernia repair.[831]

Basagana and seven colleagues used the European Community Respiratory Health Survey to assess the association between asthma prevalence and socioeconomic status in 15 European

[825] Ibid., accessed.
[826] Lethbridge, Lynn N., and Shelley A. Phipps. "Chronic Poverty and Childhood Asthma in the Maritimes Versus the Rest of Canada," *Canadian Journal of Public Health*, 2005, vol. 96, no. 1: 18-23.
[827] Chen, Yue, Helen Johansen, Satha Thillaiampalam, and Christie Sambell. "Asthma," *Health Reports*, 2005, vol. 16, no. 2: 43-46.
[828] Krahn, Murray 0., Catherine Berka, Peter Langlois, and Allan S. Detsky. "Direct and Indirect Costs of Asthma in Canada, 1990," *Canadian Medical Association Journal*, 1996, vol. 154, no. 6: 821-831.
[829] Gold, Diane R., and Rosalind Wright. "Population Disparities in Asthma," *Annual Review of Public Health*, 2005, vol. 26: 89-113. p. 95.
[830] Wissow, Lawrence S., Alan M. Gittelsohn, Moyses Szklo, Barbara Starfield, and Mary Mussman. "Poverty, Race, and Hospitalization for Childhood Asthma," *American Journal of Public Health*, 1988, vol. 78, no. 7: 777-782.
[831] Ibid. p. 780.

countries.[832] As is often the case in Europe, socioeconomic status was measured by educational attainment and occupation. Multilevel models adjusted for age, gender, body mass index, parental asthma, childhood respiratory infections, presence of immunoglobulin E to common allergens, rhinitis, smoking, and occupational exposure to irritants. In all countries, asthma was higher in groups with low socioeconomic status than in groups with high socioeconomic status. The odds of having asthma in the low education group, compared with the high education group, was 1.28, and the odds for semiskilled/unskilled manual workers versus professional/managerial workers was 1.51.

Lethbridge and Phipps used data from the 2000 National Longitudinal Survey of Children and Youth (NLSCY) to examine the role that poverty plays with regards to asthma rates in children between the ages of 2–7 years.[833] The results showed that children living in chronic poverty in the Maritimes have asthma rates (20.9%) more than 30% higher than the national average (12.4%). Chronically poor children living in the Maritimes were 1.5 times more likely to have had a recent asthma attack than children not living in poverty.

Based on 1994/1995 NPHS data, Yue Chen et al. of the University of Ottawa found that men and women from low-income households (10.3% of men and 17.1% of women) were almost twice as likely to be hospitalized for asthma as those from high-income households (5.8% of men and 9.5% of women).[834]

In a related study based on data from both the 1994/1995 and 1996/1997 NPHS, Chen et al. found that the prevalence of asthma in both males and females increased with decreases in household income.[835] The authors adjusted for gender, age, history of allergy, household size and number of bedrooms. In 1994/1995, they found that men and women aged 12 years and over with low household incomes had a 1.44- and 1.33-fold increase, respectively, in the prevalence of asthma compared with those with high incomes. Using 1996/1997 data, they compared both low and high incomes with middle incomes and found the adjusted odds ratio for men with low income to be 1.30 and for women with low income to be 1.26 compared with those having middle income. For both men and women the odds ratio was 1.27.[836]

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[832] Basagana, Xavier, Jordi Sunyer, Manolis Kogevinas, Jan-Paul Zock, Enric Duran-Tauleria, Deborah Jarvis, Peter Burney, and Josep Maria Anto. "Socioeconomic Status and Asthma Prevalence in Young Adults. The European Community Respiratory Health Survey," *American Journal of Epidemiology*, 2004, vol. 160, no. 2: 178-188.
[833] Lethbridge, and Phipps. "Chronic Poverty and Childhood Asthma in the Maritimes Versus the Rest of Canada."
[834] Chen, Yue, Robert Dales, and Daniel Krewski. "Asthma and the Risk of Hospitalization in Canada: The Role of Socioeconomic and Demographic Factors," *Chest*, 2001, vol. 119: 708-713.
[835] Chen, Yue, Robert Dales, Mei Tang, and Daniel Krewski. *Association between Income Adequacy and Asthma in Canadians*, Proceedings of Statistics Canada Symposium 2002, Modelling Survey Data for Social and Economic Research, 2002; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/11-522-XIE/2002001/session1/chen.pdf.
[836] Ibid., accessed. Income categories were based on household size. Low income was <$15,000–one or two people, $10,000–$19,000–3 or 4 people, $15,000–$29,999–5 or more people, middle income was $15,000–$29,999–1 or 2 people, $20,000–$39,999–3 or 4 people, $30,000–$59,999–5 or more people, and high income was $30,000–$59,999–1 or 2 people, $40,000–$79,999–3 or 4 people, and $60,000+–5 or more people.

Diabetes

Diabetes is a serious chronic disease that can lead to life-threatening comorbidities and disability and is estimated to contribute to health care costs in the range of $4.7 billion to $9 billion per year, depending on whether indirect costs are included.[837, 838, 839] There are three types of diabetes—type 1, type 2, and gestational diabetes, which affects pregnant women and most often ends after birth. Type 1 diabetes, which is the most severe, affects 10% of those with diabetes and occurs mainly in children.[840] Type 2 diabetes, or adult-onset diabetes, which is preventable and the most common type, affects 90% of those with diabetes. It affects the regulation of insulin and is a risk factor for heart disease, stroke, kidney failure, and blindness. Data sources in Canada, including the National Diabetes Surveillance System, are not able to distinguish between the three types.[841, 842]

According to the Public Health Agency of Canada, 40% of those with diabetes develop long-term complications.[843] In the 2005 CCHS, 19.8% of individuals with diabetes also had heart disease (compared with 4.0% without diabetes), and 60.3% had high blood pressure (comparedwith 17.4% without diabetes).[844] Risk factors for diabetes include physical inactivity, overweight or obesity, and elevated fat intake, blood glucose levels, and high blood pressure.

As the population ages, the prevalence of diabetes in the Canadian populace is expected to increase.[845] The prevalence of type 2 diabetes increased overall from 3,073 per 100,000 in 1994 to 4,377 per 100,000 in 2003. Among adults aged 20 years and over, prevalence increased by 32% among men and 19% among women in the same time period.[846, 847] In the 2005 CCHS, type 2 diabetes prevalence among those aged 12 years and over was nearly 5% (1.3 million Canadians), up from 4.7% in 2000/2001 (more than 1 million Canadians) and 3% in 1994/1995.

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837 Sanmartin, Claudia, and Jason Gilmore. *Diabetic Care in Canada: Results from Selected Provinces, 2005*, Statistics Canada. Catalogue no. 82-621-XWE, 2006; accessed Nov 2007; available from http://www.statcan.ca/english/research/82-621-XIE/2006002/diabetic.htm.

838 Public Health Agency of Canada. *Diabetes: Facts and Figures*, 2007; accessed Jan 2008; available from http://www.phac-aspc.gc.ca/ccdpc-cpcmc/diabetes-diabete/english/facts/index.html.

839 Ohinmaa, Arto, Phiip Jacobs, Scot Simpson, and Jeffrey A. Johnson. "The Projection of Prevalence and Cost of Diabetes in Canada: 2000 to 2016," *Canadian Journal of Diabetes*, 2004, vol. 28, no. 2: 116-123. See also Pohar, Sheri L., Scot H. Simpson, Sumit R. Majumdar, Philip Jacobs, Arto Ohinmaa, William Osei, Mary Rose Stang, Winanne Downey, and Jeffrey A. Johnson. *Epidemiologic and Cost Trends in Diabetes in Saskatchewan 1991 to 2001*, Working Paper 05-06, Institute of Health Economics and University of Alberta, 2005; accessed Nov 2007; available from http://www.ihe.ca/documents/ihe/publications/papers/2005-06paper.pdf.

840 Health Canada. *Diabetes in Canada. Second Edition*, Center for Chronic Disease Prevention and Control, Population and Public Health Branch, Health Canada 2002; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/publicat/dic-dac2/pdf/dic-dac2_en.pdf.

841 Ibid., accessed.

842 ________. *Responding to the Challenge of Diabetes in Canada. First Report of the National Diabetes Surveillance System (NDSS)*, 2003; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/ccdpc-cpcmc/ndss-snsd/english/pubs_reports/pdf/WEB_NDSS_English_Report-nocover.pdf.

843 Public Health Agency of Canada. *Diabetes: Facts and Figures*, accessed.

844 Sanmartin, and Gilmore. *Diabetic Care in Canada: Results from Selected Provinces, 2005*, accessed.

845 Ohinmaa, Jacobs, Simpson, and Johnson. "The Projection of Prevalence and Cost of Diabetes in Canada: 2000 to 2016."

846 Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.

847 Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.

In 2005, 14.6% over the age of 65 have type 2 diabetes.[848] However, diabetes is notoriously underdiagnosed—the Public Health Agency of Canada estimates that 2.25 million Canadians may have diabetes and about a third are not aware of their condition.[849] Health Canada estimates that diabetes may be as much as five times the number with diabetes being coded as the cause of death.[850]

Diabetes has consistently been associated with low-income levels.[851] Raphael presents evidence linking material deprivation, psychosocial stress and the adoption of unhealthy behaviours to an increase in the incidence of diabetes.[852] A recent review of studies in the U.S., Australia, France, Scotland, U.K., Germany and Denmark found a statistically significant association (after adjustment for other variables) between low socioeconomic status and severe hypoglycemia in type 1 diabetes.[853] Arleen Brown and 10 colleagues reviewed the literature on the socioeconomic position and health of persons with diabetes in the U.S. and found the same patterns—increased incidence and prevalence of diabetes among the poor in high-income countries.[854] They were particularly interested in those living in poverty with low levels of educational attainment and health literacy. This is because diabetes requires a complex range of self-management behaviours necessary to monitor blood glucose, manage blood lipid and blood pressure levels, control diet and exercise, manage multiple medications such as insulin, and conduct precise and regular examination of extremities.

Sheri Maddigan et al. used the 2000/2001 CCHS and the Health Utilities Index Mark 3 (HUI3) to assess a broad range of determinants of health to find out which were most strongly associated with health-related quality of life (HRQL) in people with type 2 diabetes.[855] They note that "specifically in diabetes, income is an important predictor of social functioning and mental health."[856] Receipt of social assistance and food insecurity were two markers of income that were

[848] Sanmartin, and Gilmore. *Diabetic Care in Canada: Results from Selected Provinces, 2005*, accessed.
[849] Public Health Agency of Canada. *Diabetes: Facts and Figures*, accessed.
[850] Health Canada. *Responding to the Challenge of Diabetes in Canada. First Report of the National Diabetes Surveillance System (NDSS)*, accessed.
[851] Raphael, Dennis, Susan Anstice, Kim Raine, Kerry R. McGannon, Syed Kamil Rizvi, and Vanessa Yu. "The Social Determinants of the Incidence and Management of Type 2 Diabetes Mellitus: Are We Prepared to Rethink Our Questions and Redirect Our Research Activities?," *Leadership in Health Services*, 2003, vol. 16, no. 3: 10-20.
[852] Ibid.
[853] Sawka, Anna M., Pauline Boulos, Ashnoor S. Talib, Amiram Gafni, Lehana Thabane, Alexandra Papaioannou, Gillian Booth, and Hertzel C. Gerstein. "Low Socioeconomic Status and Increased Risk of Severe Hypoglycemia in Type 1 Diabetes: A Systematic Review of the Literature," *Canadian Journal of Diabetes*, 2007, vol. 31, no. 3: 233-241.
[854] Brown, Arleen F., Susan L. Ettner, John Piette, Morris Weinberger, Edward Gregg, Martin F. Shapiro, Andrew J. Karter, Monika Safford, Beth Waitzfelder, Patricia A. Prata, and Gloria L. Beckles. "Socioeconomic Position and Health among Persons with Diabetes Mellitus: A Conceptual Framework and Review of the Literature," *Epidemiologic Reviews*, 2004, vol. 26: 63-77.
[855] Maddigan, Sheri L., David H. Feeny, Sumit R. Majumdar, Karen B. Farris, and Jeffrey A. Johnson. *Understanding Determinants of Health in Type 2 Diabetes*, Working Paper 05-01, Institute of Health Economics and University of Alberta, 2005; accessed Nov 2007; available from http://www.ihe.ca/documents/ihe/publications/papers/2005-01paper.pdf. HUI3 is a preference-based measure of HRQL that describes an individual's overall functional health on the basis of eight attributes—vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain and discomfort. In the CCHS, the HUI3 is administered as a 31-item questionnaire. It gives a single numerical value combining the attributes from –0.360 to 1, where 1 equals perfect health and 0 equals a state valued the same as death.
[856] Ibid., accessed. p. 16.

used to indicate health disparity. They did not use income as a variable since 11% of respondents on the CCHS who had diabetes were missing income information. The largest impact on HRQL was the comorbidities with stroke and depression, but large differences in HRQL were also observed according to social assistance and food insecurity.

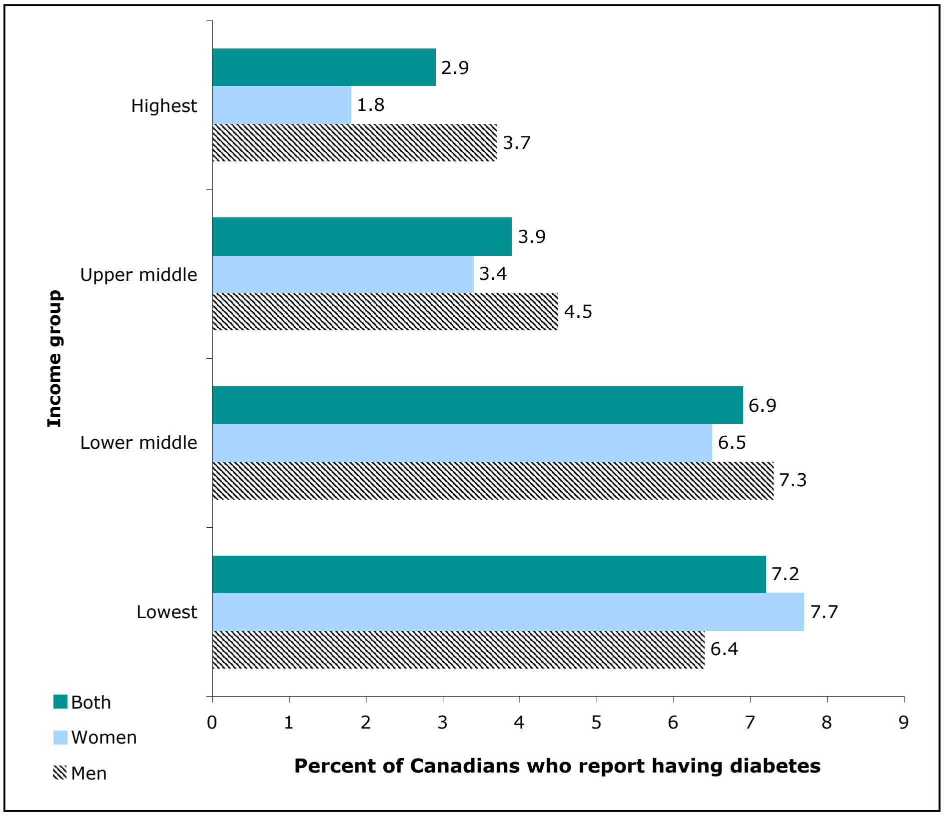
Using the Ontario Diabetes Database, Janet Hux and Mei Tang found a significant socioeconomic gradient with higher rates of diabetes among lower income quintiles, especially in the 35–64 year age group.[857] The overall prevalence in the lowest income quintile was 7.8% compared with 5.1% in the highest quintile. In a related study, Gillian Booth and Janet Hux linked Ontario neighbourhood-level data from the 1996 Census with hospital and physician service claims from the Ontario Diabetes Database for persons with diabetes from 1992–1999.[858] Outcome events were defined as one or more hospitalizations or emergency room presentations for hyperglycemia or hypoglycemia. They found that persons with diabetes in the lowest income quintile (16.4%) were 44% more likely to have an outcome event than those with diabetes in the highest quintile (11.4%). This pattern was most marked in the 45–64 year old age group (OR–1.76), and persisted after controlling for age, gender, urban vs rural residence, comorbidity, frequency of physician visits, continuity of care, physician specialty, and geographic region. Odds ratios for other ages were: All ages – 1.43, <18 – 1.06, 18–44 – 1.39, and ≥ 65 – 1.32.

Figure 17 below presents data from the Heart and Stroke Foundation of Canada, and shows the prevalence of type 2 diabetes in the 2000/2001 CCHS by income adequacy, which divides household income into quartiles. (The income category definitions can be found in Tables 55 and 56 in the Appendices.) Men and women in the lower and lower middle categories had a higher prevalence of diabetes (7.2% and 6.9%, respectively) than those in the upper middle and highest income categories (3.9% and 2.9%, respectively).

[857] Hux, Janet E., and Mei Tang. "Patterns of Prevalence and Incidence of Diabetes," in *Diabetes in Ontario: An ICES Practice Atlas*, ed. Hux, Janet E., Gillian Booth, P.M. Slaughter and A. Laupacis, Chapter 1. Toronto: Institute for Clinical Evaluative Sciences, 2003; accessed Nov 2007; available from http://www.ices.on.ca/file/DM_Chapter1.pdf.

[858] Booth, Gillian L., and Janet E. Hux. "Relationship between Avoidable Hospitalizations for Diabetes Mellitus and Income Level," *Archives of Internal Medicine*, 2003, vol. 163, no. 1: 101-106.

Figure 17.Percentage of the general population who reported having diabetes, by income group, gender, aged 20 years and over, Canada, 2000



Source: Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

Using data from the 2000/2001 CCHS, Craig et al. found that the chance of having diabetes decreased with higher income.[859] They divided respondents into two income groups—low income and middle/high-income. Low income was based on household income and the number of individuals living in the household defined by: less than $15,000 for one or two people, less than $20,000 for three or four people, and less than $30,000 for five or more people. They used low-income respondents as the reference group (OR 1.00), which was composed of 1,582 men and 2,295 women. The middle-/high-income group was composed of 12,999 men and 13,483 women. Odds ratios (OR) were adjusted for age, education, income, marital status, language, ethnicity, region, lifestyle factors, and body mass index. OR for high-income men was 0.682 (95% CI 0.550–0.845) and for high-income women 0.512 (95% CI 0.419–0.624).[860]

[859] Craig, Cameron, and Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, accessed.
[860] Ibid., accessed.

Musculoskeletal disorders

According to Colman, musculoskeletal disorders—the most common form of chronic condition—account for the highest disability costs, which amount to 75% of the total costs associated with musculoskeletal disorders.[861] These disorders represent the second costliest category of illness in Canada—after cardiovascular diseases and ahead of cancers.[862] Approximately 14% of Canadians suffer from arthritis or rheumatism, which are the most common forms of musculoskeletal disorders. In addition, musculoskeletal disorders afflict older people and can lead to unintentional injuries and falls, which "account for more than half of all hospital injury admissions in Canada; 67% of all hospital days due to injury; and 75% of all in-hospital deaths."[863] Unintentional injuries are discussed below in Section 5.3.

Musculoskeletal disorders, including arthritis and associated activity limitations, are reported to be higher in persons with low socioeconomic status.[864] The Australian Institute of Health and Welfare linked disease prevalence data with the Australian Index of Relative Socioeconomic Disadvantage (SEIFA) and found a strong association with the prevalence of rheumatoid arthritis and osteoporosis with socioeconomic status.[865] The age-standardized rate ratio was greater than 1.3 at a specific disease level. In 2005, Knut Hagen found a strong relationship between socioeconomic status—measured by income, education, and occupation—and chronic musculoskeletal complaints in a survey of 46,901 adults in Norway.[866]

Dalstra et al. reviewed self-reported arthritis, osteoarthrosis, and back complaints in eight, high-income European countries in relation to socioeconomic status as indicated by low and high education levels.[867] They found odds ratios for arthritis, osteoarthrosis, and back and spinal cord disorders to be 1.56, 1.34, and 1.19, respectively. The odds ratios for men and women were similar, with the highest ratios being for those aged 25–59 years, and lowest for those aged

[861] Colman, Ronald. *The Cost of Chronic Disease in Nova Scotia*, GPI Atlantic, Dalhousie University, and Atlantic Region Population and Public Health Branch, Health Canada, 2002; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chronic.pdf.
[862] However, Patra et al. reported that the costs of cardiovascular diseases and musculoskeletal disorders were the same in 1998. See: Patra, Jayadeep, Svetlana Popova, Jürgen Rehm, Susan Bondy, Robynne Flint, and Norman Giesbrecht. *Economic Cost of Chronic Disease in Canada, 1995-2003*, Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association, 2007; accessed Dec 2007; available from http://www.ocdpa.on.ca/docs/OCDPA_EconomicCosts.pdf.
[863] Mirolla, Michael. *The Cost of Chronic Disease in Canada*, The Chronic Disease Prevention Alliance of Canada, 2004; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chroniccanada.pdf. pp. 22–23.
[864] Badley, E.M., and D. Ibanez. "Socioeconomic Risk Factors and Musculoskeletal Disability," *Journal of Rheumatology*, 1994, vol. 21: 515-522.
[865] Australian Institute of Health and Welfare. "Burden of Arthritis and Musculoskeletal Conditions " in *Arthritis and Musculoskeletal Conditions in Australia 2005*, 7-23. Canberra: Australian Government, 2005; accessed February 2008; available from http://www.aihw.gov.au/publications/phe/amca05/amca05.pdf.
[866] Hagen, Knut. "Low Socioeconomic Status Is Associated with Chronic Musculoskeletal Complaints among 46,901 Adults in Norway," *Scandinavian Journal of Public Health*, 2005, vol. 33, no. 4: 268-275.
[867] Dalstra, J.A.A., A.E. Kunst, C. Borrell, E. Breeze, E. Cambois, G. Costa, J.J.M. Geurts, E. Lahelma, H. Van Oyen, N.K. Rasmussen, E. Regidor, T. Spadea, and J.P. Mackenbach. "Socioeconomic Differences in the Prevalence of Common Chronic Diseases: An Overview of Eight European Countries," *International Journal of Epidemiology*, 2005, vol. 34: 316-326. The countries were Finland, Denmark, Great Britain, The Netherlands, Belgium, France, Italy, and Spain.

60–79 years. For back and spinal cord disorders there were no socioeconomic differences for those over the age of 60.

Statistics Canada has reported that lower back problems—the most important cause of underlying long-term activity limitations—were not associated with socioeconomic status.[868] However, income inadequacy was significantly related to activity limitations that were musculoskeletal in origin. Cameron Mustard et al. found that in Manitoba in 1986 the odds ratio for musculoskeletal disorders between those with the highest and lowest household income (adjusted for education, and treatment for musculoskeletal disorders) to be only significant for 50–64 year olds (OR = 1.08).[869]

Gastrointestinal illness

Although gastrointestinal illness (GI) is an acute, rather than chronic disease, Shannon Majowicz et al. of the University of Guelph note the economic impact of acute gastrointestinal illness (AGI) is significant because of increased morbidity.[870] In Australia, the cost of GI was estimated by Margaret Hellard et al. of Monash University to be A$342,855,616 in 2003, of which $75,908,274 was for direct medical costs and $266,947,342 was for indirect costs.[871] The estimate was based on 0.8 cases per person per year or 15,173,430 cases. Direct costs were broken down as visits to the general practitioner or specialist, emergency room attendance, hospital admissions, medical tests, and average cost of prescribed and over-the-counter medicine. Indirect costs were based on the opportunity costs of time lost from work, which used the average wage rate in the country. These costs included those for days off per person (for people working full or part time–0.13 days off per person per year because of AGI) both for the ill person and family members needing to care for the person.

In Canada, two population-based surveys, which produced at least three studies that included AGI, have recently been conducted through the Public Health Agency of Canada to estimate disease prevalence and burden.[872] As a secondary objective to estimating disease prevalence, the surveys collected information on determinants of illness, such as low income, in relation to AGI. The studies were cross-sectional, random telephone surveys for all ages (with a parent or guardian as a proxy for children under the age of 12). Prevalence was defined as "the number of respondents reporting acute gastrointestinal illness in the previous 28 days divided by the total number of respondents."[873] Incidence rates represent the cumulative incidence rate and income

[868] Statistics Canada. *Health Status of Canadians: Report of the 1991 General Social Survey*, Catalogue 11-612E, No. 8, 1994. This report is not available on-line. It is Cited in Suleman, Zabin. "A Retrospective Demographic Study at the Calgary Urban Project Society: Chiropractic Service Delivery Beyond "Upper-Middle Class," *Journal of the Canadian Chiropractic Association*, 2001, vol. 45, no. 4: 241-247.
[869] Mustard, Cameron A., Shelley Derksen, Jean-Marie Berthelot, Michael Wolfson, and Leslie L. Roos. "Age-Specific Education and Income Gradients in Morbidity and Mortality in a Canadian Province," *Social Science & Medicine*, 1997, vol. 45, no. 3: 383-397.
[870] Majowicz, Shannon E., Julie Horrocks, and Kathryn Bocking. "Demographic Determinants of Acute Gastrointestinal Illness in Canada: A Population Study," *BMC Public Health*, 2007, vol. 7: 162-169.
[871] Hellard, Margaret E., Martha I. Sinclair, Anthony H. Harris, Martyn Kirk, and Christopher K. Fairley. "Cost of Community Gastroenteritis," *Journal of Gastroenterology and Hepatology*, 2003, vol. 18: 322-328.
[872] Majowicz, Dore, Flint, Edge, Read, Buffett, McEwen, McNab, Stacey, Scokett, and Wilson. "Magnitude and Distribution of Acute, Self-Reported Gastrointestinal Illness in a Canadian Community." p. 608.
[873] Majowicz, Dore, Flint, Edge, Read, Buffett, McEwen, McNab, Stacey, Scokett, and Wilson. "Magnitude and

was defined as the total gross annual household income.

Majowicz et al. conducted the first survey in Hamilton, Ontario between February 2001 and February 2002.[874] In this study the authors found that 10.04% (95% CI 9.94–10.14) of the population were at risk of AGI each month.[875] For those living in households with less than $20,000 per year, the prevalence rate was 15% (CI 12–16). Prevalence was higher in females and in those less than 10 years of age and between 20 and 24 years of age. Incidence rates were 1.3 cases per person year, and the average duration was approximately 4 days. The average probability that the individual developed AGI during the year was 71.6%. The authors note that these estimates are in the range of other developed countries.

In a second study, by the same authors, data from the previous study—comprising 8,108 individuals—were used to specifically investigate demographic determinants of AGI. Majowicz et al. found a statistically significant association between household income and the risk of AGI in females but not in males, where the risk of AGI was nearly constant across all income levels. In the lowest income category (total household income less than $20,000), the odds of AGI for females (0.46) were 2.46 times higher than the odds for males, regardless of age. The authors speculate that this may be because women are more prone to AGI "due perhaps to increased food-borne exposure or increased exposure to infected children…exacerbated by low-income living conditions."[876] They also found the odds of AGI in a low-income household for children under the age of 10 were 0.554 for female children and 0.225 for male children.

Kate Thomas et al. conducted a third study with survey data collected between June 2002 and June 2003 in three British Columbia communities.[877] She and her colleagues found a general monthly prevalence of AGI of 9.2% (95% CI 8.4–10.0) of the population.[878] The average duration of illness per inflicted individual was 3.7 days, which translated into 19.2 million days annually of AGI in British Columbia. These estimates are similar or the same as those found in the earlier study in Ontario. For those living in households with incomes below $20,000, the prevalence rate was 10.7% (CI 8.3–13.6). The incidence rate for this income group was 1.3 (95% CI 1.1–1.4) episodes of AGI per person-year, and an average probability that the individual developed AGI during the year was 71.6%.

Distribution of Acute, Self-Reported Gastrointestinal Illness in a Canadian Community." p. 608.

874 Majowicz, S.E., K. Dore, J.A. Flint, V. L. Edge, S. Read, M.C. Buffett, S. McEwen, W.B. McNab, D. Stacey, P. Scokett, and J.B. Wilson. "Magnitude and Distribution of Acute, Self-Reported Gastrointestinal Illness in a Canadian Community," *Epidemiology and Infection*, 2004, vol. 132: 607-617.

875 Ibid.

876 Majowicz, Horrocks, and Bocking. "Demographic Determinants of Acute Gastrointestinal Illness in Canada: A Population Study." p. 167.

877 Thomas, M. Kate, Shannon E. Majowicz, Laura MacDougall, Paul N. Sockett, Suzie J. Kovacs, Murray Fyfe, Victoria L. Edge, Kathryn Dore, James A. Flint, Spencer Henson, and Andria Q. Jones. "Population Distribution and Burden of Acute Gastrointestinal Illness in British Columbia, Canada," *BMC Public Health*, Public Health Agency of Canada, 2006, vol. 6: 307-317.

878 Thomas, et al. "Population Distribution and Burden of Acute Gastrointestinal Illness in British Columbia, Canada."

5.3 Unintentional traumatic injuries

Unintentional traumatic injuries are a burden to society not only because of the disability, pain, and suffering they cause, but also because of the resulting health costs to society and potential life lost.[879] Traumatic injuries are the leading cause of death among those under the age of 45, and are responsible for 56% of deaths for children and adolescents between the ages of 1–19 years.[880] They are also the second largest contributor to potential years of life lost (after cancer) before the age of 70.[881] It is estimated that 90% of injuries are preventable.[882] Health Canada reports that injury mortality declined by 40% between 1980 and 1997, mainly because of a reduction in deaths associated with motor vehicle collisions.[883] Marni Brownell et al. sugggest that injuries should not be referred to as being—or being caused by— "accidents," since this implies that the incidents are "random and beyond our control."[884]

As noted in more detail below, evidence of the associations between injuries and low socioeconomic status are mixed. Generally, there is a strong association between low income and mortality rates due to injuries, but several studies have found the association with morbidity rates weak. However, one study from Manitoba concluded: "Clearly, injuries are not random events but are related to social factors, including income level, and the overall healthiness and socioeconomic well-being of the population."[885]

A 1998 study by Angus et al. of Smartrisk in Toronto estimated the economic burden of unintentional injury in Canada to be $8.7 billion annually, of which $4.2 billion was for direct costs and $4.5 billion was for indirect costs.[886] Falls, largely among children and the elderly, account for 40% of the total cost, and motor vehicle crashes account for another 20% of the cost.[887] Smartrisk has also produced costs of injury reports for all provinces except Quebec.[888]

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879 Cubbin, Catherine, and Gordon S. Smith. "Socioeconomic Inequalities in Injury: Critical Issues in Design and Analysis," *Annual Review of Public Health*, 2002, vol. 23: 349-375.
880 Health Canada. *National Statistics and Trends: Injury in Canada*, 1999; accessed Dec 2007; available from http://www.injurypreventionstrategy.ca/downloads/HC_stat.pdf.
881 Public Health Agency of Canada. *Facts on Injury*, 2007; accessed Dec 2007; available from http://www.phac-aspc.gc.ca/injury-bles/facts_e.html.
882 McKeag, Ali Moses, Fang Yang, and Margaret Keresteci. *National Trauma Registry Report: Major Injury in Canada, 2004 - 2005*, National Trauma Registry, Canadian Institute for Health Information, 2006; accessed Dec 2007; available from http://secure.cihi.ca/cihiweb/products/NTR_Major_Injury_in_Canada_2006.pdf.
883 Health Canada. *National Statistics and Trends: Injury in Canada*, accessed.
884 Brownell, Marni, David Friesen, and Teresa Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences," *Canadian Journal of Public Health*, 2002, vol. 93, no. S2: S50-S56.
885 Ibid. p. S55.
886 Angus, D.E., E. Cloutier, and T. Albert. *The Economic Burden of Unintentional Injury in Canada*, Smartrisk and Public Health Agency of Canada, 1998; accessed Nov 2007; available from http://www.smartrisk.ca/contentdirector.aspx?cd=31&dd=0&sr=1.
887 Canadian Institute for Health Information. *Injuries*, 2007; accessed Dec 2007; available from http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=statistics_results_topic_injuries_e&cw_topic=Health%20Conditions&cw_subtopic=Injuries.
888 Smartrisk. *Website: Economic Burden of Injury Studies*, 2007; accessed Dec 2007; available from http://www.smartrisk.ca/ViewArticle.aspx?tp=3310. The Canadian report was produced in 1998, British Columbia and Saskatchewan in 2001, Alberta in 2002, Manitoba and Atlantic Canada in 2003, and Ontario in 2006.

The most recent national data on major injury in Canada are available for 2004–2005 through the National Trauma Registry Report (NTRR) at the Canadian Institute for Health Information (CIHI).[889] The data are reported annually, and 2005–2006 data are scheduled to be released in 2008. The data for patients hospitalized with major trauma are obtained from eight provinces—Saskatchewan and Prince Edward Island are not included. However, CIHI estimates that 90% of all major trauma cases are captured in the data set. The following statistics are taken from the most recent registry report unless otherwise noted.

In 2004–2005, 11,112 major injury cases accounted for 172,790 hospital days with an average length of stay of 16 days, and 13% of these cases were fatalities. Males suffered 72% of the injuries. Of the total injuries, 76% were internal organ injuries, 74% were musculoskeletal, and 33% were superficial. Some injuries included both organ and musculoskeletal injuries.

Of total injuries, motor vehicle collisions were responsible for 45% of the injuries, followed by falls (32%), intentional injuries such as homicide and injury purposely inflicted (9%), and other (5%), of which the leading causes were being unintentionally struck by or against an object or person, and incidents caused by machinery.

Health Canada, which includes categories not included in the NTRR, also listed the leading causes of unintentional injury to be motor vehicle collisions (9.6 / 100,000), falls (8.8 / 100,000), poisoning (2.3 / 100,000), drowning and suffocation (both 1.3 / 100,000), and fire and burns (1.0 / 100,000).[890]

Suicide is often listed as a cause of injury, but is not included in the national trauma registry. In 1997, Health Canada reported that 29% of injury deaths were from suicide, which is discussed below in Section 5.4.4 on mental health.

Motor vehicle crashes were the leading cause of injuries for all age groups with the exception of seniors aged 65 years and over for whom falls (67%) were the main cause of injury.

Children and adolescents under the age of 20 suffered 16.2% of all injuries, those aged 20 – 34 years suffered 23.4%, aged 35 – 64 suffered 37.5%, and those over the age of 65 suffered 22.9%.

5.3.1 Injury attributable to socioeconomic status

Cubbin and Smith reviewed the international literature published between 1960 and 2002 on socioeconomic status and fatal/nonfatal injuries.[891] They found a strong association between socioeconomic status and fatal unintentional injuries (and homicides), but the relationship with nonfatal injuries was less consistent. This is also the case with Canadian reports of injuries. The strength of the socioeconomic/injury relationship varies according to the type of injury, the ages

[889] McKeag, Yang, and Keresteci. *National Trauma Registry Report: Major Injury in Canada, 2004 - 2005*, accessed.
[890] Health Canada. *National Statistics and Trends: Injury in Canada*, accessed.
[891] Cubbin, and Smith. "Socioeconomic Inequalities in Injury: Critical Issues in Design and Analysis."

affected, the injury outcome, gender, and place of occurrence.[892] Generally, injuries due to motor vehicle crashes and sports and recreation are more likely to be experienced by individuals with high socioeconomic status, because of their higher rates of participation in these types of activities.

According to David Hay et al., rural residents face a disproportionate number of traumatic deaths. Approximately 31% of Canadians live in rural areas, but 70% of traumatic deaths occur in these areas, and the mortality rate of these injuries is twice that of urban Canadians with similar injuries.[893] Occupational hazards create unique patterns of injury in rural areas from farming, forestry, mining, and fishing. Hay et al. note that "road accidents, bad weather, poor roads, lack of vehicle maintenance and inadequate use of restraint systems all contribute to the increased mortality rates."[894]

Russell Wilkins et al. used data from the Canadian Mortality Data Base and census tracts to examine mortality trends in urban Canada by neighbourhood income. According to Wilkins et al., those living in the poorest income quintile suffered higher injury mortality rates—other than from motor vehicle crashes and suicides— for injuries such as falls, poisoning, drowning, fires, etc. than did those living in the highest income quintile.[895] However, income differences in mortality rates for pedestrians struck by motor vehicles show very little income difference, and the mortality of occupants in motor vehicle crashes is reversed by income difference, with those in the highest income quintile having the highest rates. Wilkins et al. note that this may be due to the different exposures to risk. In other words, those living in poorer neighbourhoods may travel by motor vehicle less often than those living in more affluent neighbourhoods.

Wilkins et al. calculated the age-standardized mortality rates per 100,000 population, and the risk ratios and risk differences for injuries—excluding motor vehicle traffic crashes, mortalities of pedestrians in motor vehicle traffic crashes, motor vehicle occupants in traffic crashes, and suicide—by gender and neighbourhood income quintile for urban Canada between 1971 and 1996. Table 42 showing these rates can be found in the Appendices.

Kathryn Wilkins and Evelyn Park used 2000/2001 CCHS data to examine injuries and found that 15% of males, compared with 11% of females reported sustaining at least one activity-limiting injury in the previous year. Adolescents between 12–19 years of age were most likely to be injured (27% males and 18% females), and beyond the age of 65 more women than men were injured.[896] However, Wilkins and Park found that males who live in the highest income households were more likely than males in general to sustain a serious injury, and for females they did not find a significant association between injury rates and household income. They suggest that the association between higher-income males with injury "may indicate a greater

[892] Alberta Centre for Injury Control and Research. *Socioeconomic Status and Injury*, 2006; accessed Dec 2007; available from http://www.acicr.ualberta.ca.
[893] Hay, David, Judi Varga-Toth, and Emily Hines. *Frontline Health Care in Canada: Innovations in Delivering Services to Vulnerable Populations*, Canadian Policy Research Networks Inc., 2006; accessed Nov 2007; available from http://www.cprn.org/documents/45652_en.pdf.
[894] Ibid., accessed. p. 8.
[895] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[896] Wilkins, Kathryn, and Evelyn Park. "Injuries," *Health Reports*, 2004, vol. 15, no. 3: 43-48.

likelihood of participation in activities and sports that require fairly substantial expenses: lessons, memberships in sports clubs, associations and fitness centres, for example, or skiing, snowboarding, and hockey."[897]

5.3.2 Childhood injury

U.S. researchers Mary Fallat et al. list poverty as a main risk factor for pediatric injury.[898] Among the reasons for this disparity, they note:

> Families with lower incomes and education live and work in more hazardous environments. [Researchers have] found that housing conditions rather than poverty itself mediated the risk of pediatric injury. Poorer neighborhoods may be characterized by substandard and overcrowded housing, lack of safe recreational facilities for children, proximity of housing to busy streets, increased exposure to physical hazards, and limited access to health care. Individuals who lack the economic means or the education to understand the concepts of injury prevention are less likely to purchase safety devices, practice injury prevention measures, or believe that they are important. Risk factors that have been found to operate on an ecological level include fewer safe play areas, broken playground equipment, broken glass, poor housing, drug activity, violence, access to firearms, limited organized sports activities or extracurricular activities, and less access to safe and affordable childcare.[899]

In 1997, Choiniere reported that children living in the poorest urban neighbourhoods in Canada had a 39% higher mortality rate and a 25% higher hospitalization rate due to injuries than children living in the wealthiest urban neighbourhoods.[900]

Catherine Birken et al. examined mortality and census tract data to determine the influence of socioeconomic status—measured by the proportion of families living below the low-income cut-off level in a census tract—on trends in the rates of death of children aged 14 and under from unintentional injuries in urban Canada from 1971–1998.[901] They found a large drop in mortality rates from 1971 to 1998 for both high- and low-income children. The rate for high-income children fell from 12.39 per 100,000 children in 1971 to 2.74 in 1998. The rate for low-income children fell from 25.33 per 100,000 children in 1971 to 5.90 in 1998. However, despite the large drop in mortality rates, the *relative* mortality rate changed very little. The rate ratio of lowest–highest income quintiles actually rose from 2.04 in 1971 to 2.15 in 1998, and low-income

[897] Ibid.
[898] Fallat, Mary E., Julia Costich, and Susan Pollack. "The Impact of Disparities in Pediatric Trauma on Injury-Prevention Initiatives," *The Journal of Trauma. Injury, Infection, and Critical Care*, 2006, vol. 60, no. 2: 452-454.
[899] Ibid. p. 452.
[900] Choiniere, R. "Injury-Related Mortality and Hospitalization Disparities," in *For the Safety of Canadian Children and Youth: From Injury Data to Preventive Measures*, ed. Health Canada. Ottawa: Minister of Public Works and Government Services, Canada, 1997. Cited in Brownell, Friesen, and Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences."
[901] Birken, Catherine S., Patricia C. Parkin, Teresa To, and Colin Macarthur. "Trends in Rates of Death from Unintentional Injury among Canadian Children in Urban Areas: Influence of Socioeconomic Status " *Canadian Medical Association Journal*, 2006, vol. 175, no. 8: 867-868.

children remained over twice as likely to die from unintentional injuries and high-income children.

Writing for Human Resources and Social Development Canada in 2001, Hassan Soubhi et al. conducted an extremely thorough analysis of the interactions and combined effects of neighbourhood, family, and child behaviour on childhood injury in Canada.[902, 903] The study used data from the first two cycles (1994/1995 and 1996/1997) of the National Longitudinal Survey of Children and Youth (NLSCY) linked to census data. Cycle 1 included children aged 0–11 years from 13,439 households and cycle 2, which was conducted with a portion of the same individuals two years later, included children aged 2–13 years from 10,261 households. This is one of the few studies that only assessed morbidity due to injury, rather than mortality.

Soubhi et al. studied many variables that specifically relate to poverty including family socioeconomic status, neighbourhood disadvantage, and neighbourhood problems. According to the authors, these variables reflect "a multidimensional and more enduring concept than income poverty."[904] Family socioeconomic status (SES) was composed of five variables: household income, level of education of the person most knowledgeable about the child (PMK) (the respondent) and of his/her spouse/partner, and prestige of the occupation of the PMK and of his/her spouse/partner.

Neighbourhood disadvantage was assessed with 7 variables, measured at the level of census enumeration area (EA), which is the smallest geographical unit from which census counts can be automatically retrieved.[905] The first two variables were assessed separately and a neighbourhood disadvantage index was created with the last five variables. These variables included percentage of: single-female headed households, households with an income less than $20,000 (variable is separate from family SES), income from government transfer payments, population aged 15 years and over without a secondary school certificate, population aged 15 and over with a university degree (reverse coded), mean household income in 1,000's of dollars (reverse coded), and unemployed aged 15 years and over.

Neighbourhood problems were assessed by responses (big problem, somewhat of a problem, or no problem) to a list of items on the survey: "How much of a problem is the following in this neighbourhood?: Garbage litter, or broken glass in the street or road, on the sidewalks, or in yards; selling or using drugs; groups of young people who cause trouble."[906]

Results, which were calculated both for cross-sectional data from cycle 1 and for longitudinal data, showed similar probabilities for all age groups. The percent of families with an income less

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902 Soubhi, Hassan, Parminder Raina, and Dafna Kohen. *Effects of Neighbourhood, Family, and Child Behaviour on Childhood Injury in Canada*, Applied Research Branch, Strategic Policy, Human Resources and Social Development Canada, 2001; accessed Dec 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/sdc/pkrf/publications/research/2001-000067/iw-01-1-6e.pdf.

903 ________. "Neighborhood, Family, and Child Predictors of Childhood Injury in Canada," *American Journal of Health Behavior*, 2004, vol. 28, no. 5: 397-409.

904 Ibid. p. 401.

905 The EA must contain a minimum of 375 dwellings in urban areas and 125 dwellings in rural areas.

906 Soubhi, Raina, and Kohen. *Effects of Neighbourhood, Family, and Child Behaviour on Childhood Injury in Canada*, accessed. p. 30.

than $20,000 and the prevalence of neighbourhood problems were both linked to a significant risk of injury. However, neighbourhood disadvantage and family socioeconomic status in general were associated with lower odds of injury. Odds ratios for the association between odds of injury and specific variables include the following (the asterisk represents use of longitudinal data):[907]

- Children under age two: neighbourhood problems–1.16; families with less than $20,000–1.03*; family socieconomic status–0.64* (lowest quartile compared with the highest quartile, children from lowest quartile have lowest odds of injury); neighbourhood disadvantage not listed.
- Children aged 2–3 years: neighbourhood problems–1.09; neighbourhood disadvantage–0.68; families with less than $20,000 and family socioeconomic status were not listed.
- Children aged 4–11 years: neighbourhood problems–1.08; families with less than $20,000–1.02*; family socioeconomic status–0.71 (lowest quartile compared with the highest quartile, children from lowest quartile have lowest odds of injury); neighbourhood disadvantage not listed.[908]

In sum, the study used more variables than most studies do to assess socioeconomic status, such as the levels of education and occupation of both parents as well as income, and results showed there was less of a likelihood for low-SES children to be injured than children with high SES. When level of family income below $20,000 was used in isolation, a small but significant inverse relationship was seen. Neighbourhood disadvantage was linked to lower odds of injury, and neighbourhood problems were associated with increased odds of injury. In addition, the authors note that they did not find a significant relationship between family SES and neighbourhood disadvantage: "These two variables seem to influence the risk of injuries independently of each other and with varying effects according to child age."[909]

Finally, at the provincial level, studies in Manitoba and Alberta have assessed the associations between childhood injury and income disparities. In 2002, Brownell et al. assessed the socioeconomic influences on 14 types of childhood injury rates in Manitoba using administrative data from the provincial Population Health Research Data Repository and Manitoba Vital Statistics.[910] There was a five-fold variation in injury mortality rates across the province with higher mortality and hospitalization rates due to injuries found in areas with less favourable socioeconomic conditions. Children living in the lowest income neighbourhoods in rural areas had injury mortality rates that were almost 2.5 times that of the highest income rural neighbourhoods, and hospitalization rates that were 3 times higher. In urban neighbourhoods the mortality rates from injuries were 4.5 times higher in lowest-income neighbourhoods than in the highest-income neighbourhoods, and hospitalization rates were 2.5 times higher. The authors also found that injury mortality rates for First Nations children aged 29 days to 14 years was more than 9 times higher than that for non-First Nations children.

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907 *Results are for both the cross-sectional and longitudinal data, with the latter being represented with an asterisk. Results for all variables were not given for all ages.

908 Soubhi, Raina, and Kohen. *Effects of Neighbourhood, Family, and Child Behaviour on Childhood Injury in Canada*, accessed.

909 Ibid., accessed. p. 53.

910 Brownell, Friesen, and Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences."

Brownell et al. also report that income differences were greater for some types of injuries than others. Income was not significantly associated with deaths due to motor vehicle crashes, poisonings, or suicide, but "children in the lowest income group were 1.5 times more likely to die from drowning, twice as likely to die from falls, over 4 times more likely to die from homicide, and over 18 times more likely to die from fires."[911] Income was significantly associated with hospitalization rates for children from the poorest neighbourhoods, which were "1.5 times higher for choking and suffocation, over 1.5 times higher for suicide attempts, 2 times higher for poisonings, over 2 times higher for fires and burns, and almost 3 times higher for violent attacks."[912] For hospitalizations due to injury there were no income effects observed in regards to falls or motor vehicle crashes.

The Alberta Centre for Injury Control and Research reports that children in Alberta from low socioeconomic families "not only have higher injury rates but their injuries tend to be more severe and more often fatal."[913] It also notes: "If the lowest socio-economic groups had experienced the same injury rate as that seen in the highest socio-economic groups, then approximately one third of all injuries would not have occurred and could have been prevented."[914] Susan Gilbride et al. also studied childhood injury in Alberta and found that most types of injuries were more frequent in children with low socioeconomic status, and especially those living on social assistance or having Aboriginal Treaty status.[915] Specifically, when compared to high-income children, low-income children had more injuries related to poisoning, burns, and open wounds, and fewer injuries for dislocations, sprains, and strains, and no difference between the groups was observed for fractures..

In conclusion, because of the strong association between poverty and childhood mortality due to injury, and the uneven results for the association between poverty and childhood morbidity due to injury, a comprehensive cost of poverty study would most likely produce the most accurate cost estimates by using mortality statistics only.

5.4 Mental health

A variety of mental illness-related disorders cause varying degrees of distress and disability in the Canadian populace. These disorders include mood disorders, such as major depressive episodes, bipolar disorder, or dysthymia, schizophrenia, anxiety disorders, personality disorders, eating disorders, and suicidal behaviour.[916] The World Health Organization (WHO) has attributed approximately 14% of the global burden of disease to "neuropsychiatric disorders,

[911] Ibid. p. S55.
[912] Ibid. p. S55.
[913] Alberta Centre for Injury Control and Research. *Socioeconomic Status and Injury*, accessed. p. 1.
[914] Ibid., accessed. p. 2.
[915] Gilbride, Susan J., Cameron Wild, Douglas R. Wilson, Lawrence W. Svenson, and Donald W. Spady. "Socio-Economic Status and Types of Childhood Injury in Alberta: A Population Based Study," *BMC Pediatrics*, 2006, vol. 6, no. 30: 1-10.
[916] Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.

mostly due to the chronically disabling nature of depression and other common mental disorders, alcohol-use and substance-use disorders, and psychoses."[917] However, Martin Prince et al., writing recently in *The Lancet,* suggest that the prevalence of mental disorders is likely underestimated because of "inadequate appreciation of the connectedness between mental illness and other health conditions…. Mental disorders increase risk for communicable and non-communicable diseases, and contribute to unintentional and intentional injury."[918]

In Canada, in 1999, 3.8% of all hospital admissions in general hospitals (1.5 million hospital days) were due to mental illnesses.[919] In 2001/2002, there were 192,079 hospitalizations for mental disorders, including 31,685 for schizophrenia.[920] According to the Canadian Institute for Health Information (CIHI), in 2002/2003, one-third of hospital days, and 15% of hospitalizations were directly (6%) or indirectly (9%) attributable to mental illnesses.[921]

Mental health problems are more prominent in women than in men.[922] According to Donna Stewart et al., "Women do not experience more mental illness than men; they are simply more prone to depression and anxiety, whereas men are more likely to have addictive disorders and personality disorders."[923]

5.4.1 Costs of mental illness

According to Health Canada, mental disorders represent one of six diagnostic categories and account for the largest share of direct health costs in Canada.[924] In 1998, Health Canada's estimate for mental disorders was $7.9 billion or $4.7 billion for direct costs and $3.2 billion for indirect costs.[925] These estimates are considered to be low because large numbers of individuals with mental health problems are treated outside of the medical system or not at all. Stephens and Joubert estimated the total burden of mental illness to be $14.4 billion in 1998, which included $6.26 billion for direct costs, and $8.13 billion for indirect costs.[926] This estimate adds indirect cost items not captured in the Health Canada 1998 estimate such as those for short-term work loss associated with depression or distress.

[917] Prince, Martin, Vikram Patel, Shekhar Saxena, Mario Maj, Joanna Maselko, Michael R Phillips, and Atif Rahman. "Global Mental Health 1. No Health without Mental Health, " *The Lancet*, 2007, vol. 370: 859-877. p. 859.
[918] Ibid. p. 859.
[919] Health Canada. *A Report on Mental Illnesses in Canada*, 2002; accessed Jan 2008; available from http://www.phac-aspc.gc.ca/publicat/miic-mmac/pdf/men_ill_e.pdf.
[920] Statistics Canada. *Hospitalizations for Mental Disorders, by Cause, 2001-2002* 2004; accessed Jan 2008; available from http://www40.statcan.ca/l01/cst01/health56a.htm.
[921] Canadian Institute for Health Information. *Annual Report*, Toronto: CIHI, 2005. Cited in Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.
[922] Health Canada. *A Report on Mental Illnesses in Canada*, accessed.
[923] Stewart, Donna E., Enza Gucciardi, and Sherry L. Grace. *Depression*, Women's Health Surveillance Report, Canadian Institute for Health Information, 2003; accessed Dec 2007; available from http://www.phac-aspc.gc.ca/publicat/whsr-rssf/pdf/WHSR_Chap_18_e.pdf. p. 1.
[924] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed. The six categories with the largest costs are: cardiovascular diseases, mental disorders, digestive diseases, respiratory diseases, injuries, and nervous system and sense organ diseases. These categories represent two-thirds of the total cost of illness.
[925] Health Canada. *Economic Burden of Illness in Canada, 1998*, accessed.
[926] Stephens, T., and N. Joubert. "The Economic Burden of Mental Health Problems in Canada," *Chronic Diseases in Canada*, 2001, vol. 22, no. 1: 18-23.

In 2004, Teh-wei Hu of the University of California at Berkeley reviewed the economic cost of mental illness studies published worldwide since 1990.[927] The majority of studies were from the United States, United Kingdom, and Australia. Results varied widely between countries, but overall mental illness contributed about 7% of health care expenditures in the U.S. and 1.8% in Australia. Total costs for overall mental illnesses in Australia in 1997/1998 were about US$1.5 billion, or US$567 million for direct costs and US$903 million for indirect costs. In 1990, costs in the U.S. exceeded US$142 billion, or US$67 billion for direct costs and US$75 billion for indirect costs. Melanie Luppa et al. recently reviewed all cost-of-illness studies of depression published worldwide.[928] Summary estimates for the average cost per case of depression ranged from US$1,000 to US$2,500 ($2003) for direct costs, and from US$2,000 to US$3,700 per case for indirect costs.

Costs for specific aspects of mental illnesses have also been calculated for Canada. Desjardins and Laurier estimated the economic burden of depression in Canada in 2000 to be $5.4 billion—$2.1 billion for direct costs and $3.3 billion for indirect costs.[929] Goeree et al. estimated the economic burden of schizophrenia in Canada in 2004 to be $6.8 billion, including $2.0 billion in direct costs, and $4.8 billion in indirect costs.[930]

According to the Canadian Mental Health Association, the estimated cost of suicide in 1998 ranges from $433,000 to $4,131,000 per individual depending on the categories used to estimate the cost such as potential years of life lost, income level and effects on survivors.[931] It also estimates the cost of attempted suicide to range from $33,000 to $308,000 per individual also depending on costing categories such as hospital services, rehabilitation, and the level of family disruption and support required following the attempt.[932]

In one of the first cost of suicide studies in Canada, which New Zealand researchers have described as "particularly clear and useful,"[933] Dale Clayton and Alberto Barceló estimated the cost of the 94 suicides reported in New Brunswick in 1996 to be nearly $80 million—$535,000 for direct costs, which included health care services, autopsies, funerals and police

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927 Hu, Teh-wei. *An International Review of the Economic Costs of Mental Illness*, Disease Control Priorities Project, Working Paper No. 31, 2004; accessed Dec 2007; available from http://www.dcp2.org/file/45/wp31.pdf.
928 Luppa, Melanie, Sven Heinrich, Matthias C. Angermeyer, Hans-Helmut Ko_nig, and Steffi G. Riedel-Heller. "Cost-of-Illness Studies of Depression. A Systematic Review," *Journal of Affective Disorders*, 2007, vol. 98: 29-43.
929 Desjardins, B., and C. Laurier. *The Burden of Depression in Canada*, International Society for Pharmacoeconomics and Outcomes Research, Seventh Annual International Meeting, May 19-22, 2002; accessed Dec 2007; available from http://www.ispor.org/meetings/va0502/presentations/sesion2/PMHIO.pdf.
930 Goeree, R., F. Farahati, N. Burke, G. Blackhouse, D. O'Reilly, J. Pyne, and J.E. Tarride. *The Economic Burden of Schizophrenia in Canada in 2004*, B.C. Mental Health and Addictions Research Network, 2005; accessed Dec 2007; available from http://www.mhanet.ca/documents/2007/The%20Economic%20Burden%20of%20Schizophrenia%20in%20Canada%20in%202004.pdf.
931 Canadian Mental Health Association. *Statistics*, 2007; accessed Jan 2008; available from http://www.cmha.ab.ca/bins/content_page.asp?cid=284-285-1258-1404.
932 Ibid., accessed.
933 O'Dea, Des, and Sarah Tucker. *The Cost of Suicide to Society*, Wellington: Ministry of Health, New Zealand, 2005; accessed Dec 2007; available from http://www.moh.govt.nz/moh.nsf/0/BFA96AA9486D2C3BCC2570D4008009E6/$File/thecostofsuicidetosociety.pdf. p. 27.

investigations, and $79.4 million for indirect costs (using a 4% discount rate), which estimated the value of lost productivity due to premature death. The mean total cost estimate per suicide was $850,000.[934] Based on this New Brunswick study, estimates for the cost of 427 suicides in Alberta in 1999 were calculated to be $365.2million—$2.4 million for direct costs and $362.8 million for indirect societal costs due to lost productivity.[935]

5.4.2 Mental illness attributable to socioeconomic status

Research has consistently shown a strong association between poverty or low socioeconomic status (SES) and mental illness.[936] According to Carles Muntaner et al., who conducted a review of the literature on the associations between socioeconomic position (SEP) and major mental disorders, there is more of an association between SEP and depression than between SEP and anxiety disorders because the diagnosis for these disorders has been subject to more fluctuation.[937] However, the authors note that evidence from the U.S. Epidemiologic Catchment Area Study "consistently suggest that lower socioeconomic status groups have a higher prevalence of panic, all types of phobias, and generalized anxiety disorder. The evidence is less conclusive for obsessive-compulsive disorder."[938] The evidence for an association between schizophrenia and SEP, especially for low income, has been mixed, although most studies do show a higher risk for those living on low income. Referring mainly to studies conducted in the U.S. and U.K., Muntaner et al. note:

> Although studies to date in the area of mental health have been descriptive or exploratory, findings on associations between residential poverty (e.g., indices of deprivation, disadvantage or poverty rate indicators) and mental health are consistent across type of study, country, level of aggregation, and outcome.[939]

In 2003, U.K. researchers Tom Fryers et al. also conducted a systematic review of the evidence from large-scale population studies conducted since 1980 on the associations between social inequalities and 'common mental disorders.'[940] They defined these disorders as "widespread 'neuroses,' mostly anxiety and depression, often combined," but not the more severe disorders such as schizophrenia, depressive psychosis, bi-polar disorder, organic psychoses and the dementias.[941] In the nine studies that met their criteria, the authors found that the most consistent associations were with low income or material standard of living, less education, and

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[934] Clayton, Dale, and Alberto Barceló. "The Cost of Suicide Mortality in New Brunswick, 1996," *Chronic Diseases in Canada*, 2000, vol. 20, no. 3. accessed Dec 2007; available from http://www.phac-aspc.gc.ca/publicat/cdic-mcc/20-2/e_e.html.

[935] Anielski, Mark. *The Alberta GPI Accounts: Suicide*, Pembina Institute, 2001; accessed Dec 2007; available from http://pubs.pembina.org/reports/10_suicide.pdf. p. 3.

[936] The terms SES and SEP are used interchangeably. In this report, the terms used by the original author are retained.

[937] Muntaner, Carles, William W. Eaton, Richard Miech, and Patricia O'Campo. "Socioeconomic Position and Major Mental Disorders," *Epidemiologic Reviews*, 2004, vol. 26: 53-62.

[938] Ibid. p. 53.

[939] Ibid. p. 57.

[940] Fryers, Tom, David Melzer, and Rachel Jenkins. "Social Inequalities and the Common Mental Disorders. A Systematic Review of the Evidence " *Social Psychiatry and Psychiatric Epidemiology*, 2003, vol. 38: 229-237.

[941] Ibid. p. 234.

unemployment, and concluded that "common mental disorders are significantly more frequent in socially disadvantaged populations."[942]

Odds ratios in these studies—most of which were from the U.S. and U.K.—which all associated low income with depression and compared individuals in the highest and lowest income categories, ranged from 1.11–2.25 for women and 1.53–2.59 for men.[943] These results are unusual because they show men have a higher risk for depression, which is the opposite of what is typically found.

Using data from a longitudinal study of individuals in Massachusetts who had undergone an acute psychiatric hospitalization between 1994–2000, Christopher Hudson assessed the level of economic stress and its association with severe mental illness.[944] Economic stress was assessed through three indicators: proportion of individuals under the federal poverty level, percentage of adults aged 15–65 years who were reported as unemployed at the time of the 2000 census, and rental housing unaffordability, calculated as median rent divided by median household income. Variables tested also included, in part, family integration, race, age, urbanization, and gender. However, the authors noted that "none of these could compete with the simple SES/economic stress model for explaining the SES–mental illness correlation, usually because these additional predictors accounted for very little additional variation in the data."[945] Hudson concluded:

> The current study reveals a remarkably strong and consistent negative correlation between socioeconomic conditions and mental illness, one that supports the role of social causation in mental illness and cannot be accounted for by geographic or economic downward mobility. The statewide database used in this study leaves little doubt that, at least in Massachusetts, the poorer one's socioeconomic conditions are, the higher one's risk is for mental disability and psychiatric hospitalization. This substantial correlation was found regardless of the particular indicator of SES or type of mental illness examined.[946]

5.4.3 Depression

In Canada, the Mental Health and Well-being Survey, based on the Composite International Diagnostic Interview instrument, was conducted as part of the CCHS in 2002, and was restricted to the population aged 15 years and over. Statistics Canada notes that depression in this survey is defined as follows:

> Major depressive disorder defined for this survey requires at least one episode of 2 weeks or more with persistent depressed mood and loss of interest or pleasure in normal activities, accompanied by problems such as decreased energy, changes in sleep and

[942] Ibid. p. 229.
[943] Confidence intervals (CI) – for women: 1.11 (0.87–1.41), 2.25 (1.85–2.74); for men: 1.53 (1.12–2.09), 2.59 (1.99–3.37)
[944] Hudson, Christopher G. "Socioeconomic Status and Mental Illness: Tests of the Social Causation and Selection Hypotheses," *American Journal of Orthopsychiatry*, 2005, vol. 75, no. 1: 3-18.
[945] Ibid. p. 17.
[946] Ibid. p. 16.

appetite, impaired concentration, and feelings of guilt, hopelessness, or suicidal thoughts.[947]

According to Health Canada, worldwide, major depression is the leading cause of years lived with disability and the fourth largest cause of lost disability-adjusted life years.[948] It reports that approximately eight percent of adults will experience a major depression during their lives, that the onset of mood disorders often occurs during adolescence, and that those who experience major depressive episodes are at risk for suicide.

Low-income individuals have consistently been found to be at a higher risk of depression relative to high-income individuals.[949] Muntaner et al. note that most longitudinal studies suggest a causal direction from SEP to depression and anxiety rather than from depression to low SEP.[950] They also report the evidence indicates that the association between low-SEP and depression reflects both short-term influences in adulthood such as financial hardship and job insecurity, as well as long-term influences rooted in child and adolescent life stages.

Lorant et al. suggest that "poorer coping styles, ongoing life events, stress exposure, and weaker social support are some examples of psychiatric risk factors that are more prevalent in lower SES groups."[951] Social and emotional supports have been found to be protective factors for depression among both high- and low-income individuals.[952] In Canada, lone parenthood has been found to be particularly associated with depression in women, and lone mothers are twice as likely to experience a major depressive episode than other women (15% compared with 7%, respectively).[953]

A 2003 meta-analysis of the research on socioeconomic position and depression by Belgian researchers Lorant et al. found that persons in the lowest socioeconomic group had odds of reporting depression about 1.81 (CI – 1.57–2.10) times higher than those in the highest socioeconomic group.[954] Most of the studies reviewed used education as the measure of socioeconomic status. However, of the four that specifically used income as the main measure and compared the highest and lowest income groups with depression, three studies had higher odds ratios—two studies from the U.S. (Lynch et al., 1997,[955] and Ulbrich et al., 1989[956]) found odds ratios of 3.24 and 3.30, respectively; and one study from The Netherlands (Reijneveld and

[947] Statistics Canada. *Comparable Health Indicators 2006. 70-HTL Prevalence of Depression*, Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/70hlt.htm.
[948] Health Canada. *A Report on Mental Illnesses in Canada*, accessed.
[949] Stewart, Gucciardi, and Grace. *Depression*, accessed.
[950] Muntaner, Eaton, Miech, and O'Campo. "Socioeconomic Position and Major Mental Disorders."
[951] Lorant, V., D. Delie_ge, W. Eaton, A. Robert, P. Philippot, and M. Ansseau. "Socioeconomic Inequalities in Depression: A Meta-Analysis " *American Journal of Epidemiology*, 2003, vol. 157, no. 2: 98-112. p. 98.
[952] Beaudet, Marie P. "Psychological Health - Depression," *Health Reports*, 1999, vol. 11, no. 3: 63-75.
[953] Ibid.
[954] Lorant, Delie_ge, Eaton, Robert, Philippot, and Ansseau. "Socioeconomic Inequalities in Depression: A Meta-Analysis ".
[955] Lynch, J.W., G.A. Kaplan, and S.J. Shema. "Cumulative Impact of Sustained Economic Hardship on Physical, Cognitive, Psychological, and Social Functioning," *New England Journal of Medicine*, 1997, vol. 337: 1889-1895.
[956] Ulbrich, P.M., G.J. Warheit, and R.S. Zimmerman. "Race, Socioeconomic Status, and Psychological Distress: An Examination of Differential Vulnerability," *Journal of Heath and Social Behavior*, 1989, vol. 30: 131-146.

Schene, 1998[957]) found an odds ratio of 3.04. The fourth study, which was from the U.K. (Weich and Lewis, 1998[958]), found a lower odds ratio of 1.48.

Brent Diverty and Marie Beaudet of Statistics Canada note that only 43% of those who experienced major depression, as identified by the 1994/1995 NPHS, were treated by a health professional.[959] Those living in households having inadequate income were twice as likely to not receive treatment as those living in households having adequate income. Diverty and Beaudet suggest that inadequate income may be a barrier to treatment because the choice of providers is often restricted under provincial health care plans and inadequate income may preclude the purchase of medications.

Beaudet reports that in the 1994/1995 NPHS, men in the lowest household income quartile were twice as likely as men in the highest quartile to experience depression, and that 10% of women in the lowest quartile experienced major depression compared with 7% of women in the highest quartile.[960]

Using the 2000/2001 CCHS, Katherine Smith et al. of the University of Toronto found the prevalence of depression in Canadian urban centres for adults aged 18–74 years was 9.2% overall, with 6.8% for men and 11.4% for women.[961] Among the low-income individuals (9.9% of total population) the depression rate was 14.5%, with 10.8% for low-income men (8.2% of total population) and 17.1% for low-income women (11.6% of total population). This compares with middle/high-income individuals where the depression rate was 8.7%, with 6.5% for men and 11%% for women. Across all categories, women had higher depression rates than men, with those who were lone parents having the highest rates (19.2%). The odds ratios for low-income vs. middle/high income were calculated as 1.37 overall, 1.31 for men, and 1.42 for women. These results are shown in Table 34 below.

[957] Reijneveld, S.A., and A.H. Schene. "Higher Prevalence of Mental Disorders in Socioeconomically Deprived Urban Areas in the Netherlands: Community or Personal Disadvantage?" *Journal of Epidemiology and Community Health*, 1998, vol. 52: 2-7.
[958]Weich, S., and G. Lewis. "Material Standard of Living, Social Class, and the Prevalence of the Common Mental Disorders in Great Britain," *Journal of Epidemiology and Community Health*, 1998, vol. 52: 8-14.
[959] Diverty, Brent, and Marie P. Beaudet. "Depression: An Undertreated Disorder?" *Health Reports*, 1997, vol. 8, no. 4: 9-18.
[960] Beaudet, Marie P. "Depression," *Health Reports*, 1996, vol. 7, no. 4: 11-24.
[961] Smith, Katherine L.W. Smith, Flora I. Matheson, Rahim Moineddin, and Richard H. Glazier. "Gender, Income and Immigration Differences in Depression in Canadian Urban Centres," *Canadian Journal of Public Health*, 2007, vol. 98, no. 2: 149-153. Low income – <$15,000 for 1–2 people, <$20,000 for 3–4 people, <$30,000 for 5+ people. Low income – n = 3,785 (9.88%), middle / high income – n = 34,528 (90.12%); 95% CI – low income total = 13.20–15.83; men – 8.93–12.65; women – 15.29–18.85.

Table 34. Prevalence of depression and odds ratio for low vs. middle/high income individuals, odds ratios, adults aged 18–74 years, Canada, 2000/2001

	Total population				Men			Women		
Income adequacy	**Total Population**		**Depression**		**Total Population**	**Depression**		**Total Population**	**Depression**	
	N	**%**	**%**	**95% CI**	**%**	**%**	**95% CI**	**%**	**%**	**95% CI**
Low income	3,785	9.9	14.5	13.20–15.83	8.2	10.8	8.93–12.65	11.6	17.1	15.29–18.35
Middle / High income	34,528	90.1	8.7	8.36–9.09	91.8	6.5	6.05–7.01	88.4	11	10.36–11.53
Odds ratio for depression	1.37 low vs middle/high		95% CI 1.21 – 1.57		1.31 low vs middle/high		95% CI 1.04–1.65	1.42 low vs middle/high		95% CI 1.21–1.67

Note: Source 2000/2001 Canadian Community Health Survey (CCHS); CI – 95% confidence interval; Low income – <$15,000 for 1–2 people, <$20,000 if 3–4 people, <$30,000 if 5+ people. Percentages have been rounded.

Source: Adapted from Smith, Katherine L.W. Smith, Flora I. Matheson, Rahim Moineddin, and Richard H. Glazier. "Gender, Income and Immigration Differences in Depression in Canadian Urban Centres," *Canadian Journal of Public Health*, 2007, vol. 98, no. 2: 149-153.

5.4.4 Mortality and Suicide

Suicide is associated with many factors, including poverty, such as physical illness, substance abuse, family violence, and social isolation.[962] According to Mark Anielski, "How the socio-economic 'cocktail' of impacts from financial stress, debt loads, a super-charged economy and marital breakdown affect suicide is not well understood…. Societal fragmentation, social isolation, media influences on self-worth, unemployment and environmental factors are additional determinants."[963]

Canada-wide, suicide is the leading cause of death for all males between the ages of 10 and 49, the second highest cause of death for youth aged 10–24 years (after motor vehicle crashes), and the fourth leading cause for women (all ages).[964] Suicide rates have been remarkably stable in Canada. Between 1979 and 1998, the annual rate was about 14 suicides per 100,000 population.[965] In 2003, 3,764 suicide deaths were reported (2,902 were male and 862 were female), up from 3,698 in 1998.[966] The WHO has estimated that for every suicide death there are at least 20 attempts.[967] According to Langlois and Morrison, in 1998, the age-standardized rate of

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962 Stewart, Gucciardi, and Grace. *Depression*, accessed.
963 Anielski. *The Alberta GPI Accounts: Suicide*, accessed. p. 3.
964 Canadian Mental Health Association. *Statistics*, accessed.
965 Langlois, Stephanie, and Peter Morrison. "Suicide Deaths and Suicide Attempts," *Health Reports*, 2002, vol. 13, no. 2: 9-22.
966 Centre for Suicide Prevention. *Suicide in Canada*, 2003; accessed Dec 2007; available from http://www.suicideinfo.ca/csp/go.aspx?tabid=147.
967 World Health Organization, Cited in Langlois, and Morrison. "Suicide Deaths and Suicide Attempts."

attempted suicide in Canada was 108 per 100,000 females and 70 per 100,000 males.[968]

Several groups have been identified as being at risk for suicide including youth, the elderly, Aboriginal peoples, gay/lesbian populations, and those who are incarcerated.[969] Approximately 294 youths die from suicide each year, and many more attempt suicide.[970] Data from the Canadian Institute for Health Information's (CIHI) National Trauma Registry Report for 2004/2005 show that persons aged 35–64 years accounted for 47% of suicides, followed by persons aged 20–34 years (32.7%).[971] Youth under the age of 20 accounted for another 10.8%, and those aged 65 and over accounted for 9.6% of cases. These data are likely to be underestimates because the CIHI data exclude cases of poisoning, which could be suicides. Langlois and Morrison of Statistics Canada report that suicides by poisoning (including drugs, carbon monoxide, and other) account for 26% of suicide deaths.[972] In the U.S., children from lone-mother households are five times more likely to commit suicide than children of two parent households.[973]

Aboriginal youth may be at particularly high risk. Poverty and suicide were shown to have strong correlation in a study of young Aboriginal males living on reserves in Alberta.[974] However, Chandler and Lalonde have found that, although the overall rate of youth suicide is higher in Aboriginal communities when compared with the general population, a number of First Nations have low or non-existent rates of suicide.[975] In these communities, strong cultural engagement seems to be a protective factor. In other words, those Aboriginal communities that are moving toward self-government and settling land claims, have control over community social services (i.e., police, education, and child welfare), and are engaged in traditional cultural healing practices have fewer youth suicides than other Aboriginal groups lacking in these cultural factors.

Russell Wilkins et al. of Statistics Canada associated neighbourhood income quintiles with mental health for urban Canada between 1971 and 1996.[976] They calculated the age-standardized mortality rates due to mental disorders and suicide per 100,000, by gender and neighbourhood

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[968] Ibid.

[969] White, Jennifer. *Suicide-Related Research in Canada: A Descriptive Overview* A background paper prepared for the Workshop on Suicide-Related Research, Mental Health Promotion Unit, Health Canada 2003; accessed Dec 2007; available from http://www.phac-aspc.gc.ca/publicat/mh-sm/suicide-research/pdf/suicide_research_e.pdf.

[970] Canadian Mental Health Association. *Reflections on Youth Suicide*, 1993; accessed Jan 2008; available from http://www.canadiancrc.com/PDFs/CMHA_mh_pamphlet_29.pdf.

[971] McKeag, Yang, and Keresteci. *National Trauma Registry Report: Major Injury in Canada, 2004 - 2005*, accessed. In the ICD-9, suicide by poisoning (E950-952) is coded separately from other methods of suicide (E953-E958).

[972] Langlois, and Morrison. "Suicide Deaths and Suicide Attempts."

[973] Cutler, David M., Edward L. Glaeser, and Karen E. Norberg. *Explaining the Rise in Youth Suicide*, Discussion Paper Number 1917, Harvard Institute of Economic Research, 2001; accessed Jan 2008; available from http://www.canadiancrc.com/PDFs/Harvard_discussion_paper_No_1917.pdf.

[974] Bagley, C. "Poverty and Suicide among Native Canadians: A Replication," *Psychological Reports*, 1991, vol. 69: 149-150. Cited in White. *Suicide-Related Research in Canada: A Descriptive Overview* accessed.

[975] Chandler, M. J., and C. Lalonde. "Cultural Continuity as a Hedge against Suicide in Canada's First Nations," *Transcultural Psychiatry*, 1998, vol. 35: 191-219. Cited in White. *Suicide-Related Research in Canada: A Descriptive Overview* accessed.

[976] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

income quintile, risk ratios and risk differences comparing the highest and lowest quintiles, and population attributable risk ratios. Table 35 below shows these rates and ratios.

Table 35. Mental disorders and suicide, age-standardized mortality rates per 100,000, risk ratio, risk difference, and population attributable risk, all ages, by gender and neighbourhood income quintile, urban Canada, 1971–1996

Year	Total	Q1-high	Q2	Q3	Q4	Q5-low	RR	RD	Excess PAR	Excess %
Mortality rates for mental disorders – both male and female										
1971	2.7	1.6	1.8	2.1	1.8	5.9	3.74	4.3	1.2	42.2
1986	5.9	4.3	4.9	4.6	5.2	10.1	2.35	5.8	1.6	27.2
1991	6.1	5.6	5.4	5.2	5.9	9.0	1.62	3.5	0.6	9.6
1996	8.2	7.7	7.5	7.1	8.8	10.1	1.30	2.3	0.5	6.2
Mortality rates for suicide										
Males										
1971	18.8	14.5	15.5	17.5	19.2	26.1	1.80	11.6	4.3	22.8
1986	20.8	15.8	15.8	16.3	22.3	33.0	2.10	17.3	5.0	24.2
1991	18.1	13.9	14.6	17.5	19.0	25.1	1.81	11.2	4.2	23.4
1996	18.7	15.6	13.8	17.3	18.4	27.5	1.76	11.9	3.2	16.9
Females										
1971	8.2	8.5	8.6	7.7	7.5	9.0	1.06	0.5	-0.3	-3.2
1986	6.4	4.9	5.2	4.4	7.5	10.3	2.11	5.4	1.5	23.7
1991	5.2	3.2	3.8	5.3	4.9	8.7	2.75	5.5	2.1	39.3
1996	5.5	3.4	4.3	4.1	6.6	8.6	2.53	5.2	2.1	38.4

Notes: Original data sources: Canadian Mortality Data Base and supplemental address files; special tabulations of census population data.
Q1 – highest income quintile; Q5 – lowest income quintile;
RR – inter-quintile rate ratio between lowest and highest income quintile (Q5/Q1);
RD – inter-quintile rate difference (Q5 - Q1)
Excess PAR – Population attributable risk (Total - Q1)
Excess % – population attributable risk percentage [100 x (Total – Q1) / Total]
ICD codes: Mental disorders – ICD8 – 290-315; ICD9 – 290-319; suicide – E950-E819

Source: Adapted from Wilkins, Russell, Jean-Marie Berthelot, and Edward Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

Wilkins et al. found that mortality rates for general mental disorders for both men and women increased between 1971 (2.7%) and 1996 (8.2%). In 1996, 6.7% of those in the highest income category died from mental disorders, compared with 10.1% in the lowest income category.

On the other hand, Wilkins et al. found that the suicide rates for males had remained almost the same between 1971 (18.8%) and 1996 (18.7%), but for women they had declined from 8.2% to 5.5% respectively.[977] For both men and women, however, the disparity between rates for the

[977] Ibid.

low- and high-income groups is substantial. For example, for males in the highest income category, the suicide rate in 1996 was 15.6% and for males in the lowest income category the rate was 27.5%. Wilkins et al. note:

> High suicide mortality rates, especially among males, represent a continuing problem in Canada. As mortality rates for other causes decline, the relative importance of such currently intractable causes of death increases and constitutes a larger portion of the overall burden of excess mortality related to socio-economic disparities.[978]

5.5 Mortality and summary measures

Data on income and other measures of socioeconomic status are not routinely collected at the time of death in Canada, so most reports on the association between income and mortality from various diseases link data from the census tract of the last known residence of the deceased with mortality data in order to estimate the individual's income.[979] According to Raphael, this method produces conservative estimates of the relationship between low income and mortality rates.[980] Also, the method is not always accurate because it does not capture mortality rates for those low-income individuals who live in more affluent neighbourhoods, and conversely, may include high-income individuals who live in low-income neighbhourhoods.

Four types of chronic disease are responsible for almost three-quarters of all deaths in Canada and are the major causes of premature death.[981] These are cardiovascular disease, cancers, chronic obstructive pulmonary disease (COPD), and diabetes. Cardiovascular diseases—mainly ischemic heart disease, also called coronary heart disease or coronary artery disease, which includes acute myocardial infarction or heart attack and hypertension, and stroke, also known as cerebrovascular disease—are the leading causes of premature mortality in Canada as well as internationally in industrialized countries. They account for approximately 32% of all deaths in Canada.[982] Cancer—the second leading cause of death in Canada—is responsible for 30% of all deaths in the country, but is the most costly illness in terms of premature mortality, which accounts for 68% of all cancer costs. Lung cancer is the leading cause of cancer deaths, accounting for 26% of all cancer-related mortality in Canada. Colon cancer, the second largest cause of cancer, is responsible for 11% of cancer deaths.[983] In the past 25 years, the proportion of deaths caused by cardiovascular diseases has declined, while the proportion of deaths caused by cancer has risen.

COPD (e.g., bronchitis, emphysema, asthma, and chronic airway obstruction) and diabetes

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[978] Ibid. p. 18.
[979] Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.
[980] Ibid., accessed.
[981] Mirolla. *The Cost of Chronic Disease in Canada*, accessed.
[982] Statistics Canada. *Mortality, Summary List of Causes 2004*, Catalogue no. 84F0209XIE 2007; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/84F0209XIE/84F0209XIE2004000.pdf.
[983] Ibid., accessed.

account for another 4.2% and 2.4% of deaths in Canada, respectively.[984] According to Colman, diabetes is under-reported on death certificates since it leads to other serious diseases that are the main diseases most often reported.[985] Therefore, estimates of mortality and health expenditures attributed to diabetes are "almost certainly underestimates, because of the convention of classifying illnesses by principal diagnosis."[986] The most recent data on causes of death in Canada are available for 2004 from Statistics Canada.[987]

Injuries are also responsible for mortality rates in Canada. In 2004, Statistics Canada reported that 6% of all deaths in 2000 were caused by injury- and poisoning-related causes, excluding adverse events in medical care.[988] The latest statistics from the Public Health Agency of Canada's Injury Surveillance On-Line also uses these 2000 data.[989] In 2000, of all injury deaths, suicides were responsible for 28%, motor vehicle collisions for 19%, and falls for 13%. As previously discussed in Section 5.3 above, traumatic injuries are the leading cause of death among those under the age of 45, and are responsible for 56% of deaths for children and adolescents between the ages of 1–19.[990] According to Health Canada, injury mortality declined by 40% between 1980 and 1997, mainly because of a reduction in deaths associated with motor vehicle collisions.[991]

5.5.1 General mortality

One of the most important and widely cited studies on the relationship between poverty or low income and mortality patterns is that conducted by Wilkins, Berthelot, and Ng of Statistics Canada, which examined changes in income-related differences in mortality rates in urban Canada from 1971 to 1996.[992] Because of its relevance to the poverty–health association, and as one of the few studies to calculate both absolute rate differences and relative risk (RR) ratios based on income differences, the study is discussed in detail and frequently cited in this section. For estimating the cost of poverty, the relative ratios from 1996 could be used for both mortality and morbidity, because more recent rates have not been calculated and since the rates did not, for the most part, dramatically change in the 1990s. However, prevalence and incidence rates would need to be updated. In addition, in comparing the results of their study with other international studies, the authors remark:

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984 Mirolla. *The Cost of Chronic Disease in Canada*, accessed.
985 Colman. *The Cost of Chronic Disease in Nova Scotia*, accessed.
986 Ibid., accessed. p. 12
987 Statistics Canada. *Age-Standardized Mortality Rates by Selected Causes, by Sex*, 2007; accessed Jan 2008; available from http://www40.statcan.ca/l01/cst01/health30a.htm.
988 Wilkins, Kathryn, and Evelyn Park. "Injuries," *Health Reports*, Statistics Canada, 2004, vol. 15, no. 3: 43-48.
989 Public Health Agency of Canada. *Injury Surveillance on-Line: Leading Causes of Deaths, Both Sexes Combined, All Ages, 2000, Canada, Crude Rates*, Health Surveillance and Epidemiology Division, Centre for Health Promotion, 2007; accessed February 2008; available from http://dsol-smed.phac-aspc.gc.ca/dsol-smed/cgi-bin/injchart?AREA=00&AGE=0&SEX=3&YEAR=00&DATA_TYPE=K_PIE&DATA_SET=MORT&CAUSE=QUICK&CCAUSECORE1=View+Chart.
990 Health Canada. *National Statistics and Trends: Injury in Canada*, 1999; accessed Dec 2007; available from http://www.injurypreventionstrategy.ca/downloads/HC_stat.pdf.
991 Ibid., accessed.
992 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

> Thus, the differentials found for Canada appear to be reasonable estimates of what might have been found with individual-level methods and longitudinal study designs and are not simply due to differences in risk factors across the quintiles.[993]

The Wilkins et al. study included residents of Canadian census metropolitan areas (CMAs), which represent about 60% of the population. According to Wilkins et al., "segregation by income is more pronounced in big cities than in small towns and rural areas."[994] Wilkins et al. obtained population data from population censuses for 1971, 1986, 1991, and 1996 and mortality data from the Canadian Mortality Data Base. This database includes the variables of age, gender, marital status, place of birth, census subdivision (municipality) of usual place of residence, and cause of death. Deaths of residents in long-term care facilities were excluded because of the difficulties in checking income levels by census tracts for residents.[995] Therefore, the total CMA population minus those living in long-term care institutions was used as the denominator for calculating mortality rates. The study base consisted of 60.7 million person-years at risk.

Approximately 357,000 deaths were analyzed by neighbourhood income quintile.[996] Within each CMA, the neighbourhoods were grouped by quintiles that were based on the percentage of population in the neighbourhood living below the low-income cut-off for that year, which varied according to CMA and family size. In the quintile grouping, the richest quintile neighbourhood had the fewest number of households living below the LICO, and the poorest quintile had the most households living below the LICO. In 1996, the percentage living below the low-income cut-off in each neighbourhood income quintile were:

- total population living below the low-income cut off – 21.5%
- quintile 1 (richest) – 7.6%
- quintile 2 – 12.8%
- quintile 3 – 19.2%
- quintile 4 – 27.1%
- quintile 5 (poorest) 41.7%

The two poorest quintiles had lower average income, higher percentage of lone parent families, higher percentage of renters, lower levels of education, higher unemployment, and a lower percentage of people with professional and managerial occupations.

Causes of death were coded by ICD–9 (and ICD–8 in 1971). Rate ratios were calculated by dividing mortality rates for the poorest quintile by mortality rates for the richest quintile, and rate differences were calculated by subtracting the mortality rate for the richest quintile from that for the poorest quintile. Age standardized mortality rates used the 1986 CMA population (less long-term institution residents) as the reference population. Excess mortality was defined as the age-

[993] Ibid. p. 11.
[994] Ibid. p. 2.
[995] The population of residents of long-term facilities was: 14.9 million in 1986, 16.5 million in 1991, 17.7 million in 1996. 1971 calculations used the total population (11.6 million).
[996] These were 73,990 deaths in 1971, 88,129 in 1986, 93,328 in 1991, and 101,786 in 1996, which represented 98% of non-institutional deaths in 1971 and 99% of non-institutional deaths in subsequent years.

standardized mortality rate for the total population less the rate of the richest quintile.

Results for general mortality trends show that for all quintiles and both men and women there was a decline in mortality for most causes of death between 1971 and 1996. However the pattern in each year showed the highest mortality rates in the lowest quintile compared with those in the highest quintile, and the relative rates declined by a lesser extent than absolute rates. Table 36 below shows the relative mortality rate ratios between the highest and lowest income quintiles by age group and gender in urban Canada between 1971 and 1996. Health disparities were largest for rates of infant mortality (under the age of 1) and for those aged 25 to 64 years. Rates for women over the age of 75 in 1986 and for men over the age of 85 in 1986 and 1996 generally did not show an income disparity, but income disparity in this age group might be larger if those living in long-term care institutions had been included. Wilkins et al. notes that acquired immune deficiency syndrome (AIDS) was primarily responsible for the large disparity for men aged 35–44 years between 1986 and 1991.[997]

[997] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

Table 36. Relative mortality rate ratios between the highest and lowest income quintiles, by age group and gender, urban Canada, 1971–1996

	Males			
Age group (years)	**1971**	**1986**	**1991**	**1996**
<1	1.99 (1.68–2.35)	2.20 (1.64–2.49)	1.65 (1.31–2.08)	1.75 (1.37–2.24)
1–14	1.62 (1.27–2.05)	1.82 (1.32–2.50)	1.78 (1.30–2.45)	1.65 (1.18d2.32)
15–24	1.24 (1.03–1.49)	1.10 (0.91–1.33)	1.27 (1.04–1.56)	1.06 (0.86–1.31)
25–34	1.68 (1.38–2.05)	1.95 (1.66–2.30)	1.83 (1.58–2.12)	1.82 (1.55–2.14)
35–44	2.29 (2.00–262)	2.40 (2.09–2.74)	3.34 (2.94–3.81)	3.24 (2.87–3.66)
45–54	2.11 (1.92–2.31)	2.34 (2.12–2.58)	2.37 (2.15–2.62)	2.61 (2.37–2.88)
55–64	1.63 (1.52–1.76)	1.98 (1.85–2.11)	1.89 (1.76–2.03)	1.88 (1.75–2.02)
65–74	1.48 (1.39–1.59)	1.55 (1.46–1.64)	1.67 (1.58–1.77)	1.49 (1.42–1.57)
75–84	1.21 (1.13–1.30)	1.18 (1.12–1.26)	1.14 (1.07–1.21)	1.18 (1.12–1.24)
85+	1.24 (1.11–1.37)	0.95 (0.87–1.13)	1.04 (0.95–1.13)	0.96 (0.89–1.03)

	Females			
Age group (years)	**1971**	**1986**	**1991**	**1996**
<1	1.94 (1.59–2.35)	1.59 (1.27–2.00)	1.59 (1.24–2.03)	1.44 (1.10–1.89)
1–14	1.70 (1.30–2.50)	1.17 (0.84–1.64)	1.49 (0.98–2.24)	1.84 (1.26–2.69)
15–24	1.26 (0.93–1.72)	1.20 (0.89–1.63)	1.18 (0.84–1.64)	1.21 (0.88–1.66)
25–34	1.74 (1.32–2.28)	1.84 (1.42–2.39)	1.52 (1.20–1.92)	2.15 (1.63–2.82)
35–44	1.87 (1.57–2.23)	1.70 (1.42–2.03)	2.06 (1.74–2.42)	2.00 (1.71–2.35)
45–54	1.59 (1.41–1.80)	1.62 (1.42–1.85)	1.63 (1.43–1.85)	1.65 (1.46–1.85)
55–64	1.43 (1.29–1.58)	1.44 (1.31–1.58)	1.57 (1.43–1.73)	1.51 (1.37–1.65)
65–74	1.15 (1.06–1.25)	1.31 (1.22–1.40)	1.32 (1.23–1.41)	1.29 (1.21–1.38)
75–84	1.06 (0.99–1.14)	0.99 (0.93–1.06)	0.96 (0.90–1.02)	0.99 (0.94–1.05)
85+	0.96 (0.88–1.04)	0.81 (0.75–0.87)	0.75 (0.73–0.80)	0.77 (0.73–0.82)

Source: Wilkins, R., J.-M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

James, Wilkins, et al. recently used data from their previous 2002 study to examine deaths caused by specific diseases amenable to medical care and deaths amenable to public health interventions, which mainly included deaths associated with smoking, alcohol abuse, motor vehicle crashes, and HIV/AIDS.[998] They found that in 1996, the avoidable causes of premature mortality together accounted for 49.6% of all income-related excess mortality among men and 42% among women. The indicator they used was age-standardized excess years of life lost (SEYLL), which was calculated as the difference in the SEYLL rate for the total population less that of the richest quintile. The authors note that SEYLL differs from the potential years of life

[998] James, Paul D., Russell Wilkins, Allan S. Detsky, Peter Tugwell, and Douglas G. Manuel. "Avoidable Mortality by Neighbourhood Income in Canada: 25 Years after the Establishment of Universal Health Insurance," *Journal of Epidemiology and Community Health* 2007, vol. 61: 287-296.

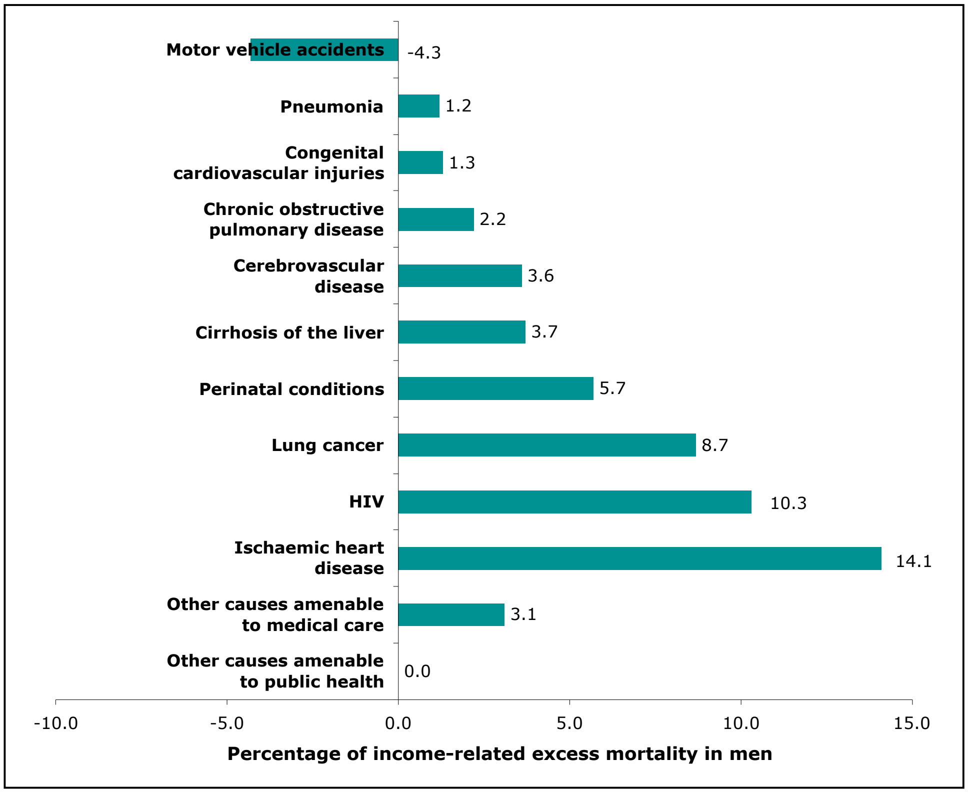
lost (PYLL) measure because, although both measures give greater weight to deaths at younger ages, compared to the PYLL, the SEYLL gives greater weight to deaths at older ages. Further explaining the difference, they note:

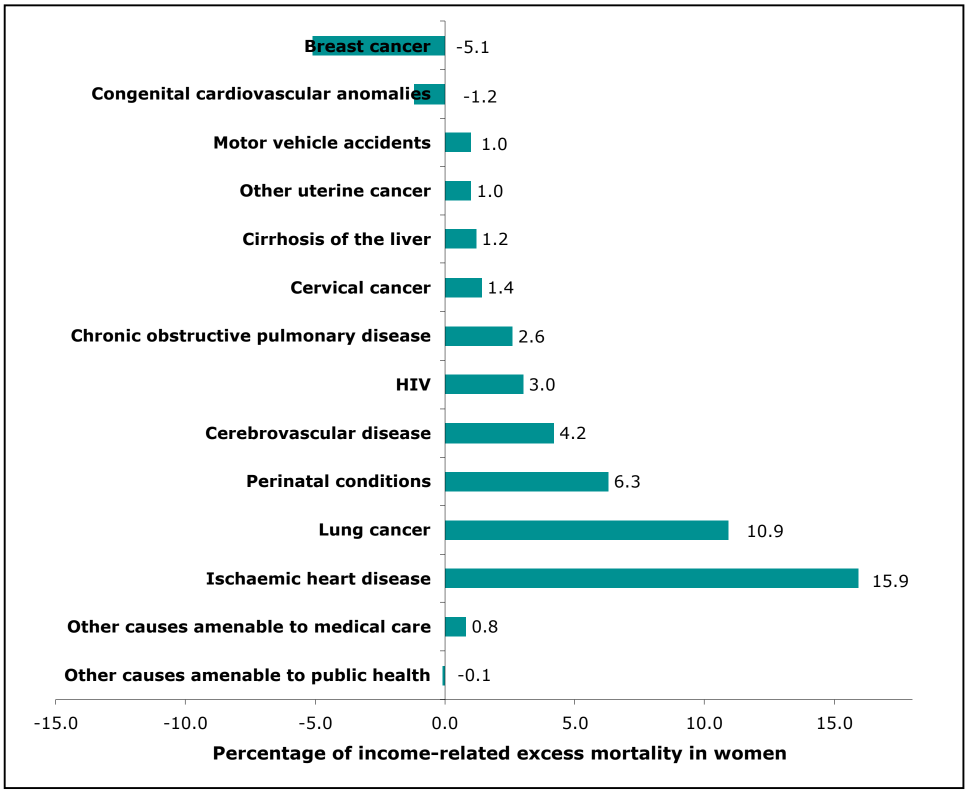
> For PYLL, the life years lost are obtained by subtracting the observed age at death from an arbitrary upper limit such as 65 or 75 years. For SEYLL, the life years lost are obtained by subtracting the observed age at death from the expected age at death for a person of that age, as shown in a life table… for the richest income quintile.[999]

The richest quintile is used to standardize deaths for all socioeconomic groups. Figure 18 below shows the proportion of all-cause income-related excess mortality attributable to avoidable causes of death for men and women in urban Canada in 1996 by SEYLL rate difference. Income-related excess mortality—SEYLL difference between the total population and the richest quintile—was highest for ishemic heart disease, which together with lung cancer, perinatal mortality, cerebrovascular disease, HIV, and COPD accounted for 49% overall excess mortality for men and 43% excess for women. The richest income quintiles experienced more deaths of men from motor vehicle crashes, and more deaths of women from breast cancer and congenital cardiovascular abnormalities.

[999] Ibid. p. 288.

Figure 18. Proportion of all-cause income-related excess mortality (QT–Q1 SEYLL rate difference) attributable to avoidable causes of death in urban Canada, 1996





Notes: SEYLL = age-standardized excess years of life lost;
QT = quintile total– SEYLL rate for the total population; Q5 = SEYLL rate for the richest quintile.

Source: James, Paul D., Russell Wilkins, Allan S. Detsky, Peter Tugwell, and Douglas G. Manuel. "Avoidable Mortality by Neighbourhood Income in Canada: 25 Years after the Establishment of Universal Health Insurance," *Journal of Epidemiology and Community Health*, 2007, vol. 61: 287-296.

Other studies in Canada at the provincial level have also shown a negative association between low income and mortality rates. For example, Cameron Mustard et al. examined age-specific socioeconomic differences in morbidity and mortality by education and household income for adults aged 15 years and over in Manitoba.[1000] The study linked data from records of health care utilization and vital statistics to the 1986 census. Mortality was inversely associated with both income and education, but this association was more consistent for income.

Leslie Roos et al. compared individual and contextual socioeconomic variables on mortality in Manitoba (1996–2002) and Nova Scotia (1990–1999).[1001] Data used for Nova Scotia came from the longitudinal 1990 Nova Scotia Nutrition Survey and for Manitoba, the 1996/1997 National Population Health Survey (NPHS), which were both linked to census data. Odds ratios (OR) for mortality were adjusted for age, gender, smoking status, body mass index, and diabetes. The adjusted OR between the lowest (<$20,000) and highest (>$40,000) income groups—with the lowest income group used as the reference group (1.0)—were 0.57 in Manitoba and 0.66 in Nova Scotia, which shows that mortality rates in the high-income groups were lower than in the low-income groups.

5.5.2 Cause-specific mortality patterns

Cardiovascular disease

Heart disease and stroke are responsible for 32% of all Canadian deaths, which is the highest mortality rate for any chronic disease.[1002] According to Wielgosz, poverty in Canada contributes three percent to the variation in mortality from cardiovascular disease.[1003] Raphael reports that income differences account for 23.7% excess in premature mortality from cardiovascular disease.[1004] He notes:

[1000] Mustard, Cameron A., Shelley Derksen, Jean-Marie Berthelot, Michael Wolfson, and Leslie L. Roos. "Age-Specific Education and Income Gradients in Morbidity and Mortality in a Canadian Province," *Social Science & Medicine*, 1997, vol. 45, no. 3: 383-397.
[1001] Roos, Leslie L., Jennifer Magoon, Sumit Guptab, Dan Chateau, and Paul J. Veugelers. "Socioeconomic Determinants of Mortality in Two Canadian Provinces: Multilevel Modelling and Neighborhood Context," *Social Science & Medicine*, 2004, vol. 59: 1435–1447.
[1002] Statistics Canada. *Age-Standardized Mortality Rates by Selected Causes, by Sex*, accessed.
[1003] Wielgosz, A. "Surveillance at Work: Zeroing in on Cardiovascular Diseases in Regional Health Units across Canada," *Canadian Journal of Cardiology*, 2003, vol. 19, no. 11: 1239-1240.
[1004] Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.

> Were all Canadians' rates of death from cardiovascular disease equal to those living in the wealthiest quintile of neighbourhoods, there would be 6,366 fewer deaths each year from cardiovascular disease. An estimate of the annual costs to Canada of these income-related cardiovascular disease effects is $4 billion.[1005]

Raphael also reports several other studies linking mortality rates and low income. In the U.S. in 1998, rates of mortality from cardiovascular disease were found to be 2.52 times higher in the lowest income group compared with the highest income group.[1006] A 1999 study in British Columbia found that men in the lowest income group had a mortality rate from hypertensive disease of 2.3 per 100,000 as compared with men in the highest income group of 0.8 per 100,000, indicating a risk almost three times higher for low-income men.[1007] A 1997 study by Roos and Mustard in Manitoba found that mortality rates from ischemic heart disease was 43% higher in the lowest income quintile than in the highest.[1008]

Wei-Ching Chang et al. studied a cohort of 5,622 patients in Alberta aged 18 years and over who experienced an initial episode of acute myocardial infarction between 1998 and 2002 to discover the effects of socioeconomic status on one-year mortality rates. According to the authors:

> In acute myocardial infarction, it is well established that a person's socioeconomic status has a profound effect on the incidence of acute myocardial infarction, medical management such as the utilization of cardiovascular services including coronary angiography, percutaneous coronary intervention (PCI), and coronary artery bypass grafting (CABG), and clinical outcomes (eg, mortality). These relationships have been demonstrated in community and hospital inpatient settings.[1009]

In that study, emergency room data was linked with 2001 census data for the median neighbourhood household income for the neighbourhood of residence, which was grouped into quartiles. The study found that the overall rate of initial myocardial infarction emergency department presentation was 182 per 100,000 patients, and of those the rate was 243 for those living in the lowest neighbourhood quartile, and 139 for those living in the highest income quartile. The relative risk was 1.75 (95% confidence interval 1.42–2.16). Also patients living in the lowest income neighbourhood were more likely to be elderly, female, and to have co-

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[1005] Ibid., accessed. p. xi.

[1006] U.S. Department of Health and Human Services. *Health, United States, 1998: Socioeconomic Status and Health Chartbook*, Centers for Disease Control and Prevention, National Center for Health Statistics, 1998; accessed Jan 2008; available from http://www.cdc.gov/nchs//data/hus/hus98.pdf. Cited in Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed. p. 14.

[1007] Wood, E., A.M. Sallar, M.T. Schechter, and R.S. Hogg. "Social Inequalities in Male Mortality Amenable to Medical Intervention in British Columbia," *Social Science and Medicine*, 1999, vol. 48: 1751-1758. Cited in Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.

[1008] Roos, N.P., and C.A. Mustard. "Variation in Health Care Use by Socioeconomic Status in Winnipeg, Canada: Does the System
Work Well? Yes and No," *Millbank Quarterly*, 1997, vol. 75, no. 89-111. Cited in Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.

[1009] Chang, Wei-Ching, Padma Kaul, Cynthia M. Westerhout, Michelle M. Graham, and Paul W. Armstrong. "Effects of Socioeconomic Status on Mortality after Acute Myocardial Infarction " *The American Journal of Medicine*, 2007, vol. 120: 33-39.

morbidities such as diabetes and peripheral vascular disease. There was also an inverse relationship between socioeconomic status and mortality rates in the emergency department, at 30 days, and at one year.

Wilkins et al. note that although the income-related mortality rate ratios for ischemic heart disease "were only moderate," and rate differences had declined since 1971, the rate differences "remained huge."[1010] According to Wilkins et al. the relative risk ratio between the highest and lowest income quintiles for ischemic heart disease in 1996 were 1.31 for males, and 1.25 for females.

Diabetes

Diabetes is one of the few chronic diseases for which mortality rates have been increasing, especially among males in the lowest income group. Deaths due to diabetes were 2.6% of all deaths in 1997 and 3.5% in 2002—an increase of 35% in five years.[1011] It is estimated to be the seventh leading cause of death in Canada and is responsible for 25,000 person years of life lost before the age of 75.[1012] Canadian adults with diabetes are twice as likely to die prematurely than those without diabetes.[1013]

According to Wilkins et al., rates for mortality caused by diabetes for males in the lowest income group increased from 17.1% in 1971 to 21.2% in 1996.[1014] This compares with rates for males in the highest income group, which decreased from 15.0% in 1971 to 13.5% in 1996. For males in general the average mortality rate for diabetes decreased between 1971 and 1986, but then increased from 1986 to 1996.

Mortality rates for diabetes for females also declined between 1971 and 1986. Since 1986 the rates have remained steady for high-income groups, but have increased for low-income groups. The mortality rate for low-income females increased from 10.6% in 1991 to 13.4% in 1996. This compares with mortality rates for high-income females, which were 9.1% in both 1991 and 1996. Wilkins et al. noted that 1991–1996 was "a period of increasing unemployment and higher prevalence and intensity of low income in urban Canada, as well as of increased wealth inequality."[1015]

According to Wilkins et al. the relative risk ratio between the highest and lowest income quintiles for diabetes mortality in 1996 were 1.56 for males, and 1.47 for females.

[1010] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996." p. 12.
[1011] Haydon, Roerecke, Giesbrecht, Rehm, and Kobus-Matthews. *Chronic Disease in Ontario and Canada: Determinants, Risk Factors and Prevention Priorities*, accessed.
[1012] Sanmartin, and Gilmore. *Diabetic Care in Canada: Results from Selected Provinces, 2005*, accessed.
[1013] Health Canada. *Responding to the Challenge of Diabetes in Canada. First Report of the National Diabetes Surveillance System (NDSS)*, accessed.
[1014] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[1015] Ibid. p. 19.

Other causes of mortality

According to Wilkins et al., most mortality rates have declined for all causes, but the disparity between the high- and low-income groups remains significant in almost all cases.[1016] However, mortality rates have increased and income disparities have grown larger for lung cancer in females, and for infectious diseases, mental disorders, and diabetes for both men and women. Infectious diseases are mainly HIV/AIDS, but the risk of tuberculosis is increasing in low-income groups.

Income differences in cirrhosis of the liver among females appears to have been eliminated, but the differences among males are still strong. Also, there is little income difference in mortality rates for breast and prostate cancer, but the incidence is stronger in the higher income groups. There was very little change in lung cancer mortality rates for males across all incomes between 1971 and 1996, although the rates started to decline in 1986, but were higher for lower-income groups. Mortality rates for suicide and other mental disorders, and injuries were discussed in Sections 5.4.4 and 5.3, respectively, above.

In sum, Wilkins et al. have calculated the age-standardized mortality rates per 100,000 and the risk ratio and risk difference, by gender and neighbourhood income quintile for urban Canada between 1971 and 1996 for the following: ischemic heart disease; cirrhosis of the liver; uterine cancer; lung, breast and prostate cancer; diabetes; perinatal conditions; pedestrians in motor vehicle traffic collisions; motor vehicle collisions occupants; injuries except motor vehicle traffic accidents and suicide; suicide; mental disorders; infectious diseases; and ill-defined conditions. Table 42 shows these rates and can be found in the Appendices.

5.5.3 Infant mortality

Infant mortality rates are based on deaths before the age of one. Infant mortality rates have declined in Canada from 10.5 infant deaths per 1,000 live births in 1980 to 6.8 in 1990 and 5.3 in 1998—a nearly 50% decrease in the 18-year time period.[1017] From 1998 to 2004 the rate remained steady at 5.3, but between 2004 and 2005 the rate rose slightly to 5.4 infant deaths per 1,000 live births. Between 2004 and 2005, the female infant mortality rate remained at 5.0, but the male rate increased from 5.5 to 5.9. According to Statistics Canada, the increase in the male infant mortality rate was mainly due to increases in Newfoundland and Labrador, Quebec, Saskatchewan, Alberta, British Columbia and the Northwest Territories, while rates declined in the other five provinces and two territories.[1018]

A British study examining the deaths of children, including infants, under the age of 8 between 1993 and 2001, notes that the factors that are most important in calculating a high risk of mortality for children are not clear.[1019] However, among the most important factors found were that the mortality rates of children at age one of fathers in manual occupations were 31% higher

[1016] Ibid.
[1017] Statistics Canada. *Deaths 2005*, accessed.
[1018] Ibid., accessed.
[1019] Corbin, Tania. "Mortality in Children Aged under 8," *Health Statistics Quarterly*, 2004, vol. 24: 30-36.

than those for children of fathers in non-manual occupations. A similar British study found the same pattern in infant mortality rates between 1976 and 2000.[1020] Other important factors contributing to higher infant mortality rates were low birth weight, being born of unmarried couples, and being born of mothers whose maternal age at delivery was below 20 years.

In Canada, Wilkins et al. calculated the infant mortality rate per 1,000 by neighbourhood income quintile, as well as rate ratios between the highest and lowest neighbourhood income quintiles in urban Canada from 1971 to 1996.[1021] In 1996, the absolute mortality rate in the lowest income quintile was 6.4 deaths for every 1,000 live births, and in the highest income quintile it was 4.0 deaths for every 1,000 live births. According to Wilkins et al., the absolute rate difference between infant mortality in the lowest and highest income quintiles in urban Canada declined from 9.8 per 1,000 in 1971 to 2.4 per 1,000 in 1996.[1022]

However, the relative rate ratios declined much less—from 1.97 in 1971 to 1.61 in 1996. In other words, in 1996, infants born in the lowest income quintile were 60% more likely to die before the age of one than infants born into the highest income quintile. Table 37 below shows the infant mortality rate per 1,000 by neighbourhood quintile in urban Canada, and rate differences and rate ratios comparing highest and lowest income quintiles between 1971 and 1996. Excess death rates are also shown, but these rates compare the highest income quintile with all of the other quintiles. Therefore, although the excess death rates indicate health disparities, they are not specifically indicative of low-income associations with mortality patterns, per se.

[1020] Maher, Joanne, and Alison Macfarlane. "Inequalities in Infant Mortality: Trends by Social Class, Registration Status, Mother's Age and Birthweight, England and Wales, 1976 - 2000," *Health Statistics Quarterly*, 2004, vol. 24: 14-29.
[1021] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[1022] Ibid.

Table 37. Infant mortality rate per 1,000 by neighbourhood income quintile, rate ratios and differences between lowest and highest income quintiles, and excess differences between the highest and all other quintiles, urban Canada, 1971 to 1996

	1971	1986	1991	1996
Total	15.0 (14.5–15.6)	7.5 (7.2–7.9)	5.8 (5.5–6.1)	5.1 (4.8–5.4)
Quintile 1 (richest)	10.2 (09.1–11.3)	5.8 (5.1–6.6)	4.5 (4.0–5.2)	4.0 (3.4–4.6)
Quintile 2	12.4 (11.3–13.1)	5.7 (5.0–6.5)	5.1 (4.5–5.8)	4.7 (4.1–5.4)
Quintile 3	15.2 (14.0–16.5)	7.7 (6.9–8.6)	5.0 (4.4–5.7)	4.9 (4.2–5.5)
Quintile 4	16.6 (15.3–17.9)	8.0 (7.2–8.9)	6.7 (6.0–7.5)	5.0 (4.4–5.7)
Quintile 5 (poorest`	20.0 (18.6–20.5)	10.5 (9.6–11.6)	7.5 (6.7–8.3)	6.4 (5.7–7.1)
Rate difference (Q5 – Q1)	9.8 (08.1–11.6)	4.8 (3.5–6.0)	2.9 (1.19–3.9)	2.4 (1.5–3.3)
Rate ratio (Q5/Q1)	1.97 (1.73–2.23)	1.82 (1.56–2.13)	1.64 (1.39–1.94)	1.61 (1.34–1.93)
Excess (Total – Q1)	4.9	1.8	1.2	1.1
Excess % (Total – Q1)/Total	32	23	21	22

Notes: 95% confidence intervals in parentheses; census population aged less than one is used as the denominator. Rate differences and rate ratios are calculated with unrounded data. Data source–Canadian Mortality Data Base supplemented with address files and special tabulations of census population data.

Source: Wilkins, R., J.-M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

Luo et al., including Wilkins, of Statistics Canada recently completed two studies of birth outcomes by neighbourhood income in British Columbia and Quebec.[1023, 1024] Both studies showed that neighbourhoods with low socioeconomic status, especially in urban areas, were associated with higher risks of neonatal death (0–27 days) and postneonatal death (28–264 days), as well as with pre-term birth, low birthweight, and stillbirth. Differences in adverse outcomes related to neighbourhood income remained after accounting for maternal characteristics such as education, age, marital status, and ethnicity.

In British Columbia, birth outcomes by neighbourhood income quintile between 1985 and 2000 in both urban and rural areas were examined using data from the British Columbia Vital Statistics Agency.[1025] The rural-area trends showed small income differences in neonatal death (OR–1.06), but no income differences for postneonatal death (OR–0.95). Trend rates for urban

[1023] Luo, Z., W.J. Kierans, R. Wilkins, R.M. Liston, J. Mohamed, and M.S. Kramer. "Disparities in Birth Outcomes by Neighbourhood Income: Temporal Trends in Rural and Urban Areas, British Columbia," *Epidemiology*, 2004, vol. 15, no. 6: 679-686.
[1024] Luo, Zhong-Cheng, Russell Wilkins, and Michael S. Kramer. Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. "Effect of Neighbourhood Income and Maternal Education on Birth Outcomes: A Population-Based Study," *Canadian Medical Association Journal*, 2006, vol. 174, no. 10: 1-7. accessed Dec 2007; available from http://www.cmaj.ca/cgi/reprint/174/10/1415
[1025] Luo, Kierans, Wilkins, Liston, Mohamed, and Kramer. "Disparities in Birth Outcomes by Neighbourhood Income: Temporal Trends in Rural and Urban Areas, British Columbia."

areas were OR–1.05 for neonatal death and OR–1.15 for postneonatal death. However, when examined in four-year intervals, the urban rates in 1997–2000 were actually higher than the trend rates. In 1997–2000 British Columbia urban areas, the crude risk ratio (RR) for neonatal death was 1.25, which fell to 1.16 after adjustments, and the postneonatal death crude RR was 2.20, which fell to 1.79 after adjustments. Relative risk ratios and adjusted odds ratios are shown in Table 38 below. Odds ratios were adjusted for infant gender, parity, plurality, ethnicity, maternal age, marital status, abortion history, mode of delivery, maternal illness, community size, and distance to the nearest hospital with obstetricians.

In Quebec, data were obtained from birth registration certificates and postal codes. Between 1991 and 2000, rural areas also had little income disparity in infant mortality, except for crude OR for postneonatal death— for neonatal death, crude OR was 0.85, and adjusted OR was 1.02, for postneonatal death, crude OR was 1.13, and adjusted OR was 0.94.[1026] As in British Columbia, the urban rates showed greater disparities. As shown in Table 38 below, in urban Quebec for neonatal death, crude OR was 1.28, and adjusted OR was 1.15, for postneonatal death crude OR was 1.68, and adjusted OR was 1.20. In 2000, both crude and adjusted neonatal death rates were similar in urban British Columbia and Quebec, but both crude and adjusted postneonatal death rates were significantly higher in British Columbia.

[1026] Luo, Wilkins, and Kramer. "Effect of Neighbourhood Income and Maternal Education on Birth Outcomes: A Population-Based Study."

Table 38. Risks of adverse birth outcomes by neighborhood income quintile from Q1 (richest) to Q5 (poorest) in urban areas, British Columbia, 1985–1988 through 1997–2000, and Quebec, 1991–2000

Outcome	**Poorest vs. Richest Neighbourhood Income Quintile**	
	Crude Risk Ratio–RR (95% CI)	**Adjusted Odds Ratio–OR* (95% CI)**
British Columbia, 1985–2000		
Neonatal death, per 1000		
1985–1988	1.28 (0.99–1.66)	1.28 (0.98–1.67)
1989–1992	1.38 (1.06–1.80)	1.24 (0.95–1.63)
1993–1996	1.04 (0.80–1.37)	0.93 (0.70–1.24)
1997–2000	1.25 (0.91–1.72)	1.16 (0.83–1.61)
Postneonatal death, per 1000		
1985–1988	1.61 (1.17–2.20)	1.26 (0.91–1.74)
1989–1992	1.63 (1.18–2.25)	1.19 (0.85–1.66)
1993–1996	1.71 (1.13–2.61)	1.25 (0.81–1.94)
1997–2000	2.20 (1.24–3.92)	1.79 (0.97–3.29)
Quebec, 1991–2000		
Neonatal death, per 1000	1.28 (1.12–1.46)	1.15 (1.00–1.33)
Postneonatal death, per 1000	1.68 (1.37–20.6)	1.20 (0.96–1.50)

Note: In B.C., odds ratios were adjusted for infant gender, parity, plurality, ethnicity, maternal age, marital status, abortion history, mode of delivery, maternal illness, community size, and distance to the nearest hospital with obstetricians. In Quebec, odds ratios were adjusted for infant gender, parity, plurality, and maternal age, education, ethnicity, marital status, and neighbourhood income quintile.

Sources: Adapted from Luo, Z., W.J. Kierans, R. Wilkins, R.M. Liston, J. Mohamed, and M.S. Kramer. "Disparities in Birth Outcomes by Neighbourhood Income: Temporal Trends in Rural and Urban Areas, British Columbia," *Epidemiology*, 2004, vol. 15, no. 6: 679-686. and Luo, Zhong-Cheng, Russell Wilkins, and Michael S. Kramer for the Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. "Effect of Neighbourhood Income and Maternal Education on Birth Outcomes: A Population-Based Study," *Canadian Medical Association Journal*, 2006, vol. 174, no. 10: 1-7. accessed Dec 2007; available from http://www.cmaj.ca/cgi/reprint/174/10/1415.

5.5.4 Life expectancy at birth

Statistics Canada defines life expectancy at birth as a standardized statistical indicator of the number of years a person would be expected to live, starting from birth, based on "mortality statistics for a given period, typically a calendar year."[1027] It adds that life expectancy is "related to socio-economic factors such as poverty and education."[1028] Women consistently have higher life expectancy than men, although the gap is shrinking. Life expectancy has been rising at least

[1027] Statistics Canada. *Comparable Health Indicators 2006. 36b-HLT Life Expectancy by Income*, Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/36bhlt.htm.
[1028] Ibid., accessed.

since 1920 when it was 59 years for males and 61 years for females.[1029] Recent statistics reporting the 2006 Census now list life expectancy at 82.5 years for women and 77.7 years for men.[1030]

Statistics Canada has calculated the life expectancy at birth by income group and gender for Canada and the provinces for 2001.[1031] The calculation is based on work by Wilkins et al. who used 1996 life tables to calculate life expectancy by income terciles. Statistics Canada notes:

> Average income for each enumeration area (EA) was calculated and then EAs were assigned to the bottom, middle, or highest income tercile. Deaths were coded to the EA based on postal codes. The life tables were then constructed using deaths assigned to each income tercile. … The 1996 percentage of deaths in each tercile is being applied to the 2000/01 abridged life table (i.e. if 40% of deaths occurred in the lowest income tercile in 1996 then 40% of deaths occurred in the lowest income tercile in 2000/01).[1032]

Table 39 below shows the life expectancy calculations made by Statistics Canada. The rates clearly reveal an income gradient in life expectancy, with high-income males living 3.2 years longer than low-income males, and high-income females living 1.1 years longer than low-income females.[1033]

Table 39. Life expectancy at birth by income group and gender, Canada, 2001

	Males			**Females**		
	Life expectancy	**95% confidence level**		**Life expectancy**	**95% confidence level**	
		Low	**High**		**Low**	**High**
All income groups	76.9	76.8	77.0	82.0	82.0	82.1
Income group, tercile 1 (lowest)	75.2	75.1	75.2	81.4	81.3	81.5
Income group, tercile 2 (middle)	77.2	77.1	77.3	82.1	82.1	82.2
Income group, Tercile 3 (highest)	78.4	78.3	78.2	82.5	82.4	82.6

Source: Statistics Canada. *Table 36b1-HLT Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/tables/dt006.htm.

1029 ________. *Life Expectancy at Birth, by Sex, by Province*, 2005; accessed Dec 2007; available from http://www40.statcan.ca/l01/cst01/health26.htm.
1030 ________. "2006 Census: Age and Sex." *The Daily*, July 17, 2007, accessed Dec 2007; available from http://www.statcan.ca/Daily/English/070717/d070717a.htm.
1031 ________. *Comparable Health Indicators 2006. 36b-HLT Life Expectancy by Income*, accessed.
1032 Ibid., accessed.
1033 ________. *Table 36b1-HLT Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/tables/dt006.htm.

As calculated by Wilkins et al., Table 40 below shows the life expectancy at birth in years for men and women by neighbourhood income quintile in urban Canada from 1971 to 1996. Life expectancy increased in all quintiles but gains were greater in the highest quintile than in the lowest, with the lowest quintile being particularly disadvantaged.

Table 40. Life expectancy at birth (years) by neighbourhood income quintile and rate differences, urban Canada, by gender, 1971 to 1996

Income Quintile	Males			
	1971	1986	1991	1996
Total	70.6 (70.4–70.7)	73.8 (73.7–73.9)	75.3 (75.2–75.4)	76.0 (75.9–76.1)
Quintile 1 (richest)	73.4 (73.0–73.7)	76.1 (75.8–76.3)	77.6 (77.4–77.9)	78.1 (77.9–78.3)
Quintile 2	72.4 (72.1–72.7)	75.3 (75.1–75.6)	76.6 (76.3–76.8)	77.2 (76.9–77.4)
Quintile 3	71.0 (70.7–71.3)	74.4 (74.1–74.6)	76.0 (75.7–76.2)	76.7 (76.5–76.9)
Quintile 4	70.6 (70.3–70.9)	73.5 (73.2–73.7)	74.7 (74.4–74.9)	75.9 (75.7–76.1)
Quintile 5 (poorest)	67.1 (66.8–67.4)	70.4 (70.2–70.7)	72.0 (71.7–72.2)	73.1 (72.8–73.3)
Q1 – Q5	6.3	5.6	5.7	5.0
Q1 – Total	2.8	2.3	2.4	2.0

Income Quintile	Females			
	1971	1986	1991	1996
Total	78.4 (78.2–78.5)	80.4 (80.3–80.5)	81.6 (81.5–81.6)	81.8 (81.7–81.9)
Quintile 1 (richest)	79.7 (79.4–80.1)	80.9 (80.6–81.2)	82.0 (81.7–82.2)	82.3 (82.1–82.6)
Quintile 2	79.4 (79.1–79.8)	80.8 (80.6–81.1)	81.8 (81.6–82.1)	82.1 (81.8–82.3)
Quintile 3	78.1 (77.8–78.5)	80.7 (80.5–80.9)	82.3 (82.1–82.5)	82.5 (82.2–82.7)
Quintile 4	78.1 (77.8–78.5)	80.4 (80.1–80.6)	81.5 (81.3–81.7)	81.8 (81.6–82.0)
Quintile 5 (poorest)	76.9 (76.6–77.2)	79.1 (78.8–79.3)	80.4 (80.2–80.7)	80.7 (80.5–80.9)
Q1 – Q5	2.8	1.8	1.6	1.6
Q1 – Total	1.4	0.5	0.3	0.5

Note: Data source–Canadian Mortality Data Base, supplemental address files, special tabulations of census population data; 95% confidence intervals in parentheses; rate differences calculated with unrounded data.

Source: Wilkins, R., J.-M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

5.5.5 Health-adjusted life expectancy (HALE)

Life expectancy measures the number of years one might be expected to live, but it does not consider the quality of the life lived. Health-adjusted life expectancy (HALE) measures both quantity and quality of life. It is a standardized statistical indicator that combines mortality data with health status data to produce a summary measure that represents "the number of expected years of life equivalent to years lived in full health, based on the average experience in a population."[1034] Marthe Gold et al. note that HALEs, which they refer to as "health-adjusted life years" or HALYs, are useful for "overall estimates of burden of disease, comparisons of the relative impact of specific illnesses and conditions on communities, and in economic analyses."[1035]

HALE is calculated at birth, based on data for those aged 15 years and over, and for those aged 65. HALE varies considerably by gender—while women live longer lives than men, their lives are not necessarily free of illness.

In addition to life expectancy, Statistics Canada has also calculated HALE at birth by income group and gender for Canada and the provinces for 2001.[1036] The calculation is based on the same work by Wilkins et al. who used 1996 life tables to calculate life expectancy by income terciles, based on average incomes in each enumeration area (EA) in 1996. The 1996 percentage of deaths in each income tercile has been applied to the 2000/2001 life tables.

The morbidity or quality of life component of HALE is referred to as health-related quality of life (HRQL). Cross-sectional age-specific HRQL data from population surveys are calculated and combined with the life tables created from the census. To calculate this, CCHS respondents in each EA were placed in three income terciles and the mean Health Utilities Index (HUI) was calculated for each tercile. HUI is a measure of HRQL that describes an individual's overall functional health on the basis of eight attributes—vision, hearing, speech, ambulation, dexterity,

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[1034] ________. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy (HALE)*, Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/37bhlt.htm.

[1035] Gold, Marthe R., David Stevenson, and Dennis Fryback. "HALYs and QALYs and DALYs, Oh My: Similarities and Differences in Summary Measures of Population Health," *Annual Review of Public Health*, 2002, vol. 23: 115-134. p. 115. They explain that HALY is a broad category of measures that include HALE, QALY (quality-adjusted life years) and DALY (disability-adjusted life years). According to Gold et al., QALYs are mainly used in cost-utility analyses of medical interventions. The World Bank and World Health Organization developed DALYs as a metric to quantify the global burden of disease and disability in populations, primarily in developing countries, but the metric is beginning to be used more widely. According to Flanagan et al., "HALY is computationally identical to DALY; however, it reflects a shift in terminology away from disability towards the broader term health, following recommendations originating from the International Network on Health Expectancy." Flanagan, Boswell-Purdy, Petit, and Berthelot. "Estimating Summary Measures of Health: A Structured Workbook Approach." p. 2.

[1036] Statistics Canada. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy.* For an example of a study using HALY as an outcome measure, see Boswell-Purdy, Jane, William M. Flanagan, Helene Roberge, Christel Le Petit, Kathleen J. White, and Jean-Marie Berthelot. "Population Health Impact of Cancer in Canada, 2001," *Chronic Diseases in Canada*, 2007, vol. 28, no. 1-2: 42-55. This study does not address low-income heath disparities.

emotion, cognition, and pain and discomfort. In the CCHS, the HUI is administered as a 31-item questionnaire. The 1994 NPHS was also analyzed to determine the tercile distribution for institutional residents.

According to Gold, et al., three general steps are used in calculating a HALY:

(a) describe health, i.e., as a health state or as a disease/condition;
(b) develop values or weights for the health state or condition, which are called HRQL weights here; and
(c) combine values for different health states or conditions with estimates of life expectancy.[1037]

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Statistics Canada describes the calculation method for HALE as follows:

> Part A: (average Health Utility Index (HUI) for institutional residents * percentage of population in institutions in the province) + (average HUI for household population * percentage of population in households in the province) = overall HUI score by sex and age group in each province.
>
> Part B: Overall HUI by sex and age group * years of life lived in each age group = health adjusted years of life lived.
>
> Part C: Health adjusted years of life lived are then summed and divided by the total number of persons surviving at given ages. This will provide HALE at birth and age 65 by province.[1038]

[1037] Gold, Stevenson, and Fryback. "HALYs and QALYs and DALYs, Oh My: Similarities and Differences in Summary Measures of Population Health." p. 118.
[1038] Statistics Canada. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy (HALE)*, accessed.

Table 41. Health-adjusted life expectancy (HALE) at birth by income group and gender, Canada, 2001

	Males			Females		
	Health-adjusted life expectancy (years)	95% confidence level		Health-adjusted life expectancy (years)	95% confidence level	
		Low	High		Low	High
All income groups	68.3	68.1	68.5	70.8	70.6	70.9
Income group, tercile 1 (lowest)	65.8	65.5	66.0	69.1	68.8	69.4
Income group, tercile 2 (middle)	68.6	68.3	68.8	70.8	70.5	71.1
Income group, Tercile 3 (highest)	70.5	70.2	70.8	72.3	72.0	72.6

Source: Statistics Canada. *Table 37a-HLT Health-Adjusted Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/tables/dt008.htm.

Table 41 above shows the health-adjusted life expectancy calculations made by Statistics Canada. The rates illustrate an income gradient in HALE, with high-income males living 4.7 healthy years longer than low-income males, and high-income females living 3.2 healthy years longer than low-income females.[1039]

5.5.6 Potential years of life lost (PYLL)

Potential years of life lost (PYLL) is a complementary indicator to life expectancy that focuses on mortality among the non-elderly. PYLL is the difference in the number of years between the age at death and a life expectancy of 75 years.[1040] Statistics Canada calculates potential years of life lost "by taking the median age in each age group, subtracting from 75, and multiplying by the number of deaths in that age group disaggregated by sex and cause of death. These data are presented as a standardized rate per 100,000 population."[1041]

Wilkins et al. found that in 1996, PYLL from birth to age 74 was highest for all cancers (30.9%), both intentional and unintentional injuries (19.2%), and circulatory diseases (17.6%).[1042]

Health Canada reported in 1999 that it is "estimated that if the same death rates as for the highest

[1039] ________. *Table 36b1-HLT Life Expectancy, at Birth, by Sex and Income Group, Canada and Provinces, 2001*, accessed.
[1040] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, accessed.
[1041] Statistics Canada. *Potential Years of Life Lost (PYLL): Three Year Average, by Sex, Population Aged 0 to 74, Canada, Provinces, Territories, Health Regions and Peer Groups*, 2007; accessed Jan 2008; available from http://www.statcan.ca/english/freepub/82-221-XIE/2007002/tblstructure/1hlthstat/1de/de1pyo-en.htm.
[1042] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

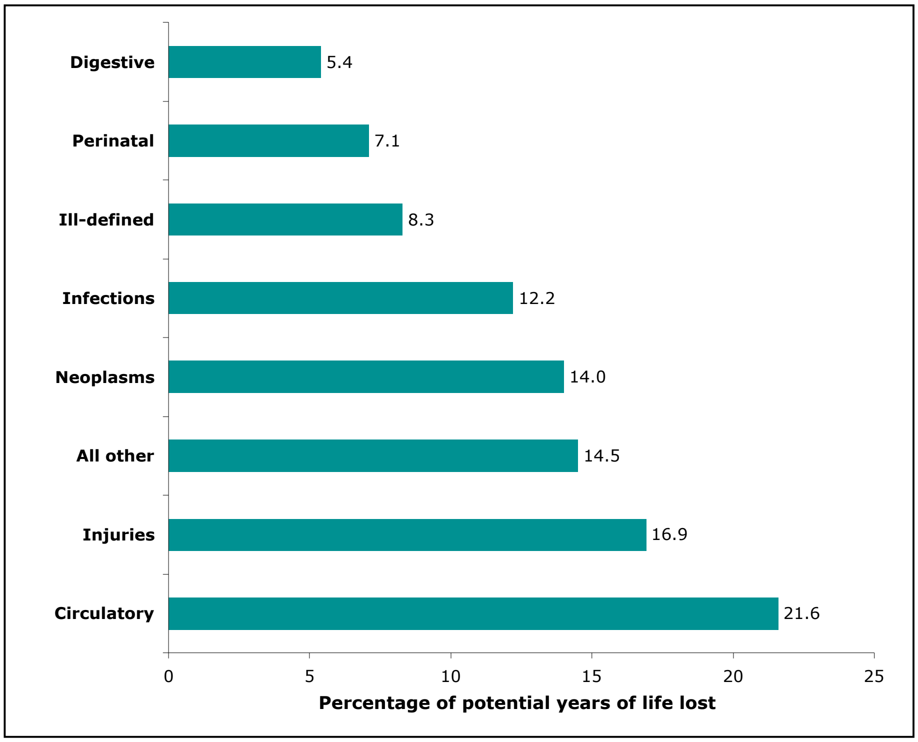
income earners applied to all Canadians, over one-fifth of all potential years of life lost before age 65 could be prevented."[1043] According to Raphael, 23% of potential years of life lost can be attributed to income differences between low- and high-income individuals, and 22% of all years lost can be attributed to income differences caused by cardiovascular disease.[1044] He notes that this calculation uses mortality rates in the wealthiest quintile of neighbourhoods as a baseline, and considers all deaths above that rate to be excess related to income differences.

Wilkins et al. define income-related excess PYLL "as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population."[1045] Therefore, the estimate for excess PYLL includes four quintiles related to the richest quintile, rather than only considering the poorest quintile in relation to the richest. Wilkins et al. found that in 1996, excess years of life lost—the percentage of total PYLL that was related to income differences—was 24.0%, which the authors note was higher than the percentage due to injuries or circulatory diseases.

Figure 19 below shows the 1996 percentage of income-related excess potential years of life lost (PYLL) by cause of death in urban Canada. The same three diseases were responsible for income-related PYLL as were responsible for total PYLL, though in reverse order—circulatory disease (21.6%), injuries (16.9%), and neoplasms (cancers) (14.0%). The authors note that "elimination of excess PYLL would result in gains in potential years of life equivalent to eradicating one of the three leading causes of death."[1046]

[1043] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, accessed. p. 2.
[1044] Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*.
[1045] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996." p. 10.
[1046] Ibid. p. 9.

Figure 19. Income-related excess potential years of life lost (PYLL) (percentage) by cause of death, urban Canada, 1996



Notes: Data source–Canadian Mortality Data Base supplemented with address files and special tabulations of census population data, International Classification of Diseases–ICD-9; "Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population."

Source: Wilkins, R., J.-M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

Table 42 below shows the income-related excess deaths and excess potential years of life lost (PYLL) before age 75, by sex, and all causes of death together, for urban Canada 1971 to 1996. Wilkins et al. remark:

> If all income quintiles had experienced the mortality rates of the richest quintile, and the same rates of excess deaths also applied to rural and small town Canada, then 13,000 fewer males and 5,000 fewer females would have died before age 75 in 1996.[1047]

They also note that the rate of excess PYLL declined by 35% between 1971 and 1996—from 1,966 in 1971 to 1,277 in 1996—but the decline happened prior to 1991. Rates of excess PYLL remained the same in 1991 and 1996. Data tables for PYLL are presently available from Statistics Canada through 2003.[1048]

[1047] Ibid. p. 9.
[1048] Statistics Canada. *Potential Years of Life Lost (PYLL): Three Year Average, by Sex, Population Aged 0 to 74, Canada, Provinces, Territories, Health Regions and Peer Groups*, accessed.

Table 42. Income-related excess deaths and excess potential years of life lost (PYLL) before age 75, by gender, all causes of death together, urban Canada, 1971–1996

	Deaths			PYLL			Non-institutional population	Rates	
	Total	Excess	% excess	Total	Excess	% excess		Excess deaths	Excess PYLL
Total									
1971	46,513	8,290	17.8	1,000,318	221,378	22.1	11,262	73.6	1,966
1986	51,983	9,951	19.1	918,510	188,981	20.6	14,446	68.9	1,308
1991	52,040	11,144	21.4	906,347	202768	22.4	15,879	70.2	1,277
1996	53,588	10,775	20.1	903,702	216,442	24.0	16,953	63.6	1,277
Males									
1971	29,450	6,001	20.4	633,329	149,182	23.6	5,596	107.2	2,666
1986	32,401	7,520	23.2	585,242	142,965	24.4	7,129	105.5	2,005
1991	32,374	8,249	25.5	580,228	149,372	25.7	7,857	105.0	1,901
1996	32,920	7,740	23.5	568,320	154,282	27.1	8,373	92.4	1,843
Females									
1971	17,063	2,289	13.4	366,990	72,196	19.7	5,665	40.4	1,274
1986	19,582	2,431	12.4	333,269	46,016	13.8	7,316	33.2	629
1991	19,666	2,896	14.7	326,119	53,396	16.4	8,022	36.1	666
1996	20,668	3,035	14.7	335,383	62,161	18.5	8,581	35.4	724

Notes: Data source–Canadian Mortality Data Base supplemented with address files and special tabulations of census population data; "Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population;" Rates–excess deaths and excess PYLL before age 75 per 100,000 non-institutional population aged 0 to 74 years.

Source: Wilkins, R., J.M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

5.6 Health service use

Studies involving hospital and health practitioner use done on the national, provincial, and local level in Canada most often show that low-income individuals use general practitioner and hospital health services more often than those with high incomes.[1049] However, higher income individuals use specialist services more often.[1050]

[1049] Asada, Yukiko, and George Kephart. "Equity in Health Services Use and Intensity of Use in Canada," *BMC Health Services Research*, 2007, vol. 7: 41-52.
[1050] Dunlop, Sheryl, Peter C. Coyle, and Warren McIsaac. "Socio-Economic Status and the Utilisation of Physicians' Services: Results from the Canadian National Population Health Survey," *Social Science and Medicine*, 2000, vol. 51: 123-133.

5.6.1 Rural–urban divide

The relationship between higher rates of use by low-income individuals is mainly confined to urban areas in Canada because rural Canadians face greater challenges in accessing health services than urban Canadians do.[1051] Rural residents account for 31% of the Canadian population and, on the whole, rural populations have a lower average income than urban Canadians but a smaller proportion living in poverty—14% live below low-income cut-offs in rural areas, compared with 18% who live below low-income cut-offs in urban populations.[1052]

David Hay et al. of Canadian Policy Research Networks note that the health status in rural populations is lower than that of urban populations, and rural communities face a unique set of health needs in addition to access that are "influenced by aging, depopulation, poverty, and occupational hazards."[1053] Rural Canadians often have to travel long distances to access health care services, many of which are underserved by nurses, physicians, and other health care providers. They also face a shortage of hospitals in rural areas, closure of emergency departments, and high transportation costs to health services that increase financial burdens. According to Hay et al., "Generally speaking, the further away a rural community is from an urban centre the fewer the options for health care services and the less specialized the service providers are."[1054]

5.6.2 Physician services and hospitalization rates

Steven Katz et al. compared physician services in Ontario and the midwestern and northeastern U.S. in 1990, and found that low-income Canadians averaged 26% more visits to physicians per year than their U.S. counterparts. They ask whether higher use of health services among low-income individuals suggest greater health problems and needs or excessive use of the system. In response to their question, they note:

> Our results suggest that higher visit rates in Ontario are not associated with a greater prevalence of low-priority care such as visits for acute upper respiratory conditions. … In particular, higher visit rates among low-income Canadians may be related to unmeasured physical health needs or greater needs related to social and familial conditions of poverty. These findings are consistent with previous studies.[1055]

Dunlop, Coyle, and McIsaac use data from the 1994 NPHS to examine visits to general practitioners and specialists by household income, adjusted for size of household and divided by quintiles.[1056] Physician services were measured by one or more visits and six or more visits to the

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[1051] Hay, Varga-Toth, and Hines. *Frontline Health Care in Canada: Innovations in Delivering Services to Vulnerable Populations*, accessed. Rural areas are defined as communities that have a population of less than 10,000 people.
[1052] Ibid., accessed.
[1053] Ibid., accessed. p. iii.
[1054] Ibid., accessed. p. iv.
[1055] Katz, Steven J., T.P. Hofer, and W.G. Manning. "Physician Use in Ontario and the United States: The Impact of Socioeconomic Status and Health Status," *American Journal of Public Health*, 1996, vol. 86: 520-524. p. 523.
[1056] Dunlop, Coyle, and McIsaac. "Socio-Economic Status and the Utilisation of Physicians' Services: Results from

physician in the past 12 months. Dunlop et al. also compared health need, as measured by self-rated health and number of health problems, with use of physician services, and found that increased need was consistently associated with increased use of both primary and specialist services. The likelihood of a visit to a general practitioner at least once during the year was found to be independent of income. However, those with lower incomes were more likely to be more frequent users (more than six visits a year) of primary physician services than those with higher incomes. On the other hand, those with higher incomes were more frequent users of specialist services (odds ratio = 1.89, females; 1.31, males, with the lowest income quintile as the reference group.)

Kephart, Thomas, and Maclean linked data from the 1990 Nova Scotia Nutrition Survey with the Nova Scotia Medical Services Insurance Physicians' Services claims database from 1991–1994 to examine use of physician services by household income.[1057] Total household income was adjusted for household size, based on Statistics Canada low-income cut-offs. They found the ratio of physician service use to be 1.43 (95% confidence interval– 1.12–1.84)—that is, those in the lowest income group were 43% more likely to use physician services than those in the two highest income groups (combined into one group to match the N.S. Nutrition Survey), after controlling for age, gender, and region. Also, the excess use associated with income inequality—assuming that those in the lowest income category had the same rate of physician use as those in the highest income category—was estimated to be 11.3% or $27.5 million per year.

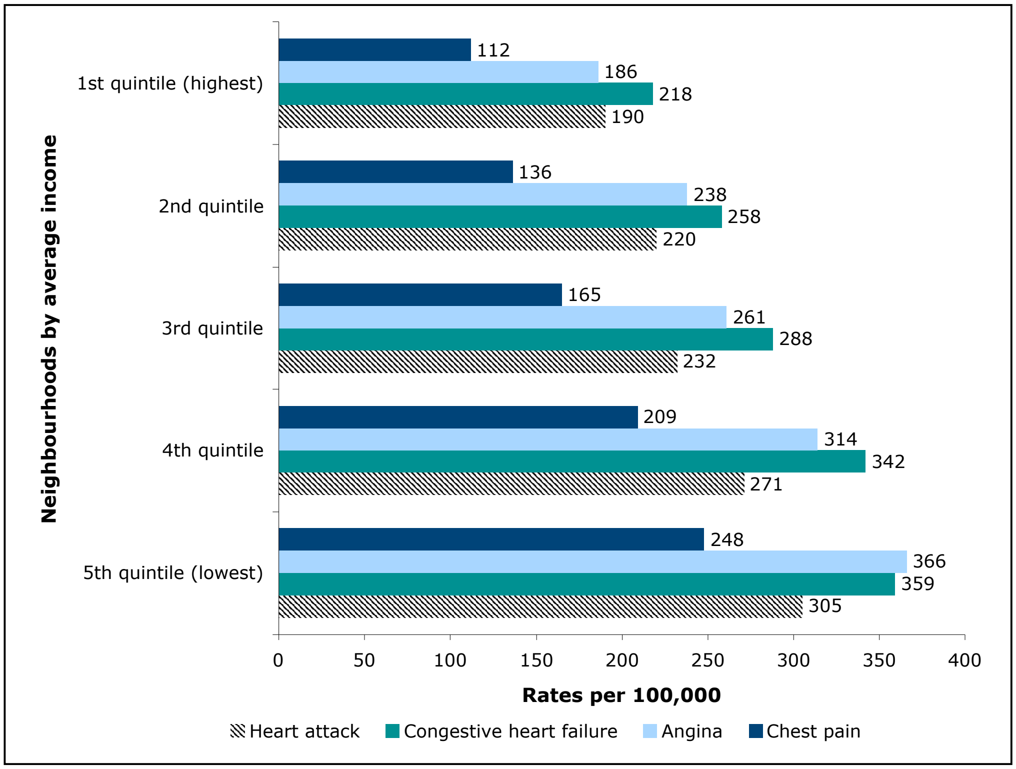
Raphael cites a 1999 study that tracked hospitalization rates in Ontario between 1992 and 1997 for heart attack, congestive heart failure, angina, and chest pains by neighbourhood income quintile. On average, "The hospitalization rates for the lowest income quintile of neighbourhoods were 69% higher for heart attacks, 65% higher for congestive heart failure, 97% higher for angina, and 121% higher for chest pain than those in the highest income quintile of neighbourhoods."[1058] Specific rates are shown in Figure 20 below.

the Canadian National Population Health Survey."

[1057] Kephart, Thomas, and MacLean. "Socioeconomic Differences in the Use of Physician Services in Nova Scotia."

[1058] Basinski, A.S. "Hospitalization for Cardiovascular Medical Diagnoses," in *Cardiovascular Health and Services in Ontario: An ICES Atlas*, ed. Naylor, C.D. and P.M. Slaughter. Toronto: Institute for Clinical Evaluative Services and Heart and Stroke Foundation, 1999. Cited in Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed. p. 57.

Figure 20. Average hospitalization rates by area income, Ontario, 1992–1997



Source: Basinski, A.S. "Hospitalization for Cardiovascular Medical Diagnoses," in *Cardiovascular Health and Services in Ontario: An ICES Atlas*, ed. Naylor, C.D. and P.M. Slaughter. Toronto: Institute for Clinical Evaluative Services and Heart and Stroke Foundation, 1999. Cited in Raphael, Dennis. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, Toronto: North York Heart Health Network, 2001; accessed Nov 2007; available from http://action.web.ca/home/narcc/attach/Inequality%20is%20Bad%20for%20Our%20Hearts%20-%202001%20Report%5B1%5D.pdf.

A Nova Scotia study by Veugelers and Yip also found the same patterns. Veugelers and Yip identified heavy users of the health care system as those who had a level of usage greater than the median level of usage.[1059] They linked data from the 1990 Nova Scotia Nutrition Survey (with respondents aged 18–75 years) with eight years of administrative health services and mortality data. Household income was divided into less than $20,000, $20,000–$39,999, and $40,000 or more. In their study, they found that the incidence of being a heavy user of general practitioner services as well as hospital use was inversely related to low household income:

> Participants who reported a household income of less than $20,000 constituted 31% of the study population and used disproportionately more health services; of all services delivered to this study population, the low-income group used 43% of the family

[1059] Veugelers, P.J., and A.M. Yip. "Socioeconomic Disparities in Health Care Use: Does Universal Coverage Reduce Inequalities in Health?," *Journal of Epidemiology and Community Health*, 2003, vol. 57: 424-428.

> physician services, 38% of the specialist services, and 50% of the days in hospital. Participants with a household income of more than $40,000 constituted 29% of the study population and used 21% of the family physician services, 26% of the specialist services, and 13% of the days in hospital. This … should be interpreted with caution, as differences are not controlled for the effects of age and gender.[1060]

When Veugelers and Yip adjusted odds ratios for health service use by income group for age and gender they found that respondents "with an income of more than $40,000 were about half as likely (odds ratio = 0.51) to be heavy users of family physician services than those with an income of less than $20,000."[1061] A similar result was found for hospital use (odds ratio = 0.58), but specialist use showed less difference (odds ratio = 0.96.) (The low-income group is the reference group).

Roos and Mustard found the same income gradient in hospital utilization in Winnepeg neighbourhoods—those living in poorer neighbourhood used hospital services more often than those living in more affluent areas.[1062] Glazier et al. compared hospital admissions between individuals living in high and low-income neighbourhoods in Toronto, which were based on the percentage of households with incomes below the low-income cut-offs residing in the neighbourhoods.[1063] They found that the age-gender adjusted hospital admission rate for individuals living in neighbourhoods with the lowest income was 87.51 per 1,000 compared with 60.86 per 1,000 for individuals living in the highest income neighbourhoods. They also found that the "average cost in the poorest quintile is 50% higher than that in the wealthiest quintile."[1064]

More recently, Lemstra, Neudorf, and Opondo compared six low-income cut-off neighbourhoods in Saskatoon—or those where more than 30% of the families in the neighbourhood had incomes below the low-income cut-off level (N = 18,228)—with the most affluent neighbourhoods (N = 16,683) and the rest of Saskatoon (N = 184,284).[1065] This census tract data was linked to the Saskatchewan centralized administrative database, which was used to collect information on 31 health indicators. Relative ratios were calculated for all of the indicators, comparing the low-income neighbourhood outcomes with those of the two comparison groups. This is one of the few studies that use objective data rather than self-reported data, and that adjusted for the presence of specific chronic health conditions, as opposed to only age and gender.

Comparing the low-income neighbourhoods with the most affluent, Lemstra et al. observed significant differences for: suicide attempts (RR = 15.58), mental disorders (RR = 4.27), injuries and poisonings (RR = 2.46), diabetes (RR = 12.86), COPD (RR = 1.53) coronary heart disease

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[1060] Ibid. p. 426.
[1061] Ibid. p. 426.
[1062] Roos, and Mustard. "Variation in Health Care Use by Socioeconomic Status in Winnipeg, Canada: Does the System Work Well? Yes and No."
[1063] Glazier, R.H., E.M. Badley, J.E. Gilbert, and L. Rothman. "The Nature of Increased Hospital Use in Poor Neighbourhoods: Findings from a Canadian Inner City," *Canadian Journal of Public Health*, 2000, vol. 91: 268-273.
[1064] Ibid. p. 270.
[1065] Lemstra, Mark, Cory Neudorf, and Johnmark Opondo. "Health Disparity by Neighbourhood Income," *Canadian Journal of Public Health*, 2006, vol. 97, no. 6: 435-439.

(RR = 1.70), and stroke (1.82). No statistically significant differences were found for cancer (RR = 1.02). Incidence rate ratios for infectious diseases were 14.89 for chlamydia, and 34.60 for hepatitis C. The rate for gonorrhea compared with the rest of Saskatoon was 7.76, but there were no cases in the affluent neighbourhoods. Similar relationships were also found for number of physician visits for the same health indicators. Significant ratios were also found between the lowest and highest income neighbourhoods for teen births (RR = 16.49), infant mortality (RR = 3.23) and all-cause mortality (RR = 2.49).[1066]

Asada and Kephart of Dalhousie University recently examined socioeconomic inequities in health care use in Canada but did not find a statistically significant income gradient.[1067] However, their study examined *excess* use of health care services after adjusting for need, and their results are not consistent with many other studies. They argue that previous studies that only adjusted for age and gender cannot tell if higher use of health care services by those with low income is reasonable given their greater health care needs. They also argue that "equal access for equal need" can only be assessed by controlling for additional need indicators such as health status. They illustrate their argument through examples of studies showing a range of outcomes.

Using data from the 2000/2001 CCHS, Asada and Kephart reviewed use, and intensity of use, of general practitioner, specialist, and hospital services of all Canadians aged 20 years and over in all provinces and territories. Socioeconomic status was measured by education and household income adjusted for household size and divided into quintiles. They adjusted health care utilization for need factors such as self-perceived health, stress, depression, activity limitations, injury, and the presence of 18 chronic conditions.

In general they found that approximately 80% of the population had at least one visit to a general practitioner, about 30% had at least one visit to a specialist, and about 9% had at least one overnight stay at a hospital annually. After adjusting for need, they found that those with low income visited a general practitioner and specialist "at least once in the previous year" less often than those with high income, but after the initial visit were likely to visit general practitioners more often, or six or more times per year. Generally, higher income individuals visited specialists more often than did low-income individuals, which is a pattern often seen in the literature.[1068] In addition, they found that income "had no statistically significant association with hospital use or non-use (hospital admission) and the intensity of use (hospital stay)."[1069] The authors also point out that the type and importance of need indicators varied by use, and intensity of use, of health services:

> For example, ambulatory conditions such as allergies and arthritis will be more important drivers of general practitioner use, while heart disease and cancer will be more important drivers of need for specialist and hospital services. Moreover, some types of conditions (e.g., diabetes) may require more follow-up than others (e.g., allergies), and thus will be more strongly associated with intensity of use.[1070]

[1066] Ibid.
[1067] Asada, and Kephart. "Equity in Health Services Use and Intensity of Use in Canada."
[1068] Ibid.
[1069] Ibid. p. 49.
[1070] Ibid.

European researchers Jiménez-Rubio, Smith, and van Doorslaer used the same 2000/2001 CCHS data to examine health equity in Canada.[1071] After adjusting for age, gender, and need—self-assessed health, activity limitations and number of chronic conditions—they found:

> [T]he poor use more GP [general practitioner] services than the rich even after need differences have been taken into account (CI [concentration index] of the need-standardised distribution of visits to GP is significantly negative, CI = -0.026). The distribution of the number of nights in hospital also favours the poor (CI = -0.117), while the distribution of medical specialist visits is significantly pro-rich (CI = 0:063).[1072]

Asada and Kephart note the discrepancies between their study and a similar one by van Doorslaer et al. and reason that the primary difference is the extent of need adjustment, which is more extensive in the Asada and Kephart study than in most other studies. In conclusion, Asada and Kephart note that the reasons for their findings are not clear and further research is required in order to understand socioeconomic differences in need-adjusted health service use.

[1071] Jiménez-Rubio, Dolores, Peter C. Smith, and Eddy van Doorslaer. "Equity in Health and Health Care in a Decentralised Context: Evidence from Canada," *Health Economics*, 2007, vol. Aug 23 [Early view - Epub ahead of print]: 1-16.
[1072] Ibid. p. 9.

PART 3: VULNERABLE POPULATIONS AND SOCIAL ISSUES

6. Vulnerable populations

Some populations in Canada are especially vulnerable to high rates of poverty including children, lone-parent mothers, Aboriginal people, unattached people, people with disabilities, immigrants who are visible minorities, and working people whose jobs pay low wages.[1073] In this section we briefly profile the first three groups—children, lone mothers, and Aboriginal peoples. The other groups are equally important when identifying and understanding the costs to our society that result from poverty, but because of time and resource limitations, it has been necessary to limit our focus.

6.1 Child poverty

The UNICEF Innocenti Research Centre uses data from the *Luxumbourg Income Study* of household surveys to report child poverty levels for the majority of Organisation of Economic Co-operation and Development (OECD) countries.[1074] It notes that child poverty represents unnecessary suffering and deprivation of millions of children who are at a measurable disadvantage in physical and mental development, health and mortality rates, educational achievement, and job prospects. According to UNICEF, child poverty is not only a problem for the children themselves, but it also represents a threat to the quality of life of *all* citizens in nations with high rates of child poverty:

> [T]he broader picture shows that those who grow up in poverty are more likely to have learning difficulties, to drop out of school, to resort to drugs, to commit crimes, to be out of work, to become pregnant at too early an age, and to live lives that perpetuate poverty and disadvantage into succeeding generations. In other words, many of the most serious problems facing today's advanced industrialized nations have roots in the denial and deprivation that mark the childhoods of so many of their future citizens.
>
> Child poverty therefore confronts the industrialized world with a test both of its ideals and of its capacity to resolve many of its most intractable social problems.[1075]

UNICEF defines poverty as households with incomes below 50% of the national median income. In a more recent UNICEF report, based on data from 2000, Canada, with a child poverty rate of 14.9%, ranked 19 in terms of child poverty out of 26 countries, with the highest ranking country—Denmark, having the lowest child poverty rate of 2.4%.[1076] The Nordic countries had

[1073] National Council of Welfare. *The Cost of Poverty*, 2001; accessed Nov 2007; available from http://www.ncwcnbes.net/documents/researchpublications/OtherPublications/2002Report-TheCostOfPoverty/ReportENG.htm.
[1074] UNICEF Innocenti Research Centre. *Innocenti Report Card: A League Table of Child Poverty in Rich Nations*, United Nations Children's Fund, 2000; accessed March 2008; available from http://www.unicef-irc.org/publications/pdf/repcard1e.pdf.
[1075] Ibid., accessed. p. 3.
[1076] UNICEF Innocenti Research Centre. *Child Poverty in Rich Countries 2005*, United Nations Children's Fund,

among the lowest child poverty rates and highest rankings. Finland, Norway and Sweden, which ranked 2–4, respectively, had child poverty rates of 2.8%, 3.4%, and 4.2%, respectively. The lowest ranking countries with the highest child poverty rates were the United States, which had a rate of 21.9% and Mexico, with a rate of 27.7%.

6.1.1 Prevalence of child poverty

Campaign 2000, a network of over 120 national, provincial, and community partners across Canada committed to ending child poverty, recently released its 2007 report card on child poverty. The report uses the latest available (2005) Statistics Canada data and the following information on the prevalence of child poverty in Canada is mainly drawn from that publication.[1077]

Marvyn Novick, a co-founder of Campaign 2000 and Professor Emeritus of Ryerson University, reports that the Canadian child poverty rate in 2005—11.7% (788,000 children) based on after-tax Low Income Cut-offs–LICOs—was exactly the same as the rate in 1989.[1078] 1989 was the year that the House of Commons voted to end child poverty by the year 2000. Clearly, little has improved in the intervening 16-year period. When the poverty rate is based on before-tax LICOs, 16.8%, or 1.1 million Canadian children are living in poverty.[1079] Campaign 2000 reports that this is the case "despite a 50% real increase in the size of our economy over the same period."[1080]

Figure 21 below shows 2005 child poverty rates for Canada and the provinces. Provincial poverty rates (based on after-tax LICOs) range from a high in British Columbia of 15.2% to a low of 3.3% in Prince Edward Island.[1081] Only Prince Edward Island, Alberta, and Quebec have child poverty rates below 10%. Quebec has shown a dramatic decrease in its child poverty rates since 1997 when its rate was 22%. It's commitment to poverty reduction and development of specific strategies—which include family supports such as an expansion of affordable childcare, increased child benefits, and improved parental leaves—have resulted in a reduction of child poverty to 9.6% in 2005. In 2006 Newfoundland and Labrador also introduced a poverty reduction strategy, but it is too soon to assess its impact.

2005; accessed March 2008; available from http://www.unicef-irc.org/publications/pdf/repcard6e.pdf.

[1077] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, 2007; accessed March 2008; available from http://www.campaign2000.ca/rc/rc07/2007_C2000_NationalReportCard.pdf.

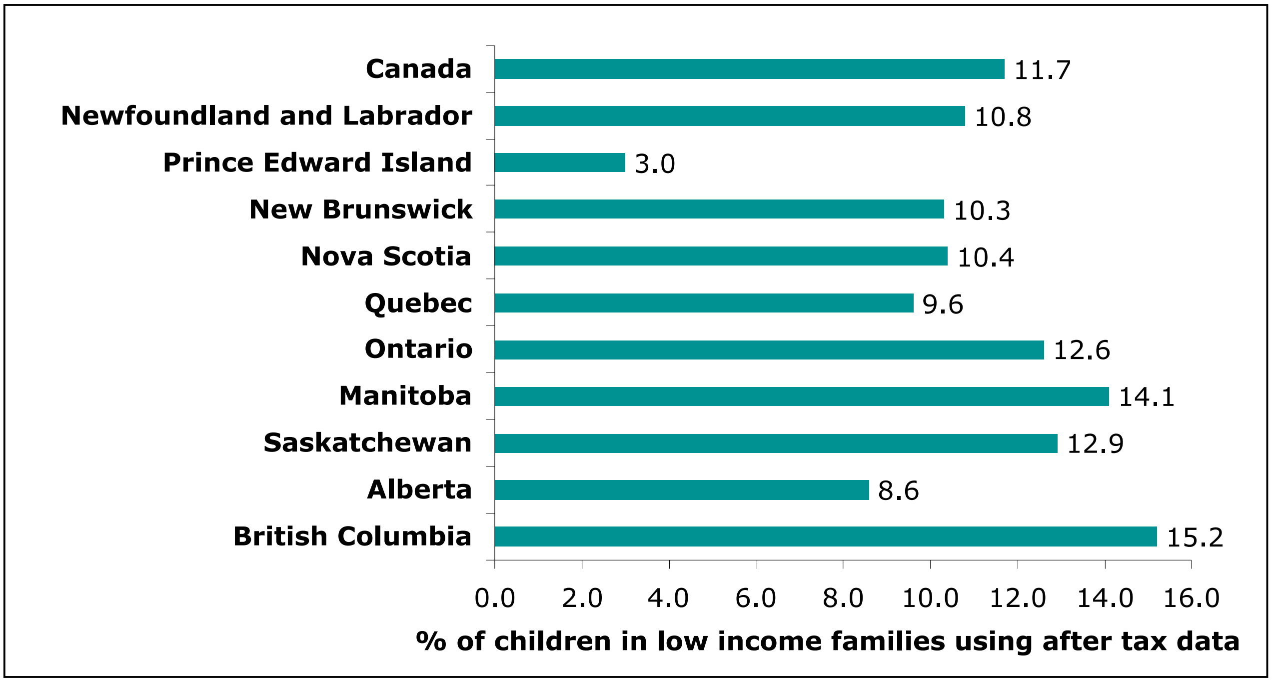
[1078] Novick, Marvyn. *Summoned to Stewardship: Make Poverty Reduction a Collective Legacy*, Campaign 2000 Policy Perspective, 2007; accessed March 2008; available from http://www.campaign2000.ca/res/dispapers/summoned_to_stewardship.pdf.

[1079] Campaign 2000. *It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada*, accessed.

[1080] Ibid., accessed.

[1081] Ibid., accessed.

Figure 21. Child poverty rates in Canada and the provinces, 2005



Source: Campaign 2000. It Takes a Nation to Raise a Generation: Time for a National Poverty Reduction Strategy. 2007 Report Card on Child and Family Poverty in Canada, 2007; accessed March 2008; available from http://www.campaign2000.ca/rc/rc07/2007_C2000_NationalReportCard.pdf

Child poverty rates are higher in vulnerable populations that face persistent disparities. Almost half (47% before tax) of lone mothers and their children live in poverty.[1082] Low income for recent immigrants is three times higher than for people born in Canada and 49% of children in recent immigrant families live below the poverty line. For children with disabilities, the poverty rate is 28%. The poverty rate for First Nations children is also extremely high—in 2001, 40% for children living outside of First Nations communities and 28% for children living in First nations communities were living in poverty. In both Saskatchewan and Manitoba, First Nations child poverty rates were more than 50%.

On average, low-income families are living on between \$9,000 and \$11,000 below Statistics Canada's Low Income Cut-off (before tax), which is the amount of money needed just to bring them *to* the poverty line. In addition, 41% of children who live in poverty live in families with at least one income earner working full-time on an annual basis. Campaign 2000 notes, " No matter where you live in Canada, the minimum wage does not bring a full-time, year-round minimum wage worker up to the poverty line. In 2006, 2.1 million workers across Canada—full and part-time—were low wage workers earning less than \$10/hour."[1083]

[1082] Ibid., accessed.
[1083] Ibid., accessed. p. 3.

6.1.2 Child outcomes associated with poverty

Evidence has shown that children who live in poverty are more likely than children living in higher-income households to have physical, psychological, emotional, and behavioural problems.[1084] These problems are seen in higher rates of respiratory illnesses and infections, sudden infant death syndrome, obesity, high blood lead levels, iron deficiency anaemia, chronic ear infections, mental retardation, fetal alcohol syndrome, and dental problems. Health Canada reports that low-income children are more likely to have a clustering of exposures manifesting in low birth weights, poor health, less nutritious foods, higher rates of hyperactivity, and delayed vocabulary development.[1085]

As David Ross and Paul Roberts of the Canadian Council on Social Development report, although children's opportunities depend on public services such as education, health, supports for housing, neighbourhoods, and communities, "low income is a common factor that influences outcomes, whatever the pathway."[1086] They also note that there is a growing body of evidence that shows "as family incomes fall, the risks of poor developmental outcomes in children's health, behaviour, learning and socialization rise."[1087]

In their report *Income and Child Well-being: A new perspective on the poverty debate,* Ross and Roberts use data from the 1994 National Longitudinal Survey of Children and Youth (NLSCY) and the National Population Health Survey (NPHS) to document the extent to which the gross income of a two-parent/two-child family affects child wellbeing. Wellbeing was measured by 27 variables such as child behaviour, learning, health status, engagement in cultural, recreational and social activities, and specific living conditions within the family and the community. The authors found that in 80% of the variables, the risk of poor child outcomes was "noticeably higher" for children whose families had incomes below $30,000 per year, and for 50% of the variables the risk was higher for children whose family income was below $40,000 per year.[1088] Their main findings include the following:

Family

- Children in low-income families were twice as likely to be living in poorly functioning families than were children in high-income families.
- Nearly 35% of children in low-income families lived in substandard housing, compared to 15% of children in high-income families.

[1084] Colman, Ronald. *The Cost of Chronic Disease in Nova Scotia*, GPI Atlantic, Dalhousie University, and Atlantic Region Population and Public Health Branch, Health Canada, 2002; accessed Nov 2007; available from http://gpiatlantic.org/pdf/health/chronic.pdf.
[1085] Health Canada. *Toward a Healthy Future: Second Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.phac-aspc.gc.ca/ph-sp/phdd/pdf/toward/toward_a_healthy_english.PDF.
[1086] Ross, David P., and Paul Roberts. *Income and Child Well-Being: A New Perspective on the Poverty Debate. Part II: Linking Poverty to Child Outcomes*, Canadian Council on Social Development, 1999; accessed March 2008; available from http://www.ccsd.ca/pubs/inckids/. p. 4.
[1087] Ibid., accessed.
[1088] If a population-weighted LICO were selected for a family of four (in effect, a national average), it would represent a family living in a large urban community of 100,000 to 499,000 people. This amount would equal $26,600.

Community

- More than one-quarter of children in low-income families lived in problem neighbourhoods, compared to one-tenth of children in high-income families.

Behaviour

- Nearly 40% of children living in low-income families demonstrated high levels of indirect aggression (such as starting fights with their peers or family members), compared to 29% of children in families with incomes of $30,000 or more.
- Approximately 20% of children in low-income families ranked in the top 15% in terms of hyperactivity and inattention, compared to about 12% of children in high-income families. The proportion of children with high hyperactivity scores dropped steadily as family incomes rose from under $20,000 to $40,000, leveled off for incomes between $40,000 and $60,000, and dropped again after incomes exceeding $60,000.

Health

- Based on parents' reports, about half of children in low-income families were reported to be in less than excellent health, compared to less than one-third of children in high-income families.
- Children in low-income families were more than twice as likely to have a problem with one or more basic ability (vision, hearing, speech or mobility) than children living in higher-income families.

Learning Outcomes

- More than 35% of children in low-income families exhibited delayed vocabulary development, compared to roughly 10% of children in higher-income families.
- The number of children receiving special education dropped sharply as family incomes increased from less than $20,000 to $40,000, at which point the rate leveled off. The likelihood of children from low-income families receiving special education was about twice that of children from middle- and high-income families.

Cultural and Recreational Participation

- Almost 75% of children in low-income families rarely participated in organized sports, compared to 25% of children in high-income families.[1089]

The literature on poverty and child outcomes is actually quite extensive, and more recent reviews and studies have come to similar conclusions as those of Ross and Roberts.[1090] In a 2007 report,

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[1089] Ross, and Roberts. *Income and Child Well-Being: A New Perspective on the Poverty Debate. Part II: Linking Poverty to Child Outcomes*, accessed.

[1090] See for example: Phipps, Shelley, and Lynn Lethbridge. *Income and the Outcomes of Children*, Statistics Canada, Catalogue no. 11F0019MIE, 2006; accessed March 2008; available from http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2006281.pdf. This study uses data from the 1994, 1996, and 1998 cycles of the National Longitudinal Survey of Children and Youth.; See also: Canadian Council on Learning (CCL). *The Social Consequences of Economic Inequality for Canadian Children. A Review of the Canadian Literature*, Prepared for First Call B.C. Child and Youth Advocacy Coalition, Research and Knowledge Mobilization Directorate, CCL, 2006; accessed March 2008; available from http://www.ccl-

Janet Currie and Wanchuan Linn use the most recent (2001–2005) waves of the U.S. National Health Interview Survey and conclude that, "low-income children are more likely than other children to have virtually every measured chronic or acute condition and are more likely to be limited by these conditions. Mental health conditions are particularly common and limiting."[1091]

Childhood problems also tend to accumulate over the life course with adults who were poor as children having poorer health, educational attainment, and employment prospects than adults who have not grown up in poverty.[1092] For example, Galobardes, Lynch, and Davey Smith report that the presence of socioeconomic risk factors in childhood or adolescence is associated with an increased risk of developing cardiovascular disease or chronic obstructive pulmonary disease in adulthood.[1093] In the report by Holzer et al. that we reviewed earlier in Section 2.1, the authors focused on measuring how childhood poverty in the U.S. affects adult outcomes later in life by using estimates of the statistical association between childhood poverty or low family income and outcomes as adults in areas such as earnings, crime, and health.[1094]

6.1.3 Cost of child poverty

The Brookings Institution Center on Urban & Metropolitan Policy gives a short summary of the costs associated with child poverty and the gains from reducing child poverty in the U.S., which it points out "has serious—and expensive—consequences for society as a whole."[1095] Briefly, the findings from various sources include the following:

- Children's Defence Fund – "Future annual losses to the economy stemming from the effects of just one year of child poverty for 14.6 million children [nationally] reach as high as $177 billion. Even if one ignores the costs associated with higher rates of future unemployment, poor worker health and inadequate academic skills, the cost of child poverty is still estimated at between $36 billion and $99 billion a year."[1096]

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cca.ca/NR/rdonlyres/EA17B0FD-B723-4253-ADBF-2746914B411E/0/FirstCall.pdf.

[1091] Currie, Janet, and Wanchuan Lin. "Chipping Away at Health: More on the Relationship between Income and Child Health," *Health Affairs*, 2007, vol. 26, no. 2: 331-344.

[1092] Galobardes, Bruna, John W. Lynch, and George Davey Smith. "Childhood Socioeconomic Circumstances and Cause-Specific Mortality in Adulthood: Systematic Review and Interpretation," *Epidemiologic Reviews*, 2004, vol. 26: 7-21.

[1093] Ibid.

[1094] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.

[1095] Brookings Institution Center on Urban & Metropolitan Policy. *The Value of Investing in Youth in the Washington Metropolitan Area*, Morino Institute, 2000; accessed March 2008; available from http://www.brookings.edu/~/media/Files/rc/reports/2000/01washington_brooking%20institution%20center%20on%20urban%20and%20metropolitan%20policy/morino.pdf. The following seven footnotes are cited in this publication.

[1096] Sherman, A. *Wasting America's Future. The Children's Defense Fund Report on the Costs of Child Poverty*, Boston: Beacon Press, 1994.

- Lynn Karoly, et al., RAND – Early interventions in the first three years of a child's life can produce significant savings to the government—as much as $24,000 in savings per $6,000 invested per child.[1097]

- Economist Steven Barnett – "The cost, including increased crime and welfare costs, of failing to provide at least two years of quality educational child care to low-income children is approximately $100,000 per child. That's a total [nationally] of about $400 billion for all poor children now under age five."[1098]

- After school programs – "Manchester, New Hampshire saved an estimated $72,692 over a period of three years because students participating in an after-school program avoided being retained in a grade and placed in special education."[1099]

- M.A. Cohen, Vanderbilt University – "For each high-risk youth prevented from adopting a life of crime, the country would save $1.7 million."[1100]

- Greenwood et al., RAND – "In addition to being more desirable and humane, early prevention of juvenile crime may be more cost-effective than current, post hoc "solutions" (like prison). Training for parents of young children who have shown aggressive behavior, incentives for high school students to graduate, and monitoring and supervising young delinquents were three such strategies shown to be more cost-effective than California's 'three-strikes' law."[1101]

- The National Institute of Justice – "Future lost productivity of severely abused children in the United States is $658 million to $1.3 billion annually, if their impairment limits their earnings by only five to ten percent."[1102]

Olena Hankivsky and D.A. Draker estimated the economic costs attributed to child sexual abuse in Canada as exceeding $3.6 billion annually. This includes both public and private costs for health, social services, justice, education, and employment.[1103] While the authors did not directly associate child sexual abuse to poverty, they noted that only the incidents that come to the attention of welfare agencies and the police are officially documented, and it is estimated that only 2% of cases of intra-familial and 6% of cases of extra-familial abuse are ever reported to the

[1097] Karoly, Lynn, Peter Greenwood, Susan S. Everingham, Jill Hoube, M. Rebecca Kilburn, C. Peter Rydell, Matthew Sanders, and James Chiesa. *Investing in Our Children: What We Know and Don't Know About the Costs and Benefits of Early Childhood Interventions*, RAND Monograph Reports, 1998.
[1098] Barnett, W.S. "Cost Benefit Analysis," in *Significant Benefits*, ed. Schweinhart, L.J., H.V. Barnes and D.P Weikart, 161-162, The High/Scope Press, 1993.
[1099] Gregory, Paula J. *Youth Opportunities Unlimited: Improving Outcomes for Youth through after School Care*, Manchester, N.H.: University of New Hampshire, 1996.
[1100] Cohen, M.A. *The Monetary Value of Saving a High Risk Youth*, Vanderbilt University, unpublished, 1997.
[1101] Greenwood, Peter, Karyn E. Model, C. Peter Rydell, and James Chiesa. *Diverting Children from a Life of Crime: Measuring Costs and Benefits*, RAND Monograph Report, 1998.
[1102] Wisdom, C.S. *The Cycle of Justice*, National Institute of Justice, Research In Brief, 1992.
[1103] Hankivsky, Olena, and D.A. Draker. "The Economic Costs of Child Sexual Abuse in Canada: A Preliminary Analysis," *Journal of Health and Social Policy*, 2003, vol. 17, no. 2: 1-33.

police.

Gordon Cleveland and Michael Krashinsky of the University of Toronto examined the economic arguments for investing in the care of young children.[1104] Although their estimates were not specifically for children living in poverty, they calculated that the cost of provide good childcare to all two-to-five year olds in Canada would be $5.2 billion per year, or less than one percent of the GDP. They conclude that for every dollar spent on these programs, approximately two dollars worth of benefits are generated.

U.K. researcher, Donald Hirsh has estimated the "costs of not ending child poverty," or the savings that would be possible if child poverty was eliminated.[1105] The costs include the following (from 2006 report, in British pounds):

- Social services for children – £3 billion
- Preventing homelessness for families with children – £500 million
- Special education for children with social, emotional, and behavioural difficulties – £3.6 billion
- Free school dinners – £300 million
- Primary healthcare for deprived children – £500 million
- Lost taxes and extra benefits from adults with poor job prospects linked to educational failure in childhood – £10 billion[1106]

In another recent British report, the TUC (Trade Union Congress) notes that ending child poverty "offers huge potential economic gains…. Failing to lift a child out of poverty now increases the likelihood that, later on, we will have to pay the costs of their children's poverty."[1107] It finds evidence that a child who has grown up in poverty is 12% more likely than a child who has not grown up in poverty to be poor as an adult. The TUC extrapolated data from the Holzer et al. report, which was reviewed earlier in this report, to quantify three factors for the U.K.: reduced productivity and economic output–£13 billion a year, increased crime–£13 billion, and the costs of poor health–£12 billion. In total it estimates that child poverty costs the U.K. nearly £40 billion per year, or £640 per person, or an average of £2,500 a year per family. They also note that the consensus in the U.K. is that reducing poverty by half would cost £4 billion, which means that the benefits are ten times the costs in 2007.

[1104] Cleveland, Gordon, and Michael Krashinsky. *The Benefits and Costs of Good Child Care: The Economic Rationale for Public Investment in Young Children - a Policy Study*, University of Toronto, 1998; accessed March 2008; available from http://www.childcarecanada.org/pubs/other/benefits/bc.pdf.

[1105] Hirsch, Donald. *The Cost of Not Ending Child Poverty. How We Can Think About It, How It Might Be Measured, and Some Evidence* Joseph Rowntree Foundation, 2006; accessed March 2008; available from http://www.jrf.org.uk/bookshop/eBooks/9781859355060.pdf.

[1106] Ibid., accessed.

[1107] Trade Union Congress (TUC). *Cutting the Costs of Child Poverty*, TUC, 2007; accessed March 2008; available from http://www.tuc.org.uk/childpoverty/cuttingthecost.pdf.

6.2 Lone-parent mothers[1108]

Lone parents include never-married, separated or divorced persons not currently living with a legal or common-law spouse, and who are living with a dependent child at home under the age of 18 years.[1109] In 2001, 81.4% of lone parents were female,[1110] and there were more than a million lone-parent mothers in Canada, which was 8.7% of all women.[1111] In addition, in that same year, lone-parent mothers headed 20% of all families with children. Lori Curtis and Michael Pennock, who recently reviewed the literature on lone-parent families, found widespread evidence that mothers heading lone-parent families are at a higher risk of living in poverty and suffering from a variety of health-related problems than those living in two-parent families.[1112]

Children living in lone-parent families are also at risk of living in poverty and of developing health and behavioural problems. In 2005, 33.4% of the 788,000 children under the age of 18 living in low-income families were living with a lone-parent mother, compared to 7.8% of low-income children who were living with two parents.[1113]

6.2.1 Profile of lone-parent mothers

In 2006, the Statistics Canada Target Groups Project (TGP) produced a statistical report on women in Canada that included the most recent data available at that time on lone-parent mothers taken from published Statistics Canada sources.[1114] Some of the highlights are presented below.

According to Statistics Canada's TGP, the proportion of women who are lone parents has doubled since 1981, partly as a result of increased divorce rates and the tendency for custody of

[1108] A note on the term "lone parent:" Ross et al. of the Canadian Council on Social Development report that the term "lone parent" is preferable to the term "single parent." They state, "The term *lone parent* is synonymous with the common usage of the term *single parent*, but in statistical surveys *single* is sometimes used to denote *never married*…. Lone parents include never-married, separated or divorced persons not currently living with a legal or common-law spouse. Additionally, unless noted otherwise, lone parents include only those with a dependent child at home under the age of 18 years. Thus, this definition excludes persons who may otherwise be single parents but whose children are older or have moved away from the home." Ross, D.P., E.R. Shillington, and C. Lochhead. *The Canadian Fact Book on Poverty 1994*, Canadian Council on Social Development (CCSD), 1994; accessed http://www.cfc-efc.ca/docs/ccsd/00000328.htm. Chapter 5.
[1109] Ibid., accessed.
[1110] Galarneau, Diane. "Education and Income of Lone Parents," *Perspectives on Labour and Income*, Statistics Canada, Catalogue no. 75-001-XIE, 2005, vol. 6, no. 12. accessed March 2008; available from http://www.statcan.ca/english/freepub/75-001-XIE/11205/art-1.pdf.
[1111] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, Statistics Canada, Social and Aboriginal Statistics Division, Catalogue no. 89-503-XIE, 2006; accessed March 2008; available from http://www.statcan.ca/english/freepub/89-503-XIE/0010589-503-XIE.pdf.
[1112] Curtis, Lori J., and Michael Pennock. "Social Assistance, Lone Parents and Health. What Do We Know, Where Do We Go?," *Canadian Journal of Public Health*, 2006, vol. 97, no. Supplement 3: S4-S10.
[1113] Statistics Canada. *Persons in Low Income after Tax, by Prevalence in Percent (2001 to 2005)*, 2007; accessed January 2008; available from http://www40.statcan.ca/l01/cst01/famil19a.htm. Based on after tax income.
[1114] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed. The main sources are the Census of Canada, the Labour Force Survey, the Survey of Labour and Income Dynamics, the General Social Survey and the Canadian Community Health Survey.

children to be awarded to mothers, although the trend recently has been towards awarding joint custody. In 2001, almost half (48.6%) of all female lone parents were either separated or divorced, 20% were widowed, 2% were married but the spouse was absent, and 29% were never-married—up from 15% in 1986 and 24% in 1996.[1115]
In the 2001 Census, of all women, lone mothers in Canada represented 3.4% of 15 to 24 year olds, 11.3% of 25 to 44 year olds, 8.7% of 45 to 64 year olds, and 8.0% of those 65 years and over.[1116]

In terms of educational attainment, in 2001, 21.9% of lone mothers had not completed high school, but more than half (52.3%) of lone mothers had studied at the postsecondary level. For mothers in couple relationships, 16.6% had not completed high school, and 46.8% had studied at the postsecondary level. However, only 11.6% of lone mothers had a bachelor's degree or higher, compared with 19.4% of couple mothers.[1117]

6.2.2 Low income among lone-parent mothers

Galarneau of Statistics Canada reports that in 2001, 71.1% of lone mothers were employed (60.8% of these mostly full time), 7.9% were unemployed, and 21.0% were not in the labour force.[1118] In 2004, 68% of lone-mothers were employed, which was a reduction from the 2001 rate, but still higher than the early 1990s, when fewer than half were employed.[1119]

Employment earnings account for the largest share of the incomes of female-headed lone-parent families. In 2003, 63% of the income of female-headed lone-parent families came from employment, compared with 86% of incomes of male-headed lone-parent families, and over 90% of incomes of two-parent families with children.[1120]

However, according to Statistics Canada's TGP, families headed by lone-parent mothers have the lowest incomes of all family types. In 2003, families headed by lone-mothers under the age of 65 had an average income of $32,500, which was 68% less than the average income of lone-parent families headed by men ($54,700). Although the average income of female lone-parents in 2003 was 18% higher than in 1997, it was 7% less than the 2001 average of just under $35,000.[1121]

Curtis and Pennock note that in the mid-1990s, 26% of employed lone parents and 73% of unemployed lone parents lived in poverty.[1122] In 2003, 38% of all families headed by lone-parent mothers, whether employed or not, had incomes that were below the after-tax LICOs, compared

[1115] Ibid., accessed.
[1116] Ibid., accessed.
[1117] Galarneau. "Education and Income of Lone Parents."
[1118] Ibid.
[1119] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed.
[1120] Ibid., accessed.
[1121] Ibid., accessed.
[1122] Curtis, and Pennock. "Social Assistance, Lone Parents and Health. What Do We Know, Where Do We Go?."

with 13% of lone-parent fathers, and 7% of non-elderly two parent families with children. In 2005, the low-income rate for female lone-parent families decreased to 29.1%. However, the incidence of low income for female lone-parent families in 2005 remained at more than four times the rate of low income for non-elderly two-parent families with children. Colman suggests that gains in income rates for lone mothers have come almost entirely by their increased employment rates, and that low-income rates for lone mothers have fallen sharply only for those with jobs.[1123]

Government transfer payments also contribute a relatively large share of the income of female-headed lone-parent families. In 2003, 27% of the income of these families came from transfer payments, compared with 11% of the income of male-headed lone-parent families and 6% of the income for two-parent families with children.

In 2004, approximately 16% of lone-parent families received social assistance payments, which have been decreasing in value since the mid-1990s. Between 1996 and 1999, welfare incomes for lone parents decreased by as much as 39%, which could be another cause of the increased entrance of lone mothers into the work force.[1124] The National Council on Welfare reports that, with three exceptions, lone parents had lower annual welfare incomes in 2005 than they had in 1997—the year before the National Child Benefit Supplement was introduced. The exceptions were in New Brunswick, which had an annual minimal increase of $12, Quebec, which had an increase of $405, and the Northwest Territories, which had an increase of $534.

In 2005, social assistance payments for lone-parent families ranged from 48% of the poverty line in Alberta to 73% of the poverty line in Newfoundland and Labrador, but most of the payments in the other provinces were between 50% and 60% of the poverty line.[1125] Colman argues that it was likely that cuts in federal budget transfers to the provinces in the 1990s and the consequent reductions in social assistance payments that actually forced more lone mothers into the market economy, thereby reducing their parenting time and producing higher rates of time stress, which has implications for the health of both the mothers and their children.[1126]

As previously discussed, the poverty gap—the gap between the poverty line or LICO and the average income for the family—represents the depth of poverty. In 2005, the poverty gap for unemployed, lone mothers was $7,400 and for employed lone mothers the gap was $6,200.[1127] This means that it would take an additional $7,400 and $6,200 respectively for the lone parent to reach the poverty line.

[1123] Colman, Ronald. *A Profile of Women's Health Indicators in Canada*, GPI*Atlantic,* Prepared for the Women's Health Bureau, Health Canada, 2003; accessed March 2008; available from http://www.gpiatlantic.org/pdf/health/womens/whbreport.pdf.
[1124] Curtis, and Pennock. "Social Assistance, Lone Parents and Health. What Do We Know, Where Do We Go?."
[1125] National Council on Welfare (NCW). *Welfare Incomes 2005*, 2006; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/WelfareIncomes/2005Report_Summer2006/ReportENG.pdf.
[1126] Colman. *A Profile of Women's Health Indicators in Canada*, accessed.
[1127] Statistics Canada. *Income in Canada 2005*, Catalogue no. 75-202-XIE 2007; accessed March 2008; available from http://www.statcan.ca/english/freepub/75-202-XIE/75-202-XIE2005000.pdf.

6.2.3 Health of lone-parent mothers

As noted, lone mothers are more likely than any other family type to be living in poverty. Marie Beaudet and Claudio Perez report that in the 1996/1997 National Population Health Survey (NPHS), lower self-perceived health was associated with receiving social assistance, and that inadequate income added high distress levels.[1128] They found that being a lone mother, per se, was not a significant predictor of health status. However, when accompanied by inadequate income, the association with poor self-perceived health was positive.

The impacts that poverty has on health in general, and on the health of women in particular are well known. For example, the Canadian Research Institute for the Advancement of Women, lists the following health outcomes as being common impacts of poverty on women in particular: acute and chronic ill health, susceptibility to infectious and other disease, increased risk of heart disease, arthritis, stomach ulcers, migraines, clinical depression, stress, breakdown, vulnerability to mental illness and self-destructive coping behaviours.[1129] Given the multiple challenges and stressors that lone mothers face, it is likely that the poverty of lone mothers and their children contributes a considerable amount to both the social and health costs of poverty.

In their review of the literature on lone-mother families in Canada, Enza Gucciardi et al. of the University of Toronto found that, in the 1996/1997 NPHS, lone mothers reported worse self-perceived health than partnered mothers.[1130] In their multiple roles as nurturers, caregivers, and providers, lone mothers were more likely to report role overload, increased stress, and higher rates of depression and anxiety than partnered mothers. Lone mothers also requested professional help for mental health problems and used mental health services more often than partnered mothers did.

Statistics Canada's TGP also reports that, in the Canadian Community Health Survey on Mental Health and Wellbeing conducted in 2002, lone mothers were likely to be "especially vulnerable to life stresses."[1131] According to Ron Colman:

> Time use surveys indicate that single mothers have much less time to spend with their children than both their non-employed counterparts and working mothers in two-parent families. That is because they carry the sole burden of unpaid household work in addition to their paid work responsibilities. When they come home from their paid jobs, employed single mothers have to shop, cook, and clean without assistance. Not surprisingly, Statistics Canada's time stress surveys show working single mothers to be the most highly time-stressed demographic group.[1132]

[1128] Beaudet, Marie P., and Claudio Perez. "The Health of Lone Mothers," *Health Reports*, 1999, vol. 11, no. 2: 1-29.

[1129] Morris, Marika. *Women and Poverty: A Fact Sheet*, Canadian Research Institute for the Advancement of Women, 2002; accessed March 2008; available from http://www.criaw-icref.ca/factSheets/Women%20and%20Poverty/Poverty%20Fact%20sheet_e.htm#_edn53.

[1130] Gucciardi, Enza, Nalan Celasun, and Donna E. Stewart. "Single-Mother Families in Canada," *Canadian Journal of Public Health*, 2004, vol. 95, no. 1: 70-73.

[1131] Statistics Canada Target Groups Project. *Women in Canada: A Gender-Based Statistical Report. Fifth Edition*, accessed.

[1132] Colman. *A Profile of Women's Health Indicators in Canada*, accessed. p. 20.

Colman cites Robin Douthitt who defines “time poverty” as the time below the minimum necessary for basic household production, including cooking, cleaning, laundry, and shopping.[1133] Douthitt finds that, when both time and income are considered, poverty rates of working single mothers in Canada are 70% higher than official estimates. Colman notes, “According to Statistics Canada’s time use surveys, full-time working single mothers put in an average 75-hour work week when paid and unpaid work are both counted. In sum, single mothers make a significant trade-off when they take a job.”[1134]

6.3 Aboriginal Peoples

The Aboriginal population of Canada merits special attention with regards to the costs of poverty. This sub-section of the Canadian population displays very different demographics than the rest of Canada’s populace, and there are many issues that are of greater concern among Aboriginal peoples. For instance, arthritis and rheumatism are more common among Aboriginal peoples (25.3%) than non-Aboriginal people (19.1%), and Aboriginal peoples are more than twice as likely than non-Aboriginal people to be obese (31% and 15%, respectively).[1135] These are just two examples of many health concerns that the First Nations Regional Longitudinal Health Survey (RHS) uncovered. This section briefly explores the demographics of Aboriginal Canadians and the concerns facing them in regards to the health costs of poverty.

6.3.1 Demographics

In the 2006 Census, 1,172,790 Canadians—or 3.8% of the population—identified themselves as part of one or more Aboriginal groups, including First Nations, Métis, and Inuit. As Table 42 below shows, 59.5% of this population is made up of First Nations peoples, 33.2% are Métis, 4.3% are Inuit, and 3% are multiple or other.[1136] The RHS recorded that 57.5% of First Nations peoples live on reserves.[1137] While this is not a percentage of the total Aboriginal population, First Nations peoples make up the majority of the total population, so it is reasonable to assume that more than half of all Aboriginal peoples in Canada live on reserves.

[1133] Douthitt, Robin. "The Inclusion of Time Availability in Canadian Poverty Measures," in *ISTAT, Time Use Methodology: Towards Consensus*. Roma, Italy: Istituto Nazionale di Statistica, 1993. Cited in Colman. *A Profile of Women's Health Indicators in Canada*, accessed.

[1134] Colman. *A Profile of Women's Health Indicators in Canada*, accessed. p. 20.

[1135] Assembly of First Nations / First Nations Information Governance Committee. *First Nations Regional Longitudinal Health Survey (RHS) 2002/03:Results for Adults, Youth and Children Living in First Nations Communities*, 2007; accessed March 2008; available from http://rhs-ers.ca/english/pdf/rhs2002-03reports/rhs2002-03-technicalreport-afn.pdf.

[1136] Statistics Canada. *Aboriginal Peoples in Canada in 2006: Inuit, Metis and First Nations, 2006 Census*, 2006; accessed March 2008; available from http://www12.statcan.ca/english/census06/analysis/aboriginal/tables/table1.htm.

[1137] Assembly of First Nations / First Nations Information Governance Committee. *First Nations Regional Longitudinal Health Survey (RHS) 2002/03:Results for Adults, Youth and Children Living in First Nations Communities*, accessed.

Table 43. Number and percentage of self-identifying Aboriginal individuals across Canada, 2006

Aboriginal identity	Number	Percentage of total Canadian population	Percentage increase from 1996 to 2006
Total population	31,241,030	100	9
Non-Aboriginal population	30,068,240	0.962	8
Total Aboriginal population	1,172,790	0.038	45
First Nations	698,025	0.022	29
Métis	389,785	0.012	91
Inuit	50,485	0.002	26
Multiple / other*	34,500	0.001	34

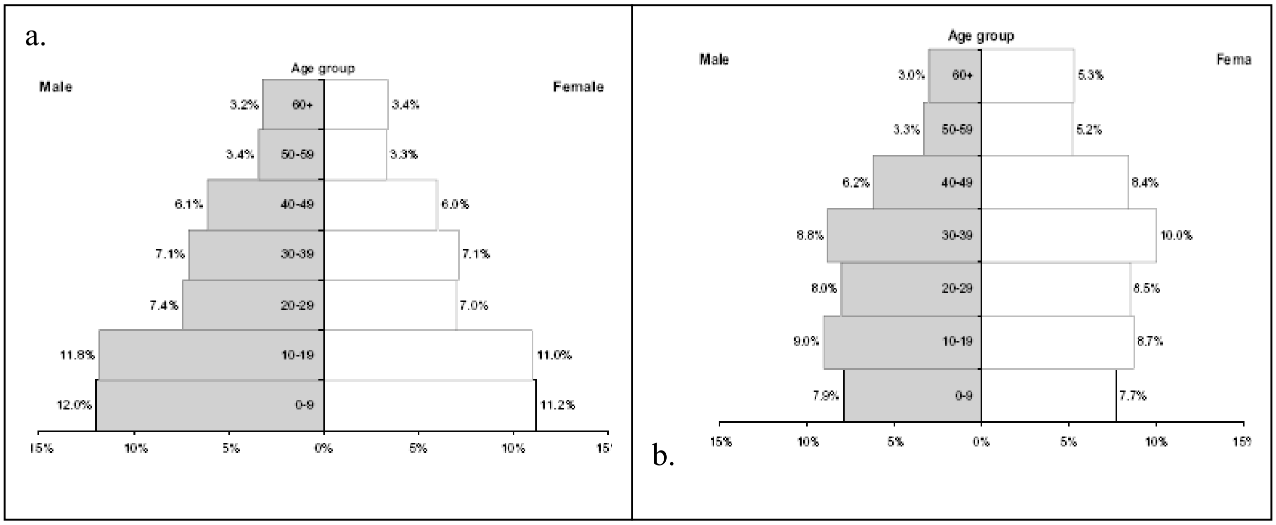
Source: Statistics Canada. Aboriginal Peoples in Canada in 2006: Inuit, Métis and First Nations, 2006 Census, 2006; accessed March 2008; available from http://www12.statcan.ca/english/census06/analysis/aboriginal/tables/table1.htm.

Notes: * Includes persons who reported more than one Aboriginal identity group and those being a Registered Indian and / or Band member without reporting an Aboriginal identity. Data have been adjusted to account for incompletely enumerated reserves in 1996 and 2006.

While Aboriginal peoples accounted for 3.8% of the Canadian population in 2001, 5.6% of all children under the age of 15 were of Aboriginal descent. Figures 22 and 23 below demonstrate that the Aboriginal population is growing faster than the non-Aboriginal population.[1138] This is particularly true for Aboriginal peoples living on reserves, where 12% of the population is younger than 9 years of age, as compared with 8% of the Aboriginal off-reserve population and 6% of the non-Aboriginal population. In fact, Statistics Canada predicts that by 2017, Aboriginal children will account for 7.4% of all children in Canada—up from 5.6% in 2001.[1139]

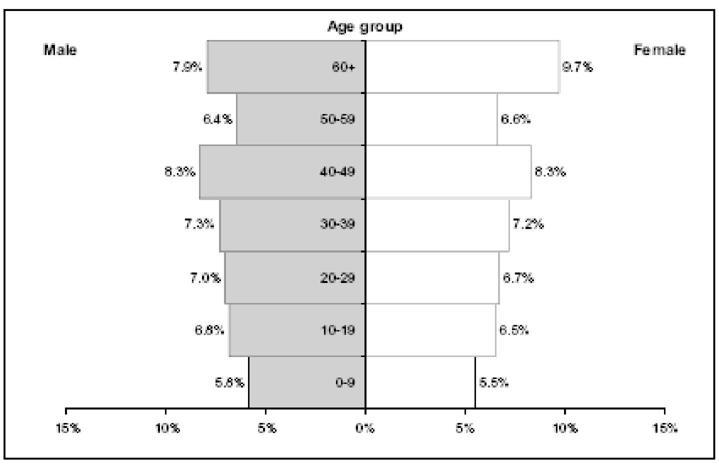
[1138] National Council of Welfare. *First Nations, Metis and Inuit Children and Youth: Time to Act*, 2007; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/FirstNationsMetisInuitChildrenAndYouth/2007Report-TimeToAct/ReportENG.pdf.
[1139] Ibid., accessed.

Figure 22. Age pyramids of a) the on-reserve Aboriginal Canadian population and b) the off-reserve Aboriginal Canadian population, 2001



Source: Source: Assembly of First Nations / First Nations Information Governance Committee. First Nations Regional Longitudinal Health Survey (RHS) 2002/03: Results for Adults, Youth and Children Living in First Nations Communities, 2007; accessed March 2008; available from http://rhs-ers.ca/english/pdf/rhs2002-03reports/rhs2002-03-technicalreport-afn.pdf. (b) based on data from INAC.

Figure 23. Age pyramid of the non-Aboriginal Canadian population, 2001



Source: Assembly of First Nations / First Nations Information Governance Committee. First Nations Regional Longitudinal Health Survey (RHS) 2002/03: Results for Adults, Youth and Children Living in First Nations Communities, 2007; accessed March 2008; available from http://rhs-ers.ca/english/pdf/rhs2002-03reports/rhs2002-03-technicalreport-afn.pdf. Based on data from Statistics Canada.

6.3.2 Aboriginal people living below the Statistics Canada Low Income Cut-Offs (LICOs)

There is not only a greater proportion of Aboriginal than non-Aboriginal children in Canada, but these children, as with the overall Aboriginal population, are more likely to live in poverty than non-Aboriginal Canadians. As Table 44 below shows, in 2000, 41% of off-reserve Aboriginal children aged 0–14 years were living below Statistics Canada's Low Income Cut-Off (LICO), whereas only 18% of non-Aboriginal children were living below the LICO—a difference of 23 percentage points.[1140]

A similarly large gap is seen across all demographic categories. In 2000, 31% of off-reserve Aboriginal peoples living in families were subsisting below the LICO, whereas only 12% of non-Aboriginal people living in families were doing so. As well, 56% of unattached Aboriginal individuals had a household income below the LICO, whereas only 38% of non-Aboriginal unattached individuals had incomes below the LICO. Unfortunately, there are currently no data available on on-reserve Aboriginal peoples living below the LICO.

Table 44. Percentage of off-reserve Aboriginal peoples and other Canadians living below Statistics Canada's Low Income Cut-Off (LICO), 2000

Demographic	Aboriginal people below LICO (%)	Non-Aboriginal people below LICO (%)
Persons living in families	31	12
Unattached individuals	56	38
Children aged 0-14	41	18
Youth aged 15-24 living in families	32	14
Youth aged 15-24 living independently	75	65

Source: National Council of Welfare. First Nations, Métis and Inuit Children and Youth: Time to Act, HS54-1/2007E-PDF 2007; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/FirstNationsMetisInuitChildrenAndYouth/2007Report-TimeToAct/ReportENG.pdf.

Note: A family includes all members of the same dwelling that are related by blood, marriage, adoption, or common-law relationship.

6.3.3 Data limitations

Many studies of Aboriginal health do not include data on income. Additionally, studies of poverty and health often do not include people living in the territories or on reserves. This means that more than half of the Aboriginal population is not represented in these studies. Given these two large data gaps, the ability to ascertain the social and health costs associated with poverty to the extent that it affects the entire Aboriginal population in Canada is extremely limited,

[1140] Ibid., accessed.

although some information is available from the First Nations Regional Longitudinal Health Survey (RHS).

6.3.4 Health status of Aboriginal people

Not only are Aboriginal peoples more likely to live below the LICO, but measures of health across all income groups, including measures of chronic diseases, injuries, and self-reported health, are almost always lower as well.[1141] For example, while only 16% of non-Aboriginal Canadians had arthritis in 2001, 26% of off-reserve Aboriginal peoples had this chronic disease.[1142] As well, while 4% of the non-Aboriginal population had diabetes, 9% of off-reserve Aboriginal peoples had diabetes.[1143] Due to both the higher rates of illness and the lower household incomes in the Aboriginal population, it is likely that poverty plays an important role in the health status of this group.

Using data from the RHS, the Assembly of First Nations compared disabled and non-disabled Aboriginal peoples with disabled and non-disabled non-Aboriginal peoples by income quintiles. Table 45 below demonstrates that, regardless of whether or not individuals are disabled, non-Aboriginal people are more likely to be in the top two income levels than are Aboriginal peoples living on reserves.[1144] In 2002, among Aboriginal peoples living on reserves, 22.0% of non-disabled and 15.1% of disabled people made more than $30,000 in household income, whereas 52.7% of non-disabled non-Aboriginal people and 40.0% of disabled non-Aboriginal people made more than $30,000 in household income.

Additionally, of those Canadians who are disabled, on-reserve Aboriginal peoples were more likely to live in low income than were non-Aboriginal people. For example, while 58.6% of disabled on-reserve Aboriginal peoples' household income was less than $15,000 in 2002 (including those who did not earn income), only 33.9% of disabled non-Aboriginal Canadians lived in households with this little income. In other words, on-reserve Aboriginal peoples with disabilities were 1.7 times more likely to be in the bottom two income quintiles than were disabled non-Aboriginal people.[1145] In contrast, only 2.7% of disabled on-reserve Aboriginal peoples' household income was greater than $50,000, whereas 18.1% of disabled non-Aboriginal peoples' household income was in this range.

[1141] Canadian Institute for Health Information. *Improving the Health of Canadians*, 2004; accessed March 2008; available from http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=PG_39_E&cw_topic=39&cw_rel=AR_322_E.
[1142] Tjepkema, Michael. *"The Health of the Off-Reserve Aboriginal Population." Health Reports: How Healthy Are Canadians? 2002 Annual Report*, 82-003-SIE, 2002; accessed January 2008; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002001.pdf. Data for the Aboriginal and non-Aboriginal population are from the 2000/2001 Canadian Community Health Survey.
[1143] Ibid., accessed. The First Nations Regional Longitudinal Health Survey reports that there are no significant differences in diabetes rates among Aboriginal peoples by income.
[1144] Assembly of First Nations / First Nations Information Governance Committee. *First Nations Regional Longitudinal Health Survey (RHS) 2002/03:Results for Adults, Youth and Children Living in First Nations Communities*, accessed.
[1145] Ibid., accessed.

Table 45. Percentage and number of adults aged 18 or older who are disabled, by household income and on-reserve Aboriginal status, Canada, 2002–2003

Annual household income	Non-disabled Aboriginal peoples		Disabled Aboriginal peoples		Non-disabled non-Aboriginal peoples		Disabled non-Aboriginal peoples	
	Percentage	Number*	Percentage	Number*	Percentage	Number**	Percentage	Number**
No income‡	7.1	28,165	9.1	36,099	4.5	1,085,130	4.5	1,085,130
< $15,000	39.7	157,485	49.5	196,361	19.4	4,678,116	29.4	7,089,516
$15,000-29,999	31.1	123,370	26.2	103,932	23.4	5,642,676	26.0	6,269,640
$30,000-49,999	16.4	65,057	12.4	49,189	27.2	6,559,008	21.9	5,280,966
$50,000+	5.6	22,215	2.7 E	10,711	25.5	6,149,070	18.1	4,364,634

Notes: * based on an estimated population of 396,688; ** based on an estimated population of 24,114,000; ‡ includes income loss; E = high sampling variability, so data point should be used with caution. Aboriginal data are from RHS and include First Nations and Inuit populations but not Métis people. Non-Aboriginal data are from Canadian Community Health Survey (CCHS) 2003. Sample sizes are 10,962 and 19,587 adults, respectively. The RHS included First Nations communities across Canada, except Nunavut. The CCHS did not survey people in the northern territories, on military bases, in institutional collective dwellings or living on First Nations reserves.

Source: Assembly of First Nations / First Nations Information Governance Committee. First Nations Regional Longitudinal Health Survey (RHS) 2002/03: Results for Adults, Youth and Children Living in First Nations Communities, 2007; accessed March 2008; available from http://rhs-ers.ca/english/pdf/rhs2002-03reports/rhs2002-03-technicalreport-afn.pdf.

Aboriginal peoples living outside of reserves are much more likely than non-Aboriginal Canadians to report having fair or poor health, regardless of income.[1146] Additionally, for both sub-sections, individuals living in lower income households are more likely to report fair or poor health than individuals in higher income households.[1147] Table 46 below demonstrates that, in 2001, 33% of low-income off-reserve Aboriginal peoples reported fair or poor health, while only 25% of non-Aboriginal people with the same income level reported the same. Similarly, 13% of high-income off-reserve Aboriginal peoples versus only 8% of non-Aboriginal people reported fair or poor health.

[1146] Tjepkema. *"The Health of the Off-Reserve Aboriginal Population." Health Reports: How Healthy Are Canadians? 2002 Annual Report*, accessed.

[1147] Income thresholds are shown below left. While Statistics Canada's LICOs (below right) are calculated based on both household and community size, it is possible to compare the two income thresholds somewhat.

Household income group	People in household	Total household income
	1 or 2	< $15,000
Low	3 or 4	< $20,000
	5+	< $30,000
	1 or 2	$15,000-29,999
Middle	3 or 4	$20,000-39,999
	5+	$30,000-59,999
	1 or 2	$30,000+
High	3 or 4	$40,000+
	5+	$60,000+

2000 LICOs

Size of family unit	Rural areas	Urban areas: Population > 30,000	30,000 to 99,999	100,000 to 499,999	500,000 +
1 person	9,947	11,498	12,583	12,780	15,172
2 persons	12,138	14,030	15,353	15,594	18,513
3 persons	15,352	17,745	19,419	19,723	23,415
4 persons	19,120	22,101	24,186	24,565	29,163
5 persons	21,371	24,701	27,031	27,456	32,595
6 persons	23,622	27,301	29,877	30,346	36,027
7 or more persons	25,872	29,902	32,722	33,237	39,459

Table 46. Percentage and number of adults aged 15 or older reporting fair or poor health, by household income and off-reserve Aboriginal status, Canada, 2002

		Aboriginal		Non-Aboriginal	
		Percentage	**Number***	**Percentage**	**Number****
Income	**Low**	33	111,210	25	6,028,500
	Middle	26	87,620	16	3,858,240
	High	13	43,810	8	1,929,120

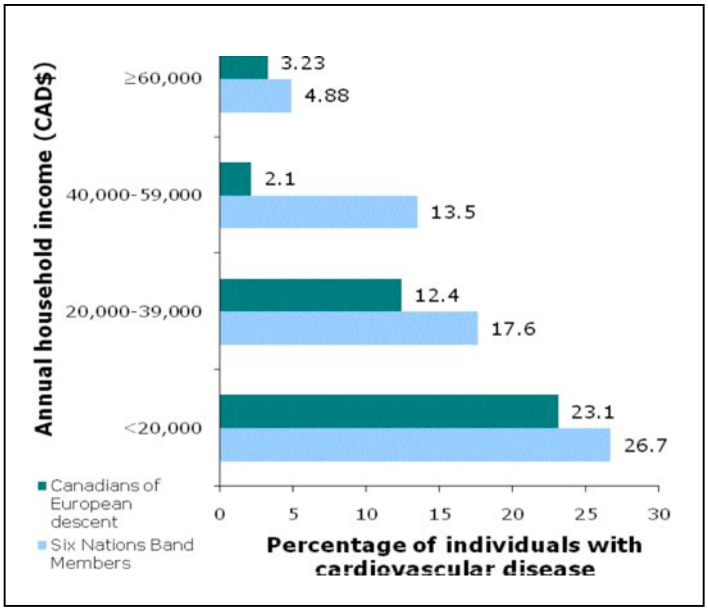
Source: Tjepkema, Michael. "The Health of the Off-Reserve Aboriginal Population." Health Reports: How Healthy Are Canadians? 2002 Annual Report, 82-003-SIE, 2002; accessed January 2008; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002001.pdf.

Notes: * based on an estimated population of 337,000; ** based on an estimated population of 24,114,000 adults aged 15 years or older. Data are from the 2000/2001 Canadian Community Health Survey. Sample sizes were 3,555 Aboriginal peoples and 120,439 non-Aboriginal peoples.

Cardiovascular disease (CVD) is also more common among First Nations peoples than among Canadians of European descent, regardless of income level.[1148] As Figure 24 below illustrates, in 2001, among those whose household income was less than $20,000, 26.7% with CVD were First Nations peoples compared to 23.1% with CVD who were of European descent. This pattern is consistent across all income levels. At the highest level, 4.88% of First Nations peoples whose household income was greater than $60,000 had CVD, whereas only 3.23% of those with European descent did.

[1148] Anand, Sonia S., Salim Yusuf, Ruby Jacobs, A. Darlene Davis, Qilong Yi, Hertzel Gerstein, Patricia A. Montague, and Eva Lonn. "Risk Factors, Atherosclerosis, and Cardiovascular Disease among Aboriginal People in Canada: The Study of Health Assessment and Risk Evaluation in Aboriginal Peoples (Share-Ap)," *Lancet*, 2001, vol. 358: 1147-1153.

Figure 24. Prevalence (%) of cardiovascular disease (CVD), by household income and First Nations status, Ontario and Alberta, 2001



Source: Anand, Sonia S., Salim Yusuf, Ruby Jacobs, et al. "Risk factors, atherosclerosis, and cardiovascular disease among Aboriginal people in Canada: the Study of Health Assessment and Risk Evaluation in Aboriginal Peoples (SHARE-AP)." Lancet, vol. 358, p. 1147-1153.

Note: Sample sizes were 301 First Nations people who were Six Nations Band Members, and 326 people of European descent from Hamilton, Toronto, and Edmonton.

7. Social issues: Indicators of social exclusion

Based on the literature reviewed in this report, the health costs of poverty are likely to be considerable. However, health is not the only area in which poverty produces excess costs. For example, poverty also contributes excess costs in the areas of employment, education, homelessness, food insecurity, crime, the environment, and social assistance. Presumably, a comprehensive report on the costs of poverty would also need to acknowledge costs related to these social issues. It should be noted that an extensive search of the literature pertaining to the relationship between poverty and specific social issues was beyond the scope of this report, which has concentrated on the health costs of poverty. Therefore the following section briefly reports salient information on social issues, but does not represent a comprehensive review of the literature in the broader field of social costs of poverty. More research is required before definitive assessments can be made concerning the portions of the relevant social outcomes that can be attributed to poverty.

7.1 Unemployment and underemployment

According to the literature, there is clearly a relationship between poverty and low-wage work or unemployment According to Linda Pannozzo and Ronald Colman:

> Poverty is not an independent variable, but has causes that can often be found in employment characteristics. Thus, non-standard work—characterized by poor pay, tenuous stability, frequent bouts of unemployment, and a polarization of work hours—contributes to both income inequality and poverty in our society.[1149]

Both scenarios described in the GPI report cited above—unemployment and underemployment— produce direct social costs including lost productivity, and government transfer payments for employment insurance, subsidized housing, and social assistance. Although transfer payments are not considered to be costs in economic models, they are often included in social models that estimate costs since these payments are considered relevant to policy makers.

In 1994, the Advisory Group on Working Time and the Distribution of Work, pointed to the high costs associated with unemployment:

> Society as a whole endures heavy social and economic losses from high rates of joblessness. The tax base of governments is eroded, and income security programs lose taxpayers' support as they become more expensive precisely because they are needed.

[1149] Pannozzo, Linda, and Ronald Colman. *Working Time and the Future of Work in Canada. A Nova Scotia GPI Case Study*, Genuine Progress Index (GPI) Atlantic, 2004; accessed March 2008; available from http://www.gpiatlantic.org/pdf/workhours/workhours.pdf. p. 282.

> Unemployment has been directly linked to ill health, crime, child abuse, family breakdown, and a host of other problems that are ultimately costly to our society.[1150]

Researchers are not consistent in their treatment of unemployment in the costing literature. For example, in the costs of poverty studies reviewed in Chapter 2 of this report, Shiell and Zhang do not include costs of unemployment at all because they view poverty as a result, rather than as a cause, of unemployment.[1151] At the other extreme, Oppenheim and Mac Gregor did use unemployment costs in their calculations, but they did not estimate a percentage of unemployed persons attributable to poverty—they simply assumed that all of the unemployed persons were in the low-income category (although they did admit that this certainly is not the case). The authors then attributed all of the wages lost by unemployed persons to be costs of poverty.[1152] To this they also added transfer payments paid to the unemployed. Holzer et al. did not use unemployment, per se, but instead estimated lost earnings of those in poverty.[1153] In the fourth cost of poverty study reviewed, Mackenbach et al. included a percentage of unemployment benefits paid and estimated the affect of ill health on the labour supply and productivity.[1154]

Official rates of unemployment underestimate real levels of unemployment and underemployment because they exclude a number of people such as: those who are out of work but have given up looking for work (called "discouraged workers"), those who are working part time because they cannot find full-time work (the "underemployed" or "involuntary part-time"), women who would like to work but do not have access to or cannot afford child care, those prematurely retired but who would rather work, or people in prisons. To partially address this problem of "hidden unemployment," in 1997 Statistics Canada began publishing a supplementary rate of joblessness, which includes some, but not all, of the "hidden unemployed."[1155] For example, the rates do not include those on social assistance who are employable but not able to find work. This has implications for the costs of poverty since those receiving social assistance, by definition, are living in poverty.

In order to estimate the costs of unemployment attributable to poverty it is first necessary to estimate the total costs of unemployment. In 2004, Pannozzo and Colman of GPI*Atlantic*

[1150] Advisory Group on Working Time and Distribution of Work. *Report of the Advisory Group on Working Time and the Distribution of Work*, Hull, Que. : Human Resources and Development Canada. HRDC Catalogue no. MP43-336/1994, 1994. Cited in Pannozzo, and Colman. *Working Time and the Future of Work in Canada. A Nova Scotia GPI Case Study*, accessed. p. 288.

[1151] Shiell, Alan, and Jenny Zhang. *The External Costs of Poverty: A Conservative Assessment*, Centre for Health and Policy Studies, University of Calgary, and Institute of Health Economics, 2004; accessed November 2007; available from http://tamarackcommunity.ca/downloads/vc/cal_costsofpoverty04.pdf.

[1152] Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Education: Public Benefits of High-Quality Preschool Education for Low-Income Children. Building Communities for Change*, Entergy Corp., 2002; accessed Nov 2007; available from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/61/e0.pdf.

[1153] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.

[1154] Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.

[1155] Statistics Canada. *Labour Force Historical Review 2001*, Statistics Canada, Catalogue no. 71F0004XCB, 2002.

produced a lengthy and in-depth report on work in Canada, with an emphasis on Nova Scotia, which estimated economic and social costs associated with unemployment, low wages, and production losses due to illness and disability, among other topics.[1156] They point out that many of these costs are mistakenly associated with progress and economic growth since they are counted as part of the Gross Domestic Product (GDP). For example, the more that is spent on health care and crime, which are highly correlated with unemployment, the more the economy grows. They note:

> [T]he Gross Domestic Product (GDP) and related market statistics make no distinction between economic activities that cause benefit and those that cause harm. By contrast, the Genuine Progress Index (GPI) recognizes that the unequal distribution of work hours, growing inequality, and unemployment carry economic costs that must be explicitly measured and made visible if policy makers are to have the full range of information they need to make decisions. Thus, spending on illness, crime, family breakdown, and other documented consequences of unemployment are counted as costs rather than gains to the economy [as they are in the GDP].[1157]

GPI*Atlantic*'s assessment of the economic costs of unemployment includes the following categories:[1158]

- Output loss costs—including short-term opportunity costs of unemployment, and
- Fiscal costs to government—
    - Employment Insurance
    - Social Assistance payments to the unemployed
    - Loss of direct tax revenue from the unemployed
    - Loss of indirect tax revenue from lack of spending on goods and services by the unemployed

Transfer payment between government and individuals are included because they are relevant to government policy. Pannozzo and Colman estimated that unemployment in Nova Scotia cost the provincial and national economy in 2001 a low of $4 billion in lost output costs and fiscal costs, when the official unemployment rate of 9.7% was used in the calculations, and a high of $6.2 billion when a more comprehensive unemployment rate of 14% was used.[1159]

[1156] Pannozzo, and Colman. *Working Time and the Future of Work in Canada. A Nova Scotia GPI Case Study*, accessed.
[1157] Ibid., accessed. p. 218.

[1158] Ibid., accessed. The methodology is based on that used in two studies: Bellemare, Diane, and Lise Poulin-Simon. *What Is the Real Cost of Unemployment in Canada*, Canadian Centre of Policy Alternatives, 1994, and Junankar, P.N. *Programme of Research and Actions on the Development of the Labour Market. Costs of Unemployment. Main Report*, Luxembourg: Commission of the European Communities, 1986.

[1159] Ibid., accessed. p. 300. In 1997 Statistics Canada began collecting and publishing "supplementary" rates of joblessness, which include at least a portion of the so-called "hidden" unemployed, and therefore present a more comprehensive and realistic picture of unemployment. Statistics Canada's underemployment estimates assess only the difference between full-time hours and the actual hours worked by involuntary part-time workers, calculated as full-time job equivalents. In 2001, this more comprehensive rate of unemployment in NS was 14%, considerably higher than the official rate of 9.7%. The costing range reported above— from $4 billion to $6.2 billion per year—used a hypothetical 3.5% unemployment base rate (or natural rate of unemployment), which means that 3.5% was

Pannozzo and Colman also estimated the social costs of unemployment, as far as available data permitted, for health, family breakdown, and crime. Relative risk factors that associate health with unemployment came mainly from an analysis by Marcel Bedard for Human Resources and Development Canada titled *The Economic and Social Costs of Unemployment.*[1160] For family breakdown costs the authors extrapolate divorce costs from U.S. data used by Redefining Progress to estimate the divorce costs attributable to unemployment.[1161] To calculate costs of crime associated with unemployment, the authors used information from the GPI*Atlantic* report, *The Cost of Crime in Nova Scotia*,[1162] and applied an estimate by B.M. Fleisher to Nova Scotia—that a 50% reduction in the unemployment rate in areas where 10% of the labour force is unemployed could reduce delinquency and property crime by 10%.[1163]

In Nova Scotia for 2001 the social costs associated with unemployment were ($2001):

- Health— $182 million using the official unemployment rate, and when the portion of "hidden" unemployment is included, the cost is $256 million.
- Family breakdown—divorce costs associated with unemployment – $10.1–$13.8 million.
- Crime—amount saved if the unemployment rate was reduced to less than 5% – between $60 million and $130 million per year.
- Total social costs of unemployment—$252–$400 million.

The next step in estimating the cost of poverty attributable to unemployment is to estimate the percentage of those living in poverty who are underemployed or unemployed and are able to work. More research is needed to establish a link between poverty and unemployment. Statistics Canada produces data on unemployment rates by educational attainment, and persons without a high school diploma are more often unemployed than those with higher educational attainment. In 2006, the unemployed rate was over 12% for those who did not graduate from high school, compared with about 6% who did graduate, and about 4% who had a university degree.[1164] However, in terms of loss of indirect tax revenue, Statistics Canada does produce data on expenditures by income quintile.

subtracted from the unemployment rate used in the calculation (either 9.7% or 14%). When a hypothetical 0% unemployment base rate was used (based on the goal of zero unemployment), the output loss and fiscal costs were higher and ranged from $5.8 billion to $8.1 billion per year.

1160 Bedard, Marcel. *The Economic and Social Costs of Unemployment*, Applied Research Branch. Human Resources Development Canada, 1996.

1161 Cobb, Clifford, Mark Glickman, and Craig Cheslog. *The Genuine Progress Indicator, 2000 Update. Redefining Progress Issue Brief*, 2001; accessed March 2008; available from http://www.rprogress.org/publications/2001/2000_gpi_update.pdf.

1162 Dodds, Colin, and Ronald Colman. *The Cost of Crime in Nova Scotia*, GPI Atlantic, 1999; accessed March 2008; available from http://www.gpiatlantic.org/pdf/crime/crime.pdf.

1163 Fleisher, B.M. "The Effect of Unemployment on Juvenile Delinquency," *Journal of Political Economy*, 71, 1963, no. 543-555.

1164 Sharpe, Andrew, Jean-Francois Arsenault, and Simon Lapointe. *The Potential Contribution of Aboriginal Canadians to Labour Force, Employment, Productivity and Output Growth in Canada, 2001-2017*, Centre for the Study of Living Standards (CSLS) Research Report No. 2007-04, 2007; accessed March 2008; available from http://www.csls.ca/reports/csls2007-04.pdf.

In terms of those who are unemployed and receiving social assistance, Pannozzo and Colman note that the Nova Scotia Department of Community Services stated in a personal communication that the department does not collect data on how many of those on social assistance are unemployed and that the numbers are always changing. The department representative reported that, "some of the individuals are employed and are receiving income support, others are unemployed and receiving employment counseling, while others are unemployable. She notes that … there is no way of determining accurate figures."[1165] Because of the difficulty of data collection and analysis, this situation is likely to be the case in other provinces as well.

In addition to the poverty costs of "hidden" underemployment noted above, there are additional costs of poverty that are associated with the working poor that would need to be calculated in a comprehensive cost of poverty report. The Canadian Policy Research Networks note that, in 2000, one in six full-time workers (about 1.7 million people) earned poverty-level wages, or less than $10 per hour.[1166] And about 30% of low-paid workers lived in households where the collective income was below the LICO. This is a very large topic involving a voluminous body of literature on the employment effects of the minimum wage. More research is needed to estimate the costs of poverty associated with the working poor.

7.2 Education

Education is one of the main variables used in the literature to indicate socioeconomic status, and in some studies, such as in the Mackenbach et al. study reviewed earlier, low educational attainment is used as a proxy for poverty. Poor educational attainment generally denotes people who did not complete high school. Statistics Canada reports that workers with higher education are more likely to have jobs with high wages and benefits, and workers with less than high school education are more likely to have jobs with low wages and benefits.[1167] David Mechanic of Rutgers University summarizes the benefits of educational attainment:

> Education could create opportunities through varied pathways including increased

[1165] Pannozzo, and Colman. *Working Time and the Future of Work in Canada. A Nova Scotia GPI Case Study*, accessed. p. 293. This study use the "Okun's Law Method" to calculate productivity losses due to unemployment. Okun's Law is based on a series of statistical tests between 1947 and 1960 and states that each percentage point above 4% in the unemployment rate is related to a 3% reduction in the real GDP. Stated as a potential gain, rather than loss, the Law indicates that a one percentage point reduction in the unemployment rate would increase the production and national/provincial income by 3%. It is calculated by CCPA, which made a few changes based on more recent evidence, as follows: Lost production = actual production x [2 (actual unemployment rate – 3.5)]/100. It should be noted that in measuring productivity losses, GPI*Atlantic* was not adhering to the notion that more production necessarily increases wellbeing. In calculating the output loss costs associated with unemployment, it noted that it was still necessary for a society to ask and examine what *kind* of productive activity is most conducive to wellbeing.

[1166] Saunders, Ron. *Making Work Pay*, Canadian Policy Research Networks, CPRN Policy Brief no. 2, 2006; accessed March 2008; available from http://www.cprn.org/documents/42558_en.pdf.

[1167] Marshall, Katherine. "Benefits of the Job," *Perspectives on Labour and Income*, Statistics Canada, Catalogue no. 75-001-XPE, 2003, vol. 15, no. 2.

> cognitive complexity and skill, greater knowledge, better coping capacities, and improved access to better and safer jobs and higher incomes. Education empowers individuals, builds self-esteem, and encourages civic engagement. It provides more personal control over work and many other aspects of one's life, as well as access to more advanced and usable knowledge. Education probably also influences deferral of gratification in constructive ways and encourages greater investment in one's own health and the health of other family members. Cultural factors, of course, have unique influences on health, but education often interacts powerfully with these influences.[1168]

Most studies of education use years of schooling as the main indicator of educational attainment. However, education involves lifelong learning and, according to Mechanic, "years of schooling is a crude proxy for the acquisition of skills, knowledge, and personal agency and lacks an indication of content or quality."[1169] He also offers the caveat that "we must be careful not to attribute influence to schooling that more reasonably results from the capacities, characteristics, culture, and values of families and individuals."[1170] However, given the lack of data, it is very difficult to disaggregate schooling and the various influences of lifelong learning on educational attainment.

In a recent report, Carlo Raffo et al. reviewed the research regarding the links between education and poverty.[1171] They found that studies examining the connections at the societal level find that the "supposed benefits" of education to society are often not seen in the case of individuals and groups from poorer backgrounds. These studies tend to focus on underlying social structures and see outcomes in health inequalities, high levels of unemployment, and poor housing and infrastructure. These factors are all linked to, and compound, poor educational attainment, especially among the poor.

The evidence for connections between education and health are vast and robust.[1172] Many authors, including Ross and Wu, have found that people with higher education have higher levels of self-reported health, and lower levels of morbidity, mortality, and disability.[1173] Woolf et al. recently estimated that 1.4 million deaths would have been averted in the United States between 1996 and 2002 if the mortality rate of those with lesser education had been the same as that of those with at least some university education.[1174] They also noted that this higher educational attainment would have averted eight times more deaths than the number of deaths averted by

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[1168] Mechanic, David. "Population Health: Challenges for Science and Society," *The Milbank Quarterly*, 2007, vol. 85, no. 3: 533-559. p. 550.
[1169] Ibid.
[1170] Ibid.
[1171] Raffo, Carlo, Alan Dyson, Helen Gunter, Dave Hall, Lisa Jones, and Afroditi Kalambouka. *Education and Poverty. A Critical Review of Theory, Policy and Practice*, York, U.K.: Joseph Rowntree Foundation, 2007; accessed Feb 2008; available from http://www.jrf.org.uk/bookshop/eBooks/2028-education-poverty-theory.pdf.
[1172] Low, David, Barbara J. Low, Elizabeth R. Baumier, and Phuong T. Huynh. "Can Education Policy Be Health Policy? Implications on Research on the Social Determinants of Health," *Journal of Health Politics, Policy, and Law*, 2005, vol. 30, no. 6: 1131-1162.
[1173] Ross, C.E., and C-L. Wu. "The Links between Education and Health," *American Sociological Review*, 1995, vol. 60: 719-745.
[1174] Woolf, S.H., R.E. Johnson, R.L. Phillips Jr., and M. Philipsen. "Giving Everyone the Health of the Educated: An Examination of Whether Social Change Would Save More Lives Than Medical Advances," *American Journal of Public Health*, 2007, vol. 97, no. 4: 679-683.

technological medical advances.

David Cutler and Adriana Lleras-Muney of Harvard and Princeton Universities, recently found the following associations between education and health:

> The magnitude of the relationship between education and health varies across conditions, but they are generally large. An additional four years of education lowers five year mortality by 1.8 percentage points (relative to a base of 11 percent); it also reduces the risk of heart disease by 2.16 percentage points
> (relative to a base of 31 percent), and the risk of diabetes by 1.3 percentage points (relative to a base of 7 percent). Four more years of schooling lowers the probability of reporting in fair or poor health by 6 percentage points (the mean is 12 percent), and reduce lost days of work to sickness by 2.3 each year
> (relative to 5.15 on average).[1175]

7.2.1 Costs of education

There have been many studies evaluating the costs and benefits of education. The majority of these studies have taken a human capital approach that considers the costs of education to be investment expenditures and additional earnings are considered to be the benefits of the investment.[1176] Most of these studies also focus on the costs and benefits to individuals rather than to society as a whole.

In 2000, Human Resources Development Canada (HRDC) reported that the total monetary rates of return for the public sector are smaller than for the private sector because of the large costs that are assumed by governments.[1177] Rates of return are the difference between expected costs and benefits, with benefits defined as additional lifetime earnings of individuals who complete high school. Private costs include income forgone while in school and expenditures such as tuition and books. Public costs include costs of the educational system, and benefits are additional earnings attributable to education that are shared with governments through taxation. According to HRDC, benefits also include non-market factors such as lower crime, economic growth, greater social cohesion, greater personal satisfaction, and higher health status. These non-market benefits are usually not included in costing studies and HRDC remarks that rates of return would be higher "if it were possible to include non-market benefits."[1178]

HRDC finds that the public rates of return for male and female high school graduates are 17% higher than the returns for those that dropped out of school at Grade 10. This compares with the private rates of return of 41% for men and 54% for women who complete high school in

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[1175] Cutler, David M., and Adriana Lleras-Muney. *Education and Health: Evaluating Theories and Evidence*, National Poverty Center Working Paper Series, #06-19, 2006; accessed Nov 2007; available from http://www.npc.umich.edu/publications/workingpaper06/paper19/working-paper06-19.pdf. p. 4.
[1176] Applied Research Branch. *Dropping out of High School: Definitions and Costs*, Strategic Policy, Human Resources Development Canada, MP32-29/01-1E, 2000; accessed November 2007; available from http://www.hrsdc.gc.ca/en/cs/sp/hrsd/prc/publications/research/2000-000063/r-01-01e.pdf.
[1177] Ibid., accessed.
[1178] Ibid., accessed. p. 51.

comparison with those who drop out at Grade 10. It notes that the OECD considers a rate of return of 10% and over on an investment is "socially profitable."[1179]

Statistics Canada reports that youth from the lowest-income households—those having incomes of $25,000 or less—had university participation rates that rose from 10% in the early 1980s to 19% by 1997.[1180] By contrast, rates for youth from the highest-income households—those with incomes of $100,000 or more—were 40%, but these rates have not changed substantially since 1980.

Examining the connections between education and health, Cutler and Lleras-Muney note, "Many estimates suggest that a year of education raises earnings by about 10 percent, or perhaps $80,000 in present value [$2006] over the course of a lifetime."[1181] They use data from the U.S. National Longitudinal Mortality Study (NLMS) to estimate the economic returns of one more year of schooling in terms of increased life expectancy:

> [One] more year of education increases life expectancy by 0.18 years if we use a 3 percent discounting rate; or by 0.6 years without any discounting (it is not clear that one would want to discount health improvements in the same manner one discounts income streams over time). Assuming that a year of health is worth $75,000—a relatively conservative value—this translates into about $13,500 to $44,000 in present value. These rough calculations suggest that the health returns to education increase the total returns to education by at least 15 percent, and perhaps as much as 55 percent.[1182]

According to Rootman and Irving, there has been some progress in estimating the economic cost of low literacy in Canada.[1183] Most of these studies, however, are concerned with problems in the workplace and labour market outcomes, rather than health care costs resulting from illiteracy or costs of interventions to improve literacy. In 1988, the Canadian Business Task Force on Literacy conducted one of the earliest studies and estimated the annual cost to business of lost productivity from low literacy to be $4.1 billion annually—$1.6 billion in lost time due to workplace accidents and $2.5 billion in lost productivity.[1184]

Writing for Statistics Canada in 2004, Serge Coulombe et al., report that a 1% increase in average literacy rates would yield a 1.5%, or $18 billion, permanent increase in the GDP and a 2.5% increase in productivity.[1185]

[1179] Ibid., accessed.
[1180] Corak, Miles, Garth Lipps, and John Zhao. "Family Income and Participation in Postsecondary Education 1980 - 2000." *The Daily*, Oct 3, 2003, accessed Nov 2007; available from http://www.statcan.ca/Daily/English/031003/d031003b.htm.
[1181] Cutler, and Lleras-Muney. *Education and Health: Evaluating Theories and Evidence*, accessed. p. 21.
[1182] Ibid., accessed. p. 21.
[1183] Rootman, Irving, and Barbara Ronson. "Literacy and Health Research in Canada. Where Have We Been and Where Should We Go?," *Canadian Journal of Public Health*, 2005, vol. 96, no. Supplement 2: S62-S76.
[1184] Ibid.
[1185] Coulombe, Serge, Jean-Franc_ois Tremblay, and Sylvie Marchand. *International Adult Literacy Survey. Literacy Scores, Human Capital and Growth across Fourteen OECD Countries*, Statistics Canada, Catalogue no. 89-552-MIE, and Human Resources and Skills Development Canada, 2004; accessed Feb 2008; available from http://www.nald.ca/fulltext/oecd/oecd.pdf. p. 31.

Robyn Hartley and Jackie Horne recently conducted a 2-volume study on the social and economic costs of poor adult literacy in order to further explore the possibilities for determining these costs for Australia.[1186] Noting that the subject has been under-researched, the authors concentrated on exploring the frameworks and methodologies available in the international literature and do not actually calculate the costs and benefits. They focused on methodologies for estimating economic and social costs and benefits in three main areas: health literacy, financial literacy, and literacy in small business, rather than the traditional approach of looking mainly at productivity, earnings, labour market participation or economic growth. They also briefly reviewed the associations between literacy and crime and social capital, but they found that these areas "are not widely reflected in the costs and benefits literature."[1187] Their report also does not review costs and benefits for education, per se, since the authors preferred direct measures of literacy. They considered measures such as early school leaving and educational qualifications to be proxy measures for literacy.

In Section 2.2.2 of this report we reviewed the 2004 cost of poverty study for Calgary by Shiell and Zhang, which estimated education costs.[1188] They included costs associated with high school drops outs, early childhood services, and additional costs associated with socioeconomic deprivation. To estimate the costs of high school drop outs they used a 1994 estimate by Ross, et al. that, of a total drop out rate of 6.7%, on average, 12.9% of students living in poverty drop out of school, compared with 5.1% of students not living in poverty who drop out.[1189] To estimate the costs, they used a 1992 report from the Conference Board of Canada, which estimated the per capita cost of each drop out to be $24,840 in 1989 dollars (or $37,560 in 2000 dollars).[1190]

Shiell and Zhang also included costs associated with socioeconomic deprivation by including the extra funds that Alberta school boards receive based, in part, on the number of families living below the LICO threshold. Since they could not disaggregate this amount from the total amount schools receive, they arbitrarily chose 10% of the extra money to include in the total costs.

In November 2007, the Centre for the Study of Living Standards released one of the most comprehensive reports assessing the potential benefits to Canadian society of increasing the education of those living in poverty.[1191] Written by Andrew Sharpe et al., , the report focuses on the potential contribution of Aboriginal Canadians, in particular, to the labour force and productivity in Canada. However, because over half of Aboriginal peoples are living in poverty, the report has implications for the wider population who are also economically and socially disadvantaged and have an educational level below the national average. Sharpe et al. note: "Investing in disadvantaged young people is one of the rare public policies with no equity–efficiency tradeoff."[1192]

[1186] Hartley, Robyn, and Jackie Horne. *Social and Economic Benefits of Improved Adult Literacy: Towards a Better Understanding*, Australian Council for Adult LIteracy, 2006; accessed Feb 2008; available from http://www.ncver.edu.au/research/proj/nr4L06.pdf.
[1187] Ibid., accessed. p. 21.
[1188] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed.
[1189] Ross, Shillington, and Lochhead. *The Canadian Fact Book on Poverty 1994*, accessed.
[1190] LeFleur, Brenda. *Dropping Out: The Cost to Canada*, Ottawa, ON: The Conference Board of Canada, 1992.
[1191] Sharpe, Arsenault, and Lapointe. *The Potential Contribution of Aboriginal Canadians to Labour Force, Employment, Productivity and Output Growth in Canada, 2001-2017*, accessed.
[1192] Ibid., accessed.

The report discusses the relationship between educational attainment and labour market outcomes such as unemployment, labour force participation, the relationship between education, income, and productivity, and the relationship between education and poverty, crime and health. Generally, the report finds the following:

> [I]n the best case scenario where by 2017 the educational attainment and the labour market outcomes at a given level of educational attainment of Aboriginal Canadians reach the same level non-Aboriginal Canadians had in 2001, the potential contribution of Aboriginal Canadians is up to an additional cumulative $160 billion (2001 dollars) over the 2001–2017 period. That represents an increase of $21.5 billion (2001 dollars) in 2017 alone. Moreover, the potential contribution of Aboriginal Canadians to the total growth of the labour force between 2001 and 2017 is projected to be up to 7.39 per cent of the total labour force growth, much higher than their projected 3.37 per cent share of the working age population in 2017. Finally, we find that the potential contribution of Aboriginal Canadians to the annual growth rate of labour productivity in Canada is up to 0.037 percentage point.[1193]

7.2.2 Early childhood education and special education services

Due to time and resource constraints, we are only able to briefly discuss a few examples of costs and savings in the area of early childhood education and special education services. According to James Heckman and Dmitriy Masterov, early childhood learning progams are considered to be one of the most effective ways to help disadvantaged children not only attain higher education outcomes but also to lower participation in social assistance programs, decrease participation in crime, and increase labour force productivity.[1194] In Canada, Margaret McCain and Fraser Mustard, the founder of the Council for Early Child Development and an internationally respected expert on early childhood education, make a similar case for early child programs based on evidence from neuroscience on early child development.[1195]

Since 2001, the Government of Canada has annually reported early childhood development and learning activities and expenditures. The 2007 report noted that under the September 2000 Federal/Provincial/Territorial Early Childhood Development (ECD) Agreement the federal government transfers $500 million per year to provinces and territories to support early childhood development programs and services.[1196]

[1193] Ibid., accessed. p. 4.

[1194] Heckman, James, and Dmitriy Masterov. *The Productivity Argument for Investing in Young Children*, National Bureau of Economic Research, NBER Working Paper No. 13016, 2007; accessed March 2008; available from http://jenni.uchicago.edu/human-inequality/papers/Heckman_final_all_wp_2007-03-22c_jsb.pdf.

[1195] McCain, Margaret Norrie, and J. Fraser Mustard. *Reversing the Real Brain Drain: Early Years Study*, Ontario Children's Secretariat and The Canadian Institute for Advanced Research, 1999; accessed Feb 2008; available from http://www.children.gov.on.ca/mcys/documents/publications/beststart-early-en.pdf.

[1196] Government of Canada. *Early Childhood Development and Expenditures and Early Learning and Child Care Activities, and Expenditures, 2004 - 2005 and 2005 - 2006*, Human Resources and Social Development Canada, the Public Health Agency of Canada, and Indian and Northern Affairs Canada, 2007; accessed March 2008; available from http://www.socialunion.ca/ecdelcc_ae/2007/en/a_e_report.pdf.

Using data from the National Longitudinal Survey of Children and Youth, Teresa To et al. found that young children between the ages of one and five years who were living in low-income households had an increased odds factor of 1.43 for poor developmental attainment.[1197] A recent Government of Canada study reported that in 2003, 12.7% of families with children under the age of six were living below the after-tax low-income cutoff (LICO), and 18.1% were living below the pre-tax LICO.[1198]

Shiell and Zhang, as noted earlier, used data from the 2000 *Canadian Fact Book on Poverty,* which estimated that low-income children are 1.8 times as likely to be enrolled in remedial or special education classes than are children with adequate income.[1199] They estimated that the per capita cost for low-income children requiring special support in Alberta was $2,155 a year.

According to Holzer et al., the U.S. Department of Education reported that primary and middle-school students are 4 percentage points, and high school students are 5 percentage points, more likely to be in special education programs if they live in poverty than students who are in the middle-income range.[1200] In the U.S., an additional $12,600 is spent on special education students, on average, per year.

Heckman and Masterov, who recently wrote a report titled *The Productivity Argument for Investing in Young Children,* found that the estimated rate of return for early intervention programs is 16%, of which 12% is the public return to society, and 4% is the private return to the participant.[1201] Oppenheim and MacGregor analyzed the benefits of providing quality preschool education to low-income three and four year olds in the U.S. and found the benefit:cost ratio to be 9.5 for the total benefit and 8.3 for the public benefit.[1202] They based costs on the cost of the Head Start program, which is for children from households living under the poverty line, and benefits on other published reports. Categories used to calculate the benefits included decreased costs of special education, crime, unemployment, and welfare payments (administration costs only), and increased benefits of grade retention, earnings, and income taxes.

[1197] To, Teresa, Astrid Guttmann, Paul T. Dick, Jay D. Rosenfield, Patricia C. Parkin, Marjan Tassoudji, Tatiana N. Vydykhan, Hongmei Cao, and Jennifer K. Harris. "Risk Markers for Poor Developmental Attainment in Young Children. Results from a Longitudinal National Survey," *Archives of Pediatrics and Adolescent Medicine*, 2004, vol. 158, no. 7: 643-649.

[1198] Government of Canada. *The Well-Being of Canada's Young Children, 2006*, Human Resources and Social Development Canada, the Public Health Agency of Canada and Indian and Northern Affairs Canada, 2007; accessed March 2008; available from http://www.socialunion.ca/well_being/2007/en/well_being.pdf.

[1199] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed. citing Ross, D. P., K. Scott, and P. Smith. *The Canadian Fact Book on Poverty 2000*, Ottawa, Canada: Canadian Council on Social Development (CCSD), 2000.

[1200] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed. citing United States Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. *25th Annual (2003) Report to Congress on the Implementation of the Individuals with Disabilities Education Act*, Volume 1, Washington, DC., 2005.

[1201] Heckman, and Masterov. *The Productivity Argument for Investing in Young Children*, accessed.

[1202] Oppenheim, and MacGregor. *The Economics of Education: Public Benefits of High-Quality Preschool Education for Low-Income Children. Building Communities for Change*, accessed.

Lynn Karoly et al. investigated the cost savings to governments of publicly-funded early childhood intervention/education programs in the U.S.[1203] The authors note that "while numerous early childhood intervention programs have been developed and tested, only a fraction of those have been evaluated in any fashion. Very few have been rigorously and thoroughly evaluated over long periods of time."[1204] The two programs analyzed both included control groups and followed disadvantaged children from birth to age 15 in the case of the Elmira Prenatal/Early Infancy Project (PEIP), and to age 27 in the case of the Perry Preschool.

Although the sample size of the evaluated programs was small and therefore not generalizable, the authors suggest that the results are representative of the types of savings possible. In the study all of the costs were accounted for. However, the benefits are likely underestimated since not all benefits are included. Karoly et al. include four types of significant savings to governments in their analysis, many of which are based on predicted lifetime expenses for the recipients:

1. **Increased tax revenues**—increased employment and earnings by program participants, including income tax at the federal and state levels, Social Security contributions by both the employer and employee, and state and local sales taxes.

2. **Decreased welfare outlays**—including Medicaid, Food Stamps, Aid to Families with Dependent Children (AFDC), and other social welfare programs, including reduced payments to recipients and reduced administrative expenses.

3. **Reduced expenditures for education, health, and other services**—including special education, emergency room visits, and stays in homeless shelters.

4. **Lower criminal justice system costs**—including arrest, adjudication, and incarceration expenses.[1205]

The programs led to the following benefits for program participants relative to the control group:

- Gains in emotional or cognitive development,
- Improvements in educational processes and outcomes,
- Increased economic self-sufficiency, initially for the parent and later for the child, through greater labour-force participation, higher income, and lower welfare usage,
- Reduced levels of criminal activity, and
- Improvements in health-related indicators such as child abuse, maternal reproductive health, and maternal substance abuse.[1206]

[1203] Karoly, Lynn A., Peter W. Greenwood, Susan S. Everingham, Jill Hoube, M. Rebecca Kilburn, C. Peter Rydell, Matthew Sanders, and James Chiesa. *Investing in Our Children What We Know and Don't Know About the Costs and Benefits of Early Childhood Interventions*, RAND Corporation, 1998.
[1204] Ibid. p. 76.
[1205] Ibid.
[1206] Ibid.

For example, in the PEIP children experienced 33% fewer emergency room visits to age four compared with the control group, and mothers were on welfare 33% less of the time. And in the Perry Preschool program, when the children reached the age of 27 their income was 60% higher than that of the control group.

The PEIP program cost the government $6,083 per child to run ($1996), provided a total savings of $24,694 per child, resulting in a net savings to government of $18,611 per child.

The Perry Preschool program cost $12,148 per child to run ($196). The program provided a total savings of $25,437 per child, resulting in a net savings of $13,289 per child. The costs were realized in the short-term and savings in the long-term. However, both programs paid for themselves through future reductions in government expenditures, and had the effect of reducing the poverty and vulnerability of the participants.

7.3 Housing and homelessness

7.3.1 Affordable housing

Adequate and affordable housing is one of the main determinants of health. People living in poverty most often live in the worst built environments and spend a higher portion of their income on shelter than those with higher incomes. According to Ernie Hood, writing in *Environmental Health Perspectives,* negative aspects of the built environment magnify health disparities:[1207]

> Substantial scientific evidence gained in the past decade has shown that various aspects of the built environment can have profound, directly measurable effects on both physical and mental health outcomes, particularly adding to the burden of illness among ethnic minority populations and low-income communities. Lack of sidewalks, bike paths, and recreational areas in some communities discourages physical activity and contributes to obesity; in those low-income areas that do have such amenities, the threat of crime keeps many people inside. Income segregation—the practice of housing the poor in discrete areas of a city—has also been linked with obesity and adverse mental health outcomes. Lack of a supermarket in a neighborhood limits residents' access to healthy foods. Dilapidated housing is associated with exposures to lead, asthma triggers (such as mold, moisture, dust mites, and rodents), and mental health stressors such as violence and social isolation.[1208]

According to Statistics Canada, those with low household income are at a greater risk for living in inadequate housing,.[1209] According the Canadian Institute for Health Information (CIHI), one

[1207] Hood, Ernie. "Dwelling Disparities. How Poor Housing Leads to Poor Health," *Environmental Health Perspectives*, 2005, vol. 113, no. 5: A310- A317.
[1208] Ibid. p. A312.
[1209] Luffman, Jacqueline. "Measuring Housing Affordability," *Perspectives on Labour and Income*, Statistics Canada, Catalogue no. 75-001-XIE, 2006, vol. 7, no. 11: 16-25. accessed Feb 2008; available from

of the risks for becoming homeless, is living in a household that spends more than 50% of its total income on housing costs.[1210] Housing, or shelter costs, include rent or mortgage payments, condominium fees, utilities (water, heat, and electricity), and property taxes. Statistics Canada reports that a household spending at least 30% of its pre-tax income for housing is said to have "affordability problems"—those paying 30% to 49% have a *moderate* affordability problem and those paying 50% or more of their income have a *severe* affordability problem.[1211]

Statistics Canada also reports that, according to the 2004 Survey of Household Spending and based on expenditures rather than only income, 14% (or 1.7 million) of households paid 30% or more of their income on housing—11.6% spent between 30% and 50%, and 2.4% spent 50% and over.[1212] Renters, who comprise one-third of households in Canada overall, spent more of their income on housing than owners did—31% of renters compared with 6% of owners spent more than 30%. However, in the lowest income quartile, 75% of renters compared with 25% of owners spent more than 30% of their income on housing. In the highest income quartile, neither renters nor owners had an affordability problem.

The odds ratio of spending 30% or more on shelter for renters with incomes up to $19,190 (lowest category, based on terciles) compared with households over $32,500 (highest category) was 18.42. This means that renters with low income had 18 times the odds of having moderate or severe affordability problems compared with those in the top half of the income distribution.

Renters with severe affordability problems tended to be those in the lowest income quarter (80.1%), those dependent on government transfers for their main source of income (80.8%), and individuals living alone—40% were non-seniors living alone and 33.4% were seniors living alone. Of renters with a moderate affordability problem, 53.7% were in the lowest income quarter, 54.6% were dependent on government transfers for their main source of income, 38% were non-seniors living alone, 22.5% were seniors living alone, and 7.9% were lone-parent families (not reported for severe affordability problems). These renters were all at risk of becoming homeless.

7.3.2 Homelessness

Frankish, Hwang, and Quantz reviewed the research on homelessness published between 1990 and 2005 with particular emphasis on the connection between homelessness and health in the Canadian context.[1213] They suggest that homelessness is the result of a complex interaction of factors at both individual and societal levels. Poverty, high housing costs, labour market conditions, decreased public benefits, and racism and discrimination are the main societal factors responsible for homelessness. At the individual level, low income, low educational attainment,

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http://www.statcan.ca/english/freepub/75-001-XIE/11106/art-2.pdf.

[1210] Canadian Institute for Health Information (CIHI). *Improving the Health of Canadians: Mental Health and Homelessness*, Ottawa: CIHI, 2007; accessed Feb 2008; available from http://secure.cihi.ca/cihiweb/products/mental_health_report_aug22_2007_e.pdf.

[1211] Luffman. "Measuring Housing Affordability."

[1212] Ibid.

[1213] Frankish, C. James, Stephen W. Hwang, and Darryl Quantz. "Homelessness and Health in Canada," *Canadian Journal of Public Health*, 2005, vol. 96, no. Supplement 2: S23-S29.

lack of job skills, mental illness and substance abuse have also been correlated with homelessness as well as with poverty in general. Poverty and substance abuse are also independent risk factors for ill health.

Frankish et al. note that homelessness is a problem in rural areas, but it has become a crisis in urban centres due to the lack of affordable housing, the loss of rental units, and a shortage of social housing.[1214] For some, homelessness is transitory, but for others, it is a chronic condition that is associated with high mortality and morbidity rates for many diseases including diabetes, respiratory and cardiovascular disease, and communicable diseases such as pneumonia, tuberculosis, HIV/AIDs, and Hepatitis C. Homeless people have higher rates of mental illness (such as depression and anxiety), suicide, injury, and assaults than the general population. While homelessness in the past was associated mainly with single men, today its population is heterogeneous. As well as single men and women, homelessness affects children and families and people of all races and ethnicities. Gordon Laird reports that one-third of the homeless population consists of youth between the ages of 16 and 24, and nearly one-in-seven emergency shelter users are children.[1215]

The prevalence of homelessness depends on the definition used. CIHI provides four definitions that depend on the level of homelessness:

- Being without physical shelter and sleeping outdoors or in emergency shelters—often referred to as "absolute homelessness,"
- Having shelter that does not meet basic standards of health and safety, including protection from the elements, access to sanitary facilities, personal safety and security of occupancy,
- Living in a household that spends more than 50% of its total income on housing costs—sometimes called "at risk of homelessness,"
- Temporarily staying with friends or family—also known as "couch surfers" or the "hidden homeless."[1216]

Most reports on the prevalence of homelessness discuss absolute homelessness, and especially the numbers of persons sleeping in shelters, and therefore likely underestimate the problem.

Frankish et al. report that data from the 2001 Census indicated that over 14,000 individuals were homeless in Canada, but that most advocates and researchers believe this number vastly underestimates the problem and new measurement strategies are needed.[1217] In 2005, the National Homeless Initiative, the federal secretariat that was most directly responsible for homelessness initiatives in Canada until it was closed in 2007, estimated that 150,000 Canadians were homeless.[1218] A 2007 report by Gordon Laird on homelessness in Canada notes that given

[1214] Ibid.
[1215] Laird, Gordon. *Shelter. Homelessness in a Growth Economy: Canada's 21st Century Paradox*, Sheldon Chumir Foundation for Ethics and Leadership, 2007; accessed Feb 2008; available from http://www.chumirethicsfoundation.ca/files/pdf/SHELTER.pdf.
[1216] Canadian Institute for Health Information (CIHI). *Improving the Health of Canadians: Mental Health and Homelessness*, accessed.
[1217] Frankish, Hwang, and Quantz. "Homelessness and Health in Canada."
[1218] Laird. *Shelter. Homelessness in a Growth Economy: Canada's 21st Century Paradox*, accessed.

the rapid growth in municipal counts, some non-governmental sources estimate that the total homeless population, where homelessness is given defined more broadly, is between 200,000 and 300,000 people.[1219]

Cities such as Vancouver, Toronto, Calgary, and Halifax have initiated local homelessness counts to capture more accurate numbers. According to the "Street Health Report 2007" for Toronto, poverty and lack of affordable housing are the main causes of homelessness.[1220] It reports that in Toronto alone approximately 32,000 different people slept in a homeless shelter in 2002, and almost 6,500 people stayed in a shelter on any given night in 2006, which is a sharp increase from 1992, when 1,900 people stayed in a shelter on any given night. Of the people interviewed for the report, 78% had been homeless for at least a year, but the average duration of homelessness was 4.7 years.

The CIHI report presents the first data on hospital use by homeless Canadians (not including Quebec).[1221] According to CIHI, 52% of acute care hospitalizations among the homeless and 35% of emergency department visits among the homeless were for mental disorders. Of the latter group, 54% was for psychoactive substance use.

Laird calculated the cost of homelessness, based on the government's estimated homeless population of 150,000 people, to be between \$4.5 and \$6 billion per year (\$2001), which included costs associated with health care, the criminal justice system, social services, and emergency shelters.[1222] He notes that in any given Canadian community, at least 0.5% of the population will be homeless, and that the "leading Canadian estimate of the average cost of each homeless individual" is between \$30,000 and \$40,000 per homeless person per year (including shelter costs).[1223] This range is based on a 2001 study in British Columbia titled *The Costs of Homelessness in British Columbia*.[1224]

The British Columbia study headed by Margaret Eberle et al. argues that homelessness costs the province more than providing the homeless with affordable housing would.[1225] In general, the report found that it cost \$24,000 per year to provide health care, criminal justice, and social services (excluding housing) to homeless individuals—which was \$6,000 or33% more than what it cost to provide a formerly homeless person with services, including housing. It estimates that providing supportive housing for the homeless could save between \$8,000 and \$12,000 per person per year.

[1219] Ibid., accessed.
[1220] Khandor, Erika, and Kare Mason. *The Street Health Report 2007*, Toronto: Street Health and the Wellesley Institute, 2007; accessed March 2008; available from http://www.streethealth.ca/Downloads/SHReport2007.pdf.
[1221] Canadian Institute for Health Information (CIHI). *Improving the Health of Canadians: Mental Health and Homelessness*, accessed.
[1222] Laird. *Shelter. Homelessness in a Growth Economy: Canada's 21st Century Paradox*, accessed.
[1223] Ibid., accessed. p. 87.
[1224] Eberle, Margaret, Deborah Kraus, Steve Pomeroy, and David Hulchanski. *Homelessness – Causes and Effects, Volume 3: The Costs of Homelessness in British Columbia*, British Columbia Ministry of Social Development and Economic Security and B.C. Housing Management Commission, 2001; accessed Feb 2008; available from http://www.housing.gov.bc.ca/housing/homeless/Vol3.pdf.
[1225] Ibid., accessed.

Laird notes that other organizations have found higher costs. For example, a 2005 report from the National Secretariat on Homelessness found that the average costs per person per year ($2005), based on existing facilities, across four cities—Toronto, Vancouver, Montreal, and Halifax—were:

- $66,000 to $120,000 for institutional responses (prison, detention, and psychiatric hospitals);
- $13,000 to $42,000 for emergency shelters (cross section of youth, men's facilities, women's facilities, family facilities, and shelters for victims of violence);
- $13,000 to $18,000 for supportive and transitional housing, and
- $5,000 to $8,000 for affordable housing without supports (singles and family).[1226]

In 2001, Dennis Culhane et al. reported that homeless individuals in New York City cost the government about US$41,000 a year for shelter, health, and social services, and those that were placed in housing cost the government US$22,000 per year for housing and treatment—saving US$19,000 per person per year.[1227]

In 2006, a research team at Dalhousie University, led by Frank Palermo calculated the cost of homelessness in the Halifax Regional Municipality, and the costs of providing supportive housing.[1228] They define supportive housing as "a form of affordable housing with support services attached to help a client perform daily living functions that may not otherwise be possible," and note that the "provision of supportive housing substantially reduces the burden on hospitals, psychiatric care, prisons and jails. … People in supportive housing on average spend only one third as much time in these facilities as the homeless population."[1229]

Palermo et al. also suggest that investing in supportive housing, using a "Housing First" approach, can save about 41% of the costs of homelessness per person. A "Housing First" approach is one where the supportive housing is permanent, is offered immediately with few questions asked and with low entry demands, is cost effective and socially beneficial. This approach has been used in New York City and other places as the preferred long-term solution that ends, rather than manages, homelessness.

Costs were calculated per person per day for six public services that are typically accessed by homeless individuals—shelter, jail, prison, hospital, psychiatric hospital, and supportive housing. Palermo et al. used frequency of service use (days per year) from the Culhane et al. study for

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[1226] Laird. *Shelter. Homelessness in a Growth Economy: Canada's 21st Century Paradox*, accessed. citing Pomeroy, Stephen, and Focus Consulting. *The Cost of Homelessness: Analysis of Alternate Responses in Four Canadian Cities*, National Secretariat on Homelessness, 2005. The Pomeroy report could not be located on-line. The National Secretariat on Homelessness was closed in 2007.

[1227] Culhane, Dennis, Stephen Metraux, and Trevor Hadley. *The Impact of Supportive Housing for Homeless People with Severe Mental Illness on the Utilization of the Public Health, Corrections, and Emergency Shelter Systems: The New York Initiative*, Centre for Mental Health Policy and Services Research, University of Pennsylvania, 2001; accessed Feb 2008; available from http://www.fanniemaefoundation.org/programs/pdf/rep_culhane_prepub.pdf

[1228] Palermo, Frank, Beata Dera, Delaine Clyne, Heather Ternoway, and Beth Lewis. *The Cost of Homelessness and the Value of Investment in Housing Support Services in Halifax Regional Municipality*, Cities & Environment Unit, Dalhousie University, 2006; accessed Feb 2008; available from http://www.cahhalifax.org/DOCS/costofhomelessnessjune06report.pdf.

[1229] Ibid., accessed. p. 3.

New York,[1230] costs per person per day for jail and hospital costs from Dodds and Colman,[1231] and costs for prison and psychiatric hospital from the Pomeroy study.[1232] Costs for supporting housing and shelter were directly supplied to them by local service providers. Table 47 below shows the costs per person per day, average use by homeless persons, and average use by persons in supportive housing.

Palermo et al. found that it cost $13,362 per year to support a homeless person compared with $4,410 (or 67% less) to support someone in supportive housing—a difference of $8,951 per person per year.

Table 47. Public facility costs per person per day in Metro Halifax, N.S., average service use by a homeless individual in a shelter compared with a formerly homeless person in supportive housing, 2006

Type of Public Facility	Cost per person per day (CDN)	Average use by homeless person (days/yr)	Average use by person in supportive housing (days/yr)
Supportive housing	$39.50	–	–
Shelter	$58.00	–	–
Jail	$121.00	5	3
Prison	$275.00	4.65	1.2
Psychiatric hospital	$210.50	28.65	12.5
Hospital	$662.00	8.25	1.65
Total per person, per year		$13,362	$4,410

Source: Adapted from Palermo, Frank, Beata Dera, Delaine Clyne, Heather Ternoway, and Beth Lewis. *The Cost of Homelessness and the Value of Investment in Housing Support Services in Halifax Regional Municipality*, Cities & Environment Unit, Dalhousie University, 2006; accessed Feb 2008; available from http://www.cahhalifax.org/DOCS/costofhomelessnessjune06report.pdf.

1230 Culhane, Metraux, and Hadley. *The Impact of Supportive Housing for Homeless People with Severe Mental Illness on the Utilization of the Public Health, Corrections, and Emergency Shelter Systems: The New York Initiative*, accessed.
1231 Dodds, and Colman. *The Cost of Crime in Nova Scotia*, accessed.
1232 Pomeroy, and Consulting. *The Cost of Homelessness: Analysis of Alternate Responses in Four Canadian Cities*.

7.4 Food insecurity

Health Canada takes its definition of "food security" from the Food and Agricultural Organization (FAO), and notes that food security is strongly related to household income and "the financial ability of households to access adequate food"[1233] The FAO states: "[F]ood security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[1234] Food insecurity is, of course, the opposite of this. Larry Brown et al. of the Harvard School of Public Health, note:

> Households that are not determined to be hungry, as such, may be food insecure if they run out of food or do not know where the next meal is coming from, or if parents have to cut back on the portions of food served, cut down on the types of food categories available to the family, or have to rely on soup kitchens or food pantries to feed their family.[1235]

According to Brown et al., food insecurity is due to external factors that are political and economic in nature, not to individual judgment. Individuals, who are often working for pay that is inadequate to meet household needs, must pay their rent and utilities, but their food purchases are "elastic" and frequently cut back in order to get by.

Aileen Robertson of the World Health Organization (WHO) reports that rich nations, as well as poor nations, face food poverty and health inequalities that result from food insecurity.[1236] These inequalities increase the prevalence of diet-related poor health and place an enormous burden on societies and the most vulnerable. The most vulnerable groups are those with low income and are likely to be children, lone mothers, and older people. Robertson remarks that, compared with high-income persons, low-income persons "often eat less well, the proportion of their income spent on food is higher, they have poor access to food and little choice in quality and range, and they often suffer more ill-health."[1237]

Cate Burns reviewed the international literature on the link between poverty, food insecurity, and obesity and found a strong relationship.[1238] Those persons with the least economic, social, and

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[1233] Health Canada. *Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) - Income-Related Household Food Security in Canada*, Office of Nutrition Policy and Promotion, Health Products and Food Branch, Health Canada, 2007; accessed March 2008; available from http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/surveill/income_food_sec-sec_alim_e.pdf. p. ix.

[1234] Food and Agriculture Organization (FAO). *Rome Declaration on World Food Security and World Food Summit Plan of Action*, Rome, Italy: FAO, 1996; accessed Sept 2006; available from http://www.fao.org/docrep/003/w3613e/w3613e00.htm , Cited in Health Canada. *Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) - Income-Related Household Food Security in Canada*, accessed. p. ix.

[1235] Brown, J. Larry, Donald Shepard, Timothy Martin, and John Orwat. *The Economic Cost of Domestic Hunger. Estimated Annual Burden to the United States*, Sodexho Foundation, the Public Welfare Foundation, and Spunk Fund, Inc., 2007; accessed March 2008; available from http://www.helpstophunger.org/pdfs/Economic_Cost_of_Domestic_Hunger.pdf. p. 10.

[1236] Robertson, Aileen. "Social Inequalities and the Burden of Food-Related Health," *Public Health Nutrition*, 2001, vol. 4, no. 6A: 1371-1373.

[1237] Ibid. p. 1371.

[1238] Burns, Cate. *A Review of the Literature Describing the Link between Poverty, Food Insecurity and Obesity with Special Reference to Australia*, Victorian Health Promotion Foundation, 2004; accessed March 2008; available from educational resources were found to be at greater risk of obesity. For women, the risk of obesity was 20% to 40% higher in individuals who were food insecure, regardless of education or lifestyle behaviours. The reasons for this are complex, but in general Burns notes that persons dealing with low income will likely select less expensive, but more energy-dense, foods to maintain their energy needs. Foods with a high water content such as fruits and vegetables have a low energy density. Foods containing little water, but are high in fat and sugar, such as potato chips, soft drinks, fried foods, and most "fast foods" have a high energy density. Burns observes that "developments in agriculture and food technology have made energy-dense foods accessible to consumers at a very low cost…. Cheap and tasty energy-dense foods—this is a very obesogenic combination."[1239]

For the first time in Canada, the 2004 Canadian Community Health Survey (CCHS), cycle 2.2, Nutrition specifically measured the financial ability of households to access adequate food.[1240] The food security module, which will be repeated in subsequent cycles of the CCHS, was adapted from the 18-item U.S. Food Security Survey Module that has been used in the U.S. since 1995. The 2007 Health Canada report analyzing the CCHS survey estimates national and provincial food security of adults and children in Canadian households. Key findings of the report include the following:

- More than 1.1 million households (9.2%) were food insecure at some point in the previous year as a result of financial challenges they faced in accessing adequate food.

- Overall, 2.7 million Canadians, or 8.8% of the population, lived in food insecure households.

- Food insecurity was generally more prevalent among adults (9.0%) than among children (5.2%) in the household—especially when the experience of food insecurity was severe (adults 2.9%, children 0.4%).

- The prevalence of food insecurity was higher among households with certain characteristics, including:
    - those with incomes in the lowest (48.3% were food insecure) and lower middle (29.1%) categories of household income adequacy, compared with those in the middle (13.6%), upper middle (5.2%) and highest (1.3%) categories of household income adequacy,
    - those relying on social assistance (59.7%) or worker's compensation/employment insurance (29.0%) as their main source of household income, compared with those with salary/wages (7.3%) and those with pensions/seniors' benefits (4.9%) as their main source of income,

http://www.vichealth.vic.gov.au/assets/contentFiles/Literature%20Review%20Poverty_Obesity_Food%20Insecurity.pdf.

[1239] Ibid., accessed. p. 15.

[1240] Health Canada. *Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) - Income-Related Household Food Security in Canada*, accessed.

- off-reserve Aboriginal households (33.3%), compared with non-Aboriginal households (8.8%).

- Among households with children, the prevalence of food insecurity was higher among those led by a lone parent (22.5%), especially a female lone parent (24.9%), compared with households led by a couple (7.6%).

- Among households without children, the prevalence of food insecurity was higher among unattached individuals (13.7%), compared with couple households (3.5%).[1241]

Mark Nord et al., compared food insecurity in Canada and the United States and found it to be substantially lower in Canada where approximately 9% of the population was food insecure, compared with 14% of the U.S. population.[1242] They note that food insecurity was higher in both countries for adults rather than children, since adults typically reduce their own food intake to increase that of their children. In fact, food insecurity was approximately twice as high among adults as among children, and severe food insecurity was six to seven times as high among adults as among children. Nord, et al. suggest that "economic, policy, and program regimes that support the underlying factors associated with food security have the potential to reduce health inequities."[1243]

In 2007, in what they report to be the first such analysis, Brown et al. estimated the economic cost of domestic hunger in the United States to be US$90 billion per year in US$2005.[1244] This translates to an average of US$300 per person or US$800 per household. In the report they equate "hunger" with food insecurity as defined by the U.S. Federal Food Security Survey Module, which as noted was adapted for the CCHS in Canada.

Basically, the study included cost estimates for the following three areas:

- Charitable activities – products, operations, and depreciation of food banks, local and national feeding programs, volunteer hours and expenses, and other programs. (total – US$14.5 billion)

- Hunger-related illness and psychosocial dysfunction for migraines, colds, iron deficiency, depression, anxiety, suicide, upper gastrointestinal tract disorders, other hospitalization, excess cost of other fair or poor health status. (total for direct and indirect costs – US$66.8 billion)

- Less education and lower productivity–direct and indirect costs for absenteeism

[1241] Ibid., accessed. p. x.
[1242] Nord, Mark, Michelle Hooper, and Heather Hopwood. "Food Insecurity in Canada and the United States: An International Comparison." Paper presented at the 19th IUHPE World Conference on Health Promotion and Education, Vancouver, British Columbia, Canada, June 11-15, 2007, 2007, International Union for Health Promotion and Education (IUHPE); available from http://www.nyccah.org/files/Canada_US_Comparison.pdf.
[1243] Ibid. p. 1.
[1244] Brown, Shepard, Martin, and Orwat. *The Economic Cost of Domestic Hunger. Estimated Annual Burden to the United States*, accessed.

and grade retention (drop out). (total – US$9.2 billion)[1245]

In order to find relative risk ratios and make their calculations, the authors conducted an extensive literature review on food insecurity. Their technical analyses was not given in their report, but they did invite researchers to contact the principal authors for more information.

7.5 Crime

The Canadian Centre for Justice Statistics reports that crime rates in Canada have been declining since 1991 and in 2006 reached the lowest point in over 25 years.[1246] This is particularly true for non-violent crimes such as break-ins (down 50% from 1991 and down 5% in 2006 from 2005 levels), auto theft, and thefts under $5,000. In 2006, increases were seen in the rates of many serious violent crimes, such as assaults with a weapon, but homicide rates dropped 10% from 2005 rates. However, in general, between 2005 and 2006, violent crimes committed by youth increased by 3%—the 2006 rates of youth accused of homicide was the highest since 1961—but dropped 3% for property crime. During the same time period, drug crimes increased by 2%, but 60% of all drug crimes are for cannabis offenses, and these rates were down by 4%. However, cocaine offenses rose by 13% and crystal meth (methamphetamine hydrochloride) by 8%.

It is difficult to know the exact prevalence of crime. Critics charge that people are increasingly not reporting crimes, either because they are afraid of retribution or do not trust the police. In a news report columnist Ralph Surette argues:

> The point is that the statistics may be not only short of giving the full picture, but may mask the opposite: a rise in unreported grey-zone crime which is not merely crime but a fraying of the social fabric, a growing disrespect for the elementary values that keep communities intact—most of it, … linked to drugs, notably cocaine.[1247]

In regards to youth crime in general, others such as Bernard Schissel, of the University of Saskatchewan, argue that youth crimes appear to be up because these crimes are reported more often now than in the past because of zero tolerance policies in schools and communities.[1248] Therefore, the police are called in more often than they used to be. So, crime rates among youth may not be that different than they were 10 or 15 years ago, but the laws are stricter now and tolerance is lower.

Crimes associated with substance abuse in connection with poverty, and the proportion of crime

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[1245] Ibid., accessed.

[1246] Silver, Warren. "Crime Statistics in Canada, 2006," *Juristat*, Canadian Centre for Justice Statistics, Statistics Canada – Catalogue no. 85-002-XIE, 2007, vol. 27, no. 5. accessed Feb 2008; available from http://www.statcan.ca/english/freepub/85-002-XIE/85-002-XIE2007005.pdf.

[1247] Surette, Ralph. "Flawed Crime Statistics and the Story They Hide." *Chronicle Herald*, Halifax, N.S.: Juy 28, 2007, A-15.

[1248] Schissel, Bernard. *Still Blaming Children: Youth Conduct and the Politics of Child Hating (2nd Edition)*, Halifax, N.S.: Fernwood Publishing, 2006.

that can be attributed to alcohol and illicit drug use have been discussed earlier in Section 5.1.3 of this review. We have also reviewed the costs of crime in Chapter 2— Sections 2.1.2, 2.2.3, and 2.3.1—on examples of methodologies used in cost of poverty studies.

7.5.1 Youth crime

The U.S. Surgeon General's report on youth violence reports that poverty is a risk factor for youth violence, but that it is important to acknowledge the accumulation of risk factors: "Risk factors usually exist in clusters, not in isolation. Children who are abused or neglected, for example, tend to be in poor families with single parents living in disadvantaged neighborhoods beset with violence, drug use, and crime."[1249] The report identifies the strongest risk factors during childhood for youth violence between the ages of 15 to 18 as involvement in serious but not necessarily violent criminal behavior and substance use. Moderate risk factors are identified as being male, having aggressive behaviour, low family socioeconomic status or poverty, and antisocial parents. The report also finds poverty in rural areas to be less of a risk factor than social disorganization:

> Social disorganization is also a risk factor for violence in rural areas. One study of rural communities found that poverty plays a less important role in predicting violence than residential instability, broken homes, and other indicators of social disorganization. In fact, very poor areas were not characterized by high residential instability or a large proportion of broken homes. In cities, however, the combination of poverty with instability and family disruption is predictive of violence.[1250]

Using data from the Incident-Based Uniform Crime Reporting Survey from 1995 to 2005, which is called "the first large-scale developmental study of delinquency in Canada based on police-reported data," Peter Carrington notes that a small number of active offenders is responsible for the majority of crimes in this cohort—most child and adolescent offenders committed few recorded offences and most of these were minor crimes.[1251] Chronic offenders, which comprised 10% of offenders, were responsible for 46% of all recorded crime committed by child and adolescent offenders. In 2005 Carrington previously reported that 16% of offenders were responsible for 58% of all incidents in this age group.[1252] Carrington also reports that there was no evidence of a progression from less serious to more serious types of crime by individual offenders.

[1249] U.S. Department of Health and Human Services. "Risk Factors for Youth Violence," in *Youth Violence: A Report of the Surgeon General*. Washington, D.C.: Office of the Surgeon General, in partnership with the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, the National Institutes of Health, National Institute of Mental Health, and the Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, 2001; accessed Feb 2008; available from http://mentalhealth.samhsa.gov/youthviolence/surgeongeneral/SG_Site/toc.asp.

[1250] Ibid. p. 57.

[1251] Carrington, Peter J. *The Development of Police-Reported Delinquency among Canadian Youth Born in 1987 and 1990*, Crime and Justice Research Paper Series. Statistics Canada Catalogue no. 85-561-XIE. no. 9, 2007; accessed March 2008; available from http://www.statcan.ca/english/research/85-561-MIE/85-561-MIE2007009.pdf.

[1252] Carrington, Peter J., Anthony Matarazzo, and Paul deSouza. *Court Careers of a Canadian Birth Cohort*, Crime and Justice Research Paper Series. Statistics Canada Catalogue no. 85-561-XIE. no. 6, 2005; accessed Feb 2008; available from http://www.statcan.ca/english/research/85-561-MIE/85-561-MIE2005006.pdf.

David Bjerk of McMaster University used U.S. longitudinal data to estimate the degree to which youth crime is related to household economic status.[1253] He notes that most criminal careers begin during the juvenile years, and finds that youth from households in the lowest third of the wealth distribution are 66% more likely to have participated in a serious crime than youth from households in the upper third of the wealth distribution. Bjerk notes that "almost all of the strong relationship between household wealth and youth criminal participation can be traced to observable characteristics that differ between rich and poor youth."[1254] According to Bjerk, children from poorer families more likely to participate in serious crime are because:

- they are exposed to more criminal activity in their neighborhoods,
- they expect to have fewer future opportunities available to them, and/or
- their parents are less able to invest sufficient time, energy, and skill in their upbringing.

Bjerk suggests that "policies that affect these characteristics, and/or alter the cross-wealth differences in these characteristics among youth, will likely have large impacts on youth criminal participation."[1255]

When income is used as the indicator, rather than wealth (the difference between assets and liabilities), and less serious crime rates are added to serious crime rates, Bjerk finds:

> [T]he estimated relationship between household economic status and youth criminal activity is not very strong. Youth from households in the poorest third of the income distribution are only about 21 percent more likely to participate in crime than youth from households in the richest third of the household income distribution."[1256]

7.5.2 Costs of crime

Writing for the World Health Organization, Hugh Waters et al. investigated the economic dimensions and costs of interpersonal violence, which includes child abuse, violence between intimate partners, rape, workplace violence, and youth and gang violence.[1257] They found evidence to indicate that the society- and community-level risk factors for interpersonal violence include economic inequality, poverty, weak economic safety nets and unemployment.[1258] They also note that studies on income inequality as a societal- and community-level risk factor for

[1253] Bjerk, David. *Youth Criminal Participation and Household Economic Status*, McMaster University, Department of Economics Working Paper Series, 2004-10, 2004; accessed Feb 2008; available from http://socserv.mcmaster.ca/econ/rsrch/papers/archive/2004-10-cpart_WP.pdf.
[1254] Ibid., accessed. p. 4.
[1255] Ibid., accessed.
[1256] Ibid., accessed. p.3.
[1257] Waters, Hugh, Adnan Hyder, Yogesh Rajkotia, Suprotik Basu, Rehwinkel. Julian Ann, and Alexander Butchart. *The Economic Dimensions of Interpersonal Violence* Department of Injuries and Violence Prevention, World Health Organization, Geneva, 2004; accessed Feb 2008; available from http://whqlibdoc.who.int/publications/2004/9241591609.pdf.
[1258] Ibid., accessed.

violence have focused almost exclusively on homicide, which is influenced by unemployment, economic deprivation, frustration and social disintegration. One study by Fajnzylber, Lederman and Loayza found income inequality was significantly associated with violent crime, and that poverty alleviation leads to less crime.[1259]

According to Waters et al., many of the studies detailing the costs of violence have come from the U.S. and have used a broad range of categories for costs. A few studies have come from Canada:

- Health Canada reported in 2002 that the direct medical costs for all types of violence against women cost $1.1 billion.[1260]
- In 1995, Tanis Day found direct medical costs, lost earnings and opportunity costs of time, policing, legal fees, and incarceration costs, and psychological costs of violence against women in Canada totaled $1.2 billion.[1261] Waters et al. comment that Day likely underestimated the costs of violence against women since Health Canada reached a similar estimate when counting only direct medical costs.
- In 1997, Miller and Cohen calculated the cost of gun-related violence in the U.S. to be US$155 billion. When psychological costs and the value of quality of life were included, they found that, in Canada, the cost of gun-related violence was 36% of the U.S. cost.[1262]
- In an earlier 2005 report, Miller found that the 1991 cost of gunshot injuries in Canada, including lost productivity and psychological costs was $5.6 billion.[1263]

In Chapter 2 of this report, three of the four cost of poverty studies reviewed contained estimates for the cost of crime. Holzer et al. (Section 2.1.2) used victimization costs of street crime to calculate costs of crime because they make an assumption that poverty only matters for street crime (although they admit that this is not necessarily the case).[1264] They also did not include protective measures of crime such as spending on policing, prisons, and private security, since they assumed these costs do not change much with marginal changes in crime rates. They attributed 20% of the annual incidence of crime to poverty, which they then increased to 40% to adjust for survey bias (i.e., lack of reporting). They also adjusted the victimization costs of street crime, which they did not itemize, downward by 40% for hereditary influences,[1265] and by 60%

[1259] Fajnzylber, P., D. Lederman, and N. Loayza. "Crime and Violence: An Economic Perspective," *Economia*, 2000, vol. 1: 219-302. Cited in Waters, Hyder, Rajkotia, Basu, Ann, and Butchart. *The Economic Dimensions of Interpersonal Violence* accessed. p. 38.
[1260] Health Canada. *Violence against Women. Impact of Violence on Women's Health*, 2002; accessed by Waters et al., 5 March 2003; available from http://www.hc-sc.gc.ca/. This report could not be located.
[1261] Day, Tanis. *The Health-Related Costs of Violence against Women in Canada: The Tip of the Iceberg*, Centre for Research on Violence Against Women and Children Publication Series, The University of Western Ontario, 1995; accessed March 2008; available from http://www.crvawc.ca/docs/pub_day1995.pdf.
[1262] Miller, T.R., and M.A. Cohen. "Costs of Gunshot and Cut/Stab Wounds in the United States, with Some Canadian Comparisons," *Accident Analysis and Prevention*, 1997, vol. 29: 329-341.
[1263] Miller, T.R. "Costs Associated with Gunshot Wounds in Canada in 1991," *Canadian Medical Association Journal*, 1995, vol. 153: 1261-1268.
[1264] Holzer, Schanzenbach, Duncan, and Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, accessed.
[1265] Research on "hereditary" influences associated with poverty, or the "intergenerational transmission of poverty," has found this topic to be contentious and the evidence inconclusive. See: Bird, Kate. *The Intergenerational*

for environmental effects of poverty. In 2007, total cost in the U.S. was found to be $170 billion per year, or 1.3% of the GDP.

Shiell and Zhang (Section 2.2.3) could not find evidence to support the claim that a greater share of the costs of crime could be attributed to poverty.[1266] They comment that poor people are not more likely to engage in illegal activities than are more wealthy people, although they may be arrested and charged more often. Therefore, the authors arbitrarily chose 1% to represent the cost savings to the judicial system if poverty were reduced, and calculated 1% of the total cost of the criminal justice system to represent the cost of crime attributable to poverty.

In Section 2.3.1 of this review, the 2006 Oppenheim and MacGregor report attributes 50% of the total net burden of crime in the U.S. to poverty.[1267] They included costs to victims (medical expenses, lost earnings, and costs for victim services, and intangible costs such as pain and suffering, and reduced quality of life), value of stolen motor vehicles, burglaries and larceny costs, incarceration, and other costs to the police and judicial system. The authors calculated the total cost of crime in the U.S. that was caused by poverty to be $660.8 billion.

In 1999, Dodds and Colman produced a 223-page report on the economic costs of crime in Nova Scotia.[1268] Although it does not report the costs attributable to poverty, the report develops an accounting framework for estimating crime costs to society. The report focuses on "street crime" such as violent attacks and theft, because as the authors note "that is the emphasis of prevailing social norms and legal structures in Canada."[1269] However, they also point to evidence in the literature that estimates the annual losses from corporate crime or white collar crime may be 50 times the losses incurred from street crime, and that organized crime is generating illicit profits estimated to be $20 billion a year.

Dodds and Colman briefly review sociodemographic characteristics that are highly correlated with crime, but are careful to point out that these characteristics cannot be viewed as causing crime. Specifically, they note that high rates of crime have been associated with gender, age, substance abuse, unemployment, and low education. In Nova Scotia, 85% of adult criminal court cases in 1996/97 involved males, and 95% of those incarcerated were male. Most offenders were relatively young—the median age in Canada was 34 years of age for federal prisoners and 31 years of age for provincial prisoners.

According to Dodds and Colman, the evidence indicates that 80% of offenders in Canada have used psychoactive substances, that 30%–50% of prison inmates have a drug-dependency problem, and that 50%–75% had drugs in their urine at the time of arrest. Crime rates are also

Transmission of Poverty: An Overview, London, U.K.: Chronic Poverty Research Centre 2007; accessed March 2008; available from http://www.chronicpoverty.org/pdfs/99Bird.pdf.

[1266] Shiell, and Zhang. *The External Costs of Poverty: A Conservative Assessment*, accessed.

[1267] Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf.

[1268] Dodds, and Colman. *The Cost of Crime in Nova Scotia*, accessed.

[1269] Ibid., accessed. p. 45.

correlated with business cycles and unemployment rates over time—approximately 52% of Canadian prison inmates are unemployed when sentenced. Justice statistics show that 36% of all prisoners and 46% of federal prisoners, who are the most serious offenders, have less than a grade 10 education, while 19% have less than a grade 10 education in the general population.

Despite major data limitations noted by the authors, the report uses available, standard, and official data sources so that the costs of crime could be reproduced for, and be comparable with, other provinces. The sources for crime data recommended as a basis for other crime cost estimates are from the Statistics Canada Canadian Centre for Justice Statistics and other Statistics Canada publications. Where data were missing, the authors consulted provincial justice department sources. They also used private sources of data such as statistics from insurance companies and surveys conducted by the National Crime Prevention Council, the Retail Council of Canada (for estimates of business defensive expenditures, shoplifting, etc), and academic sources.

The estimate for the cost of crime in Nova Scotia for 1997 ranged from the conservative estimate of nearly $554 million to nearly $1.2 billion for the comprehensive estimate. Table 48 below presents the categories used in the estimation, as well as the economic costs for 1997. The conservative estimate includes victim losses due to reported crime (including hospitalization costs due to violent crime, and lost production), public justice costs (including police expenditures, courts, legal aid, and prosecutions, and corrections costs), and private defensive expenditures on crime prevention and detection (including security systems and guards, and theft insurance).

The comprehensive estimate adds costs of unreported crime, unpaid work losses, voluntary work, insurance premiums, and costs of “shattered lives,” based on court awards for serious crimes. Costs that are not included are those related to impaired driving, illegal drug offenses, prostitution, and other crimes not classified as property or violent crimes, most white collar and corporate crime, non-hospital medical costs, non-retail business and government defensive expenditures, private spending on criminal lawyers, civil justice costs, indirect and induced crime costs such as property value losses, and forgone economic activity due to fear of crime.

Table 48. Costs of crime in Nova Scotia, 1997

Conservative Estimate (millions)	
Victim Losses: Reported Crimes	
Direct Victim Losses due to Property Crime	102.4
Direct Victim Monetary Losses in Assaults and Sexual Assaults	0.6
Cost of Hospitalization due to Violent Crime	1.6
Lost Potential Economic Production due to Homicide	23.4
Lost Production due to Absenteeism resulting from Criminal Attack	4.2
Subtotal	**132.2**
Public Justice Costs	
Police Expenditures, incl. N.S. share of RCMP expenditures	143.3
Courts, Legal Aid, and Prosecutions	39.5
Corrections: Provincial, N.S. share of Federal, and Youth	74.8
Subtotal	**257.6**
Private Defensive Expenditures on Crime Prevention/Detection	
Home Security Systems	45.5
Private Security Guards and Private Investigators	56.3
Retail Business Defensive Costs (Store Surveillance, Alarms, etc.)	37.0
Theft Insurance (Premiums minus Claims)	25.0
Subtotal	**163.8**
Total Conservative Estimate	**553.6**
Comprehensive Estimate (millions)	
Total Conservative Estimate (from above)	*553.6*
Victim Losses due to Unreported Property Crime	165.2
$ Losses, Hospitalization, Absenteeism: Unreported Violent Crime	5.2

Unpaid Household Work Losses	8.2
Unpaid Voluntary Work Losses	1.4
Voluntary Work: Crime Prevention, Legal Aid, w/ Victims, Offenders	16.0
Business Shrinkage due to Shoplifting, Employee Theft: Retail Only	113.8
Insurance Fraud (higher premiums)	66.4
"Shattered Lives" (based on court awards for serious violent crimes)	249.0
Total Comprehensive Estimate	**1,178.8**

Source: Dodds, Colin, and Ronald Colman. *The Cost of Crime in Nova Scotia*, GPI Atlantic, 1999; accessed March 2008; available from http://www.gpiatlantic.org/pdf/crime/crime.pdf.

7.6 Environment

Environmental conditions are thought to be important factors in producing and maintaining health disparities.[1270] According to Yohannes Miriam of Environment Canada, diseases and hazards related to environmental factors include:

- infections arising from pathogens in polluted water, food, milk, etc.;
- respiratory infections due to crowding and poverty;
- vector-borne diseases associated with diverse ecological factors and conditions;
- parasitic infections flourishing under ecological conditions which favor intermediate hosts;
- chronic obstructive lung disease through exposure to dust;
- cancer and birth defects induced by radiation and organic chemicals, including pesticides and petrochemicals; and
- mental and psychological disorders arising from social stress, such as the breakdown of traditional lifestyles, unemployment and mass migration.[1271]

Kirk Smith et al., of the University of California at Berkeley and the World Health Organization, estimated that 25%–33% of the global burden of disease may be caused by environmental factors.[1272] In 2006, the World Health Organization (WHO) estimated that 23% of all mortalities and 24% of all disability adjusted life years (DALYs) globally are linked to environmental risk

[1270] Gee, Gilbert C., and Devon C. Payne-Sturges. "Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts," *Environmental Health Perspectives*, 2004, vol. 112, no. 17: 1645-1653.
[1271] Mariam, Yohannes. *Causal Relationship between Indicators of Human Health, the Environment and Socioeconomic Variables for the OECD Countries*, Munich Personal RePEc Archive (MPRA) Paper no 666, 1999; accessed March 2008; available from http://mpra.ub.uni-muenchen.de/666/1/MPRA_paper_666.pdf.
[1272] Smith, Kirk R., Carlos F. Corvalán, and Tord Kjellström. "How Much Global Ill Health Is Attributable to Environmental Factors? ," *Epidemiology*, 1999, vol. 10, no. 5: 573–584.

factors that are preventable.[1273]

Reiner Banken argues that, because of the multiple factors involved with the social impacts of environmental stressors, that quantitative predictions based on cause and effect patterns is difficult, if not impossible.[1274] Therefore, he suggests that prediction of the social impacts should "be understood as the prediction of tendencies and types of impacts. While the process of risk analysis provides probabilities of future consequences given current exposure to risk factors, the social impact assessment identifies possibilities of future consequences."[1275]

David Boyd and Stephen Genuis recently estimated the environmental burden of disease (EBD) in Canada for respiratory disease, cardiovascular disease, cancer and congenital affliction.[1276] Their study used environmentally attributable fractions (EAFs) that were estimated by WHO, which calculated EAFs of mortality and morbidity for 85 categories of disease.[1277] Smith et al. define EAF as "the percentage of a particular disease category that would be eliminated if environmental risk factors were reduced to their lowest feasible levels."[1278] Boyd and Genuis remark that, "the EAF is the proportion of each health condition that can reasonably be attributed to exposure to environmental hazards, such as air pollution or contaminated water."[1279] They confine the environmental risk factors to chemical, biological, and radiological hazards. Boyd and Genuis found:

> 10,000–25,000 deaths; 78,000–194,000 hospitalizations; 600,000–1.5 million days spent in hospital; 1.1 million–1.8 million restricted activity days for asthma sufferers; 8,000–24,000 new cases of cancer; 500–2,500 low birth weight babies; … occur in Canada each year due to respiratory disease, cardiovascular illness, cancer, and congenital affliction associated with adverse environmental exposures.[1280]

They estimated the economic impact of EBD in Canada by applying the EAFs for the four categories of disease to Health Canada's Economic Burden of Disease 1998 data, and found that the total direct and indirect costs of the EBD for these four categories to be between $3.6 and $9.1 billion ($2006). They remark that this is a conservative approach "because Canadian health-care expenses have risen faster than inflation."[1281]

[1273] Boyd, David R., and Stephen J. Genuis. "The Environmental Burden of Disease in Canada: Respiratory Disease, Cardiovascular Disease, Cancer, and Congenital Affliction," *Environmental Research*, 2008, vol. 106, no. 2: 240-249.

[1274] Banken, Reiner. "From Concept to Practice: Including the Social Determinants of Health in Environmental Assessments," *Canadian Journal of Public Health*, 90, 1999, vol. Supplement 1, no. S27-S30.

[1275] Ibid.

[1276] Boyd, and Genuis. "The Environmental Burden of Disease in Canada: Respiratory Disease, Cardiovascular Disease, Cancer, and Congenital Affliction."

[1277] Pruss-Ustun, A., and C. Corvalan. *Preventing Disease through Healthy Environments: Towards an Estimate of the Environmental Burden of Disease*, Geneva: World Health Organization, 2006; accessed March 2008; available from http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf.

[1278] Smith, Corvalán, and Kjellström. "How Much Global Ill Health Is Attributable to Environmental Factors? ."

[1279] Ibid.

[1280] Boyd, and Genuis. "The Environmental Burden of Disease in Canada: Respiratory Disease, Cardiovascular Disease, Cancer, and Congenital Affliction." p. 240.

[1281] Ibid. p. 246.

According to Gilbert Gee and Devon Payne-Sturges, the impact of environmentally-related diseases can be seen in reduced life expectancy and/or death and reduced productivity in vulnerable groups living in poverty.[1282] However, as Boyd and Genuis conclude, more work on the EBD in Canada is needed to assess how the EBD affects vulnerable populations, especially children, Aboriginal people, and low-income Canadians, as well as to assess the wide variations among regions and provinces in the distribution of environmental hazards.[1283]

Gee and Payne-Sturges suggest that the main explanation for environmentally-related health disparities is that disadvantaged communities are often located in environmentally degraded areas that have greater exposure to environmental toxins such as air pollution, pesticides, and lead.[1284] Nita Chaudhuri noted in the *Canadian Journal of Public Health* that children are especially vulnerable to the effects of environmental contaminants.[1285] Children living in poverty are more likely to grow up in neighbourhoods located near polluting industries or near heavily used transportation corridors. They are also more likely to grow up in improperly maintained buildings that have high levels of contaminants and toxic residuals.

Jerrett et al. assessed the short-term association between air pollution and mortality in different zones of Hamilton, Ontario.[1286] In Hamilton, which has one of the largest steel making complexes in North America, the lower socioeconomic neighbourhoods are concentrated in the highest pollution areas. The study divided the city into five zones based on proximity to fixed site air pollution monitors. The authors found that "the largest health effects from ambient air pollution exposure occur in areas with lower socioeconomic characteristics."[1287]

Costs of the environmental effects of poverty are also found in areas other than health. In their study of the economics of poverty, Oppenheim and MacGregor estimated the return over time on investments in creating energy-efficiency in low-income households to be "seven-fold."[1288] Based on information from the Low Income Home Energy Assistance Program (LIHEAP) and the National Community Action Foundation, they calculated that:

> [I]f all Americans lived in weatherized and energy efficient homes and had the income to pay their full share of utility bills, all other ratepayers would save nearly $6 billion in poverty costs, including fuel assistance, lifeline and other rate assistance; weatherization

[1282] Gee, and Payne-Sturges. "Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts."
[1283] Boyd, and Genuis. "The Environmental Burden of Disease in Canada: Respiratory Disease, Cardiovascular Disease, Cancer, and Congenital Affliction."
[1284] Gee, and Payne-Sturges. "Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts."
[1285] Chaudhuri, Nita. "Child Health, Poverty and the Environment: The Canadian Context," *Canadian Journal of Public Health*, 1998, vol. 89, no. Supplement 1: S26-S33.
[1286] Jerrett, M., R. T. Burnett, J. Brook, P. Kanaroglou, C. Giovis, N. Finkelstein, and B. Hutchison. "Do Socioeconomic Characteristics Modify the Short Term Association between Air Pollution and Mortality? Evidence from a Zonal Time Series in Hamilton, Canada," *Journal of Epidemiology and Community Health*, 2004, vol. 58: 31-40.
[1287] Ibid. p. 39.
[1288] Oppenheim, Jerrold, and Theo MacGregor. "Advocacy: Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans " *Journal of Energy Assistance*, 2007, vol. 1, no. 2. accessed March 2008; available from http://www.energyassistancejournal.org/Vol.1,No.2%20content/Economics%20of%20Poverty.pdf.

and efficiency costs; and the costs of late and unmade payments, such as service disconnections.[1289]

More work is needed to explore the relationship between poverty and environmental hazards and factors in order to determine what proportion of outcomes can be associated specifically with poverty.

7.7 Social assistance

According to Dennis Raphael, there are four issues that "drive the incidence of poverty in Canada."[1290] These are "level of social assistance benefits, level of the minimum wage, incidence of low-wage employment, and differences in employment situations and wages of groups identified as being at risk for poverty."[1291] While it is beyond the mandate of this report to consider all of these issues, here we briefly look at the issue of social assistance in Canada. Section 4.3.3 of this report briefly explores the subject of the working poor.

Social assistance or welfare is the "social safety net of last resort in Canada," which provides financial assistance needed to meet the basic needs of individuals and families who have no other means of financial support.[1292] The National Council on Welfare reports that people who receive welfare are often seen as lazy or undeserving, but that there are many reasons people need assistance:

> People are on welfare because they have lost their jobs, are widowed, are separated or divorced and are raising their children alone, are fleeing abusive relationships, or have a disability that prevents them from holding a job. Increasing numbers of people on welfare have multiple barriers to employment. They face additional challenges due to any combination of low job skills, lack of access to child care, long-term unemployment or substance abuse problems, to name a few. So why should people care? Because, in a Canada with an increasing number of non-standard and insecure jobs—most of them low-paid with few or no benefits—and limited access to Employment Insurance, many are a step away from having to turn to welfare themselves. And all Canadians are paying the price through higher health and justice costs, lost human potential, and the diminished productive capacity of those living in poverty.[1293]

The components of welfare income include federal child benefits, provincial and territorial welfare benefits, provincial child benefit and tax credit programs, and the GST rebate. Basic social assistance is designed to cover the cost of food, clothing, personal and household items,

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[1289] Ibid.
[1290] Raphael, Dennis. *Poverty and Policy in Canada. Implications for Health and Quality of Life*, Toronto: Canadian Scholars' Press Inc., 2007. p. 69.
[1291] Ibid.
[1292] National Council on Welfare (NCW). *Welfare Incomes 2005*, accessed. p. 1.
[1293] Ibid., accessed. p. 83.

and shelter requirements.[1294] Some jurisdictions also provide special needs assistance on an individual basis for items such as special diets, drug and medical services, and allowances related to disability or old age.

The Canada Child Tax Benefit (CCTB) is a base benefit provided to all low- and middle-income families with children. As a supplement to the CCTB, the National Child Benefit (NCB), a joint federal, provincial, territorial government initiative, is provided to low-income families with children. In some provinces the NCB supplement is treated as unearned income and deducted from social assistance payments, leaving welfare families no better off. According to the Federal-Provincial-Territorial (FPT) Directors of Income Support, funds that result from adjustments are often used to support other programs benefiting low-income families.[1295] Newfoundland and Labrador, New Brunswick, Nova Scotia, Quebec and Manitoba do not adjust, or "claw back," social assistance payments based on the NCB.

Each Canadian province and territory is responsible for social assistance and income support-related programs within their own jurisdictions, such as children's benefits and disability supports programs.[1296] Therefore, the provinces and territories have different policies and services. The FPT Directors of Income Support collected statistics from the various provincial and territorial agencies and data systems, which they included in a 2006 report describing the various social assistance and other income support programs. Because of extensive variations in the programs including the types of data collected, reporting methods, and different definitions used, the FPT Directors warn that "statistics for a given province or territory should not be compared across jurisdictions."[1297]

In 1996, the federal Canada Health and Social Transfer (CHST) replaced the Canada Assistance Plan (CAP) and the Established Programs Financing (EPF). Revised in 2004, the federal CHST transfers to provinces and territories consist of the Canada Health Transfer (CHT) to be used for health services, and the Canada Social Transfer (CST) to be used for postsecondary education, social assistance and social services. As a condition of eligibility for social assistance, unemployed able-bodied persons, including single parents, must pursue and accept any reasonable offer of employment or retraining. A relatively new category of recipients is that of persons with multiple barriers to employment, including substance abuse, low basic skills, long-term unemployment, and childcare or transportation issues. These persons require intensive interventions and are dealt with differently by the jurisdictions.

According to the FPT Directors, "[A] number of provinces-territories have introduced earned income or in-work supplements that are designed to increase the financial return associated with low-wage employment."[1298] For example, in Newfoundland and Labrador, which is one of the most generous provinces, a single employable person is allowed up to $75 in exemptions and a family with one or more children is allowed up to $150. British Columbia has no earnings

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[1294] Federal-Provincial-Territorial (FPT) Directors of Income Support. *Social Assistance Statistical Report: 2005*, Social Programs Analysis Division, Human Resources and Social Development Canada 2006; accessed March 2008; available from http://www.hrsdc.gc.ca/en/cs/sp/sdc/socpol/publications/reports/sd10-3-2004e/sasr2005en.pdf.
[1295] Ibid., accessed.
[1296] Ibid., accessed.
[1297] Ibid., accessed. p. 2.
[1298] Ibid., accessed. p. 9.

exemptions, Nova Scotia and New Brunswick do not allow exemptions during the first month on assistance, and Ontario and Saskatchewan allow no exemptions for the first three months on assistance.[1299] The National Council of Welfare estimated that in 2005, approximately 10% of all households on welfare reported earnings from employment.[1300]

Since 1986, the National Council of Welfare (NCW) has published annual estimates of welfare incomes for four types of households in each province and territory: a single employable person, a single person with a disability, a lone-parent with a 2-year-old child, and a two-parent family with two children aged 10 and 15.[1301] In 2005, the latest data reported by NCW, 1,679,800 people, or five percent of the population— including nearly half a million children—received social assistance, or welfare benefits. In addition, another 150,000 First Nations people on reserve receive social assistance, which is provided by Indian and Northern Affairs Canada and regulated by the First Nations communities.

According to NCW, after adjustments for inflation, many of the welfare incomes in 2005 were lower than they were in 1986, with one-third of households losing $3,000 or more per year. Since 1994, when welfare rates peaked, the losses were much higher in some provinces. For example, since 1994, in Alberta, the income of a single person decreased by almost 50%, in Ontario, the income of a lone parent decreased by almost $6,600, and the income of a couple with two children decreased by more than $8,700.

In addition, all welfare incomes have remained far below the poverty line and are therefore not designed to lift people from poverty. In 2005, the average welfare income in Canada for all households was approximately below 66% of the poverty line, and more than half of all welfare households had incomes that were 50% of the poverty line or less.[1302] The exception was Newfoundland and Labrador where lone parent income was 73% of the poverty line. Single employable people had the lowest rates, which ranged from a low of 19% of the poverty line in New Brunswick to a high of 46% in Newfoundland and Labrador. For lone parents with one child, Alberta (48%) had the lowest rate, while Newfoundland and Labrador (73%) had the highest.

Table 49 below, which is adapted from the National Council of Welfare estimates, compares total welfare income to poverty lines based on before tax LICOs for the largest city in each province. It also shows the poverty gap or the difference between the welfare income and the poverty line. The territories are not included because they are not included in the Survey of Labour and Income Dynamics, which is used to generate LICOs.

[1299] National Council on Welfare (NCW). *Welfare Incomes 2005*, accessed.
[1300] Ibid., accessed.
[1301] Ibid., accessed.
[1302] Welfare amounts differ by jurisdiction, but the data here represent the Canadian average.

Table 49. Adequacy of welfare incomes, 2005

Province	Total number receiving welfare	Total welfare income	Poverty line: before tax LICO	Poverty gap	Total welfare income as % of poverty line
Newfoundland and Labrador	**48,500**				
Single employable		$8,198	$17,895	-$9,697	46%
Person w/ disability		$9,728	$17,895	-$8,167	54%
Lone parent, 1 child		$16,181	$22,276	-$6,095	73%
Couple, 2 children		$19,578	$33,251	-$13,673	59%
Prince Edward Island	**6,900**				
Single employable		$6,214	$17,784	-$11,570	35%
Person w/ disability		$8,084	$17,784	-$9,700	45%
Lone parent, 1 child		$13,707	$22,139	-$8,432	62%
Couple, 2 children		$21,213	$33,046	-$11,833	64%
Nova Scotia	**52,300**				
Single employable		$5,422	$17,895	-$12,473	30%
Person w/ disability		$8,897	$17,895	-$8,998	50%
Lone parent, 1 child		$12,917	$22,276	-$9,359	58%
Couple, 2 children		$19,032	$33,251	-$14,219	57%
New Brunswick	**45,300**				
Single employable		$3,427	$17,895	-$14,468	19%
Person w/ disability		$7,995	$17,895	-$9,900	45%
Lone parent, 1 child		$13,656	$22,276	-$8,620	61%

Province	Total number receiving welfare	Total welfare income	Poverty line: before tax LICO	Poverty gap	Total welfare income as % of poverty line
Couple, 2 children		$17,567	$33,251	-$15,684	53%
Quebec	**518,200**				
Single employable		$6,947	$20,778	-$13,831	33%
Person w/ disability		$10,063	$20,778	-$10,715	48%
Lone parent, 1 child		$15,395	$25,867	-$10,472	60%
Couple, 2 children		$20,704	$38,610	-$17,906	54%
Ontario	**676,500**				
Single employable		$7,007	$20,778	-$13,771	34%
Person w/ disability		$12,057	$20,778	-$8,721	58%
Lone parent, 1 child		$14,451	$25,867	-$11,416	56%
Couple, 2 children		$19,302	$38,610	-$19,308	50%
Manitoba	**60,900**				
Single employable		$5,818	$20,778	-$14,960	28%
Person w/ disability		$8,601	$20,778	-$12,177	41%
Lone parent, 1 child		$13,282	$25,867	-$12,585	51%
Couple, 2 children		$20,357	$38,610	-$18,253	53%
Saskatchewan	**48,700**				
Single employable		$6,663	$17,895	-$11,232	37%
Person w/ disability		$8,893	$17,895	-$9,002	50%
Lone parent, 1 child		$13,235	$22,276	-$9,041	59%
Couple, 2 children		$19,327	$33,251	-$13,924	58%
Alberta	**56,400**				

Province	Total number receiving welfare	Total welfare income	Poverty line: before tax LICO	Poverty gap	Total welfare income as % of poverty line
Single employable		$5,050	$20,778	-$15,728	24%
Person w/ disability		$7,851	$20,778	-$12,927	38%
Lone parent, 1 child		$12,326	$25,867	-$13,541	48%
Couple, 2 children		$19,497	$38,610	-$19,113	50%
British Columbia	**149,300**				
Single employable		$6,456	$20,778	-$14,322	31%
Person w/ disability		$10,656	$20,778	-$10,122	51%
Lone parent, 1 child		$13,948	$25,867	-$11,919	54%
Couple, 2 children		$18,466	$38,610	-$20,144	48%
Yukon	**1,100**	–	–	–	–
Northwest Territories	**1,900**	–	–	–	–
Nunavut	**13,800**	–	–	–	–

Notes: Total income is based on the maximum allowable in each category; poverty line is based on Statistics Canada's before-tax LICO (low income cutoff) for the largest city in the province; poverty gap is the difference between the poverty line and the amount of income received; total welfare income as % of poverty line shows income received as a percentage of the poverty line; numbers of welfare recipients in each category were not available from the source; figures are not presented for the territories since they do not participate in the Survey of Labour and Income Dynamics (SLID), which is used to calculate the LICOs.

Source: Adapted from National Council on Welfare (NCW). *Welfare Incomes 2005*, 2006; accessed March 2008; available from http://www.ncwcnbes.net/documents/researchpublications/ResearchProjects/WelfareIncomes/2005Report_Summer2006/ReportENG.pdf.

According to Timothy Smeeding and based on 2000 data, overall, Canadian government programs reduce the poverty rate by 46%.[1303] However, this is well below the average poverty

[1303] Smeeding, Timothy. *Poor People in Rich Nations: The United States in Comparative Perspective*, Luxembourg reduction rate of the eight European nations also included in the analysis. Sweden's governmental spending reduces the country's poverty rate by 77.4%—the largest amount among the countries studied—and Germany, Belgium, Austria, and Finland are close behind with governments reducing poverty by nearly 70%. The smallest reduction of poverty takes place in the U.S. at 26.4%. Based on a poverty line of 50% below the median income, Canada's poverty rate in 2000 was 12%. Sweden and Finland had much lower poverty rates at 6% and 4.5% respectively, but the U.S. had a higher poverty rate of 16%.[1304]

Raphael notes that "one key indicator of public commitment to supporting citizens is percentage of Gross Domestic Product (GDP) transferred to citizens through programs, services, or cash benefits."[1305] He also points out that "nations that transfer a greater proportion of resources are more likely to have lower poverty rates than those who transfer a smaller proportion of resources."[1306] Referring to data from the Organisation of Economic Co-operation and Development (OECD), Raphael notes that the average public expenditure by high-income countries in 2001 was 21% of GDP.[1307] Canada has relatively low tax rates—ranking 24th among 30 industrialized nations—and spends 17.8% of GDP on public expenditures. This compares with the higher-taxed countries of Denmark, spending 29.2% of GDP, and Sweden, spending 28.9% of GDP. In 2001, Canada spent 6.7% of GDP on health, 4.8% on old age, 0.8% on incapacity-related benefits, and 0.9% on family benefits.

Smeeding also reports that Canada spends 5.8% of its GDP on social benefits for non-elderly persons—Sweden (11.6%) and Finland (10.9%) spend a much higher percentage, while the U.S. (2.3%) spends a very small percentage.[1308]

Income Study Working Paper Series, Working Paper No. 419, 2005; accessed March 2008; available from http://www.lisproject.org/publications/liswps/419.pdf.

1304 Ibid., accessed.

1305 Raphael. *Poverty and Policy in Canada. Implications for Health and Quality of Life*. p. 342.

1306 Ibid.

1307 Ibid. citing Organisation for Economic Co-operation and Development (OECD). *Social Expenditure Database 2001*, 2004; accessed 2004; available from http://www.oecd.org/els/social/expenditure.

1308 Smeeding. *Poor People in Rich Nations: The United States in Comparative Perspective*, accessed.

PART 4: CONCLUSION AND RECOMMENDATIONS

8. Conclusion

This literature review explored the technical background information that would be required to produce a report assessing the health costs associated with poverty in Canada. As such, it detailed methodologies used in four previous studies that assessed broad social and economic costs of poverty. It also explored methodologies used in socioeconomic health disparity studies, as well as general cost of illness studies. Basic information on Canadian and international poverty measures were reported, and evidence was found for the association of poverty with various health indicators. In addition, it briefly reviewed several groups that are especially vulnerable to the health impacts of poverty, and other social issues that influence the relationship between poverty and health.

Despite its importance to policy makers and others, there is currently no comprehensive study that quantifies the economic costs of poverty in Canada. According to David Hay of the Canadian Policy Research Networks, economic arguments in support of action on the social determinants of health, which recognize the interdependence of economic and social policies, are growing in importance in Canada and Europe.[1309] Work that is currently taking place at the Public Health Agency of Canada, through its health disparities project, to develop a rationale for investing in the social determinants of health, and other work underway at the provincial level to develop poverty reduction strategies, make the completion of a full cost of poverty study for Canada both timely and relevant.

This literature review focused on two main aspects—the methodology used in other cost of poverty studies and empirical evidence for the association between poverty and health. Basically it found that there is sufficient evidence in the literature to enable calculations of the excess burden of disease that can be attributable to poverty in Canada. Relative risk ratios were found that can be used to calculate poverty attributable fractions (PAF) to estimate the excess burden of illness attributable to poverty. This information can be used to estimate the economic costs of poverty in terms of direct health care costs and indirect costs measured in terms of lost production from illness or premature death—the value of years of life lost due to premature death (mortality costs), and the value of activity days lost due to short-term and long-term disability (morbidity costs due to long- and short-term disability), which are the categories used by Health Canada in costing the economic burden of illness in Canada (EBIC).[1310]

However, because this review focused on the health costs of poverty, more work is needed to find empirical evidence in the literature of the portion of costs of other social issues that could be attributed to poverty and used to estimate the excess costs that poverty generates in these areas. Social issues that could be considered are low educational attainment, crime, housing and homelessness, food insecurity, environmental affects, unemployment and underemployment, and

[1309] Hay, David I. *Economic Arguments for Action on the Social Determinants of Health*, Canadian Policy Research Networks and Public Health of Canada, 2006; accessed Nov 2007; available from http://www.cprn.org/documents/46128_en.pdf.
[1310] Health Canada. *Economic Burden of Illness in Canada, 1998*, 2002; accessed Nov 2007; available from http://www.phac-aspc.gc.ca/publicat/ebic-femc98/pdf/ebic1998.pdf.

spending on social assistance programs.

In addition, more research is needed to evaluate potential benefits of poverty reduction strategies in relation to costs, and to understand the portion of the annual costs that fall to business, governments, the health care sector, and individual citizens through their taxes.

8.1 Methodologies reviewed

In Chapter 2 of this report, we reviewed the following cost of poverty studies in some detail, emphasizing the methodologies used. These four reports were the only comprehensive studies of the topic found in the literature. All of the reports are recent—the two from the United States were completed in 2006 and 2007, the report from Europe was completed in 2007, and the report from Calgary, Alberta in Canada was completed in 2004:

1. Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. 2007. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*[1311]

2. Shiell, Alan, and Jenny Zhang. 2004. *The External Costs of Poverty: A Conservative Assessment* [Calgary][1312]

3. Oppenheim, Jerrold, and Theo MacGregor. 2006. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*[1313]

4. Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. 2007. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*[1314]

All four studies used very different methodologies and assumptions, but they all reached the general conclusion that poverty is very expensive:

- Holzer, et al. found that poverty costs the U.S. $500 billion per year (US$2007) or $540

[1311] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.
[1312] Shiell, Alan, and Jenny Zhang. *The External Costs of Poverty: A Conservative Assessment*, Centre for Health and Policy Studies, University of Calgary, and Institute of Health Economics, 2004; accessed November 2007; available from http://tamarackcommunity.ca/downloads/vc/cal_costsofpoverty04.pdf.
[1313] Oppenheim, Jerrold, and Theo MacGregor. *The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans*, Entergy, 2006; accessed October 2007; available from http://www.entergy.com/global/our_community/advocate/Poverty_book.pdf.
[1314] Mackenbach, Johan P., Willem Jan Meerding, and Anton E. Kunst. *Economic Implications of Socio-Economic Inequalities in Health in the European Union*, Health and Consumer Protection Directorate-General, European Commission, 2007; accessed October 2007; available from http://ec.europa.eu/health/ph_determinants/socio_economics/documents/socioeco_inequalities_en.pdf.

billion Canadian ($2008, adjusted for currency exchange and inflation).[1315]

- Shiell and Zhang estimated that poverty costs Calgary between $8.3 million and $56.8 million per year ($2003), or between $9 million and $62 million in $2008.

- Oppenheim and MacGregor estimated that poverty cost the U.S. $1.5 trillion (US$2005), or approximately $2 trillion in $2008 Canadian dollars.[1316]

- Mackenbach et al. estimated the cost of socioeconomic inequalities in health for the EU-25 countries as a whole. They did not summarize their costs because they were for different categories. For example, they calculated the cost of social security benefits (unemployment and disability payments), which are considered to be transfers rather than costs. However, for descriptive illustration, their costs totaled €1.4 trillion (€2004), which is the equivalent of $2.5 trillion in 2008 Canadian dollars.[1317]

All four studies used different indicators and methodologies:

- Holzer et al. estimated lost earnings of adults in the work force who grew up in poverty, victimization costs of violent crime, and excess health costs, which were calculated as additional expenses for health care, and costs based on self-reported Quality Adjusted Life Years (QALY). They compared the costs for adults who had grown up in poverty with a reference group consisting of adults with household incomes at twice the U.S. poverty line.

  To estimate the cost of crime, the authors used victimization costs of street crime to calculate costs of crime because they make an assumption that poverty only matters for street crime (although they admit that this is not necessarily the case).[1318] They also did not include protective measures of crime such as spending on policing, prisons, and private security, since they assumed these costs do not change much with marginal changes in crime rates. They attributed 20% of the annual incidence of crime to poverty, which they then increased to 40% to adjust for survey bias (i.e., lack of reporting). They also adjusted the victimization costs of street crime, which they did not itemize, by 40% to account for "hereditary influences."[1319]

- Shiell and Zhang did not include either unemployment costs since they argued that poverty is a consequence of unemployment, rather than a cause, or social assistance payments, which

[1315] Using exchange rate of 1.0604.
[1316] Using exchange rate of 1.2471.
[1317] Using exchange rate of 1.6711.
[1318] Holzer, Harry J., Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. *The Economic Costs of Poverty in the United States: Subsequent Effects of Children Growing up Poor*, Institute for Research on Poverty, Discussion Paper no. 1327-07 2007; accessed October 2007; available from http://www.americanprogress.org/issues/2007/01/pdf/poverty_report.pdf.
[1319] Research on "hereditary" influences associated with poverty, or the "intergenerational transmission of poverty," has found this topic to be contentious and the evidence inconclusive. Therefore, we do not recommend the use of hereditary influences in a full cost of poverty study. See: Bird, Kate. *The Intergenerational Transmission of Poverty: An Overview*, London, U.K.: Chronic Poverty Research Centre 2007; accessed March 2008; available from http://www.chronicpoverty.org/pdfs/99Bird.pdf.

are considered to be transfers. They also made a distinction between "bad consequences" and resources that are the additional economic needs required to support those in poverty. Bad consequences, such as low-birth weight or basic costs of illness deemed to be caused by poverty, were not included. Only those forgone resources that added an additional burden to social systems were counted.

They included an additional burden on the health care system by individuals living in poverty, which consisted of additional physician consultations and excess days spent in the hospital. They also included costs per high school drop out, excess costs to the criminal justice system, and costs of program support, such as administrative expenses to process income support payments.

Shiell and Zhang compared individuals in the lowest income quintile with those in the 2nd income quintile (or reference group).

- Oppenheim and MacGregor included factors not considered to be costs by the other researchers, such as transfers from government programs, direct costs to victims of crime, and some unemployment costs. They did not compare those who were poor with a reference group, but used published costs and estimated costs of poverty based (somewhat arbitrarily) on the proportion of the cost attributable to poverty.

  The main categories used were crime, health, unemployment, and antipoverty investments. For crime, they used many categories including the value of stolen motor vehicles, costs to victims, intangible pain and suffering and reduced quality of life, and attributed 50% of the costs to poverty. For health costs, they used the total private and public spending on those who were uninsured, simply assumed that all of those who are poor were uninsured, and attributed 100% of the cost to poverty. For costs of unemployment they used a cost found in another study, reduced the wage it was based on from $11.20 per hour to $5.15 per hour, and added unemployment benefit payments and job training. Anti-poverty investment costs were public and private (charity) expenses for a variety of programs such as homeless shelters, public housing, legal aid, social assistance job training programs, and so forth.

- Mackenbach et al. was the only study to use cost of illness methodology, which included estimating risk ratios for mortality rates, odds ratios for "less than good" self-assessed health, and population attributable fractions. They used education as the socioeconomic indicator and separated the population into a simple dichotomy—those aged 25–65 (working age) who had low educational attainment (high school drop outs and lower) and those aged 25–65 who had a high educational attainment (secondary completion and higher). To measure inequalities, they used two health indicators—mortality rates and self-assessed health (for morbidity rates). They also estimated years of life gained (life expectancy), and morbidity free life expectancy and years of life gained. Although they didn't directly indicate mortality or morbidity rates by cause of death or type of disease, they did note the socioeconomic variations seen in the patterns related to the cause of death or disease.

  To estimate costs, the authors applied the results of the inequality measurements to four categories: health as a capital good, health as a consumption good, health care utilization, and social security benefits. However, because of the different categories, they did not sum the results. For health as a capital good they used the human capital approach to value health through its effects of salaries and wages (total €141 billion– €2004); for health as a consumption good, which they noted implied satisfaction or quality of life, they applied a "willingness to pay" methodology, applied a loss of 15 years per death due to inequalities, and valued each life saved at €862,500 (total €980 billion–€2004). The value of each life saved is approximately $1.6 million in CDN$2008.[1320]

Physician and hospital use were used to estimate health care utilization. These two costs were said to be one half of the total cost for health care utilization, so the estimates were doubled to include all of health care costs (total €177 billion–€2004). Finally, they estimated social security benefits, including only unemployment and disability benefits. Although unemployment and disability benefits are transfers, the authors argued that they may have an indirect effect on the economy (total €60 billion–€2004).

8.1.1 Examples of assumptions made in the studies

Because of a lack of data, all of the authors made various assumptions, some of which were admittedly arbitrary. Although the authors made different assumptions, the following list illustrates a few examples of assumptions made by Shiell and Zhang in order to arrive at a cost estimate:

- Because the data used was sorted by neighbourhood income quintile, rather than by individuals and individual incomes, Shiell and Zhang needed to make an assumption about the income of individuals who live in the lowest income quintile neighbourhood. They assumed that the individuals who were in the lowest income quintile all lived in the lowest quintile of neighbourhoods, which they noted actually understates the costs.

- Shiell and Zhang assumed that if the incomes of those in the lowest quintile reached that of those in the 2nd lowest quintile, the difference between the two lowest quintiles would represent the cost savings.

- Shiell and Zhang used a 1992 Conference Board of Canada report to estimate the costs of dropping out of high school. That report estimated that 5.1% of students not living in poverty drop out of high school, and that 12.9% of students living in poverty drop out. The authors assumed that the percentages from 1992 were the same in 2003 and applied the rates to Calgary in 2003. The cost per drop out, which was $24,840 ($1989), was converted to 2003 constant dollars and used to estimate costs.

- The authors assumed that the percentages found in one place (e.g. Winnipeg or Manitoba) could apply to the percentages in the place being measured (e.g., Calgary). This is an approach often used. For example, Statistics Canada calculated Health Adjusted Life Years (HALY) at birth by income group and gender for Canada and the provinces for 2001.[1321] The

[1320] Using exchange rate of 1.6711.
[1321] Statistics Canada. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy (HALE)*,

calculation is based on the work by Wilkins et al. who used 1996 life tables to calculate life expectancy by income terciles, based on average incomes in each enumeration area (EA) in 1996. Statistics Canada applied the 1996 percentage of deaths in each income tercile to the 2000/2001 life tables.

- Shiell and Zhang could not find a significant association between poverty and crime, and noted that those who were poor were not more likely to engage in illegal activities. Therefore, they arbitrarily attributed 1% of the criminal justice system costs to poverty.

It is likely that a full cost of poverty study would also need to use similar assumptions since many of the relative risk ratios that were found in the literature, and that are needed to calculate PAFs, are based on neighbourhood income quintiles, and are based on data that are (approximately) 10 years out of date. The assumption is that the same ratios apply today. However, PAFs must be recalculated based on more recent prevalence data.

8.2 Evidence for the association between poverty and health

Many studies noted that there is an association between poverty and poor health outcomes. However, very few actually used poverty or low income as the variable of interest or actually calculated the relative risk ratios. In addition, when risk ratios were calculated, the studies were often not comparable since they used different measures of income. For example, studies used both before-tax and after-tax income; sorted income by neighbourhood incomes, household incomes, or individual incomes; and divided income levels by terciles, quartiles, quintiles, or deciles.

In addition, the reference groups that were used to compare groups living in poverty were often different. As noted, Holzer et al. compared adults who grew up in poverty with adults who had incomes at twice the U.S. poverty line. Shiell and Zhang compared individuals in the lowest income quintile with those in the 2nd lowest income quintile. Mackenbach et al. used a simple dichotomy comparing individuals having low educational attainment with individuals having high educational attainment. Wilkins et al. compared health outcomes of those living in the highest-income neighbourhood quintiles with the outcomes of those living in the other four income-quintile neighbourhoods combined.

This literature review found potentially useable relative risk ratios that estimate the association between poverty and health in Canada for the following categories:

- **Tobacco use** – Cora Lynn Craig et al., using 2000/2001 CCHS data, found those living in households in the lowest income quintile had higher rates of daily smoking (32%) than those living in households with higher incomes (22%).[1322]

Catalogue no. 82-401-XIE, 2006; accessed Dec 2007; available from http://www.statcan.ca/english/freepub/82-401-XIE/2006000/considerations/hlt/37bhlt.htm.

[1322] Craig, Cora Lynn, Christine Cameron, and Adrian Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*,

- **Obesity** – LePetit and Berthelot, writing for Statistics Canada, used the National Population Health Survey (NPHS), which is a longitudinal survey that interviewed the same individuals every two years from 1994/1995 to 2002/2003, calculated adjusted risk ratios for overweight men and women aged 20 to 56 years becoming obese by income quintiles.[1323] Overweight individuals in low-income households were more than twice as likely to become obese than individuals in high-income households.

- **Alcohol and illicit drug use and misuse** – In 2006, Jurgen Rehm et al. of the Canadian Centre on Substance Abuse (CCSA) used mainly 2002 data to produce a major report on the costs of tobacco, alcohol, and illegal drug use in Canada.[1324] The report provides the most comprehensive and up-to-date information on this subject available in Canada.

  Rehm et al. used prevalence data on levels of alcohol consumption from the 2003/2004 Canadian Addiction Survey (CAS) and did not find heavy drinking to be significantly correlated with income adequacy. However, 18.2% of those with the lowest income adequacy were heavy drinkers, compared with 16.1% in the highest level. Among respondents with low income, 8.7% reported weekly heavy drinking and 26.6% reported monthly heavy drinking, compared to 6.7% and 25.5% respectively among those with the highest incomes.

  Illicit drugs included in the CAS were cannabis, heroin and other opiates, cocaine and crack, amphetamines, and hallucinogens. Cannabis use was actually highest in the highest income category. When use was estimated by income adequacy, the percentage of respondents reporting use of any of the other illicit drugs (cocaine, amphetamines, ecstacy, hallucinogens, and heroin) was not consistent between lifetime and past-year use. Of those reporting lifetime use, the percentage of users in the lowest income category (17.9%) was less that the percentage of the highest income users (19.4%). However, among those who report past-year use, the percentage was higher among the lowest income users (4.5%) than among the highest income users (2.8%).

  The odds ratios of those in the lowest compared with the highest income groups who reported one or more types of harm from illicit drug use, showed that those in the lowest income group had significantly more harm associated with their drug use than those who are in the highest income group. In the lowest income group 18.9% of past-year users and 36.3% of lifetime users reported one or more harms, compared with 13.1% of past-year users and 17.8% of lifetime users in the highest income category.

- **Self-rated health –** Statistics Canada reports self-rated health by gender, but special

Canadian Population Health Initiative and the Canadian Institute for Health Information, 2005; accessed Dec 2007; available from http://secure.cihi.ca/cihiweb/products/Sociodemographic_Lifestyle_e.pdf.

[1323] LePetit, Christel, and Jean-Marie Berthelot. *Obesity: A Growing Issue*, Statistics Canada, Catalogue No. 82-618-MWE2005003, 2005; accessed Dec 2007; available from http://www.statcan.ca/english/research/82-618-MIE/2005003/pdf/82-618-MIE2005003.pdf.

[1324] Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/.

tabulations are needed to access self-rated health data by income. However, the report, *Statistical Report on the Health of Canadians,* examines self-rated health status data from the 1996/1997 NPHS and reports results by income.[1325]

Stephane Tremblay et al. used data from the 2000/2001 CCHS to examine both individual and regional socioeconomic contexts and health.[1326] Of those who reported fair or poor health the highest proportions were in the lowest (27.6%) and lower-middle (26.6%) income categories. In the upper-middle income category, which is used as the reference category to estimate odds ratios, 10.2% reported fair or poor health. In the highest income category 5.7% reported the same.

- **Chronic disease –** Chronic disease is most often studied in terms of mortality data, which the Heart and Stroke Foundation of Canada notes is primarily due to data availability.[1327] According to Raphael, cardiovascular disease is the disease that is most associated with low income among Canadians.[1328] However, he bases this observation on mortality data. The Canadian Cancer Society, Statistics Canada, and other organizations report annual cancer statistics with a lag time of several years. However, *Canadian Cancer Statistics* last reported cancer rates by income level in 1990.[1329]

  Cameron Mustard et al. examined age-specific socioeconomic differences in morbidity and mortality by education and household income for adults aged 15 years and over in Manitoba.[1330] The study linked data from records of health care utilization and vital statistics to the 1986 census. Lethbridge and Phipps used data from the 2000 National Longitudinal Survey of Children and Youth (NLSCY) to examine the role that poverty plays with regards to asthma rates in children between the ages of 2–7 years living in the Maritimes.[1331] The results showed that children living in chronic poverty in the Maritimes have asthma rates

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[1325] Health Canada. *Statistical Report on the Health of Canadians*, Health Canada, Statistics Canada, Canadian Institute for Health Information, 1999; accessed August 2002; available from http://www.hc-sc.gc.ca/hppb/phdd/report/stat/pdf/english/all_english.pdf.

[1326] Tremblay, Stéphane, Nancy Ross, and Jean-Marie Berthelot. "Regional Socio-Economic Context and Health," *Health Reports*, 2002, vol. 13: 33-44. accessed Nov 2007; available from http://www.statcan.ca/english/freepub/82-003-SIE/2002001/pdf/82-003-SIE2002003.pdf.

[1327] Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

[1328] Raphael, Dennis. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, Toronto: North York Heart Health Network, 2001; accessed Nov 2007; available from http://action.web.ca/home/narcc/attach/Inequality%20is%20Bad%20for%20Our%20Hearts%20-%202001%20Report%5B1%5D.pdf.

[1329] Canadian Cancer Society. *Canadian Cancer Statistics 2007*, Canadian Cancer Society, National Cancer Institute of Canada, Statistics Canada, Provincial/Territorial Cancer Registries, and Public Health Agency of Canada, 2007; accessed Jan 2008; available from http://www.cancer.ca/vgn/images/portal/cit_86751114/36/15/1816216925cw_2007stats_en.pdf.

[1330] Mustard, Cameron A., Shelley Derksen, Jean-Marie Berthelot, Michael Wolfson, and Leslie L. Roos. "Age-Specific Education and Income Gradients in Morbidity and Mortality in a Canadian Province," *Social Science & Medicine*, 1997, vol. 45, no. 3: 383-397.

[1331] Lethbridge, Lynn N., and Shelley A. Phipps. "Chronic Poverty and Childhood Asthma in the Maritimes Versus the Rest of Canada," *Canadian Journal of Public Health*, 2005, vol. 96, no. 1: 18-23.

(20.9%) more than 30% higher than the national average (12.4%).

For diabetes, which has consistently been associated with low-income levels,[1332] Janet Hux and Mei Tang found a significant socioeconomic gradient with higher rates of diabetes among lower income quintiles, especially in the 35–64 year age group in Ontario.[1333]

The Heart and Stroke Foundation of Canada presents prevalence of type 2 diabetes data from the 2000/2001 CCHS by income adequacy, which divides household income into quartiles. It found that men and women in the lower and lower middle categories had a higher prevalence of diabetes (7.2% and 6.9%, respectively) than those in the upper middle and highest income categories (3.9% and 2.9%, respectively). Also using data from the 2000/2001 CCHS, Craig et al. found that the chance of having diabetes decreased with higher income.[1334] They calculated odds ratios that were only based on two income groups—low income and middle/high-income.

- **Unintentional traumatic injuries –** Evidence of the associations between injuries and low socioeconomic status are mixed. Generally, there is a strong association between low income and mortality rates due to injuries, but several studies have found the association with morbidity rates weak. According to the Alberta Centre for Injury Control and Research, generally injuries due to motor vehicle crashes and sports and recreation are more likely to be experienced by individuals with high socioeconomic status, because of their higher rates of participation in these types of activities.[1335]

  According to Wilkins et al., those living in the poorest income quintile suffered higher injury mortality rates—other than from motor vehicle crashes and suicides— for injuries such as falls, poisoning, drowning, fires, etc. than did those living in the highest income quintile.[1336] However, income differences in mortality rates for pedestrians struck by motor vehicles show very little income difference, and the mortality of occupants in motor vehicle crashes is reversed by income difference, with those in the highest income quintile having the highest rates. Wilkins et al. calculated the age-standardized mortality rates per 100,000 population, and the risk ratios and risk differences for injuries by gender and neighbourhood income quintile for urban Canada between 1971 and 1996.

  Catherine Birken et al. examined mortality and census tract data to determine the influence of socioeconomic status—measured by the proportion of families living below the low-income

[1332] Raphael, Dennis, Susan Anstice, Kim Raine, Kerry R. McGannon, Syed Kamil Rizvi, and Vanessa Yu. "The Social Determinants of the Incidence and Management of Type 2 Diabetes Mellitus: Are We Prepared to Rethink Our Questions and Redirect Our Research Activities?," *Leadership in Health Services*, 2003, vol. 16, no. 3: 10-20.
[1333] Hux, Janet E., and Mei Tang. "Patterns of Prevalence and Incidence of Diabetes," in *Diabetes in Ontario: An ICES Practice Atlas*, ed. Hux, Janet E., Gillian Booth, P.M. Slaughter and A. Laupacis, Chapter 1. Toronto: Institute for Clinical Evaluative Sciences, 2003; accessed Nov 2007; available from http://www.ices.on.ca/file/DM_Chapter1.pdf.
[1334] Craig, Cameron, and Bauman. *Socio-Demographic and Lifestyle Correlates of Obesity—Technical Report on the Secondary Analyses Using the 2000–2001 Canadian Community Health Survey*, accessed.
[1335] Alberta Centre for Injury Control and Research. *Socioeconomic Status and Injury*, 2006; accessed Dec 2007; available from http://www.acicr.ualberta.ca.
[1336] Wilkins, Russell, Jean-Marie Berthelot, and Edward Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

cut-off level in a census tract—on trends in the rates of death of children aged 14 and under from unintentional injuries in urban Canada from 1971–1998.[1337] In 2002, Marni Brownell et al. also reported income differences for childhood injuries in Manitoba.[1338]

- **Mental health –** According to Carles Muntaner et al., who conducted a review of the literature on the associations between socioeconomic position (SEP) and major mental disorders, there is more of an association between SEP and depression than between SEP and anxiety disorders because the diagnosis for these disorders has been subject to more fluctuation.[1339] In Canada, Beaudet reports that in the 1994/1995 NPHS, men in the lowest household income quartile were twice as likely as men in the highest quartile to experience depression, and that 10% of women in the lowest quartile experienced major depression compared with 7% of women in the highest quartile.[1340] Using the 2000/2001 CCHS, Katherine Smith et al. of the University of Toronto calculated the odds ratios for depression among men and women with low-income vs. those with middle/high income.[1341]

  Russell Wilkins et al. of Statistics Canada associated neighbourhood income quintiles with mental health for urban Canada between 1971 and 1996.[1342] They calculated the age-standardized mortality rates due to mental disorders and suicide per 100,000, by gender and neighbourhood income quintile, risk ratios and risk differences comparing the highest and lowest quintiles, and population attributable risk ratios.

- **Mortality –** Data on income and other measures of socioeconomic status are not routinely collected at the time of death in Canada, so most reports on the association between income and mortality from various diseases link neighbourhood data from the census tract of the last known residence of the deceased with mortality data in order to estimate the individual's income.[1343]

  One of the most important and widely cited studies on the relationship between poverty or low income and mortality patterns is that conducted by Wilkins, Berthelot, and Ng of Statistics Canada.[1344] Wilkins et al. calculated the age-standardized mortality rates per 100,000 and the risk ratio and risk difference, by gender and neighbourhood income quintile

1337 Birken, Catherine S., Patricia C. Parkin, Teresa To, and Colin Macarthur. "Trends in Rates of Death from Unintentional Injury among Canadian Children in Urban Areas: Influence of Socioeconomic Status " *Canadian Medical Association Journal*, 2006, vol. 175, no. 8: 867-868.
1338 Brownell, Marni, David Friesen, and Teresa Mayer. "Childhood Injury Rates in Manitoba. Socioeconomic Influences," *Canadian Journal of Public Health*, 2002, vol. 93, no. S2: S50-S56. p. S55.
1339 Muntaner, Carles, William W. Eaton, Richard Miech, and Patricia O'Campo. "Socioeconomic Position and Major Mental Disorders," *Epidemiologic Reviews*, 2004, vol. 26: 53-62.
1340 Beaudet, Marie P. "Depression," *Health Reports*, 1996, vol. 7, no. 4: 11-24.
1341 Smith, Katherine L.W. Smith, Flora I. Matheson, Rahim Moineddin, and Richard H. Glazier. "Gender, Income and Immigration Differences in Depression in Canadian Urban Centres," *Canadian Journal of Public Health*, 2007, vol. 98, no. 2: 149-153.
1342 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
1343 Raphael. *Inequality Is Bad for Our Hearts: Why Low Income and Social Exclusion Are Major Causes of Heart Disease in Canada*, accessed.
1344 Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."

for urban Canada between 1971 and 1996 for the following: ischemic heart disease; cirrhosis of the liver; uterine cancer; lung, breast and prostate cancer; diabetes; perinatal conditions; pedestrians in motor vehicle traffic collisions; motor vehicle collision occupants; injuries except motor vehicle traffic accidents and suicide; suicide; mental disorders; infectious diseases; and ill-defined conditions. They also calculated infant mortality rates and life expectancy by neighbourhood income quintile.

Rate ratios were calculated by dividing mortality rates for the poorest quintile by mortality rates for the richest quintile, and rate differences were calculated by subtracting the mortality rate for the richest quintile from that for the poorest quintile. Excess mortality was defined as the age-standardized mortality rate for the total population less the rate of the richest quintile. They also used these ratios to calculate population attributable fractions comparing the richest quintile with the total quintiles.

- **Health-adjusted life expectancy (HALE) –** Using data from the same Wilkins et al. study noted above, Statistics Canada has calculated HALE at birth by income group and gender for Canada and the provinces for 2001.[1345]

- **Potential years of life lost (PYLL)** – Wilkins et al. also estimated potential years of life lost and found that in 1996, PYLL from birth to age 74 was highest for all cancers (30.9%), both intentional and unintentional injuries (19.2%), and circulatory diseases (17.6%).[1346] Wilkins et al. define income-related excess PYLL "as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population."[1347] Therefore, the estimate for excess PYLL includes four quintiles related to the richest quintile, rather than only considering the poorest quintile in relation to the richest.

- **Health service use –** Dunlop, Coyle, and McIsaac use data from the 1994 NPHS to calculate odds ratios for visits to general practitioners and specialists by household income, adjusted for size of household and divided by quintiles.[1348] Those with lower incomes were more likely to be more frequent users (more than six visits a year) of primary physician services than those with higher incomes. On the other hand, those with higher incomes were more frequent users of specialist services.

  Kephart, Thomas, and Maclean linked data from the 1990 Nova Scotia Nutrition Survey with the Nova Scotia Medical Services Insurance Physicians' Services claims database from

[1345] Statistics Canada. *Comparable Health Indicators 2006. 37-HLT Health Adjusted Life Expectancy.* For an example of a study using HALY as an outcome measure, see Boswell-Purdy, Jane, William M. Flanagan, He_le_ne Roberge, Christel Le Petit, Kathleen J. White, and Jean-Marie Berthelot. "Population Health Impact of Cancer in Canada, 2001," *Chronic Diseases in Canada*, 2007, vol. 28, no. 1-2: 42-55. This study does not address low-income heath disparities.
[1346] Wilkins, Berthelot, and Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996."
[1347] Ibid. p. 10.
[1348] Dunlop, Sheryl, Peter C. Coyle, and Warren McIsaac. "Socio-Economic Status and the Utilisation of Physicians' Services: Results from the Canadian National Population Health Survey," *Social Science and Medicine*, 2000, vol. 51: 123-133.

1991–1994 to examine use of physician services by household income.[1349] They calculated the ratio of excess physician service use associated with income inequality, assuming that those in the lowest income category had the same rate of physician use as those in the highest income category.

Veugelers and Yip identified heavy users of the health care system in Nova Scotia as those who had a level of usage greater than the median level of usage.[1350] However, they used non-standard income groupings. For example, they calculated odds ratios for health service use by income group for age and gender by comparing those with an income of less than $20,000 with a high-income group having an income of more than $40,000.

[1349] Kephart, G., V. Thomas, and D. MacLean. "Socioeconomic Differences in the Use of Physician Services in Nova Scotia," *American Journal of Public Health*, 1998, vol. 88, no. 5: 800-803.
[1350] Veugelers, P.J., and A.M. Yip. "Socioeconomic Disparities in Health Care Use: Does Universal Coverage Reduce Inequalities in Health?," *Journal of Epidemiology and Community Health*, 2003, vol. 57: 424-428.

9. Recommendations

9.1 Comprehensive cost of poverty study

The purpose of this literature review was to evaluate the possibility and feasibility of conducting a comprehensive cost of poverty study for Canada. As a first step, models of cost of poverty studies were explored and empirical evidence of the associations between poverty and health in Canada were found. In principle, estimates of the costs of poverty could be constructed for a wide variety of health outcomes, including behavioural risk factors, morbidity measures of self-rated health, the presence of one or more chronic conditions, disability or the number of days not worked due to illness, restrictions on daily activities, and a variety of mortality indicators. However, there are a number of challenges to such a study, and as noted by the authors of all of the cost of poverty studies reviewed, there are many uncertainties in every step of the analysis. These uncertainties are evidenced in estimations of the magnitude of health inequalities in Canada, in estimations of the proportions of health and other outcomes that can be attributed to poverty, and in potential estimations of the effect of health disparities on economic outcomes.

Ideally, a rigorous costing study would take the cost of illness approach used by Blakely et al., and would have access to up-to-date relative risk ratios and population attributable fractions that identify the proportion of health and other social issues that can be attributed to poverty. However, comprehensive and recent health disparity data are not available. Therefore, a number of choices and assumptions need to be made concerning the format of a costing study, the indicators to include, and the relative risk ratios to use.

9.1.1 Relative risk ratios, population attributable fractions, and data needs

In order to determine the health costs of poverty in Canada, data needs to be collected from a broad range of categories—income, health and other social issues, and economic costs. There are no specific disparity indicators in Canada, but basic data is, for the most part, available through Statistics Canada.

Generally, the data required include those for poverty levels and the prevalence of low-income in the general population and in specific vulnerable groups. Also needed are data for a multitude of health indicators ranging from self-rated health to chronic disease prevalence, mental health status, injuries, and mortality patterns. In addition, data on relative risks and population attributable fractions, which estimate the proportion of poor health that can be attributed to poverty, must be collected and/or calculated. The data needs for this costing study are similar to those needed for summary measures of health, about which Flanagan et al. of Statistics Canada note:

> Estimating summary measures of health requires a wide variety of data including: population counts; incidence and mortality rates; life expectancies; cause-specific and observed survival; distributions, durations, and preference scores across a multitude of

health states; and risk factor data to estimate population attributable fractions (PAF). Disaggregating by age group and sex further explodes the quantity of data.[1351]

For a cost of poverty report, we could also add to the above list: “poverty” to the risk factor data, “by low-income measures” to the disaggregating step, economic costing data, and data for a number of years to assess trends for all of the indicators. As noted, there are no health disparity indicators commonly reported in Canada, and data collection is complicated by the fact that many of the data are available only for provincial levels and are not centrally located. We have relied on previous reports that have used data collected by linking various databases such as mortality and health surveillance databases, and provincial, census, postal code, and health survey data.

Shelley Phipps argues that despite the limitations in poverty measures, the best readily available measure of individual socioeconomic status, “consistent with a clear consensus in the literature,” is “household income after taxes and transfers, appropriately adjusted to account for differences in family size and assigned to each individual within the family.”[1352] While household income is a widely used measure in Canada, it is often used inconsistently, which makes comparisons between reports difficult. For example, relative risk ratios were found sporadically in the literature, but these were based on different poverty and income measures such as before-tax and after-tax measures in different years, and sorted by terciles, quartiles, quintiles, or deciles.

Wilkins et al. of Statistics Canada produced one of the most comprehensive studies that estimated relative risk ratios for urban Canada mortality indicators. In order to use these data, an assumption would need to be made that the relative proportions found in the 1996 data for urban Canada can be applied to more recent prevalence data for all of Canada to create new PAFs. This is an approach that has been taken by Statistics Canada as well as the authors of all of the costing studies reviewed. For estimating the cost of poverty, the relative ratios from 1996 could be used for both mortality and morbidity, because more recent rates have not been calculated and since the rates did not, for the most part, dramatically change in the 1990s. However, prevalence and incidence rates, as well as population attributable fractions would need to be updated.

In addition, in order to use the ratios calculated by Wilkins et al. as well as other data distributed by neighbourhood income, an assumption similar to that made by Shiell and Zhang would need to be made. Because the data used in their study were sorted by neighbourhood income quintile, rather than by individuals and individual incomes, Shiell and Zhang needed to make an assumption about the income of individuals who live in the lowest income quintile neighbourhood. They assumed that the individuals who were in the lowest income quintile all lived in the lowest quintile of neighbourhoods. They noted that this is not the case in actuality and that making this assumption tends to produce low estimates.

[1351] Flanagan, William, Jane Boswell-Purdy, Christel Le Petit, and Jean-Marie Berthelot. "Estimating Summary Measures of Health: A Structured Workbook Approach," *Population Health Metrics*, 2005, vol. 3, no. 5: 1-12. accessed Dec 2007; available from http://www.pophealthmetrics.com/content/pdf/1478-7954-3-5.pdf (open access). p. 2.

[1352] Phipps, Shelley. *The Impact of Poverty on Health: A Scan of Research Literature*, Canadian Population Health Initiative, 2003; accessed Nov 2007; available from http://dsp-psd.communication.gc.ca/Collection/H118-11-2003-1E.pdf. p. i, emphasis in original.

A second comprehensive study by Rehm et al. of Statistics Canada produced useable data for tobacco, alcohol, and illegal drug use and misuse. RRs were also found in the literature for obesity, self-rated health, depression, and some chronic diseases such as diabetes. However, ratios for most chronic diseases and injury were based on mortality data linked to census tract, neighbourhood data, rather than on individual morbidity data.

An alternative approach, which was used in the Holzer et al. and Blakely et al. studies, limited the poverty association with health and other social issues to unadjusted measures of high and low income. For example, Holzer et al. used simple estimates of the relationships between poverty and the outcomes rather than estimates from studies that, in an attempt to isolate the effects, adjusted for factors correlated with poverty such as education or occupation. They noted that attempts to control for variables are mostly unsuccessful since the list of variables is almost always incomplete. In this alternative, special tabulations could be run by Statistics Canada that would generate income quintile data for the indicators chosen. Data for high- and low-income quintiles could then be used to estimate crude relative risk ratios and population attributable fractions. This approach could possibly be combined with the ratios found in the literature and could produce fairly rigorous estimates.

9.1.2 Indicators and format

Because of the complexity involved, the cost of poverty studies that were reviewed used fairly simple frameworks and a limited number of indicators. A study for Canada could be based on the Mackenbach et al. study, which was the only one to use relative risk ratios and the cost of illness methodology. This study only used indicators for mortality rates and self-assessed health for morbidity rates. It also included life expectancy, morbidity-free life expectancy, and years of life gained, but did not directly indicate mortality or morbidity rates by cause of death or type of disease. In addition, to estimate costs, the authors applied the results of the inequality measurements to four categories: health as a capital good which evaluated costs of lost productivity, health as a consumption good which evaluated quality of life costs, health care utilization, and social security benefits. However, the Mackenbach et al. study used education, rather than income, as the socioeconomic indicator, and a simple dichotomy that divided the population into high and low educational attainment categories, which is not specific enough to capture poverty levels. Therefore, it would not be comparable to a Canadian study.

9.2 Next steps

Because a major purpose of a cost of poverty study is to inform policy makers, health issues must be placed into a larger socioeconomic context. A comprehensive cost of poverty study would need to include indicators in social areas other than health, such as crime, education, unemployment, homelessness, food insecurity, the environment, and social assistance. Although Chapter 7 in this review briefly reviewed information on these social issues, a more comprehensive exploration of the literature in the field of social costs of poverty needs to be conducted. More research is required before definitive assessments can be made concerning the portions of the relevant social outcomes that can be attributed to poverty.

In addition, understanding the costs that poverty generates would be incomplete without also understanding the potential investment savings that could be produced with reductions in the costs of poverty. Investing in programs to reduce health and other disparities can have important economic benefits. Best practices for poverty reduction strategies used in other countries need to be reviewed with a view to ascertaining investment benefits that might be applied to Canada. For example, the British government has committed the country to specific poverty reduction strategies, with the result being that between 1999 and 2004, it removed 600,000 children from living in poverty.

Mackenbach et al. note that the quantitative benefits of policy options to reduce socioeconomic inequalities in health are not known. However, they approached this issue briefly in their report by estimating the savings that policies in Britain and the Netherlands to reduce disparities in infant mortality and life expectancy could produce if the targets were reached. They note that if Britain achieved its targets for 2010, it would reduce the economic impact of health inequalities by 10%. The economic benefits of policy strategies designed to reduce poverty are therefore an important component of a cost of poverty study, since reducing poverty is the ultimate objective.

In sum, before a definitive plan to estimate comprehensive costs of poverty for Canada can be developed, including which indicators to use, there must be a review of both the social costs of poverty other than health and the investment benefits of poverty reduction strategies.

A comprehensive study that estimates the costs that poverty generates and the potential benefitsof poverty reduction is an extremely complex, but worthwhile, endeavor. As previously noted, itis both timely and relevant to the wellbeing of not only those individuals and groups living in poverty in Canada but to Canadian society as a whole.

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APPENDICES

Table 50. International Classification of Disease (ICD), smoking-related diseases

Disease category	ICD-10	ICD-9	Comparability ratio
Malignant neoplasm			
Lip, oral cavity, pharynx	C00-C14	140-149	0.960
Oesophagus	C15	150	0.997
Stomach	C16	151	1.006
Pancreas	C25	157	0.998
Larynx	C32	161	1.005
Trachea, lung, bronchus	C33-C34	162	0.984
Cervix uteri	C53	180	0.987
Kidney and renal pelvis	C64-C65	189	1.000
Urinary bladder	C67	188	0.997
Acute myeloid leukemia	C92.0	205	1.012
Cardiovascular diseases			
Ischemic heart disease	I20-I25	410-414, 429.2	0.999
Other heart disease	I00-I09, I26-I51	390-398, 415-417, 420-429.1, 429.3-429.9	0.969
Cerebrovascular disease	I60-I69	430-438	1.059
Atherosclerosis	I70	440	0.964
Aortic aneurysm	I71	441	1.001
Other arterial disease	I72-I78	442-448	0.850
Respiratory diseases			
Pneumonia, influenza	J10-J18	480-487	0.698
Bronchitis, emphysema	J40-J42, J43	490-492	0.894
Chronic airway obstruction	J44	496	1.097

Notes: This table provides a list of diseases known to be attributable to smoking. The ICD is revised periodically to incorporate changes in the medical field. To date, there have been 10 revisions of the ICD. The information included in the table above are the 9th and 10th revisions, which reflect changes from 1979–1998 and 1999–present, respectively. The comparability ratios between the two sets of data are similar and included above.

Sources: U.S. Centers for Disease Control and Prevention (CDC). available at: http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm, Cited in Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.

Table 51. Smoking rates in Canada and Provinces, ages 15–24 years, 1999–2005

Region	1999	2000	2001	2002	2003	2004	2005	Percent decline
Canada	32	29	27	26	25	23	22	31
Newfoundland and Labrador	33	34	31	29	28	27	24	27
Prince Edward Island	33	29	27	27	26	24	22	33
Nova Scotia	33	31	29	27	27	26	20	39
New Brunswick	32	33	32	24	27	25	24	25
Quebec	38	34	30	34	31	29	27	29
Ontario	29	27	25	24	22	20	19	34
Manitoba	31	31	32	28	25	23	26	16
Saskatchewan	32	30	32	32	31	27	30	16
Alberta	33	27	29	24	25	22	23	30
British Columbia	25	23	22	18	17	20	19	24

Sources: Health Canada. (2006) Canadian Tobacco Use Monitoring Survey, Annual Results, 1999 – 2005, assessed June 2007, available from http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/ctums-esutc/index_e.html, Cited in Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.

Table 52. Smoking rates in Canada and Provinces, ages 25+, 1999–2005

Region	1999	2000	2001	2002	2003	2004	2005	Percent decline
Canada	24	24	21	20	20	19	18	25
Newfoundland and Labrador	27	26	24	23	22	21	20	26
Prince Edward Island	24	25	25	22	20	21	19	21
Nova Scotia	28	30	24	25	21	19	21	25
New Brunswick	25	25	24	20	24	24	21	16
Quebec	29	27	23	24	23	21	21	27
Ontario	22	22	19	19	19	18	16	27
Manitoba	22	25	24	20	20	20	21	5
Saskatchewan	24	28	24	19	22	21	20	17
Alberta	24	22	24	22	19	20	20	17
British Columbia	19	19	16	16	16	14	14	26

Sources: Health Canada. (2006) Canadian Tobacco Use Monitoring Survey, Annual Results, 1999 – 2005, assessed June 2007, available from http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/stat/ctums-esutc/index_e.html, Cited in Colman, Ronald, and Janet Rhymes. *The Cost of Tobacco Use in Nova Scotia*, Nova Scotia division of the Canadian Cancer Society and Genuine Progress Index Atlantic (GPI Atlantic), 2007; accessed Nov 2007; available from http://www.gpiatlantic.org/pdf/health/tobacco/costoftobacco-ns-2007.pdf.

Table 53. Relative Risk values for current and former cigarette smokers, morbidity and mortality for ICD-10 codes

Condition	Gender	Current	Former
Malignant Neoplasm:			
Oropharyngeal cancer	M/F	4.55	1.76
Oesophageal cancer	M/F	4.01	1.79
Pancreatic cancer	M/F	1.86	1.15
Laryngeal cancer	M/F	7.48	2.86
Urinary tract cancer	M	3.18	2.90
Stomach cancer	M/F	1.47	1.18
Cervical cancer	F	2.30	1.80
Renal cell carcinoma	M–F	1.59–1.27	1.37–1.09
Lung cancer (active smoker)	M–F	23.90–8.70	7.50–2.00
Cardiovascular Diseases:			
Atherosclerosis	M/F	2.54	1.82
Ischemic heart disease			
Cardiac arrhythmias			
Heart failure:			
Age < 45 yrs	M/F	2.50	1.45
45–59 yrs	M/F	1.90	1.45
60–69 yrs	M/F	1.50	1.45
70–79 yrs	M/F	1.20	1.12
80+ yrs	M/F	1.10	1.12
Cerebrovascular diseases			
Age < 65 yrs	M/F	3.12	1.30
> = 65 yrs	M/F	1.65	1.15
Pulmonary circulatory disease	M/F	9.80	6.70
Respiratory Diseases:			
Pneumonia / influenza	M/F	1.47	1.29
Chronic obstructive pulmonary disease	M/F	9.80	6.70
Conditions arising during the perinatal period:			
Low birthweight and short gestation (maternal use)	F	2.04	–
Sudden infant death syndrome (maternal use)	F	2.76	–

Source. Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/

Table 54. Smoking attributable fractions for mortality or morbidity by gender, age and disease category (ICD-10), Canada

Section 1

Condition / Cause of death	SAF % (all ages)		0 to 14 years		15 to 29 years		30 to 44 years	
	Male	Female	Male	Female	Male	Female	Male	Female
ACTIVE SMOKERS								
Malignant neoplasms								
Oropharyngeal cancer	57.0	47.2	–	–	0.630	0.561	0.669	0.608
Oesophageal cancer	48.4	38.0	–	–	0.518	0.476	0.550	0.500
Stomach cancer	16.1	11.7	–	–	0.128	0.185	0.189	0.164
Pancreatic cancer	17.1	12.7	–	–	0.216	0.190	0.230	0.196
Laryngeal cancer	67.0	59.1	–	–	0.686	0.642	0.727	0.677
Trachea, bronchus, and lung cancers	88.6	62.5	–	–	0.860	0.579	0.884	0.645
Cervical cancer	–	34.7	–	–	–	0.346	–	0.378
Urinary tract cancer	55.1	36.9	–	–	0.587	0.517	0.685	0.485
Renal cell carcinoma	26.5	06.8	–	–	0.245	0.084	0.280	0.103
Bladder cancer	67.9	51.3	–	–	0.599	0.524	0.647	0.570
Acute myeloid leukemia	15.7	13.1	–	–	0.185	0.174	0.218	0.202
Total	**60.9**	**43.2**						
Cardiovascular diseases								
Ischaemic heart disease								
Age < 45 years	51.9	45.1	–	–	0.466	0.406	0.521	0.453
45–59 years	42.2	37.3	–	–	–	–	–	–
60–69 years	29.1	23.4	–	–	–	–	–	–
70–79 years	10.0	7.3	–	–	–	–	–	–
80+ years	8.9	5.1	–	–	–	–	–	–
Pulmonary circulatory disease	83.3	76.5	–	–	0.808	0.792	0.831	0.813
Cardiac arrhythmias								
Age < 45 years	50.9	43.8	–	–	0.466	0.406	0.521	0.453
45–59 years	42.2	37.3	–	–	–	–	–	–
60–69 years	29.1	10.5	–	–	–	–	–	–

Condition / Cause of death	SAF % (all ages)		0 to 14 years		15 to 29 years		30 to 44 years	
	Male	Female	Male	Female	Male	Female	Male	Female
70–79 years	10.0	7.3	–	–	–	–	–	–
80+ years	8.9	5.1	–	–	–	–	–	–
Heart failure								
Age < 45 years	50.8	44.2	–	–	0.466	0.406	0.521	0.453
45–59 years	42.2	37.3	–	–	–	–	–	–
60–69 years	29.1	23.4	–	–	–	–	–	–
70–79 years	10.0	7.3	–	–	–	–	–	–
80+ years	8.9	5.1	–	–	–	–	–	–
Cerebro-vascular diseases								
Age < 65 years	39.2	35.2	–	–	0.388	0.391	0.428	0.376
>=65 years	14.3	9.6	–	–	–	–	–	–
Atherosclerosis	31.6	31.3	–	–	0.371	0.426	0.390	0.444
Total	**18.7**	**11.3**						
Respiratory diseases								
Pneumonia / Influenza	19.9	12.9	–	–	0.175	0.162	0.200	0.181
Chronic obstructive pulmonary disease	83.1	75.4	–	–	0.808	0.792	0.831	0.813
Total	**65.4**	**51.2**						
Conditions arising during perinatal period								
Low birthweight and short gestation	24.7	20.6	0.247	0.206	–	–	–	–
Sudden infant death syndrome	31.2	26.5	0.312	0.265	–	–	–	–
Total	**26.7**	**22.4**						
Injury								
Total Fire injury	**28.0**	**28.0**	–	–	0.280	0.280	0.280	0.280
Total Active Smokers	**37.8**	**24.0**						
PASSIVE SMOKERS								
Lung cancer	1.5	1.4	–	–	0.035	0.032	0.016	0.013
Ischaemic heart disease	1.6	1.2	–	–	0.040	0.036	0.018	0.015
Total Passive Smokers	**1.6**	**1.3**						

Section 2

Condition / Cause of death	45 to 59 years		60 to 69 years		70 to 79 years		80 and older	
	Male	Female	Male	Female	Male	Female	Male	Female
ACTIVE SMOKERS								
Malignant neoplasms								
Oropharyngeal cancer	0.662	0.614	0.581	0.519	0.509	0.460	0.476	0.362
Oesophageal cancer	0.547	0.503	0.495	0.432	0.456	0.382	0.441	0.318
Stomach cancer	0.191	0.167	0.171	0.138	0.151	0.114	0.147	0.091
Pancreatic cancer	0.221	0.194	0.186	0.153	0.153	0.122	0.143	0.092
Laryngeal cancer	0.729	0.686	0.678	0.616	0.653	0.571	0.640	0.505
Trachea, bronchus, and lung cancers	0.904	0.720	0.897	0.678	0.877	0.614	0.872	0.493
Cervical cancer	–	0.386	–	0.349	–	0.317	–	0.275
Urinary tract cancer	0.686	0.486	0.608	0.419	0.519	0.374	0.483	0.314
Renal cell carcinoma	0.291	0.107	0.273	0.083	0.253	0.064	0.248	0.047
Bladder cancer	0.675	0.583	0.682	0.559	0.679	0.526	0.681	0.485
Acute myeloid leukemia	0.240	0.210	0.246	0.194	0.243	0.175	0.245	0.152
Cardiovascular diseases								
Ischaemic heart disease								
45 to 59 years	0.422	0.373	–	–	–	–	–	–
60 to 69 years	–	–	0.291	0.234	–	–	–	–
70 to 79 years	–	–	–	–	0.100	0.073	–	–
80 or older	–	–	–	–	–	–	0.089	0.051
Pulmonary circulatory disease	0.841	0.819	0.838	0.796	0.830	0.769	0.829	0.733
Cardiac arrhythmias								
45 to 59 years	0.422	0.373	–	–	–	–	–	–
60 to 69 years	–	–	0.291	0.234	–	–	–	–
70 to 79 years	–	–	–	–	0.100	0.073	–	–
80 or older	–	–	–	–	–	–	0.089	0.051
Heart failure								
45 to 59 years	0.422	0.373	–	–	–	–	–	–

Condition / Cause of death	45 to 59 years		60 to 69 years		70 to 79 years		80 and older	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
60 to 69 years	–	–	0.291	0.234	–	–	–	–
70 to 79 years	–	–	–	–	0.100	0.073	–	–
80 or older	–	–	–	–	–	–	0.089	0.051
Cerebrovascular diseases								
Age < 65 years	0.412	0.373	0.347	0.299	–	–	–	–
65 or older	–	–	0.172	0.142	0.145	0.116	0.137	0.088
Atherosclerosis	0.399	0.427	0.358	0.414	0.325	0.411	0.282	0.267
Respiratory diseases								
Pneumonia / Influenza	0.212	0.186	0.207	0.165	0.199	0.144	0.198	0.122
Chronic obstructive pulmonary disease	0.841	0.819	0.838	0.796	0.830	0.769	0.829	0.733
Injury								
Fire injury	0.280	0.280	0.280	0.280	0.280	0.280	0.280	0.280
PASSIVE SMOKERS								
Lung cancer	0.020	0.018	0.018	0.016	0.015	0.013	0.010	0.009
Ischaemic heart disease	0.023	0.020	0.021	0.018	0.017	0.014	0.011	0.011

Source. Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/

Table 55. Income 5-category (quintile) definition

Income level	Income	Household size
Lowest	Less than $10,000	1 to 4 persons
	Less than $15,000	5 or more persons
Lower middle	$10,000 to 14,999	1 or 2 persons
	$10,000 to $19,999	3 or 4 persons
	$15,000 to $29,999	5 or more persons
Middle	$15,000 to $29,999	1 or 2 persons
	$20,000 to $39,999	3 or 4 persons
	$30,000 to $59,999	5 or more persons
Upper middle	$30,000 to $59,999	1 or 2 persons
	$40,000 to $79,999	3 or 4 persons
	$60,000 to $79,999	5 or more persons
Highest	$60,000 or more	1 or 2 persons
	$80,000 or more	3 or more persons

Source: Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

Table 56. Income 4-category definition (quartile)

Income level	Income	Household size
Lowest	Less than $15,000	1 or 2 persons
	Less than $20,000	3 or 4 persons
	Less than $30,000	5 or more persons
Lower middle	$15,000 to 29,999	1 or 2 persons
	$20,000 to $39,999	3 or 4 persons
	$30,000 to $59,999	5 or more persons
Upper middle	$30,000 to $59,999	1 or 2 persons
	$40,000 to $79,999	3 or 4 persons
	$60,000 to $79,999	5 or more persons
Highest	$60,000 or more	1 or 2 persons
	$80,000 or more	3 or more persons

Source: Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada*, Centre for Chronic Disease Prevention and Control, Health Canada, Canadian Cardiovascular Society, and Heart and Stroke Foundation of Canada, 2003; accessed Dec 2007; available from http://www.cvdinfobase.ca/cvdbook/CVD_En03.pdf.

Table 57. Age standardized mortality rates per 100,000 population, rate ratios and rate differences between quintiles, population attributable risk, and population attributable risk percentage, for selected causes of death, all ages, by gender and neighbourhood income

	Total	Q1 highest income	Q2	Q3	Q4	Q5 lowest income	RR**	RD‡	Excess*	%‡‡ excess
All causes+										
Both males and females										
1971	712.8	615.9	641.9	701.9	710.6	847.1	1.38	231.2	96.9	13.6
1986	589.7	526.9	547.5	566.1	595.8	702.9	1.33	175.9	62.8	10.6
1991	526.3	468.3	492.6	497.3	541.9	630.5	1.35	162.2	58.0	11.0
1996	502.0	450.0	472.8	474.6	505.1	593.1	1.32	143.1	51.9	10.3
Males										
1971	961.7	801.4	849.3	936.1	942.5	1,186.9	1.48	385.5	160.2	16.7
1986	792.4	675.3	713.3	752.9	808.9	983.9	1.46	308.7	117.1	14.8
1991	706.7	588.1	645.9	669.3	735.5	880.4	1.50	292.3	118.6	16.8
1996	663.9	567.9	608.5	630.6	672.8	813.5	1.43	245.6	96.0	14.5
Females										
1971	523.1	474.4	483.2	524.7	533.2	584.8	1.23	110.3	48.7	9.3
1986	440.0	420.9	426.1	428.0	437.3	489.1	1.16	68.1	19.1	4.3
1991	394.4	380.8	384.6	372.3	399.2	440.9	1.16	60.1	13.7	3.5
1996	385.2	367.2	376.6	363.0	383.7	427.7	1.16	60.5	18.0	4.7
Ischemic heart disease										
Males										
1971	338.3	289.9	300.4	335.6	324.0	406.8	1.40	116.9	48.4	14.3
1986	217.8	190.1	208.4	215.7	225.2	246.4	1.30	56.3	27.7	12.7
1991	165.7	142.5	161.7	159.1	172.4	190.1	1.33	47.6	23.2	14.0
1996	145.3	126.8	137.0	140.6	149.7	165.7	1.31	38.8	18.5	12.7
Females										
1971	150.2	135.7	140.1	144.9	154.2	167.1	1.23	31.4	14.5	9.7
1986	99.0	95.7	94.8	94.6	98.7	109.2	1.14	13.5	3.3	3.3
1991	76.9	73.5	72.8	72.4	78.9	86.2	1.17	12.7	3.4	4.4
1996	67.3	61.7	64.4	61.8	68.3	77.0	1.25	15.3	5.6	8.3
Injuries except motor vehicle traffic accidents and suicide										
Both males and females										
1971	27.1	18.6	23.9	22.6	27.1	42.2	2.27	23.6	8.5	31.5
1986	18.4	14.2	14.8	15.8	18.2	28.8	2.03	14.6	4.2	22.7
1991	16.6	13.5	13.6	15.1	16.0	25.3	1.88	11.8	3.1	18.7
1996	16.0	12.7	14.7	13.2	15.4	23.5	1.85	10.8	3.3	20.8
Cirrhosis of liver										
Males										
1971	16.2	8.2	9.9	14.6	15.3	29.9	3.66	21.7	8.1	49.7
1986	13.4	8.6	7.8	13.5	14.8	21.8	2.55	13.3	4.9	36.2
1991	11.9	7.5	8.4	9.1	13.1	21.2	2.85	13.8	4.4	37.2
1996	10.2	6.7	7.3	8.9	11.2	16.7	2.50	10.0	3.5	34.2
Females										
1971	7.5	4.5	6.0	8.0	6.3	11.9	2.66	7.4	3.0	40.1
1986	5.3	4.0	4.4	5.2	5.6	6.8	1.67	2.7	1.2	23.1
1991	4.6	3.0	4.4	3.5	4.6	7.3	2.42	4.3	1.6	34.3
1996	3.4	3.6	3.3	3.4	3.5	3.4	0.95	-0.2	-0.2	-5.6
Uterine cancer										
Females										

	Total	Q1 highest income	Q2	Q3	Q4	Q5 lowest income	RR**	RD‡	Excess*	%‡‡ excess
1971	10.4	6.2	6.0	11.5	11.8	13.3	2.16	7.1	4.2	40.6
1986	6.0	4.5	4.4	5.9	5.7	8.2	1.82	3.7	1.5	24.6
1991	5.7	4.7	4.4	5.5	5.4	7.4	1.58	2.7	1.0	17.9
1996	5.3	4.3	3.3	5.6	5.1	6.4	1.50	2.1	1.1	20.2
Perinatal conditions										
Both males and females										
1971	11.4	8.0	9.6	11.8	12.0	15.1	1.90	7.1	3.4	30.1
1986	4.7	3.7	3.9	4.7	5.0	6.3	1.70	2.6	1.0	21.4
1991	3.4	2.9	2.7	2.8	3.9	4.6	1.57	1.7	0.5	13.4
1996	3.6	2.4	3.7	3.8	3.3	4.7	1.94	2.3	1.2	33.6
Pedestrians in motor vehicle traffic accidents										
Both males and females										
1971	4.4	2.3	3.2	5.0	5.0	5.7	2.45	3.4	2.0	46.7
1986	1.9	1.5	1.6	1.9	1.9	2.6	1.78	1.2	0.4	22.9
1991	1.6	0.9	1.5	1.4	1.8	2.3	2.44	1.4	0.7	42.1
1996	1.2	0.9	1.1	0.8	1.4	1.8	2.13	1.0	0.4	31.5
Motor vehicle occupants										
Both males and females										
1971	14.1	13.6	14.1	15.6	15.3	12.5	0.92	-1.1	0.5	3.7
1986	8.6	9.4	8.8	8.4	8.3	8.2	0.87	-1.2	-0.9	-10.1
1991	7.1	8.9	7.5	6.6	6.6	6.5	0.74	-2.3	-1.7	-24.5
1996	5.4	6.6	7.1	5.0	4.8	3.5	0.53	-3.1	-1.2	-22.3
Lung cancer										
Males										
1971	61.4	48.5	49.0	58.6	64.6	77.1	1.59	28.6	12.9	21.0
1986	73.0	51.7	62.3	72.0	77.2	94.8	1.83	43.0	21.2	29.1
1991	69.2	54.6	58.3	64.8	73.6	91.6	1.68	37.0	14.5	21.0
1996	63.6	51.5	56.6	60.7	67.2	80.1	1.56	28.6	12.1	19.1
Females										
1971	8.8	7.7	8.5	6.8	10.3	10.1	1.32	2.5	1.1	12.7
1986	23.1	18.7	21.6	21.8	23.7	28.0	1.49	9.2	4.3	18.8
1991	27.8	25.6	25.6	26.9	27.8	32.6	1.27	7.0	2.2	7.9
1996	30.7	27.0	30.0	30.4	30.5	34.8	1.29	7.8	3.7	12.0
Breast cancer										
Females										
1971	28.5	30.7	28.0	28.9	28.1	27.8	0.90	-3.0	-2.2	-7.7
1986	30.2	29.9	30.6	30.0	30.5	29.8	1.00	-0.1	0.3	0.9
1991	27.7	28.8	28.4	27.2	25.5	28.4	0.99	-0.3	-1.0	-3.8
1996	26.7	30.4	25.5	26.2	25.8	26.6	0.88	-3.8	-3.7	-13.8
Prostate cancer										
Males										
1971	19.8	18.1	22.1	22.9	18.0	18.7	1.03	0.6	1.7	8.7
1986	23.1	22.7	25.8	21.9	23.6	22.3	0.99	-0.3	0.5	2.0
1991	23.1	24.6	23.6	24.5	21.4	22.0	0.90	-2.5	-1.5	-6.6
1996	20.9	24.4	21.6	21.0	20.0	18.0	0.74	-6.4	-3.5	-16.5
Suicide										
Males										
1971	18.8	14.5	15.5	17.5	19.2	26.1	1.80	11.6	4.3	22.8
1986	20.8	15.8	15.8	16.3	22.3	33.0	2.10	17.3	5.0	24.2
1991	18.1	13.9	14.6	17.5	19.0	25.1	1.81	11.2	4.2	23.4
1996	18.7	15.6	13.8	17.3	18.4	27.5	1.76	11.9	3.2	16.9
Females										

	Total	Q1 highest income	Q2	Q3	Q4	Q5 lowest income	RR**	RD‡	Excess*	%‡‡ excess
1971	8.2	8.5	8.6	7.7	7.5	9.0	1.06	0.5	-0.3	-3.2
1986	6.4	4.9	5.2	4.4	7.5	10.3	2.11	5.4	1.5	23.7
1991	5.2	3.2	3.8	5.3	4.9	8.7	2.75	5.5	2.1	39.3
1996	5.5	3.4	4.3	4.1	6.6	8.6	2.53	5.2	2.1	38.4
Infectious diseases										
Both males and females										
1971	4.6	3.4	2.9	3.9	4.5	7.6	2.25	4.2	1.3	27.2
1986	5.8	3.9	3.6	4.7	6.4	10.1	2.58	6.2	1.9	32.6
1991	10.2	5.1	6.4	8.0	11.3	20.4	3.99	15.3	5.0	49.5
1996	10.5	6.0	7.5	7.6	1.0	20.5	3.41	14.5	4.5	42.7
Ill-defined conditions										
Both males and females										
1971	4.4	2.6	3.7	3.6	4.1	6.9	2.62	4.3	1.8	40.5
1986	8.0	5.3	5.0	7.0	8.0	13.8	2.60	8.5	2.7	33.6
1991	11.5	8.1	8.4	10.0	12.3	18.3	2.27	10.3	3.4	29.6
1996	10.0	6.7	7.3	8.2	10.6	17.0	2.52	10.2	3.3	32.8
Mental disorders										
Both males and females										
1971	2.7	1.6	1.8	2.1	1.8	5.9	3.74	4.3	1.2	42.2
1986	5.9	4.3	4.9	4.6	5.2	10.1	2.35	5.8	1.6	27.2
1991	6.1	5.6	5.4	5.2	5.9	9.0	1.62	3.5	0.6	9.6
1996	8.2	7.7	7.5	7.1	8.8	10.1	1.30	2.3	0.5	6.2
Diabetes										
Males										
1971	15.5	15.0	13.4	15.7	15.6	17.1	1.14	2.1	0.5	3.0
1986	13.0	10.5	14.3	12.5	13.1	14.6	1.39	4.1	2.4	18.8
1991	13.7	11.3	11.5	12.2	14.5	18.8	1.67	7.5	2.5	17.9
1996	16.1	13.5	13.5	14.5	16.8	21.2	1.56	7.6	2.6	16.1
Females										
1971	13.3	10.5	10.1	13.4	13.3	17.2	1.64	6.7	2.8	20.9
1986	9.2	8.0	8.8	9.3	9.7	10.1	1.26	2.1	1.2	12.5
1991	9.2	9.1	8.2	8.6	9.8	10.6	1.17	1.6	0.2	1.7
1996	9.9	9.1	7.8	9.5	8.9	13.4	1.47	4.3	0.7	7.6

Notes:
Q1 – highest income group; Q5 – lowest income group
** – Inter-quintile rate ratio (Q5/Q1)
‡ – Inter-quintile rate difference (Q5 – Q1)
* – Population-attributable risk (Total – Q1)
‡‡ – Population-attributable risk percentage [100 x (Total – Q1)/Total]
+ – Includes causes for which detailed data are not shown

Source: Wilkins, R., J.-M. Berthelot, and E. Ng. "Trends in Mortality by Neighbourhood Income in Urban Canada from 1971 to 1996," *Health Reports*, 2002, vol. 13 (Supplement): 1-28.

Table 58. Relative risks used for estimation of alcohol-attributable fractions (AAF), morbidity and mortality; AAF for mortality, all ages; and AAF for morbidity, ages 15–44 years

CONDITION	Alcohol exposure / Drinking categories – %						AAF mortality		AAF Morbidity*		AAF Morbidity*	
	I – low		II – hazardous		III – harmful		All ages		15 – 29 years		30 – 44 years	
	M	F	M	F	M	F	M	F	M	F	M	F
Malignant neoplasms												
Mouth & oropharynx cancers	1.45	1.45	1.85	1.85	5.39	5.39	.327	.186	.418	.240	.392	.225
Stomach cancer	1.07	1.04	1.15	1.08	1.32	1.16	–	–	–	–	–	–
Oesophageal cancers	1.80	1.80	2.38	2.38	4.36	4.36	.376	.241	.459	.297	.436	.283
Liver cancer	1.45	1.45	3.03	3.03	3.60	3.60	.317	.220	.395	.231	.373	.227
Laryngeal cancer	1.83	1.83	3.90	3.90	4.93	4.93	.425	.310	.512	.333	.490	.326
Breast cancer	–	–	–	–	–	–	–	.064	–	.073	–	.071
< 45 years	–	1.15	–	1.41	–	1.46	–	–	–	–	–	–
> = 45 years	–	1.14	–	1.38	–	1.62	–	–	–	–	–	–
Other neoplasms	1.10	1.10	1.30	1.30	1.70	1.70	.087	.050	.125	.061	.115	.058
TOTAL	–	–	–	–	–	–	**.305**	**.093**	–	–	–	–
Diabetes												
Diabetes mellitus	0.99	0.92	0.57	0.87	0.73	1.13	**-.051**	**-.025**	.073	.029	.066	.028
Neuro-psychiatric conditions												
Alcohol psychosis	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Alcohol dependence syndrome	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00

CONDITION	Alcohol exposure / Drinking categories – %						AAF mortality		AAF Morbidity*		AAF Morbidity*	
	I – low		II – hazardous		III – harmful		All ages		15 – 29 years		30 – 44 years	
	M	F	M	F	M	F	M	F	M	F	M	F
Alcohol abuse	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Unipolar major depression	–	–	–	–	–	–	.084	.028	.140	.019	.126	.021
Degeneration of the nervous system due to alcohol	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Epilepsy	1.23	1.34	7.52	7.22	6.83	7.52	.497	.375	.552	.339	.528	.352
Alcoholic polyneuropathy	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
TOTAL	–	–	–	–	–	–	.859	.578	–	–	–	–
Cardiovascular diseases												
Hypertensive disease	1.15	1.33	1.53	2.04	2.19	2.91	.226	.078	.306	.095	.286	.091
Ischaemic heart disease	0.82	0.82	0.83	0.83	1.00	1.12	-.093	-.049	.121	-.069	-.113	.064
Alcoholic cardiomyopathy	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Cardiac arrhythmias	1.51	1.51	2.23	2.23	2.23	2.23	.257	.173	.327	.202	.310	.195
Cerebrovascular diseases	0.97	0.70	1.08	0.80	1.76	1.96	.026	-.066	.059	.089	.051	-.083
Ischaemic stroke	*0.94*	*0.66*	*1.13*	*0.84*	*1.19*	*1.53*	*-.060*	*-.082*	*.002*	*-.120*	*-.003*	*-.109*
Haemorrhagic stroke	*1.12*	*0.74*	*1.40*	*1.04*	*1.54*	*1.94*	*.089*	*-.036*	*.129*	*-.065*	*.119*	*.058*
Oesophageal varices	1.26	1.26	9.54	9.54	9.54	9.54	.539	.445	.627	.383	.603	.401
TOTAL	–	–	–	–	–	–	-.047	-.039	–	–	–	–

CONDITION	Alcohol exposure / Drinking categories – %						AAF mortality		AAF Morbidity*		AAF Morbidity*	
	I – low		II – hazardous		III – harmful		All ages		15 – 29 years		30 – 44 years	
	M	F	M	F	M	F	M	F	M	F	M	F
Digestive diseases												
Alcoholic gastritis	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Cirrhosis of the liver	1.30	1.30	9.05	9.50	13.00	13.00	.581	.457	.665	.424	.640	.435
Cholethiasis	0.82	0.82	0.68	0.68	0.50	0.50	-.131	-.071	.202	-.096	-.182	-.090
Acute & chronic pancreatic	1.30	1.30	1.80	1.80	3.20	1.80	.232	.117	.301	.133	.280	.129
Chronic pancreatic (alcohol induced)	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
Skin diseases												
Psoriasis	1.58	1.58	1.60	1.60	2.20	2.20	.275	.154	.317	.204	.300	.191
Conditions arising during the perinatal period												
Low birth weight (drinking of mothers)	–	1.00	–	1.40	–	1.40	.068	.068	–	–	–	–
Fetal alcohol syndrome	–	–	–	–	–	–	1.00	1.00	1.00	1.00	1.00	1.00
TOTAL	–	–	–	–	–	–	1.0	1.0	–	–	–	–

Notes: Titles that are bold are main categories. Categories in italic are sub-categories of immediate prior category, – = not given, bold number font = total. Morbidity AAF are shown for ages 15–29 and 30–44 years for descriptive purposes. AAFs, which generally decrease with age, are also available for ages 45–59, 60–69, 70–79, and 80+. Morbidity AAFs are not given for "all ages." A minus sign before the number (e.g., -.039) indicates that the alcohol has a preventive effect on the condition.

Source: Adapted from Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/. Tables APP-10, I-A-1, and APP-12.

Table 59. Alcohol-attributable fractions (AAF) for injuries, Canada

CONDITION	AAF–Injury all ages	
	M	**F**
Unintentional injuries		
Motor vehicle collisions	.394	.182
Poisonings	.240	.215
Accidental poisoning & exposure to alcohol	*1.00*	*1.00*
Falls	.179	.059
Fires	.408	.185
Drownings	.338	.287
Other unintentional injuries	.306	.204
TOTAL	**.308**	**.166**
Intentional injuries		
Suicide, self-inflicted injuries	.173	.137
Intentional self-poisoning by and exposure to alcohol	*1.00*	*1.00*
Homicide	.367	.340
Other intentional injuries	.297	–
TOTAL	**.308**	**.166**
Ethanol and methanol toxicity, undetermined intent	1.00	1.00
Finding of alcohol in blood	1.00	1.00

Note: Titles that are bold are main categories. Categories in italic are sub-categories of immediate prior category. Source: Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/. Appendix 4 and 5.

Table 60. Drug-attributable fractions (DAF) for mortality or morbidity by disease category and gender, all ages, Canada, 2002

CONDITION	DAF all ages	
	M	**F**
Mental and behavioural disorders due to use of:		
Opioids	1.00	1.00
Cannabinoids	1.00	1.00
Cocaine	1.00	1.00
Other stimulants, including caffeine	1.00	1.00
Hallucinogens	1.00	1.00
Multiple drug use and use of other psychoactive substances	1.00	1.00
Opiate and cocaine poisoning	1.00	1.00
HIV	.216	.216
Viral hepatitis C	.560	.560
Viral hepatitis B	.260	.260
Acute and subacute endocarditis	14.0	14.0
Neonatal conditions; low birthweight & short gestation; maternal opiate use	.030	.030
Cannabis-attributable traffic collisions (fatal)	.140	.140
Cocaine-attributable traffic collisions (fatal)	.030	.030
Suicide, self-inflicted injuries	.052	.195
Homicide	.090	.090

Source: Rehm, J., D. Baliunas, S. Brochu, B. Fischer, W. Gnam, J. Patra, S. Popova, A. Sarnocinska-Hart, and B. Taylor. *The Costs of Substance Abuse in Canada, 2002*, Canadian Centre on Substance Abuse, 2006; accessed Dec 2007; available from http://www.ccsa.ca/CCSA/EN/Research/Costs_of_Substance_Abuse_in_Canada/. Table I-D-1.