

This four-part series provides an overview of children's health in Canada and prospects for the future. It does so through a population health approach that is informed by a social determinants of health perspective. Part I provides some key indicators of Canadian children's health at the national and provincial levels, and presents them within a comparative international perspective. Part II highlights the mechanisms and pathways by which children's health becomes shaped by their living conditions and the public policies that create these living conditions. Part III explores the social determinants of children's health and considers their quality within various governmental policy frameworks. Part IV considers the role physicians can play in improving the quality of the social determinants of health, thereby improving Canadian children's health.

The health of Canada's children. Part I: Canadian children's health in comparative perspective

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In the present article, the state of Canadian children's health is provided through an examination of scores on a set of key health indicators. National and provincial infant mortality rates show little recent improvement, and in the case of low birth weight rates, a worsening trend is evident. These health indicators are strongly related to income, and studies documenting these associations are reviewed. Compared with other wealthy nations, Canada performs poorly with regard to infant mortality rates and somewhat less so for low birth weight rates. For other health indicators and measures of the quality of the social determinants of children's health (such as poverty) and children's well-being, Canada's performance suggests that there are numerous areas for improvement.

Key Words: *Paediatrics; Public policy; Social policy*

The current article presents the most recent evidence on the state of key indicators of Canadian children's health, with a special focus on infant mortality and low birth weight rates. National and provincial data are provided, and these figures are presented from an international perspective. The role that income plays in health outcomes is examined via an analysis of findings from a Statistics Canada pan-Canadian study of urban areas, a Quebec-wide study of childbirth outcomes and a recent City of Toronto study of inequalities in children's health. The concept of the social determinants of children's health is introduced, and recent evidence concerning the quality of these determinants of health in Canada is presented.

HEALTH STATUS

A wide range of indicators of children's health exist, but the initial focus of the present article is on two key indicators that have been the focus of much international attention: infant

La santé des enfants canadiens. Partie I – La santé des enfants canadiens dans une perspective comparative

Dans le présent article, on détermine l'état de santé des enfants canadiens grâce à l'examen d'indices sur une série d'indicateurs clés de la santé. Les taux provincial et national de mortalité des nourrissons se sont peu améliorés récemment, et pour ce qui est du taux de petit poids de naissance, on constate une tendance évidente vers l'aggravation. Ces indicateurs de la santé sont fortement liés au revenu, et les études étayant ces associations font l'objet d'une analyse. Par rapport à d'autres pays riches, le Canada obtient un mauvais rendement en ce qui a trait au taux de mortalité des nourrissons et un rendement un peu moins mauvais en matière de petit poids de naissance. À l'égard des autres indicateurs de santé et des mesures de la qualité des déterminants sociaux de la santé (comme la pauvreté) et du bien-être des enfants, le rendement du Canada laisse supposer que de nombreux secteurs laissent place à l'amélioration.

mortality and low birth weight rates (1). Infant mortality rate refers to the incidence of newborns dying during their first year of life, and is considered by many to be the single best indicator of overall population health (2). Low birth weight rate is also an important indicator of health because it is associated with a wide range of health problems across the life-span (see addendum) (3). In the present article, additional illustrative indicators of children's health and well-being are provided. Later articles in the series will consider the factors that shape scores on these indicators.

Infant mortality rate

The most recent national and provincial data on infant mortality in Canada are available for 2005 (4). The national infant mortality rate for Canada in 2005 was 5.4 per 1000 live births, which was higher than the 2001 rate of 5.2 per 1000 live births. Recent national figures (2001, 5.2 per 1000 live births; 2002, 5.4 per 1000 live births; 2003, 5.3 per 1000 live

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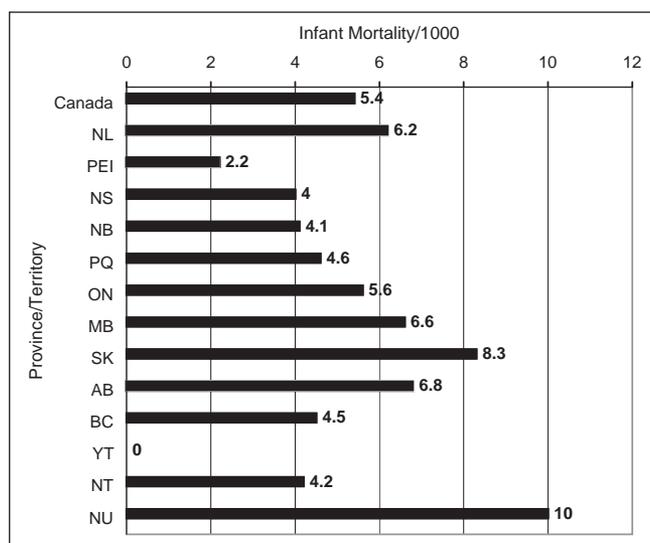


Figure 1) Infant mortality rates by Canadian provinces and territories, 2005. AB Alberta; BC British Columbia; MB Manitoba; NB New Brunswick; NL Newfoundland and Labrador; NS Nova Scotia; NT Northwest Territories; NU Nunavut; ON Ontario; PEI Prince Edward Island; PQ Quebec; SK Saskatchewan; YT Yukon Territory. Adapted from reference 4

births; 2004, 5.3 per 1000 live births; and 2005, 5.4 per 1000 live births) indicate no evidence of improvement. Figure 1 shows provincial/territorial data for 2005. Of note is that infant mortality rates are higher in the Prairie provinces, with the highest rate occurring in Nunavut, a reflection of the generally higher infant mortality rates observed among Canadian Aboriginals (1.5 to four times greater than the non-Aboriginal population), who constitute a larger proportion of the population in these jurisdictions (5). (The rate for Yukon represents the unreliability of a single annual indicator for smaller populations.) Of note is that every province and territory except for Prince Edward Island reports rates greater than 4.0 per 1000 live births. This is noteworthy because, as will be discussed later, 10 wealthy developed nations have national rates that are lower than this rate.

Low birth weight rate

The most recent national and provincial/territorial data on low birth weight rate in Canada are available for 2005 to 2006 (6). Two rates are available: in-hospital births and all births. These rates reflect the standard practice of including babies weighing less than 2500 g but, because of reporting differences, excluding those weighing less than 500 g. Figure 2 provides Canadian Institute for Health Information in-hospital data and Statistics Canada data for 2005. For both measures, low birth weight rates have been increasing in Canada.

Figure 3 shows provincial data for in-hospital births for 2005. The pattern seen for infant mortality of higher rates in the Prairie provinces is not evident for low birth weight rates. Besides the high rate in Nunavut, of note are the rather high rates seen in Alberta and Ontario, two provinces

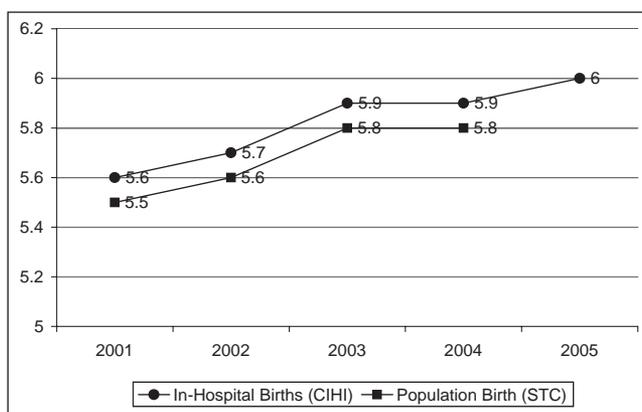


Figure 2) Rates of low birth weight per 100 newborns (excluding babies weighing less than 500 g) in Canada from 2001 to 2005 using in-hospital (Canadian Institute for Health Information [CIHI]) and population births (Statistics Canada [STC]). Adapted from reference 6

commonly believed to be the wealthiest in Canada. While there are numerous clinical factors that influence infant mortality and low birth weight, at a population level these indicators, in large part, represent the living conditions to which prospective mothers are exposed (3,7).

VARIATIONS IN INFANT MORTALITY BY NEIGHBOURHOOD INCOME

It is well established that variations in health indicators are strongly related to income. Three representative sources of data confirm this point. The first is data from Statistics Canada on variations in health outcomes as a function of neighbourhood income in urban Canada. The second is a report on birth outcomes in Quebec, while the third is a very recent report on health inequalities from Toronto Public Health (similar data are available from the BC Early Learning Partnership and the Manitoba Centre for Health Policy).

Statistics Canada analysis

Analyses by Statistics Canada indicate systematic variations in infant mortality, and low birth weight rates are related to average neighbourhood income. The most definitive work in Canada on income and health is by Wilkins et al (8,9), who studied these issues among residents classified in quintiles based on average neighbourhood income in which they live.

Data on Canadians' income are not routinely collected by health authorities, so researchers frequently examine the relationship between income and mortality and morbidity by drawing on census tract data to estimate family income. First, neighbourhoods are placed in one of five quintiles based on the percentage of residents living below Statistics Canada's low-income cut-offs. The first quintile includes the areas where the average income is the highest; the fifth quintile includes areas where the average income is the lowest. The analyses by Wilkins et al (8,9) of urban areas in Canada revealed that in 1996, 7.6% of people living in the first quintile, 12.8% of those in the second quintile, 19.2% of those in the third quintile, 27.1% of those in the fourth quintile and

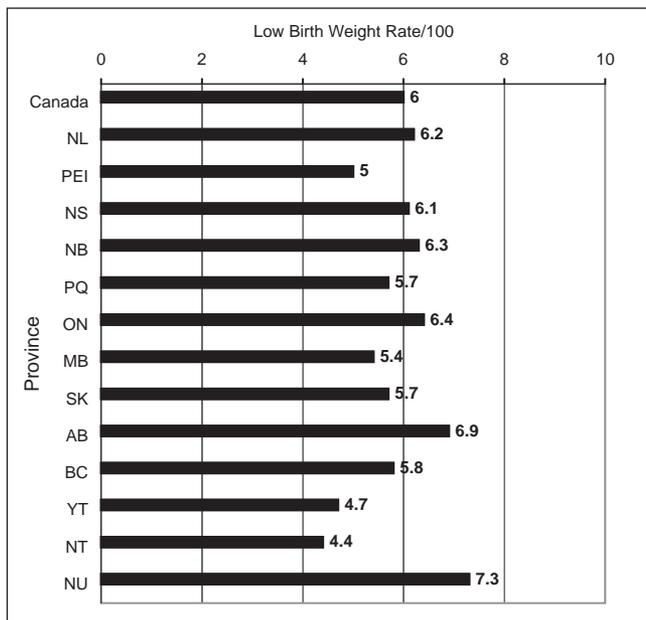


Figure 3) Low birth weight rate by Canadian provinces and territories, 2005 to 2006. AB Alberta; BC British Columbia; MB Manitoba; NB New Brunswick; NL Newfoundland and Labrador; NS Nova Scotia; NT Northwest Territories; NU Nunavut; ON Ontario; PEI Prince Edward Island; PQ Quebec; SK Saskatchewan; YT Yukon Territory. Adapted from reference 6

41.7% of those in the fifth quintile were living in poverty, as defined by Canada's low-income cut-offs.

Then, based on information available from hospital records, infant mortality and low birth weight rates for the areas within each income quintile are calculated. Figure 4 shows the most recent data available for urban Canada analyses. The gap between the lowest income quintile and the next quintile was the largest for infant mortality and low birth weight rates. The infant mortality rate is 60% higher in the poorest income quintile than in the richest quintile areas. The low birth weight rate is 43% higher in the poorest income quintile than in the richest quintile areas.

Birth outcomes in Quebec

Luo et al (10) correlated neighbourhood income with several birth-related health outcomes using sets of Statistics Canada data for the time period 1991 to 2000. Table 1 provides the details of how income quintile is related to a host of health outcomes.

As shown, neighbourhood income quintile is related to a whole range of birth outcomes. The findings are all robust, and the Q5 versus Q1 ratio is 1.23 for preterm births, 1.40 for small gestational age births, 1.44 for stillbirths, 1.16 for neonatal deaths and 1.48 for postneonatal deaths.

Health inequalities among children in Toronto, Ontario

A Toronto report looked at three key indicators of children's health and well-being as a function of average neighbourhood income: singleton low birth weight, readiness to learn at age of school entry, and teen pregnancy rate (11).

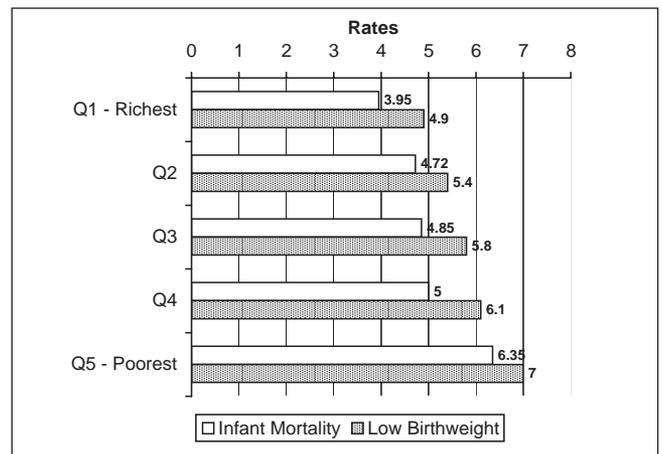


Figure 4) Infant mortality (per 1000 live births) and low birth weight rates (per 100 newborns) by income quintile of neighbourhood in urban Canada, 1996. Adapted from references 8 and 9

TABLE 1
Adverse birth outcomes by neighbourhood income quintile in Quebec, 1991 to 2000

	Quintile by income				
	Q5 – Poorest	Q4	Q3	Q2	Q1 – Richest
Preterm births, %	8.2	7.4	7.2	7.0	6.7
SGA births, %	12.3	11.2	10.6	9.8	9.1
Stillbirths per 1000 births	4.6	4.0	3.9	3.4	3.2
Neonatal deaths per 1000 births	3.9	3.8	3.3	2.9	3.3
Postneonatal deaths per 1000 births	2.0	1.5	1.3	1.5	1.4

SGA Small for gestational age. Adapted from reference 10

All of these indicators are well established indicators of both childhood and adult health status, as well as general well-being (12-14). Table 2 provides some key demographics of Toronto neighbourhoods in the income quintiles on the basis of percentage of residents living below the Statistics Canada low-income cut-offs. Clearly, these areas differ on some key income-related criteria.

Figure 5 shows that there are clear differences in various measures of children's health and well-being: low birth weight rate, percentage lacking readiness to attend school at time of school entry, and teenage pregnancy rate as a function of income quintile. Indeed, whichever health indicator – for children or adults – one chooses to examine, such profound differences as a function of income are common (15,16). The manner in which income plays such an important role in shaping health is discussed in the next instalment of this series.

PLACING CANADIAN CHILDREN'S HEALTH INDICATORS IN COMPARATIVE PERSPECTIVE

A population health perspective both situates and explains health status differences among jurisdictions in terms of the living conditions to which citizens are exposed (17,18). It is increasingly accepted that the quality of these living conditions result, in large part, from the

TABLE 2
Key demographic characteristics of differing income quintiles within Toronto, 2006

	Quintile by income				
	Q5 – Poorest	Q4	Q3	Q2	Q1 – Richest
Population	507,965	481,700	512,510	484,740	508,710
Per cent living below LICO	40.9	29.5	23.5	18.1	10.5
Average household income (after tax)	\$43,480	\$49,822	\$56,143	\$63,660	\$94,381
Unemployed, 15 years of age or older, %	10.4	8.4	7.4	6.8	5.3

LICO Low-income cut-offs. Adapted from reference 11

public policy environments of these jurisdictions (19). Where does Canada stand on these health indicators compared with other developed nations? The Organisation for Economic Co-operation and Development (OECD) periodically provides such comparative data in its *Health at a Glance* and *Society at a Glance* series.

Infant mortality

Figure 6 shows 2005 infant mortality rates for 30 OECD nations. Canada's rate of 5.3 per 1000 live births gives it a relative ranking of 24 among 30 nations (2). (The OECD infant mortality rate reported differs slightly from the Statistics Canada reported rate of 5.4, but does not change Canada's ranking.) The national rates of the top seven nations are superior to rates seen among the wealthiest 20% of urban neighbourhoods in Canada. A recent United States report (20) points out that in 1980, Canada was ranked 10th among 30 wealthy developed nations on this indicator. By 2002, Canada's relative ranking had fallen to 22nd among 30. Its rank is now 24th among 30.

Figure 6 also shows very low infant mortality rates common to a wide range of nations: northern Europe, central Europe and Asia. While Turkey and Mexico's high rates should not be surprising, the United States also has higher rates than just about every other wealthy developed nation.

Low birth weight rates

Figure 7 shows 2005 low birth weight rates for 30 OECD nations (2). Canada's rate of 5.9 per 100 newborns gives it a somewhat better ranking of ninth among the 30 nations. Of note are the very low rates of the Nordic nations. The USA ranks 25th among the 30 nations.

The nations doing better than Canada in both infant mortality and low birth weight rates are for the most part not as wealthy as Canada in terms of gross domestic product (21). For example, the average Swede is worth \$2,000 less than the average Canadian in terms of the overall wealth of these nations (per capita gross domestic product), yet its children's health indicators are far superior to Canada's (21).

Other indicators

In passing, it is worth noting that during the period 1991 to 1995, 9.7 Canadian children per 100,000 died from injuries (22). Canada's rate gives it a ranking of 18th among

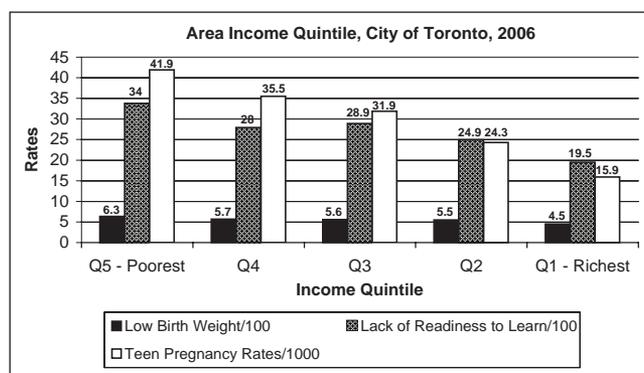


Figure 5) Child health indicators as a function of area income quintile of the City of Toronto, 2006. Adapted from reference 11

26 wealthy industrialized nations. Canada's teenage birth rate during the 1990s was 20.2 births to 1000 women younger than 20 years of age (12), a ranking of 21st among 28 wealthy industrialized nations for which these data were available.

INTRODUCING THE SOCIAL DETERMINANTS OF CHILDREN'S HEALTH

How can income-related differences in Canadian children's health status and Canada's relative standing among developed nations on these health indicators be explained? As elaborated on in subsequent parts of the present series, there is an emerging consensus that the answer is in the economic and social conditions to which children and their families are exposed (19,23). These conditions include levels of income, education and wealth; degree of employment, housing and food security; working and community conditions; and the quality of health and social services that are available.

These conditions have come to be known as the social determinants of health, and accumulating evidence indicates that their impact on health among members of wealthy industrialized nations are stronger than the commonly ascribed factors of behavioural risk factors, genetics and even health care (1,23-25).

Child poverty

As an introduction to the social determinants of health, child poverty has been the subject of many international health-related surveys, because living in poverty represents a clustering of disadvantage in exposures to a range of social determinants of health (26,27). These analyses reveal that nations with higher poverty rates generally show poorer population health across the entire range of the population, an issue examined in future articles (28).

A quick glimpse of where Canada falls in this larger picture can be seen in Figure 8. In the mid-2000s, Canada's poverty rate – defined as living in a family whose income is less than 50% of the national median income – was among the highest of developed nations, placing Canada 20th among 30 OECD nations (29). This same report by the OECD identified Canada as one of three nations showing the greatest increase in poverty and income inequality since the mid-1990s (29).

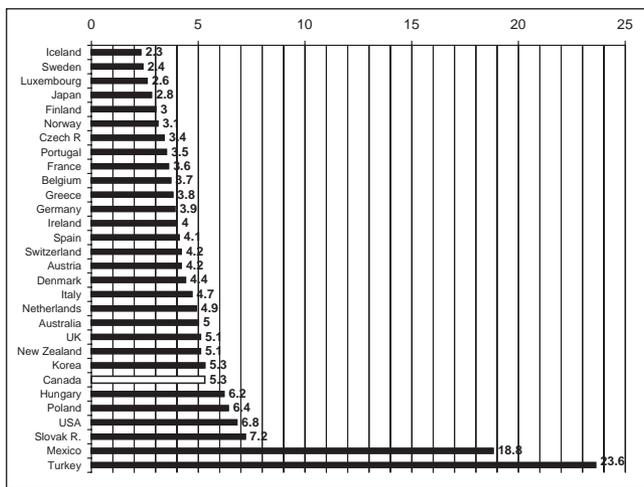


Figure 6) Infant mortality rates per 1000 live births in Organisation for Economic Co-operation and Development nations, 2005. Adapted from reference 2. R Republic; UK United Kingdom; USA United States

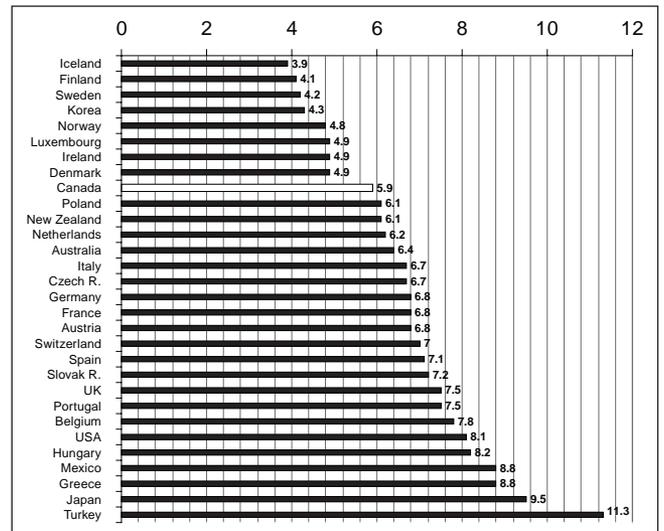


Figure 7) Low birth weight infants per 100 newborns in Organisation for Economic Co-operation and Development nations, 2005. Adapted from reference 2. R Republic; UK United Kingdom; USA United States

A range of issues should be of concern

Further analyses of the range of health determinants and Canada's place among developed nations can be seen in two reports (1,25) by the Innocenti Research Centre.

Report 1: The first report is entitled, "An overview of child well-being in rich countries: A comprehensive assessment of the lives and well-being of children and adolescents in the economically advanced nations" (25).

The report examines six themes: material well-being; health and safety; educational well-being; family and peer relationships; behaviours and risks; and subjective well-being. Multiple indicators are provided for each theme.

The material well-being theme consists of relative income poverty as measured by the percentage of children living in homes with equivalent incomes below 50% of the national median; households without jobs as measured by the percentage of children in families without an employed adult; and reported deprivation as measured by the percentage of children reporting low family affluence, percentage of children reporting few educational resources, and the percentage of children reporting fewer than 10 books in the home.

Health and safety consists of health at age zero to one year as measured by the number of infants dying before age one year per 1000 births and percentage of infants born with low birth weight (less than 2500 g); preventive health services as measured by the percentage of children aged 12 to 23 months immunized against measles, DPT (diphtheria, pertussis and tetanus) and polio; and safety as measured by deaths from accidents and injuries per 100,000 aged zero to 19 years.

Educational well-being consists of school achievement at age 15 years – average achievement in reading literacy, average achievement in mathematical literacy, and average achievement in science literacy; beyond basics – percentage aged 15 to 19 years remaining in education; and transition

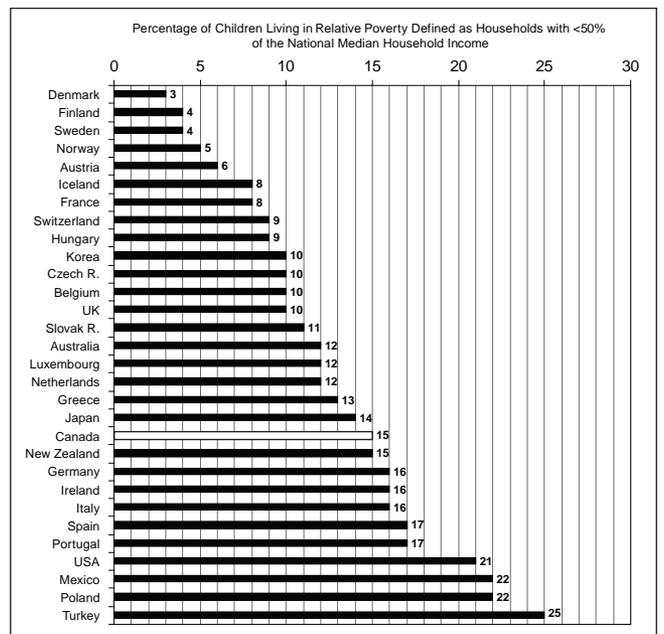


Figure 8) Child poverty in wealthy nations, mid-2000s. Adapted from reference 29. R Republic; UK United Kingdom; USA United States

to employment – percentage aged 15 to 19 years not in education, training or employment, and percentage of 15-year-olds expecting to find low-skilled work.

Relationships consists of family structure – percentage of children living in single-parent families and percentage of children living in stepfamilies; family relationships – percentage of children who report eating the main meal of the day with parents more than once a week and percentage of children who report that parents spend time 'just talking' to them; and peer relationships – percentage of 11-, 13- and 15-year-olds who report finding their peers 'kind and helpful'.

TABLE 3
Canada's relative rankings on six thematic sets of indicators of child well-being (n=21)

Thematic area	Component 1	Component 2	Component 3
Material well-being – 6th	Relative income poverty – 15th	Households without jobs – 8th	Reported deprivation – 4th
Health and safety – 13th	Health at age 0 to 1 year – IMR: 21st; LBW: 8th	Preventive health services – 16th	Safety – 13th
Educational well-being – 2nd	School achievement – 2nd	Beyond basics – n/a	Transition to employment – 10th
Relationships – 18th	Family structure – 15th	Family relationships – 18th	Peer relationships – 23rd
Behaviours and risks – 17th	Health behaviours – 12th	Risk behaviours – 17th	Experience of violence – 15th
Subjective well-being – 15th	Self-reported health – 10th	School life – 12th	Personal well-being – 10th

IMR Infant mortality rate; LBW Low birth weight; n/a Not available. Adapted from reference 25

Health behaviours and risks consists of health behaviours measured by percentage of children who eat breakfast, percentage who eat fruit daily, percentage physically active and percentage overweight; risk behaviours measured by percentage of 15-year-olds who smoke, percentage who have been drunk more than twice, percentage who use cannabis, percentage having sex by age 15 years, percentage who use condoms and teenage fertility rate; and experience of violence measured by percentage of 11-, 13- and 15-year-olds involved in fighting in the past 12 months, and the percentage reporting being bullied in the past two months.

Subjective well-being consists of health – percentage of young people rating their own health no more than 'fair' or 'poor'; school life – percentage of young people 'liking school a lot'; and personal well-being – percentage of children rating themselves above the mid-point of a 'life satisfaction scale', and percentage of children reporting negatively about personal well-being. Table 3 provides Canada's relative rank on each of these indicators.

Twenty-one OECD nations were included in the analysis. Overall, Canada ranked 12th among 21 nations. Canada's thematic rankings were as follows: material well-being, sixth of 21; health and safety, 13th of 21; educational well-being, second of 18; family and peer relationships, 18th of 21; behaviours and risks, 17th of 21; and subjective well-being, 15th of 21. Clearly, Canada has numerous issues related to the health of children that could be improved.

Report 2: The second report entitled, "The child care transition: A league table of early childhood education and care in economically advanced countries" (1), rates Canada as last – tied with Ireland at 25th among 25 wealthy developed nations – for meeting internationally (Canada meets one of 10) applicable benchmarks for early childhood care and education (1). The report describes these as a "set of minimum standards for protecting the rights of children in their most vulnerable and formative years". Importantly, the report shows that the nations with the greatest number of benchmarks met had the lowest infant mortality and lowest birth weight rates.

CONCLUSION

In the present article, the general parameters of children's health in Canada have been outlined. Canada's performance on several key indicators of children's health is at best mediocre and the sequential cross-sectional analyses provide little evidence of recent improvement. Scores on child

health indicators are strongly related to the income received by Canadian families. The effect of income on health is a function of the importance of the social determinants of health, which are best described as comprising the living conditions to which children are exposed. Canada performs poorly in international comparisons on health and determinant indicators, and recent surveys provide a troubling picture with regard to many aspects of children's health in Canada. The strong association of socioeconomic status to adverse birth outcomes, and Canada's relatively poor performance on these indicators compared with other wealthy nations, led one prominent researcher to comment with regard to intrauterine growth restriction (IUGR) – an important cause of adverse birth outcomes (3):

Indeed, countries with the lowest rates of IUGR and preterm birth have achieved those low rates not by health care interventions, but rather by reducing the prevalence of socio-economic disadvantage. It may not be possible to eliminate the higher risks of IUGR and preterm birth among the poor without eliminating poverty itself.

In part II of the series, the mechanisms and pathways by which children's health is either supported or threatened are outlined. This analysis is about how living conditions 'get under the skin' to determine health. The living conditions to which children are exposed are especially important, because these not only shape children's health but also play a large role in shaping the health status children come to experience as adults.

ADDENDUM: There is a lively debate concerning the criteria for data collection on low birth weight and how the data might be affected by the introduction of reproductive technologies (Consensus statement on healthy mothers-healthy babies: How to prevent low birth weight, Institute of Health Economics Consensus Statements, 2007). However, these issues would not substantially alter the basic conclusions concerning the broad picture of Canadian children's health indicators, which are very consistent over time and consistent with what is known about the social determinants of pregnancy outcomes in Canada and elsewhere.

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