

## **British Columbia's Longevity Advantage: A Comparison of Deaths across Canadian Provinces and Territories**

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### **Introduction**

Life expectancy at birth in Canada for both sexes combined recently surpassed the 80 year mark. This was the first country in the Americas to do so - up to 80.8 years by 2006. This basic statistic suggests substantial improvements in public health, medicine, socioeconomic conditions and nutrition - in reducing the risk of early death. Yet this is not to neglect the fact that inequities continue to characterize Canadian regions in terms of population health and mortality.

While throughout most of the 20<sup>th</sup> century the reported range in life expectancy across provinces narrowed, over the last decade and a half there has been a reversal of this trend. In examining statistics on life expectancy (at birth) across Canadian provinces, the reported range narrowed from about 7 years in the early 1930s to only 1.5 years by 1992 (Beaujot and McQuillan 1982; McVey and Kalbach 1995). Yet over the last decade and a half, there has been a reversal in this trend, with this range back up to 3.2 years by 2006. This reversal was unexpected as life expectancies across high-income countries have been tending to converge (White 2002). To demonstrate the extent to which mortality varies in Canada, consider the fact that males in British Columbia (BC) have a life expectancy

**TABLE 1 Life Expectancy by Sex, Province and Territory, Canada 2006**

	Provinces 2006									Territories 2002 <sup>1</sup>				
	B.C.	Nfld	PEI	NS	NB	Que.	Ont.	Man	Sask	Alb.	Yuk.	NW	Nvt.	Canada T
Males	79.2	75.6	77.3	77.0	77.7	78.3	78.9	76.8	76.8	78.1	73.9	73.2	67.2	78.4
Females	83.6	80.8	82.2	82.2	82.4	83.3	83.2	81.7	82.0	82.9	80.3	79.6	69.6	83.0

Note: 1. \*Estimates of life expectancy for the territories at the time of writing were available only for 2002 while provincial estimates were available for 2006.

Source: Statistics Canada (2009).

almost 4 years longer than the residents of Newfoundland and Labrador (at 79.2 relative to 75.6 years) while females report an almost 3 year advantage (at 83.6 relative to 80.8 years) (Table 1). If Canadians overall had the same mortality risks as reported in BC, this country would currently rank first across nations in terms of longevity and life expectancy (BC Provincial Health Services Authority 2007).

For well over a decade BC has lead all other provinces and territories in Canada in terms of the health status of its residents. In drawing comparisons across the U.S., there is only one state with as high a life expectancy at birth (i.e. Hawaii). With this in mind, the current paper considers in greater detail BC's longevity advantage. With basic mortality data compiled for provinces and territories, we examine via standardization procedures differences as observed in mortality across provinces and territories. Total deaths are estimated under the hypothetical situation that all Canadians achieve the same sorts of mortality rates as observed in BC, with these estimates then compared systematically with observed deaths. What are the causes of death that account for most of these differences? What are some of the factors responsible for BC's relative advantage, or more specifically, some of the relevant risk factors at associated with these deaths?

## Data and Methods

Data on deaths in Canada are compiled by the Health Information and Research Division of Statistics Canada, with the cooperation of provincial vital statistics registers. In 2006, Statistics Canada was using the World Health Organizations' International Classification of Diseases (ICD 10) – with its exhaustive classification of deaths by cause. For the purpose of the current study, we collapse this detail into a limited number of broad categories, including (i) cardiovascular diseases (I00-I59, I80-I99), (ii) cerebrovascular diseases (I60-I69), (iii) malignant neoplasm (C00-C97), (iv) diabetes mellitus (E10-E14), (v) influenza and pneumonia (J10-J18), (vi) other acute and chronic diseases of the respiratory system (J00-J06, J20-J22, J40-J47, J60-J66, J69, J90-J98), (vii) accidents (V01-X59, Y85, Y86), suicides (X60-X84, Y89.9), and homicides (X85-Y09, Y89.9), and (viii) all remaining causes. While considerable effort has gone into minimizing differences in classification procedures across various regions of Canada, we

believe that this broad classification of deaths serves to minimize the impact of any error that might unintentionally remain after compiling data across jurisdictions.

Since the provincial registers are collected for the entire population, sampling errors are not a concern in the current study. While non-sampling errors can occur in both the denominator and numerator of death rates, there is little evidence to suggest significant bias (Kerr and Morrissette 1997). Since the registration of deaths is a legal requirement in Canada (necessary for legal burial and for settling estate matters), reporting is considered virtually complete with negligible late registration (Statistics Canada 2008). With regard to the denominator of death rates, the current study relies upon the most accurate population data available, i.e. population estimates by age, sex and province, for 2006. As Canada has a national census every five years, this population estimate makes a slight adjustment in moving from census day to mid year and relies upon highly accurate estimates of net undercount by province, age and sex (Statistics Canada 2008).

Owing to some of the shortcomings in drawing comparisons of demographic rates across populations, demographers routinely employ "standardization" techniques (Shryock 2004; Siegel 2002). These techniques have been developed in order to adjust crude rates and total counts for compositional differences across populations. Standardization was first developed in recognition of the simple fact that since demographic rates usually vary in an important manner across different parts of a population, compositional differences alone can lead to all sorts of difficulties in making systematic comparisons. It is well known, for example, that the incidence of mortality varies strongly by age and that differences among populations in age structure can have a considerable influence on the number of deaths reported. Consider the simple fact that in Canada's northern most territory Nunavut (where the risk of early death is higher than anywhere else in Canada), the crude death rate is almost half of the Canadian rate, merely due to its relatively young age structure.

While standardization can be used to take into consideration any number of compositional factors (for example, differences in education, marital status and immigration status), our primary concern here is standardization for the impact of age/sex structure. Using direct standardization, we first apply BC age and sex specific death rates to the 2006 Canadian population, subdivided into five year age groups and sex. In so doing, the simple question is asked: how many fewer deaths would Canada experience if it had the same age sex specific mortality rates as BC? The resulting number of deaths, by age and sex, is compared with the corresponding actual number of Canadian deaths: the difference indicates the number of excess deaths. This provides the reader with an intuitive sense as to real cost of differences in mortality and population health in Canada, with a direct indication of lives theoretically lost. As a next step, we again apply BC age and sex specific death rates, yet shifting our attention to each of the 2006 provincial/territorial populations. The resulting numbers provide us with an indication of excess deaths by province/territory, i.e. the number of deaths that occur with rates equivalent to BC's mortality relative to what was actually observed. In order to obtain greater detail as to the underlying nature of these differences, we next consider BC/Canadian mortality differences, by extending our

standardization to “cause of death”. Here we again calculate, in an analogous manner, the number of excess Canadian deaths that would have occurred, yet this time as associated with the aforementioned broad classification of causes as based on the World Health Organization’s ICD.

This standardization procedure is very comparable to Torrey and Haub’s (2007) recent comparison of U.S. and Canadian mortality patterns – yet we use it here to compare BC patterns with the rest of Canada. We then conclude by briefly reviewing how specific risk factors associated with early death vary in a systematic manner across Canadian provinces and territories, and how this is relevant to explaining BC’s relative advantage.

### **Demographic Characteristics of Excess Canadian Deaths**

Table 2 portrays the results of our standardization at the national level. Here we address the simple question: how many deaths would hypothetically occur in Canada if it experienced roughly the same age sex specific mortality rates as BC in 2006? As aforementioned, this is done by applying BC age and sex specific death rates (columns 7 and 8) to the 2006 Canadian population - excluding BC (columns 1 and 2). Both the population data and mortality rates are subdivided into five year age groups and sex, with the exception of ages 0-1 and 1-4. Columns 3 and 4 portray the number of deaths that actually occurred across Canada, while columns 9 and 10 include the number of deaths that might have occurred under this hypothetical situation. The remaining columns in Table 2 report the excess deaths, by age and sex (columns 11-13), obtained as the difference between actual deaths and this second hypothetical distribution.

As indicated, this excess mortality outside of BC in 2006 was equivalent to 9,341 deaths, for both sexes combined – a figure which accounts for about 1 in 20 deaths overall outside of this province. Among males, the application of BC rates leaves for about 6.6% fewer deaths (6,571), while among females the advantage is less pronounced, at about 2.8% (2,771 deaths). By age and sex, the BC advantage does not exist at younger ages (with the exception of infant mortality), while increasing systematically among older Canadians, beginning in middle age. Heterogeneity in BC’s population, by age and sex, explains the disadvantage at younger ages and the advantage as documented at older ages. The total of excess deaths across all ages is not trivial, and is comparable if not greater in magnitude than the total number of Canadian deaths as associated with accidents (9,500), diabetes mellitus (7,800), influenza and pneumonia (5,800), Alzheimer’s disease (5,700) and intentional self harm, suicide (3,600).

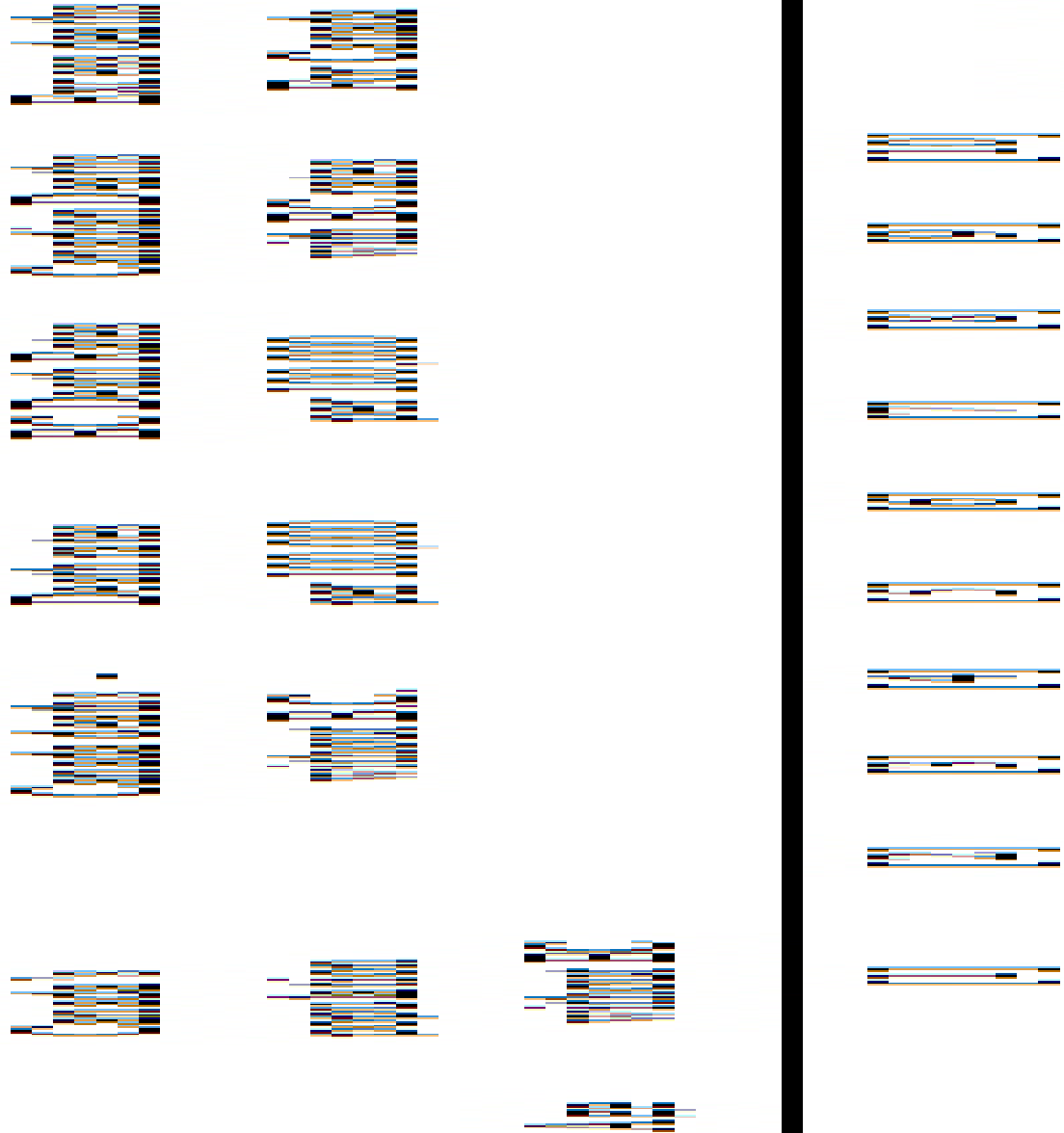
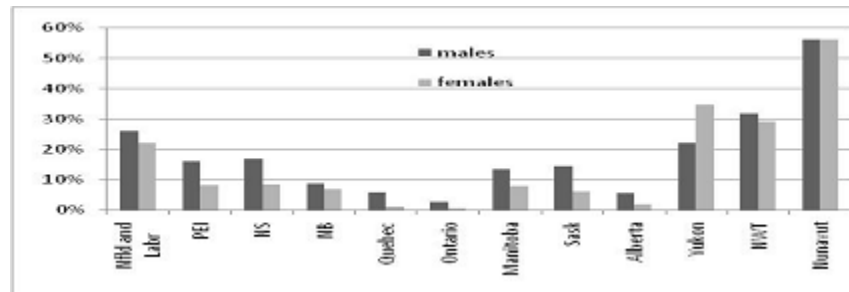


TABLE 2 Excess Deaths for Canada (excluding BC) relative to BC mortality, by Age and Sex, 20

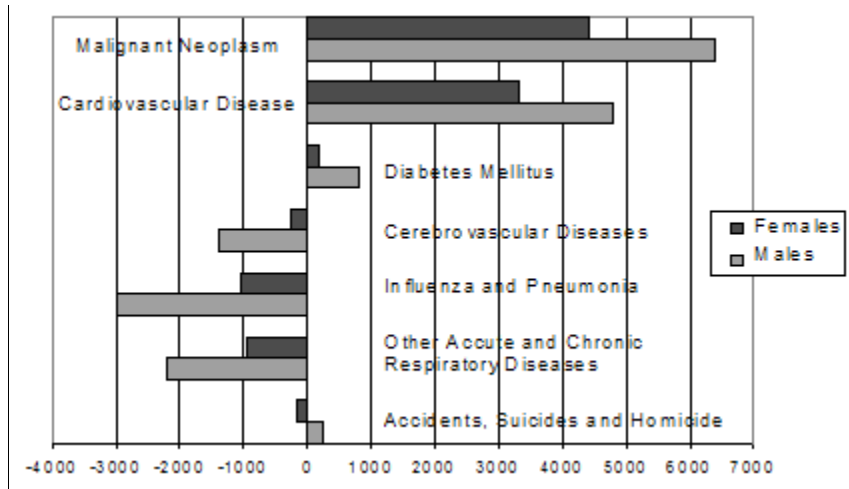


**FIGURE 1 Percentage of Excess Deaths by Province and Sex in Comparing Actual Deaths with Deaths Estimated with BC Mortality Rates and Provincial Population Structures, 2006**  
Source: Statistics Canada, 2009; Author's Calculations

## Provincial/Territorial Differences

While useful at the national level, the above standardization does not capture the full extent to which mortality conditions vary across regions of Canada, as specific provinces and territories are known to be particularly disadvantaged. Overall, the population and mortality data that entered into this national standardization exercise is most heavily weighted by Canada's largest provinces – Ontario and Quebec – two provinces which report mortality rates relatively close to BC. Figure 1 provides us with greater detail of what is happening across Canada, by shifting our attention to excess mortality in specific provinces and territories. The percentages as reported in Figure 1 are completely analogous to the figures as mentioned above, i.e. they indicate the extent to which deaths would be reduced with BC mortality rates – yet in this case we shift our attention to specific provinces and territories.

Ontario, Quebec and Alberta are all quite close to BC in terms of mortality, with the lowest percentage of excess deaths for both men and women. Greater variation is observed for smaller provinces as well as the three northern territories (Yukon, NWT and Nunavut). Newfoundland is the most disadvantaged province, with 1 in 4 male deaths and 1 in 5 female deaths estimated as excess if BC rates prevailed. Similarly, the other remaining Atlantic provinces (PEI, NS and to a lesser extent NB) all report higher than average excess deaths, as is also true for two of the Prairie provinces (Manitoba and Saskatchewan). As an extreme, our standardization exercise suggests that deaths in Nunavut in Canada's far north might be reduced by more than one half, while Yukon and NWT also both report a substantial percentage of all excess deaths (in the order of 20-30%). To the extent to which the rest of Canada obtain standards comparable to BC, the gains in terms of years lived and reduced health care costs could be quite pronounced.



**FIGURE 2** Difference in Deaths, by Cause and Sex, Obtained by Comparing Actual Canadian Deaths by Cause with Deaths Estimated with BC Mortality Rates and Canada's Population Structure, 2004

Source: Statistics Canada, 2004. Author's Calculations.

Note: Deaths were organized by selected grouped causes, age group and sex, Canada, provinces and territories. While Statistics Canada has released data on total deaths by age and sex for the year 2006, this standardization relied upon the most up to date currently available on deaths by age, sex and "cause", i.e. for the calendar year 2004.

## Deaths by Cause

Building on this standardization exercise, it is useful to extend our analysis to also consider "cause of death". In breaking down our mortality rates by cause, we find excess Canadian deaths relative to BC in predominantly two of the seven aforementioned cause categories. Figure 2 summarizes the results of several distinct standardizations, each of which considered one of the aforementioned cause categories. Two of these categories: Malignant Neoplasm (or Cancer) and Cardiovascular Disease are particularly important in terms of excess deaths, just as they constitute two of the most important causes of death overall in Canada.

Overall, Malignant Neoplasm (Cancer) is the most common cause of death in Canada, followed by cardiovascular disease, accounting for about 30 and 23% of all deaths, respectively. In terms of our standardization, results at the national level indicate that these two categories account for about 78% of all excess deaths (both sexes) for the population residing outside of the province (or 45% and 33% for each cause respectively). For males in particular, Malignant Neoplasm is responsible for fully 49% of all excess Canadian deaths, which is equivalent to 13% of actual cancer deaths observed nationally. Excess Canadian male deaths from Cardiovascular Diseases represent about 11% of deaths from that cause. In 2004, Canadians would have experienced roughly 6400 fewer male and 4400 fewer female deaths from Cancer and roughly 4800 fewer male deaths and 3300

fewer female deaths from Cardiovascular disease.

Diabetes Mellitus also contributes to this advantage (or about 800 male deaths and 200 female deaths). In one category that we investigated, “accidents/suicides/homicides”, the hypothetical and the actual numbers were roughly the same, i.e. with a slightly greater risk of death outside of BC for males (about 250 excess deaths) offset by a slightly lesser risk for females (150 savings). With regard to cerebrovascular disease, influenza, pneumonia as well as other diseases of the respiratory system, BC actually reports a disadvantage relative to elsewhere in Canada. This latter observation is consistent with the idea of competing risks of death, that is, as the risk of cardiovascular disease and cancer declines in a population, particularly in middle age, then the prevalence of other causes of death increases yet delayed to older ages (Kue Young 2004). Although the data is not presented here, the excess mortality as associated with these latter categories of causes characteristically exist among the aged when persons are more frail and vulnerable. Deaths from influenza and pneumonia, for example, affect mostly the oldest age groups for both men and women.

As discussed earlier in reference to Table 2, the BC advantage is virtually non-existent at younger ages (with the exception of infant mortality). One factor not obvious in explaining this situation is a higher risk of accidental death among younger adults in BC. On the other hand, this risk is counterbalanced by lower risks at older ages, explaining the negligible differences as observed overall. With most of the mortality risks, the BC advantage increases systematically from middle age onward, while again diminishing slightly at the oldest of ages. Among Canadians aged 85+, the BC advantage is very small for men and non-existent for women. While not presented in the current text, in terms of cardiovascular disease, 74% of excess male deaths and 49% of excess female deaths occur between the ages of 50 and 74. In terms of Cancer, excess deaths between the ages of 50 and 74 represent 51% of excess cancer deaths for men and 40% for women. The real costs elsewhere in Canada in terms of higher mortality due to these causes are obvious and substantial.

### **Explaining B.C.’s Advantage**

Given the lack of information available on the characteristics and life experience of the deceased in Canada’s system of Vital Statistics, the sorts of analyses that have been conducted historically in this country have been quite limited. This situation has changed somewhat recently, as Statistics Canada has developed a particularly promising dataset that systematically links mortality records from Vital Statistics with individual census records (Canadian Census Mortality Follow Up Study 2008). Unfortunately, this dataset has yet to be made available to researchers outside of government, although some of preliminary research as associated with it clearly shows its potential in contributing to demographic literature on the socioeconomic determinants of mortality (Wilkins et al 2008). Currently in the public domain, there continues to be an absence of micro data on the socioeconomic characteristics and education of the deceased, as well as their



past risk behaviors and/or the quality of medical care.

Regardless of data limitations, population health researchers, sociologists, demographers and epidemiologists have long pointed to how various socioeconomic and cultural factors appear to impact mortality risks (Wilkins 1980; Wilkins and Adams 1990; Raphael 2004; Ross et al 2007; Trovato 2009; Orpana et al 2010). Wilkins et al (2002), for example, provided evidence as to this socioeconomic gradient, working with the neighborhood as their unit of analysis. After grouping a large sample of urban neighborhoods into quintiles in terms of their poverty (or more precisely, low income rates), life expectancy at birth was documented. The differences as observed between the richest and poorest neighborhoods were shown to be substantial - or about 3.5 years in terms of life expectancy at birth, and as much as 5 years when considering exclusively males. Similar differences in terms of socioeconomic status have been documented across a wide variety of industrialized countries (Guo et al 1999; Hertzman 2001; Marmot 2005; Marmot and Wilkinson 2005).

The aforementioned Canadian Census Mortality Follow Up Study has provided direct data to this effect, documenting the inverse socioeconomic gradient in mortality risk that exists in Canada at the national level: as socioeconomic status across individuals increases, the mortality risk declines (Wilkins et al 2008). With regard to the socioeconomic characteristics of those that died between the 1991 and 2001 censuses, Statistics Canada (2008) documented how mortality rates were highest among persons with less than a high school education, were unemployed or not in the labour force, were in unskilled jobs, and were in the lowest income brackets. It directly follows that mortality is highest in regions of the country that have the highest poverty rates, greatest unemployment and underemployment, with a less educated population. Across provinces, some of the differences are relatively pronounced, as for example, the unemployment rate in Newfoundland at the end of 2007 was almost three times BC's - at 13.2% and 4.2% (Statistics Canada 2009). In terms of education, almost one half of BC's population - aged 25-64 - have some form of post-secondary education, which compares with only about one third of Newfoundland's population (Statistics Canada 2007).

Higher mortality has been linked to the stresses associated with social exclusion, poor job prospects, and difficult living conditions. In addition, selected occupations are noted for their occupational and environmental hazards (Marmot and Wilkinson 2005). Feinstein (1993) has pointed out that health inequalities in Canada are influenced by social class differences in terms of long term behaviors potentially seriously detrimental to health, including diet, smoking, exercise, alcohol and substance use, and risk taking. The pressures associated with difficult work and living conditions and the stress associated with such insecurities lead some people to drink or smoke as a form of relaxation, or to engage in other risky behaviors. In an analysis of health and mortality disparities in Canada, James et al (2007) have suggested that disparities continue to characterize Canadians, particularly in terms of causes of death that might be thought to be largely amenable to greater public health interventions - for example, lung cancer, cirrhosis of the liver and accidental death. Accordingly, one might expect that

public health interventions have had varying success across different regions of the country, as socioeconomic conditions vary as do other factors that shape the quality of life and health habits of Canadians.

While the Census Mortality Follow Up Study has documented a socioeconomic gradient to mortality in Canada, it does not provide direct information on relevant risk factors known to be associated with cardiovascular disease and cancer, such as smoking, hypertension and obesity, as well as diet, exercise and alcohol consumption. Yet since cancer and cardiovascular disease are responsible for the bulk of BC's longevity advantage, it is useful to at least briefly consider how these risk factors vary across regions. Figure 3 provides a summary of relevant information from various population health surveys on provincial differences, including on the prevalence of smoking, alcohol abuse (percentage reporting having 5 or more drinks on one occasion, 12 or more times annually), the incidence of obesity (BMI of 30 or greater), high blood pressure (percentage diagnosed with hypertension), diet (percentage that report consuming, on average, fruits and vegetables at least five or more times per day) and physical activity (active or moderately active).

These statistics clearly document how well BC is doing on all of these indicators relative to other provinces; i.e. residents of BC are least likely to smoke, least like to drink heavily, least likely to be obese, and rank second across provinces/territories in terms of high blood pressure, being physical active and maintaining a healthy diet. In terms of high blood pressure, BC is likely in better shape than NWT regardless of the statistics provided in Table 3, as many living with hypertension are not yet diagnosed with the disorder. In other words, BC ranks first or second on these indicators in drawing comparisons across provinces and territories, suggesting considerable success in promoting a culture that encourages a healthy lifestyle.

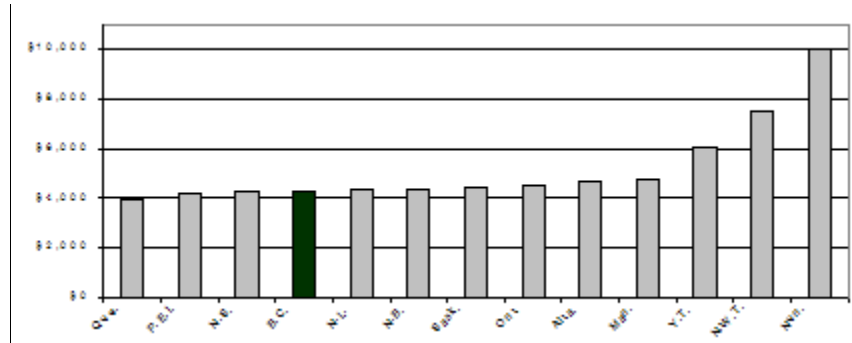
Regions of Canada with the weakest economies (the Atlantic Provinces and the Northern Territories) have higher than average mortality, just as they rank relatively poorly on the risk factors listed in Figure 3. While BC is doing very well on these same indicators, its longevity advantage also relates to the affluence of this province relative to many other regions of Canada. In terms of average household income, BC ranks 3<sup>rd</sup> across provinces and territories in 2007 (behind Alberta and Ontario). In terms of unemployment, this province ranks 4<sup>th</sup> lowest in 2007. In terms of education, BC ranks 2<sup>nd</sup> only to Ontario in terms of the proportion of its population aged 25-64 with a university degree. BC also performs relatively well across several other indicators (low income rate, income inequality, high school drop out rate, labour force participation rate, etc), although it typically does not lead the country in this regard (Statistics Canada 2009). It is a combination of a sound economy as well as its leading performance on the risk factors listed in Figure 3 that explains the lower risk of both cancer and cardiovascular disease in BC.

Persons of higher socioeconomic status have the advantage of various structural and cultural supports for relatively healthy behavior, with potentially less isolation and more social support. Yet other socio-economic and cultural factors as well as public health interventions associated with different geographic

CDN	21.9	21.8	16.0	15.9	49.0	41.3
N	58.5	30.8	15.6	--	40.7	22.1
NWT	38.0	38.9	21.9	11.0	49.3	26.3
YT	36.0	34.4	25.2	15.2	55.4	38.5
AL	21.9	23.9	18.3	14.0	53.4	39.1
SK	.	.	.	.	.	.
MN	.	.	.	.	.	.
ON	<del>20.0</del> <b>24.0</b>	<del>24.0</del> <b>20.8</b>	<del>20.8</del> <b>16.1</b>	<del>16.1</del> <b>46.8</b>	<del>46.8</del> <b>34.9</b>	
QC	.	.	.	.	.	.
NB	.	.	.	.	.	.
NS	<del>23.1</del> <b>20.8</b>	<del>20.8</del> <b>20.0</b>	<del>20.0</del> <b>19.0</b>	<del>19.0</del> <b>43.0</b>	<del>43.0</del> <b>30.0</b>	
PEI	.	.	.	.	.	.
L	.	.	.	.	.	.
BC	<del>25.8</del> <b>18.5</b>	<del>18.5</del> <b>21.0</b>	<del>21.0</del> <b>14.0</b>	<del>14.0</del> <b>45.7</b>	<del>45.7</del> <b>30.9</b>	

TABLE 3 Proportion of the High-Mortality Group by Province/Territory, 2007





**FIGURE 3 Per Capita Health Care Expenditures (Public and Private), 2007**

Source: CIHI, Health Care Indicators, 2009; Author's calculations

regions in Canada have also influenced lifestyle and promoted population health. In this regard, a more careful appraisal of BC's situation could have important implications for health policy elsewhere in Canada as well as the broader North American context. This is particularly true as there are provinces and several states south of the border which have outperformed BC in terms of the vitality and strength of their economies, while lagging behind in terms of population health and longevity.

### Needed Research

The Canadian health insurance system has been organized to ensure access on the basis of health need rather than income. While the delivery of health care is primarily of provincial jurisdiction, the federal government through the Canadian Health Care Act has attempted to assure that the residents of all provinces and territories in Canada have reasonable access to comparable health services without financial burden. With the support of federal equalization payments and the Canadian Health Transfer program, all provinces are expected to provide a level of service that meets national standards. Yet despite these efforts, disparities continue to characterize Canadian society in terms of health outcomes, both with regard to deaths that might be considered preventable with early intervention from the health care system (for example, a death due to late detection or treatment of a cancer) just as there are disparities in the number of deaths that could be potentially amenable to public health interventions – for example, unnecessary deaths due to smoking or obesity, despite early detection and treatment (James et al 2006).

Unfortunately, Canadian researchers do not have a solid quantitative fix on the extent to which each is true, as there are major methodological challenges in disentangling these causes. Furthermore, there is an absence of longitudinal data that could facilitate a careful appraisal of this issue. As noted earlier, the mortality data currently available are limited, as Canadian deaths have yet to be linked with information on the quality of care that persons receive throughout their life course,

nor have they been linked to information on the sorts of risk behaviors mentioned above. Despite this situation, Figure 3 provides us with some insight as to the importance of differences in provincial health care delivery when explaining BC's longevity advantage. More specifically, Figure 3 documents the per capita health care expenditures for each province and territory. Such data demonstrates that BC's advantage is most certainly "not" the by-product of spending substantially more than other provinces on the delivery of health care. Total per capita expenditures (both private and public combined) are no more expensive in BC than elsewhere in Canada (i.e. while the differences are not great, BC actually ranked 10<sup>th</sup> across 13 jurisdictions in terms of total expenditures per capita). Similarly, in considering exclusively costs to government (excluding private expenditures), the differences across provinces are again relatively modest, with BC falling somewhere toward the middle of the pack in this regard.

Complicating any interpretation of Figure 3 is the fact that BC's population is considerably healthier than elsewhere in Canada, such that, with everything else remaining the same, the demand for many types of health care services is lower here than elsewhere. This in turn at least partially explains the relative ranking of provinces on health care expenditures. Worthy of further research is the extent to which BC is better served by its health care system relative to provinces with comparable expenditures yet in greater need for service. For example, to what extent is the reduced risk for both cancer and cardiovascular disease in BC translate into cost savings for this province's health care system relative to elsewhere in Canada?

Statistics Canada's Canadian Census Mortality Follow Up Study could allow for further research on the socioeconomic gradient of mortality, yet in shifting emphasis from the national level to specific provinces/territories. To what extent do associations that exist nationally between socioeconomic status and mortality persist or remain constant across Canada's regions? Do persons of relative disadvantage in BC experience the same sorts of mortality risks as persons of comparable status elsewhere in Canada? What of the relative success of public health initiatives in reducing disparities in terms of population health? To what extent do disparities persist in terms of access to health care services, including specialized care? Complicating any analysis are other factors, distinct to BC, that obscure somewhat the relationships as documented. For example, what of the impact of immigration on population health, as BC is second only to Ontario in terms of the percentage of its population born outside of the country (at 27.5 percent and 28.3 percent, respectively). Researchers have speculated as to impact of the so called "healthy immigrant effect" on population health. The impact of immigration over time is complex, as for example, immigrants generally settle in Canada with better health than the Canadian born, yet as time passes, this "healthy immigrant effect" tends to diminish (Wilkins et al 2006).

While there has been past research on the determinants and consequences of such fundamental risk factors as smoking, sedentary living, or diet and obesity, a specific focus on the BC situation appears warranted, particularly in recognition of the low incidence of these risks relative to elsewhere in North America. How do the determinants of these risks differ in this province, if at all? For example, the

incidence of smoking is considerably lower in BC than elsewhere in Canada (at only about 17%) although it is far from obvious as to why this is the case. Similarly there are widely expressed concerns over other fundamental health risks, including the rapid rise obesity in North America, as interrelated with associated risks of poor diet, a lack of physical inactivity and hypertension. At only 11.5% classified as obese in BC, the incidence of this health risk almost appears like an outlier in the broader North American context. While this province has the lowest incidence in Canada, there is not a single state in the US with an obesity rate that even comes close to what is observed in BC.

This risk factor is not to be downplayed, as recent research suggests that obesity may be the single most important factors in explaining the growing gap between Canadian and American life expectancies (Torrey and Haub 2007). The US Centre for Disease Control and Prevention (2009) indicates that only one state south of the border has an obesity rate lower than 20%, while fully 32 states had rates greater than 25% and six states had rates greater than 30%. American research has suggested that among adults with a BMI equal or greater than 30, life expectancy at age 40 is reduced by about 7 years – or 6.85 years and 7.01 years, for men and women respectively (Peeters et al 2003). This statistic is observed after controlling for related health risks, including smoking behavior and hypertension.

There is considerable unrealized potential of public health initiatives to reduce health disparities in Canada, also true of the broader North American context. Further research into understanding BC's success in promoting public health relative to elsewhere in the North America could be very useful in informing health policy. There are potential gains in population health that could be very cost effective, particular given the small percentage of total government expenditures currently devoted to public health interventions – estimated to be at about 8.5 percent in 2005 (CIHI 2009). This is particularly true in a context of rapid population aging and forecasted upward pressures on health care expenditures, true of both Canada and the US.

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