

Evolution of Life Expectancy and Health Equity in Canadian Health Regions from 1986 to 2007

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Abstract

Background: Life expectancy (LE) analysis was conducted in this study to explore time trends for Canadian mortality rates from 1986 to 2007 by age and sex and compare these trends to sociodemographic characteristics. Objective: To measure Canadian's LE by age, sex, provinces/territories and health regions, detect lower LE in Canada due to variant lifestyle and socioeconomic status, compare the difference of Canadian LE among these areas over time. Results: Canadians' LE at birth has increased 3.2 years in 1986-2007 in women, and 5.2 years in men. LE in British Columbia and Ontario were 81.2 and 81.0, higher than the average in Canada (80.7) in 2007. Regions with the highest LE were Richmond Health Service Delivery Area (BC), York Regional Health Unit (ON), and Peel Regional Health Unit (ON) in compared to the three regions with lowest LE: Région du Nunavik (QC), Burntwood/Churchill (MB), and Nunavut Territory in both sexes.

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20 **Index terms**— life expectancy, age, sex, mortality, health status, risk factors, biostatistics, canada.

1 Introduction

22 Life expectancy (LE) is frequently used as an indicator of the health of a population. Identifying gaps in life 23 expectancy between different groups in different provinces and territories helps draw attention to particularly 24 vulnerable populations in Canada. However, life expectancy measures the length rather than the quality of life, 25 and does not necessarily represent the number of years spent in good health [1].

26 In the last five decades, life expectancy in Canada has been ranked in the top 10 among the 34 countries now 27 in the Organization for Economic Cooperation and Development (OECD) [2][3]. In 2007, the most recent period 28 for which data are available for all OECD countries, Canada ranked ninth, with a life expectancy at birth of 29 80.7 years for both sexes combined. This was 1.9 years lower than the first-ranked country, Japan. Canadian 30 men were in eighth place, 1.2 years below top-ranked Switzerland, and Canadian women were tied for ninth with 31 Sweden, 3.0 years below Japan [4].

32 The gap in life expectancy between males and females differs by country. In Canada, life expectancy at birth 33 is 4.6 years longer for women than men. Among the top 10 OECD countries, the gap in life expectancy is largest 34 in France (7.0 years) and smallest in Iceland (3.5 years) [4].

35 The objective of this study is to identify where Canada has the highest overall life expectancy, and to relate 36 the findings to associated health behaviours and socio-demographic characteristics.

2 II.

3 Data and Methods

39 We used the Canadian Vital Statistics Death Database for the period of 1986 to 2007. All death records are 40 based on information abstracted and compiled from death certificates and are provided to Statistics Canada by 41 the vital statistics registrars in each province or territory. The mortality data in this analysis are coded using

7 DISCUSSION

42 both the 9 th and 10 th Revision of the International Classification of Diseases (ICD-9 and ICD-10). Annual
43 population estimates were taken from Statistics Canada's annual demographic statistics (Statistics Canada.
44 Annual Demographic Estimates: Canada, Provinces and Territories 2011). For each province or territory
45 (Northwest Territory, Yukon, and Nunavut) and health regions, overall average and sexspecific mortality rates
46 were calculated for the study period. The annual population was considered as a weight to produce a weighted
47 average of annual mortality rate and life expectancy for provinces/territories and health regions.

48 Life expectancy was then related to the health regions by age and sex. These variables were examined together,
49 with socio -demographic characteristics. A peer group was created based on similarities in the populations
50 of health regions along a number of sociological categories, including: income inequality; percentage of the
51 population aged 65+; unemployment rate; property ownership; and average years of schooling [5]. We compared
52 the significant differences among respective peer groups, provinces/territories and the Canadian national level
53 group.

54 When the result is "0", this means there is no statistical difference; "+1" means there is a positive statistical
55 difference; and "-1" means there is a negative statistical difference between compared groups.

56 LE analysis was conducted to explore time trend for Canadians mortality rate from 1986 to 2007 by all causes,
57 age, and sex. All analyses were conducted by using SAS, version 9.1, statistical software.

58 4 III.

59 5 Results

60 6 Life

61 expectancy in Canada improved significantly from 1986 to 2007.

62 Women's life expectancy at birth increased from 79.8 years in 1986 to 83.0 years in 2007, while men's increased
63 from 73.2 to 78.4 years in the same period-increases of 3.2 years for women and 5.2 for men (Figure 1). Our study
64 noted only modest variability in LE by province, with the only noteworthy exception being the much lower female
65 LE in Newfoundland and Labrador. Figure ?? shows how life expectancy at birth varies across Canada. Among
66 the provinces in 2007, British Columbia (BC) had the longest life expectancy, 81.2 years, following by Ontario
67 (81.0), Quebec (80.7), Alberta (80.5), PEI (80.2), and New Brunswick (80.0). Newfoundland and Labrador had
68 the lowest, 78.3 years. However, when we compare the differences between 1986 and 2007 period, we found
69 that the highest increase in LE was for PEI, there are 4.3 years difference, higher than average (4.2) in the
70 general population. Ontario was 4.2 years, the same as in the average LE in Canada. LE in other provinces
71 and territories were lower than general population (Figure ??). YKT/NWT/NUT-Yukon Territory/North West
72 Territory/Nunavut Territory LE in the different health regions of different provinces and territories varied in
73 health regions and sex. The three regions with the highest LE were Richmond Health Service Delivery Area
74 (BC), York Regional Health Unit (ON), and Peel Regional Health Unit (ON) in both sexes (84.6, 83.8, 83.2),
75 males (82.6, 82.0, 81.3), and females (86.2, 85.4, 84.9) respectively. In contrast, the three regions with the lowest
76 LE were Région du Nunavik (QC), Burntwood/Churchill (MB), and Nunavut Territory in both sexes (71.3, 71.3,
77 72.0), males (69.3, 68.4, 68.9), and females (72.5, 74.6, 76.0). Results showed that the three highest LE have
78 positive statistical difference in comparing with the previous reference period (+1), the Canadian national level
79 (+1), the peer group rate (+1) and the provincial level (+1). However, the three regions with the lowest LE were
80 negative statistical lower than the Canadian national level (-1), the peer group rate (-1) and the provincial level
81 (-1). (Table 1

82 7 Discussion

83 Life Expectancy (LE) is a commonly used component of the Human Development Index (HDI), along with adult
84 literacy, education, and standard of living [6].

85 Although our study noted only modest differences in LE by province, we observed large variations in LE by
86 health regions. This highlights the importance of conducting surveillance with sufficient granularity to adequately
87 inform public health action. Health regions with low LE in tended to be clustered in the north, while those with
88 high LE in tended to be in regions in the south which were most urbanized and had experienced the highest levels
89 of immigration. The most disadvantaged health units had life expectancies comparable to those experienced in
90 Canada as a whole 40 years ago [7].

91 Life expectancy is lower for males than for females: this gap has been present to varying degrees for nearly a
92 century. This gap between the sexes narrowed over the study period [8][9][10].

93 The reasons for this may be that life expectancy tends to be lower in regions with poor living conditions, a lack
94 of primary health care, higher accident rates, and the rates of smoking, heavy drinking and obesity are relatively
95 higher than other regions in Canada [11][12][13][14][15][16].

96 These regions also have higher rates of extended unemployment, fewer high school and university graduates,
97 a relatively larger Aboriginal population and are generally tended to be more rural and remote [17].

98 Our results are comparable to those in some European countries and in Japan. The difference in life expectancy
99 at birth between the best and worst European countries in this respect is more than 10 years for both sexes. Life
100 expectancy at birth in the European Union-27 countries (new members after 2004) was 75.1 years (men) and

101 81.3 years (women). The difference between the 10th and 90th percentile of 272 regions was 8.0 (men) and 5.6
102 years (women). Men lived 6.1 years and women 3.9 years shorter in the new member states (NMS, new members
103 since 2004) than in the European Union-15 countries.

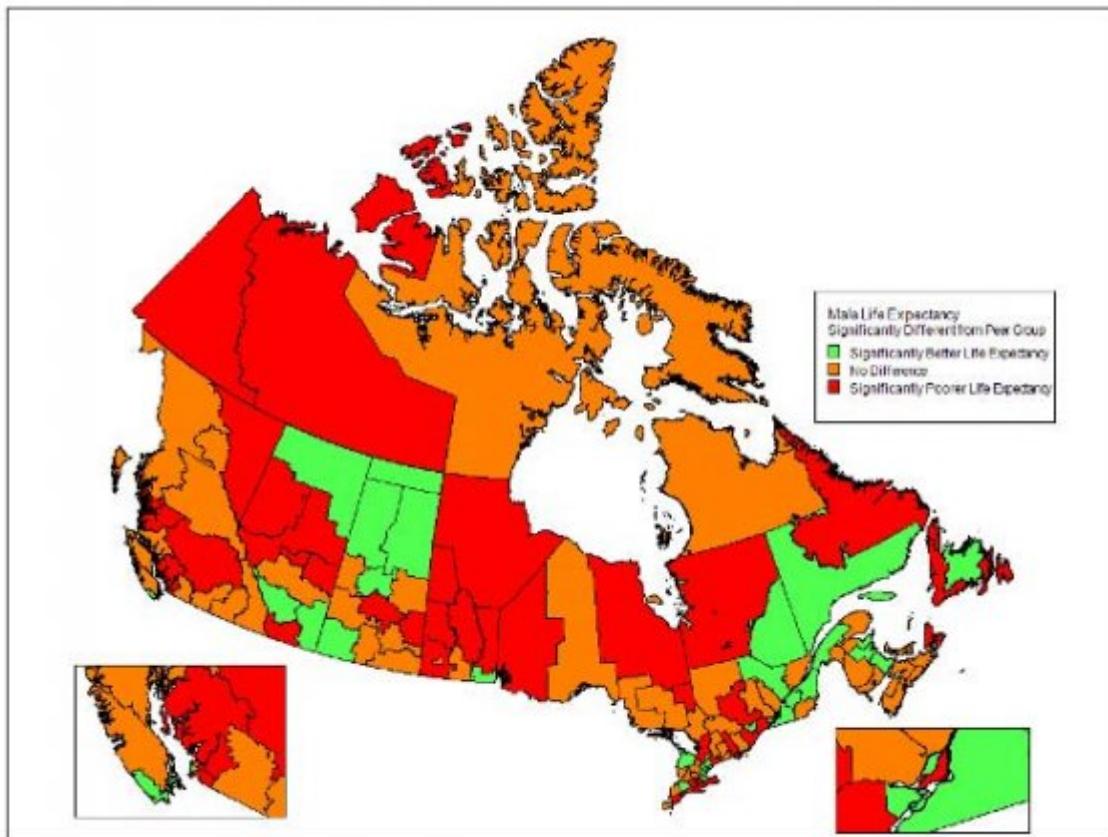
104 The main causes explaining differences in life expectancy are ischemic and other heart disease, stroke, alcohol
105 related mortality, lung cancer and injuries [18][19] ??20[21]. The contributions of medical care and pollution
106 are likely to be modest; health behaviour, diet, and alcohol consumption seem to be more important; smoking
107 seems to have the largest impact [11][12][13][22][23][24]. In contrast, people in health regions with life expectancy
higher than the Canadian average practice good health behaviours, have high average years of schooling, high ¹



1

Figure 1: Figure 1 :

108



12

Figure 2: Figure 1 :Figure 2 :

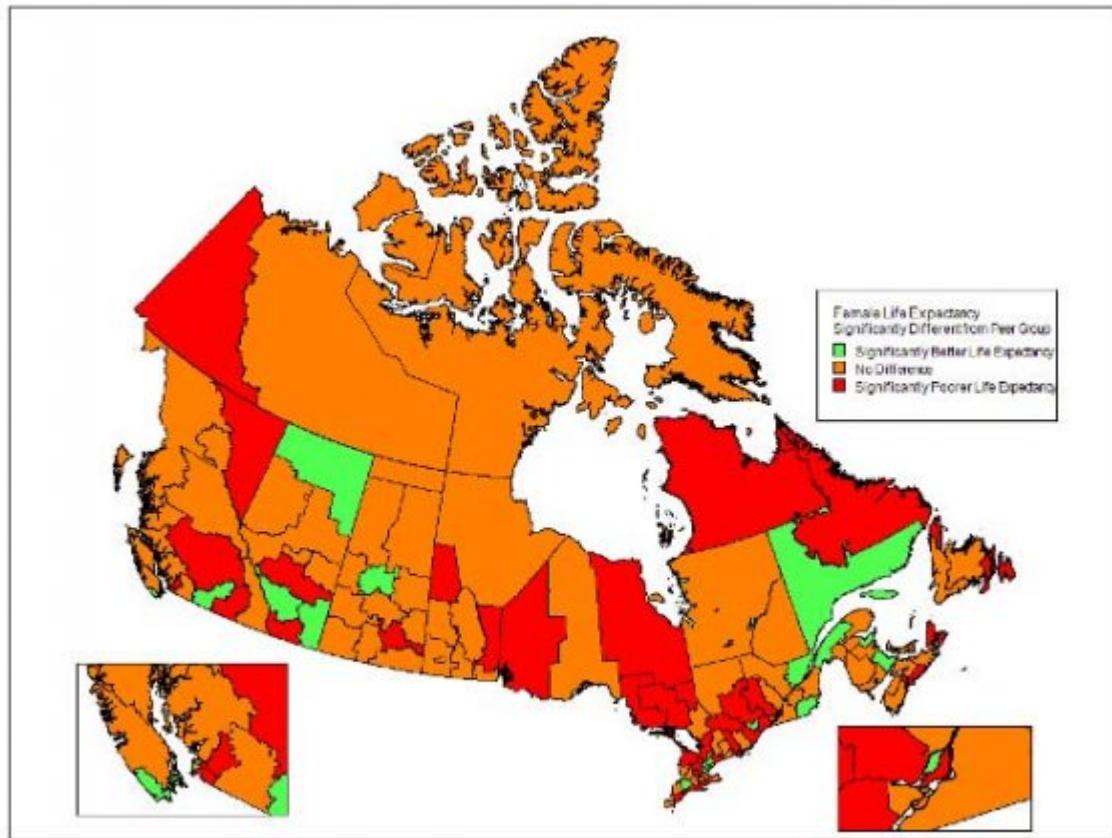


Figure 3:

1

Figure
2:

	Life of Expectancy (year)										
CAN	76.5								80.7		
NL	76.3						78.3				
PEI	75.9							80.2			
Provinces/territories	77.0	76.8	76.5	76.4	76.1	75.9		79.5	79.3	81.0	
QC NB NS								79.7	80.0	80.7	
AB					76.7			80.5			
BC						77.6				81.2	
YT/NT/NU	75.8										
73	74	75	76			77	78	79	80	81	82

Figure 4: Life Expectancy at birth, by provinces/territories in Canada from 1986 to 2007Table 1 :

7 DISCUSSION

1

		Compared to previous period	Male	Female			
Compared to national level peer group	Canadian national group in Canada 2005-2007*	Three top highest LE in the health regions	Code 95% C.I. 95% C.I. 95% C.I.	Both Male Femae	Rich Service Health Delivery	Service	Area
					5931	84.6	
					84.2	84.9	
					82.6	82.1	
					83.2	86.2	
					85.7	86.7	

Figure 5: Table 1 -

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