The Evolution of Longevity: Evidence from Canada

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Statistics Canada: 100 Years and Counting, December 2018

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Canada - Life expectancy

![Graph showing life expectancy from 1965 to 2015 for women and men in Canada. The line for women is consistently higher than that for men.](image)

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Longevity - the ultimate inequality


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The Evolution of Longevity: Evidence from Canada
Question, approach, and contribution

Question: How has longevity evolved across the earnings distribution in Canada?

- Canadians concerned with inequality in longevity
- Policy, pensions, planning
Question, approach, and contribution

- **Question:** How has longevity evolved across the earnings distribution in Canada?
  - Canadians concerned with inequality in longevity
  - Policy, pensions, planning
- **Approach:** Canada Pension Plan administrative records
  - Universe of data, birth cohorts, 1916–1955
  - Fifty years of earnings and mortality, 1966–2015
Question, approach, and contribution

- **Question:** How has longevity evolved across the earnings distribution in Canada?
  - Canadians concerned with inequality in longevity
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- **Approach:** Canada Pension Plan administrative records
  - Universe of data, birth cohorts, 1916–1955
  - Fifty years of earnings and mortality, 1966–2015

- **Contributions:**
  - Cohort vs. cross-sectional longevity
  - Gather insight on drivers of US differential longevity
1. There is a longevity gradient in Canada.
   - Going V1–V20: 8 years for men after age 50; 3.5 years for women.
Major Findings

1. There is a longevity gradient in Canada.
   - Going V1–V20: 8 years for men after age 50; 3.5 years for women.

2. Gains in longevity uniformly shared across earnings quantiles.
   - Stark contrast to US facts.
Previous research

- Surveys matched to mortality records.
  - Canada:
    - Mustard et al. (1997, 2013)
    - Boisclair et al. (2015)
    - Baker, Currie & Schwandt (2017)
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- Big administrative data
  - Canada:
    - Wolfson et al. (1993)
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- Administrative data
  - Larger samples, longer time periods
  - Lacking covariates
The CPP Administrative Records

OCA files

- Generated for OSFI Office of the Chief Actuary
- Statutory requirement for CPP Actuarial Reports
- We requested subsample with YOB 1916-1955. The Universe.
- Starting sample 11,078,445 CPP contributors

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We can see

- Exact birth/death dates.
- Earnings reported to CPP since 1966.
- Application and effective dates for benefits.
- Gender. No other individual characteristics.
The CPP Administrative Records

About the data - overview

- We worked with those born 1923+
- Condition sample on survival to age 50.
- We study post-50 mortality.
  - We see up to 2015.
  - 1923 YOB is 92 in 2015. 1955 YOB is 60 in 2015.
- Use age 45-49 average earnings to rank within cohorts
  - Deciles, ventiles, percentiles.
- Our sample: 3.7 M men, 2.8 M women
Estimating life expectancy by quantile

What we have:
- 1925 cohort: survival up to age 90.
- 1955 cohort: survival up to age 60.
Estimating life expectancy by quantile

What we have:

- 1925 cohort: survival up to age 90.
- 1955 cohort: survival up to age 60.

![Graph showing survival rates for different cohorts.](image-url)
Result #1: Canada has a mortality gradient

Men and women born in the 1930s, survival to age 75
Result #1A: Canada has a mortality gradient

Men and women born 1923-1955, life expectancy at age 50
Result #2: Longevity gains in Canada

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Result #3: Cohort and cross-section life expectancy

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Result #4: Is there a Canadian ‘Case–Deaton’ effect?

Age 60 survival across cohorts

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## Value of an Annuity

<table>
<thead>
<tr>
<th></th>
<th>1st Quintile</th>
<th>5th Quintile</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920s</td>
<td>6.11</td>
<td>7.99</td>
<td>30.8%</td>
</tr>
<tr>
<td>1950s</td>
<td>7.74</td>
<td>9.89</td>
<td>27.9%</td>
</tr>
</tbody>
</table>

**Difference ($)**

|       | 1.63         | 1.90         |

**Difference (%)**

|       | 26.6%        | 23.8%        |

Expected present value of an annuity of $1 paid from age 65 to death, from point of view of 50 year old.
What is driving steepening of US gradient?

- Mortality depends on history of shocks and investments
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- Health insurance:
  - Insurance impact at older ages? (Cutler, Deaton, & Lleras-Muney 2006, Finkelstein & McKnight 2008)
  - Important Canada–US differences post-1960s
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- Education & health behaviours:
  - Mediates newly arriving health information (Cutler, Deaton, & Lleras-Muney 2006)
  - Canada–US difference?
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- Long-run stress and hardship:
  - Mortality and psychosocial stress (Cutler, Deaton, & Lleras-Muney 2006)
  - Allostatic load; accumulated bio-psychological impact (McEwen and Stellar 1993)
  - Canada - currently more generous social safety net
Conclusion

Our question:
- How has longevity evolved across earnings distribution in Canada?

Our findings:
1. There is a gradient in Canada. Moving from 1st to 20th ventile adds 8 years of life for men, 3.5 for women.
2. The gradient is improving uniformly over time, in contrast to US.
3. Little evidence of Case-Deaton effects in 21st century
4. Cohorts vs. cross-section estimates matter