Socioeconomic Variations in Multiple Cause Mortality

A geographic approach

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Paul Peters, Michel Lopez-Barrios, Tomoko McGaughey
Carleton University, Ottawa, Canada
Two Stories, with context

Context of multiple cause mortality in Canada
COVID-19 and multiple cause mortality
Euthanasia – Medical Assistance in Dying (MAiD)

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Context – Mortality in Canada

TRENDS IN MORTALITY, 2000 – 2021

Number of deaths

Statistics Canada. Table 13-10-0800-01. Deaths and mortality rate (age standardization using 2011 population), by selected grouped causes.
Context – Mortality in Canada

TRENDS IN MORTALITY, 2000 – 2021

Statistics Canada. Table 13-10-0800-01. Deaths and mortality rate (age standardization using 2011 population), by selected grouped causes
Context – Mortality in Canada

MORTALITY BY INCOME, 2001 – 2020

MORTALITY BY INCOME QUINTILE

Statistics Canada. Table 13-10-0833-01, Table 13-10-0759-01.
Context – Mortality in Canada

DATA ACCESS AND AVAILABILITY

Vital Statistics
• Available in Research Data Centres (1950 – 2021)
• Individual-level records
• Includes detailed geography
• Some neighbourhood SES measures assigned via postal code

Multiple Cause Files
• Available in Research Data Centres (2000 – 2021)
• Complete from 2002 onward
• Links to Vital Statistics
Context – Mortality in Canada

Linked Data
• Census-linked cohorts are available from 1991 through 2016
• Link Census “long-form” to vital statistics, hospitalization, emergency room visits, cancer incidence, annual place or residence

Planned Analysis
• The analysis presented here will be expanded using the census cohorts
• (Vetting rules changed in September, limiting data release for today.)
## Context – Mortality in Canada

### Multiple Causes of Death

<table>
<thead>
<tr>
<th>Year</th>
<th># of Deaths</th>
<th>Mean # of Causes</th>
<th>% of Deaths with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 cause</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5+ causes</td>
</tr>
</tbody>
</table>

### Data

<table>
<thead>
<tr>
<th>Year</th>
<th># of Deaths</th>
<th>Mean # of Causes</th>
<th>% of Deaths with</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>243,020</td>
<td>3.15</td>
<td>18.74</td>
</tr>
<tr>
<td>2012</td>
<td>246,090</td>
<td>3.16</td>
<td>18.99</td>
</tr>
<tr>
<td>2013</td>
<td>251,790</td>
<td>3.3</td>
<td>17.87</td>
</tr>
<tr>
<td>2014</td>
<td>258,295</td>
<td>3.29</td>
<td>18.4</td>
</tr>
<tr>
<td>2015</td>
<td>263,820</td>
<td>3.29</td>
<td>19.23</td>
</tr>
<tr>
<td>2016</td>
<td>266,640</td>
<td>3.26</td>
<td>20.06</td>
</tr>
<tr>
<td>2017</td>
<td>276,355</td>
<td>3.26</td>
<td>19.86</td>
</tr>
<tr>
<td>2018</td>
<td>283,340</td>
<td>3.26</td>
<td>20.25</td>
</tr>
<tr>
<td>2019</td>
<td>283,710</td>
<td>3.3</td>
<td>20.17</td>
</tr>
<tr>
<td>2020</td>
<td>306,790</td>
<td>3.29</td>
<td>20.4</td>
</tr>
<tr>
<td>2021</td>
<td>301,830</td>
<td>3.2</td>
<td>24.56</td>
</tr>
</tbody>
</table>

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Statistics Canada, Vital Statistics Deaths Database, Author Calculations

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Context – Mortality in Canada

MULTIPLE CAUSES OF DEATH

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Context – Mortality in Canada

Mortality in Canada

MEAN NUMBER OF CAUSES BY INCOME QUINTILE

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
## Context – Mortality in Canada

### MULTIPLE CAUSES OF DEATH

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Rank (deaths, both sexes)</th>
<th>SRMU (Males)</th>
<th>SRMU (Females)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischaemic heart disease</td>
<td>1</td>
<td>2.09</td>
<td>2.02</td>
</tr>
<tr>
<td>Dementia &amp; Alzheimer disease</td>
<td>2</td>
<td>2.21</td>
<td>1.98</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>3</td>
<td>1.11</td>
<td>1.10</td>
</tr>
<tr>
<td>COVID-19</td>
<td>4</td>
<td>1.09</td>
<td>1.10</td>
</tr>
<tr>
<td>Ill-defined causes</td>
<td>5</td>
<td>9.07</td>
<td>12.02</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>6</td>
<td>2.41</td>
<td>2.18</td>
</tr>
<tr>
<td>COPD</td>
<td>7</td>
<td>3.06</td>
<td>2.84</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>8</td>
<td>1.24</td>
<td>1.20</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>9</td>
<td>5.24</td>
<td>5.16</td>
</tr>
<tr>
<td>Other blood cancers</td>
<td>10</td>
<td>1.46</td>
<td>1.45</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>11</td>
<td>1.05</td>
<td>1.04</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>12</td>
<td>1.61</td>
<td>1.34</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>13</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>14</td>
<td>5.49</td>
<td>5.33</td>
</tr>
<tr>
<td>Other heart diseases</td>
<td>15</td>
<td>4.12</td>
<td>3.72</td>
</tr>
</tbody>
</table>

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
Coding as per Bishop et. al (2022)
COVID-19 – Mortality

TRENDS IN COVID-19 DEATHS

• As in many countries, COVID-19 had a differential impact on the population

• Multiple cause of death statistics can provide additional information on the impact of COVID-19 on mortality
COVID-19 – Mortality

TRENDS IN COVID-19 DEATHS

Statistics Canada. Table: 13-10-0784-01

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14
COVID-19 – Mortality

CONTRIBUTING CONDITIONS

**COVID-19 as Underlying Cause**

- Respiratory: 10%
- Cardiovascular: 25%
- Neuropsychiatric conditions: 15%
- Cancer: 9%
- Digestive Diseases: 6%
- Genitourinary: 6%
- Endocrine: 21%
- Blood: 1%
- Others: 3%

**COVID-19 as Contributing Cause**

- Respiratory: 25%
- Cardiovascular: 22%
- Neuropsychiatric conditions: 10%
- Cancer: 8%
- Digestive Diseases: 7%
- Genitourinary: 6%
- Endocrine: 4%
- Blood: 6%
- Others: 3%

Statistics Canada. Table: 13-10-0784-01

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COVID-19 – Mortality

COVID-19 DEATHS BY AGE

COVID-19 Deaths (Underlying Cause)

COVID-19 Deaths (Contributing Cause)

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COVID-19 – Mortality

COVID-19 DEATHS BY MARITAL STATUS

COVID-19 Deaths (Underlying Cause)

COVID-19 Deaths (Contributing Cause)

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COVID-19 – Mortality

COVID-19 DEATHS BY MARITAL STATUS

Percent of COVID Deaths by Number of Causes, 2020

Percent of COVID Deaths by Number of Causes, 2021

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COVID-19 DEATHS BY INCOME QUINTILES

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
COVID-19 – Mortality

COVID-19 DEATHS BY INCOME QUINTILES

Percent of COVID Deaths by Number of Causes, 2020

Percent of COVID Deaths by Number of Causes, 2021

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
COVID-19 – Mortality

COVID-19 DEATHS BY INCOME QUINTILES

• In 2020, lower number of cause of death for higher income quintiles

• In 2021, this trend was not as apparent

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
COVID-19 – Mortality
CODING AS UNDERLYING OR CONTRIBUTING

- In 2020, the SRMU for COVID-19 deaths was very low (nearly all underlying)
- In 2021 this didn’t change significantly, except in Quebec where the SRMU increased

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
Ill-Defined Causes of Death

I46, I509, I959, I99, J960, J969, P285, R00–R99 (excluding R95)

Percent of Deaths Coded as Ill-Defined

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
Ill-Defined Causes of Death

Medical Assistance in Dying (MAiD)
- Allows eligible individuals to receive assistance from medical practitioners to end their life
- Specific eligibility criteria under initial law
- Eligibility was expanded in 2021 (required by courts)

Deaths increased from 1,018 in 2016 → 10,064 in 2021
Ill-Defined Causes of Death

I46, I509, I959, I99, J960, J969, P285, R00–R99 (excluding R95)

Males

Females

Percent of Deaths that are Ill-Defined, by Income Quintile, Males

Percent of Deaths that are Ill-Defined, by Income Quintile, Females

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
Ill-Defined Causes of Death

I46, I509, I959, I99, J960, J969, P285, R00–R99 (excluding R95)

74% of “ill-defined” causes of death

2% difference between lowest and highest income quintiles

Is now 3.3% of all deaths in Canada.

Statistics Canada, Vital Statistics Deaths Database, Author Calculations
Two Stories, with context

Differences in contributing cause statistics by SES

COVID-19 has been coded differentially as underlying or contributing

Euthanasia – Medical Assistance in Dying (MAiD) is now a major cause of death in Canada
  There are large & significant differences by income quintiles
  Is coded as “ill-defined” – but actually isn’t (usually R98)
Contact Information

Dr. Paul Peters, PhD
Associate Professor
Carleton University
Ottawa, Canada
paul.peters@carleton.ca
http://carleton.ca/determinants
• Percent involvement of underlying an associated SRMU
  • By sex, by period (2018-2019, 2020-2021)