The Association between Frailty and Health Care Use from a Population Health Perspective Using Data from the Canadian Longitudinal Study on Aging

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What is Frailty?

- State of increased vulnerability to declining health status and adverse health outcomes, including mortality and institutionalization
- Complex, involves multiple systems, and changes over time
- Lack of resilience, or impaired ability to rebound from stressors
- Becomes more common with aging
Frailty Measurement

Frailty was measured using the accumulated deficit approach, which involves 3 steps:

1. Identify a list of health deficits that (Searle et al, 2008):
   - Relate to age and health status
   - Do not saturate too early
   - Cover a range of systems (physical, psychological, chronic conditions)

2. Rescale the deficits to variables ranging from 0 (no deficit) to 1 (most severe deficit)
   1. Binary variables are coded as 0 or 1
   2. Ordinal variables are assigned weights on this scale
      e.g. for self-rated health:
      0=Excellent 0.25=Very good 0.5=Good 0.75=Fair 1=Poor
   3. Continuous variables are transformed or cut-offs are used to define binary deficits

3. The Frailty Index is calculated as:
   - The sum of deficits in the individual, divided by the number of potential deficits
Deficits in the CLSA

Deficits were selected based on literature and discussion with an expert panel to form the index of 90 items*

- Physical function tests (5 items)  
  *(Comprehensive only)*
- Self-reported functional status (14 items)  
  *(Tracking only)*
- Self-rated general health
- Self-rated mental health
- Eyesight rating
- Hearing rating
- Satisfaction with Life Scale (SWLS) (5 items)
- Depressive symptoms (CES-D 10) (10 items)
- Cognitive function tests (4 items)
- Activities of daily living (OARS scale) (14 items)
- Social participation prevented by health
- Body mass index
- Chronic conditions (32 items)

*76 items in the Comprehensive cohort, 85 in Tracking
# Paper 1: Frailty Differences Across Population Characteristics Associated with Health Inequality

## Social Stratifiers

<table>
<thead>
<tr>
<th>Socioeconomic Status</th>
<th>Indigenous Peoples</th>
<th>Place of Residence</th>
<th>Population Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>First Nations</td>
<td>Rural/Urban</td>
<td>Age</td>
</tr>
<tr>
<td>Education</td>
<td>Inuit</td>
<td></td>
<td>Immigrant status</td>
</tr>
<tr>
<td>Employment</td>
<td>Métis</td>
<td></td>
<td>Sexual orientation</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td>Functional health</td>
</tr>
<tr>
<td>Material and social deprivation</td>
<td></td>
<td></td>
<td>Cultural/racial background</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male or Female</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Jurisdiction</th>
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</thead>
<tbody>
<tr>
<td>National or Provincial/Territorial</td>
</tr>
</tbody>
</table>

*From: Pan-Canadian Health Inequalities Reporting Initiative: Key Health Inequalities in Canada - A National Portrait*
Sources of Heterogeneity unadjusted

Mean Frailty (population)
Objective

- Examine the association between frailty and health care use from a population health
- Participants were assessed for use of the following types of healthcare in past 12 months:

  - Emergency Department
  - Hospital Admission
  - Family Physician
  - Specialist Physician
  - Formal (paid) Home Care
  - Informal Home Care
Methods

• Estimated the prevalence of each type of health care use
• Examined the average frailty among participants who used each type of health care, compared to those who did not.
• Estimated the association between each type of health care and a 1% increase in Frailty Index
  • Risk Difference (RD) calculated using linear binomial regression
  • Risk Ratio (RR) calculated using logistic binomial regression
  • Each adjusted for sex and education
• Regression analyses were stratified by annual household income
Results

Mean Frailty Index by Income, Stratified by Health Care Use Status
Results

Mean Frailty Index by Income, Stratified by Health Care Use Status

![Graph showing Mean Frailty Index by Income and Health Care Use Status]
Results

Mean Frailty Index by Income, Stratified by Health Care Use Status

Formal (paid) Home Care in Past 12mos

- No
- Yes

Informal (unpaid) Home Care in Past 12mos

- No
- Yes
Results

• A 1% (or 0.01 unit) increase in Frailty Index is associated with an increase of 0.01%-1.4% in the probability of using one of these types of healthcare services in the past year.

• Risk difference for Emergency, Hospital, and Home Care for change in Frailty was associated with income.

• Risk difference for Family Physician and Specialist visits were not associated with income.
Results

• With a 1% (or 0.01 unit) increase in Frailty Index, the probability of a participant having used one of these types of healthcare services in the past year is increased by a factor of by $1.01 - 1.10$.

• Decreasing Risk Ratio for Emergency, Hospital, and Home Care with change in Frailty was associated with income

• Decreasing Risk Ratio for Family Physician and Specialist visits were not associated with income.
Frailty is associated with both income and health care use.

- The association between certain types of health care services and frailty is stronger in low-income compared to high-income participants.

- The use of certain health care services is more common among low-income participants.

- Absolute measures of association (Risk Difference) are more appropriate for these comparisons than relative measures of association (Relative Risk or Odds Ratio).
  - Relative measures show an inverse relationship between frailty and health care use.

Conclusion
Contact:
Data inquiries: access@clsa-elcv.ca
General inquiries: info@clsa-elcv.ca

CLSA is funded by the Government of Canada through CIHR and CFI, and provincial governments and universities

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Extra Slides
<table>
<thead>
<tr>
<th>Annual Household Income</th>
<th>Emergency Department n (%)</th>
<th>Hospital Overnight n (%)</th>
<th>Family Physician n (%)</th>
<th>Specialist Physician n (%)</th>
<th>Formal Home Care n (%)</th>
<th>Informal Home Care n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $20,000</td>
<td>984 (30.3)</td>
<td>535 (16.5)</td>
<td>2902 (89.4)</td>
<td>1675 (51.6)</td>
<td>478 (14.7)</td>
<td>682 (21.0)</td>
</tr>
<tr>
<td>$20,000 or more, but less than $50,000</td>
<td>3314 (24.9)</td>
<td>1658 (12.4)</td>
<td>12116 (90.9)</td>
<td>6669 (50.0)</td>
<td>1001 (7.5)</td>
<td>1968 (14.8)</td>
</tr>
<tr>
<td>$50,000 or more, but less than $100,000</td>
<td>3734 (20.4)</td>
<td>1549 (8.5)</td>
<td>16613 (90.8)</td>
<td>8960 (49.0)</td>
<td>746 (4.1)</td>
<td>2001 (10.9)</td>
</tr>
<tr>
<td>$100,000 or more, but less than $150,000</td>
<td>1658 (18.1)</td>
<td>613 (6.7)</td>
<td>8197 (89.6)</td>
<td>4312 (47.2)</td>
<td>278 (3)</td>
<td>865 (9.5)</td>
</tr>
<tr>
<td>$150,000 or more</td>
<td>1170 (16.0)</td>
<td>400 (5.5)</td>
<td>6476 (88.4)</td>
<td>3412 (46.6)</td>
<td>156 (2.1)</td>
<td>608 (8.3)</td>
</tr>
</tbody>
</table>
Health Inequalities Available in CLSA

- Sex
- Age
- Income
- Education
- Retirement
- Population density (urban vs. rural)
- Marital status

- Pampalon Index – Material Factor Score
- Pampalon Index – Social Factor Score
- Social isolation
- Loneliness/living alone
- Nutrition
- Smoking
Annual household income fully adjusted, stratified by sex
Annual household income fully adjusted, stratified by age.
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