The Canadian Longitudinal Study on Aging: A Platform for Research on Aging

SYMPOSIUM
IAGG
San Francisco, CA
July 26, 2017
Symposium Overview

• CLSA study design and methods (Susan Kirkland, Dalhousie University, NS)

• Multiple chronic conditions related to disability and social participation (Lauren Griffith, McMaster University, ON)

• Associations between sensory loss and social networks, participation, support, and loneliness (Paul Mick, University of British Columbia, BC)

• Understanding inequalities and inequities in health and wellness among older Canadians (Yukiko Asada, Dalhousie University, NS)

• Characteristics of Caregiver Burden (Yoko Ishigami-Doyle, Dalhousie University, NS)

• Discussant (Andrew Wister, Simon Fraser University, BC)

• Questions (Istvan Molnar-Szakacs, McGill University, QC)
The Canadian Longitudinal Study on Aging: Study Design and Methods

Susan Kirkland, PhD
Dalhousie University

Christina Wolfson, Parminder Raina, Lauren Griffith, Mark Oremus, and the CLSA Research Team

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July 26, 2017
The Canadian Longitudinal Study on Aging (CLSA)

• Strategic initiative of CIHR; on Canadian research agenda since 2001

• Team of 3 principal investigators, more than 160 co-investigators from 26 institutions

• Multidisciplinary - biology, genetics, medicine, psychology, sociology, demography, nursing, economics, epidemiology, nutrition, health services

• Largest study of its kind to date in Canada for breadth and depth: following 50,000 Canadians for 20 years
Overall Aims of the CLSA

- To examine aging as a dynamic process
- To investigate the inter-relationship among intrinsic and extrinsic factors from mid life to older age
- To capture the transitions, trajectories and profiles of aging
- To provide infrastructure and build capacity for state-of-the-art, interdisciplinary, population based research and evidenced-based decision making
CLSA Timeline and Milestones

- **Team Design**
  - Objectives
  - Content

- **Acceptability**
  - Bio-specimens
  - Recruitment
  - Data Linkage

- **Pilot**
  - Recruitment
  - Validate measures
  - SOPs, TMs
  - Pilot protocol

- **Data Collection**
  - Data Cleaning
  - Data Release

- **Phase I**
  - Feasibility Studies

- **Phase II**
  - Validation, Pilot

- **CFI**
  - Recruitment
  - Baseline Data Collection

- **First Follow Up**
  - Data Collection

Timeline:
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017

Abbreviations:
- RFA
- IR
- CFI
50,000 women and men aged 45 – 85 community dwelling at baseline

Tracking (20,000)
Randomly selected
10 provinces

Comprehensive (30,000)
Randomly selected
25-50 km of 11 sites in 7 provinces

Questionnaire
• By telephone (CATI)

Questionnaire
• In person, in home (CAPI)

Physical Assessments
Blood, Urine
• At Data Collection Site

20 year study: Full follow up every 3 years, maintaining contact in between

Data Linkage
Participants aged 45 to 85 at baseline (51,338)

Baseline

FU-1

FU-2

FU-3

FU-4

FU-5

FU-6

2010 - 2015

2015

2018

TIME

20 Years

CLSA Overview

Questionnaire data (telephone and in-person interviews) (>50,000)

Physical assessments and biological specimens (>30,000)

Active follow-up (FU) every 3 years

- Questionnaire
- Physical assessments
- Biological specimens
- Health-care utilization
- Disease registries
- Mortality databases

Data and Biological Sample Repositories

Researchers
Recruitment Sampling Frame

- Partnered with Statistics Canada
  - CCHS 4.2 Healthy Aging Survey
  - 2006 census as an area frame to select households
  - Agreed to share contact information

- Partnered with provincial Ministries of Health
  - Health Card Registration databases
  - Mailouts, return Consent to Contact form

- Supplemented with Random Digit Dialing
  - Pre-recruitment, agree to recontact
Exclusion Criteria at Baseline

• Resident of the 3 territories (Northwest Territories, Nunavut, Yukon)
• Living in an institution
• Living on a First Nations Reserve
• Full time member of the armed forces
• Temporary visa holder
• Cognitive impairment
• Unable to communicate in French or English
National Scope
Representative Sampling Frame

- Winnipeg
- Vancouver
- Victoria
- Surrey
- Calgary
- Hamilton
- Ottawa
- Montreal
- Sherbrooke
- Halifax
- St. John’s

- Telephone Interviews
- Home Interviews & Data Collection Site Visits
Innovative Electronic Data Capture

Pre-recruits Sent Study Information

Participants Consent to Participate in CLSA

Participants Provide Questionnaire Data (n=50,000)

DATA COLLECTION SITE VISIT
Physical/Neuropsychological Data

DATA COLLECTION SITE VISIT
Physical/Neuropsychological Data

Biological Data Processing
- Blood
- Urine

n=30,000
Home Interview

n=20,000
Telephone Interview

Stored at Biorepository and Bioanalysis Centre

Stored at Statistical Analysis Centre

Data dissemination to researchers

Questionnaire data processing
Depth and Breadth of CLSA Baseline Questionnaire modules

- **DEMOGRAPHIC**
  - Education
  - Marital status
  - Ethnicity

- **HEALTH BEHAVIOURS**
  - Smoking, alcohol
  - Nutritional risk
  - Food frequency
  - Physical activity
  - Health care utilization
  - Medication use
  - Supplement use

- **HEALTH STATUS**
  - General health
  - Women’s health
  - Chronic conditions, symptoms

- **PHYSICAL**
  - Oral health
  - Injuries, falls
  - Mobility
  - Pain, discomfort
  - Functional status
  - ADL, IADL

- **PSYCHOLOGICAL**
  - Cognition—Executive function, memory, psychomotor speed
  - Depression
  - Mood
  - Psychological distress
  - Veteran identifier
  - Satisfaction with life
  - PTSD

- **SOCIAL**
  - Social networks
  - Social support
  - Social participation
  - Online communication
  - Social inequality
  - Care receiving
  - Care giving
  - Retirement status
  - Labour force participation
  - Retirement planning
  - Transportation
  - Mobility, Migration
  - Built environments
  - Home ownership
CLSA Data Collection

Data Collection Site

Physical Assessments:
- Height, Weight, BMI
- Bone Density, Body Composition, Aortic Calcification
- Blood Pressure
- ECG
- Carotid Intimal-Medial Thickness
- Pulmonary Function
- Vision & Hearing
- Performance testing

Cognitive Assessments:
- Neuropsychological Battery
  - Memory
  - Executive function
  - Reaction time

Biospecimen Collection:
- Blood
- Urine
Bio specimen processing
42 aliquots per participant

- Basic hematologic tests done on site
- Remainder processed, frozen within 2 hours
- Shipped weekly
- Stored in Nitrogen tanks at BBC McMaster
FU1: New Study Content

- Child maltreatment
- Elder abuse
- Epilepsy
- Arterial stiffness
- Unmet health-care needs
- Workability
- Preventive health behaviours
- Enhanced hearing, oral health and transportation
- Sexual orientation and gender identity
- Subjective cognitive decline
- Loneliness
- Decedent information
FU1: Accommodation Strategies

- Changing circumstances
  - Migration out of area
  - Cognitive impairment
  - Physical impairment
  - Sensory impairment
  - Institutionalization

- Accommodation strategies to maintain long-term participation
  - Allows for flexible participation
  - Baseline exclusion criteria no longer apply
FU2: Modifications to the Protocol

- Content revision, additions
- Proxy Questionnaire
  - Basic (30 min) and Extended (40 min)
- Decedent Questionnaire
  - Death, living arrangements, function at one month prior, care receiving, care preferences and decisions
- Linkage with provincial administrative health data bases
  - Mortality via provinces
  - Exploring national linkage via CIHI
- Planning for FU2 now underway
Data and Biospecimen Access

- **Fundamental tenets:**
  - The rights, privacy and consent of *participants* must be protected and respected at all times
  - The confidentiality and security of *data and biospecimens* must be safeguarded at all times
  - CLSA data and biospecimens are resources that will be used optimally to support research to benefit all Canadians
  - No preferential or exclusive access
  - Available to researchers at public institutions
## Demographic Characteristics of CLSA Participants at Baseline

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Tracking N=21,241</th>
<th>Comprehensive N=30,097</th>
<th>Total N=51,338</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>5832 (27.5)</td>
<td>7595 (25.2)</td>
<td>13427 (26.2)</td>
</tr>
<tr>
<td>55-64</td>
<td>6564 (30.9)</td>
<td>9856 (32.7)</td>
<td>16420 (32.0)</td>
</tr>
<tr>
<td>65-74</td>
<td>4634 (21.8)</td>
<td>7362 (24.5)</td>
<td>11996 (23.4)</td>
</tr>
<tr>
<td>75-85</td>
<td>4211 (19.8)</td>
<td>5284 (17.6)</td>
<td>9495 (18.5)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>10835 (51.0)</td>
<td>15320 (50.9)</td>
<td>26155 (50.9)</td>
</tr>
<tr>
<td>Male</td>
<td>10406 (49.0)</td>
<td>14777 (49.1)</td>
<td>25183 (49.1)</td>
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<tr>
<td><strong>Language</strong></td>
<td></td>
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<tr>
<td>English</td>
<td>17483 (82.3)</td>
<td>24291 (80.7)</td>
<td>41774 (81.4)</td>
</tr>
<tr>
<td>French</td>
<td>3758 (17.7)</td>
<td>5806 (19.3)</td>
<td>9564 (18.6)</td>
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<tr>
<td><strong>Born in Canada</strong></td>
<td>18513 (87.2)</td>
<td>24644 (81.9)</td>
<td>43157 (84.1)</td>
</tr>
</tbody>
</table>
## Summary of Data Available

<table>
<thead>
<tr>
<th>Dataset</th>
<th>N</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tracking – Baseline 60-minute telephone interview (Version 3.2)</strong></td>
<td>21,241</td>
<td>• Alphanumeric questionnaire data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cognition data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Open text variables</td>
</tr>
<tr>
<td><strong>Tracking Maintaining Contact Questionnaire - Baseline 30-minute telephone interview (Version 2.0)</strong></td>
<td>19,052</td>
<td>• Alphanumeric questionnaire data</td>
</tr>
<tr>
<td><strong>Comprehensive Baseline in-home interview and Data Collection Site visit (Version 3.1)</strong></td>
<td>30,097</td>
<td>• Alphanumeric questionnaire data</td>
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<tr>
<td></td>
<td></td>
<td>• Cognition data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Physical assessments (incl. DXA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hematological biomarkers</td>
</tr>
<tr>
<td><strong>Comprehensive Maintaining Contact Questionnaire - Baseline 30-minute telephone interview (Version 2.0)</strong></td>
<td>28,789</td>
<td>• Alphanumeric questionnaire data</td>
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## Core Biomarkers: Baseline

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Biomarkers</th>
</tr>
</thead>
</table>
| **HEMATOLOGY**                           | 25,425 | - Erythrocytes  
- Granulocytes  
- Hematocrit  
- Hemoglobin  
- Lymphocytes  
- Platelets  
- MCV  
- MCHC  
- MPV  
- RDW  
- Non-HDL  
- Thyroid stimulating hormone (TSH)  
- Triglycerides  
- 25-Hydroxyvitamin D  
- Hemoglobin A1c (n = 26961)  
- HDL  
- LDL  
| **CHEMISTRY**                            | 27,170 | - Albumin  
- Alanine aminotransferase (ALT)  
- C-reactive protein (CRP)  
- Creatinine  
- Cholesterol  
- Ferritin  
- Free T4  
- Hemoglobin A1c (n = 26961)  
- HDL  
- LDL  |
| **GENETICS**                             | 10,000 | - Genome-wide genotyping  
- DNA extracted from buffy coat on samples (n = 26,884)  
- 820K UK Biobank Axiom Array (Affymetrix) |
| **EPIGENETICS**                          | 1,500  | - DNA methylation  
- DNA extracted from PBMCs  
- 850K Infinium MethylationEPIC BeadChip (Illumina) |
| **METABOLOMICS**                         | 1,000  | - Mass spectrometry |
| **Data Collection Sites (DCS)**          |       |                                                                                             |
| **CALGARY LABORATORY SERVICES (CLS)**    |       |                                                                                             |
| **GENETIC AND EPIGENETIC CENTRE (GEC)**  |       |                                                                                             |
| **METABOLOMICS**                         |       |                                                                                             |
| **Kyoto, Japan**                         |       |                                                                                             |

*Available mid-2018*
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<table>
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<tr>
<th>University</th>
<th>Investigators and Co-investigators</th>
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<tbody>
<tr>
<td>UVic</td>
<td>Debra Sheets, Lynne Young, Holly Tuokko</td>
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<tr>
<td>UBC</td>
<td>Teresa Liu-Ambrose, Michael Kobor</td>
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<td>SFU</td>
<td>Andrew Wister, Scott Lear</td>
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<tr>
<td>UCalgary</td>
<td>David Hogan, Marc Poulin, Eric Smith, Alex Chin, Hossein Sadrzadeh</td>
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<tr>
<td>UManitoba</td>
<td>Verena Menec, Phil St. John</td>
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<td>McMaster</td>
<td>Parminder Raina, Cynthia Balion, Lauren Griffith, Andrew Costa, Harry Shannon, Christopher Patterson, Michael Veall, Guillaume Paré, Brenda Vrkljan</td>
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<tr>
<td>UOttawa</td>
<td>Vanessa Taler, Larry Chambers</td>
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<tr>
<td>McGill</td>
<td>Christina Wolfson, Ron Postuma, Brent Richards, Mark Lathrop</td>
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<tr>
<td>USherbrooke</td>
<td>Hélène Payette, Benoît Cossette</td>
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<tr>
<td>Dalhousie</td>
<td>Susan Kirkland</td>
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<tr>
<td>Memorial</td>
<td>Gerry Mugford</td>
</tr>
<tr>
<td>UToronto</td>
<td>Andrew Paterson</td>
</tr>
<tr>
<td>UWaterloo</td>
<td>Mark Oremus, Mary Thompson, Changbao Wu</td>
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+ Scientific working group members and co-investigators
CLSA Funders and Partners
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