Canadian Longitudinal Study on Aging: Advancing the Science of Aging through Interdisciplinary Research

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A New Milestone

- For the first time in the history, the number of people on the planet aged 60 and over has surpassed those under 5

- Canada is also seeing the graying of the population
Population Totals in Canada by Age Group and Year

<table>
<thead>
<tr>
<th>AGE</th>
<th>MALES</th>
<th>BOTH SEXES</th>
<th>FEMALES</th>
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1991 TOTALS: 13938100 | 28117600 | 14179500
The Aging Revolution

- The rapid and continuing increase in human survival.
- New scientific understanding of the ageing process.
- The changing nature of old age and its determinants.
- Expectations, adjustments and policy.
Upward trend in life expectancy continue, cease, or reverse?

+ Effective interventions against age-related diseases
+ Improved environment for ageing
+ Life-cycle deceleration (delayed reproduction)

- Adverse effects of excess nutrition
- Adverse effects of alcohol and drug abuse
- Adverse effects of increasingly sedentary lifestyles
- Life-cycle acceleration (early maturation)
Why ageing occurs

Intrinsic ↔ Extrinsic

How ageing is caused
What Accounts for the Individuality of Human Ageing?
**Genetic Heritability of Human Lifespan**

*Cournil & Kirkwood* *Trends in Genetics* 2001

<table>
<thead>
<tr>
<th>Twin Studies</th>
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<td>McGue et al (1993)</td>
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<tr>
<td>Herskind et al (1996)</td>
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<td>Ljungquist et al (1998)</td>
<td>&lt;0.33</td>
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<table>
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<tr>
<th>Traditional Family Studies</th>
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<td>Philippe (1978)</td>
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<tr>
<td>Bocquet-Appel &amp; Jakobi (1990)</td>
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<td>Mayer (1990)</td>
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<td>Gavrilova et al (1998)</td>
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<td>Cournil et al (2000)</td>
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</table>

**Genes account for 25% of what determines longevity**
Extrinsic Factors
Beyond Biology

- Nutrition
- Lifestyle
- Social
- Psychological
- Physical Environment
- Chance
Future of Research on Aging in Post-Genomic Era

- Age-related changes—"complexity"
  - INDIVIDUAL LEVEL
  - SOCIETAL AND CONTEXTUAL LEVEL

- Innovative study design that advance science of aging and health as well as inform health and social policy

- Need for interdisciplinary long-term longitudinal studies
Need for Integration to Understand Aging and Health

Environmental influences
(e.g., rural, socio-economic, exercise, nutrition)

Chronic diseases
(diabetes, cancer, dementia, arthritis, cardio)

Genetics

e.g., telomeres / oxidative stress
psychological & cognitive abilities
immune functions

Aging

infections

Health Services Utilization

time

CLSA ELCV
Policy Needs

- Changing demographics #1 priority of Canadian Federal and Provincial Governments

- Healthy aging is important to the Canadian public and policy makers

- Canada differs from other countries in its:
  - health and social policy
  - health care delivery systems
  - climate, environment, geography, and
  - retirement policy and pension programs

- Seniors of tomorrow have different needs and expectations
  - major implications & challenges for the health care system and for social programs
The Canadian Longitudinal Study on Aging (CLSA)

A key strategic initiative of CIHR

More than 160 researchers - 26 institutions

Multidisciplinary - biology, genetics, medicine, psychology, sociology, demography, economics, epidemiology, nursing, nutrition, health services, biostatistics, population health
Innovation - Cell to Society

- Mid life to old age
- Quantitative traits
  - Physical
  - Social
  - Psychological
- Gene-environment interactions
- Disease, disability, psychosocial consequences
- Adaptation

CLSA ELCV
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: successful aging.
- To provide infrastructure and build capacity for sustained high quality research on aging in Canada.
CLSA Program of Research

- Biological Function
  - Genetics/epigenetics

- Physical Function
  - Mobility/Chronic diseases/Injury

- Psychological Function
  - Cognition/Mental Health/Coping

- Social Function
  - Work and retirement/Social Participation/Housing/Economics
Data Linkage

- Data linkage to existing databases:
  - Healthcare utilization data bases
  - Drug databases
  - By geographical region (postal code)
    - Pollution: air, water
    - Climate: temperature, precipitation
    - Motor vehicle density
CLSA Architecture

Data collection on all 50,000
Questionnaires, Database linkage
Follow-up over 20 years
Every 3 years age 45-84
Equipment and Infrastructure Supporting Research on Aging

Computer-Assisted Telephone Interview Centres
Collect health and psychosocial data (located in Halifax and Sherbrooke).

Genetics and Epigenetics Centre
Genotyping, epigenetic analysis, and bioinformatics, (located in Vancouver).

Biological Processing Centre
Bio-banking, biomarker discovery & analysis (located in Hamilton).

National Coordinating Centre
Oversight, project management, data management, communication for overall initiative (located in Hamilton).

Data Collection Centres
Collection of nutrition, physical, clinical data, & biological specimens.

Statistical Analysis Centre
Assimilation, distribution, and analysis of all CLSA data (located in Montreal).
Highly Qualified Personnel

Formation of a premier national training facility for the Study of Aging with 500+ HQP trained w/in 5 years

<table>
<thead>
<tr>
<th></th>
<th>PI's/Faculty</th>
<th>Postdoctoral Fellows</th>
<th>Graduate Students</th>
<th>Research Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total HQP</td>
<td>18 – 21</td>
<td>160 – 165</td>
<td>135 - 150</td>
<td>180 – 300</td>
</tr>
</tbody>
</table>

Interdisciplinary Scholar Program in Aging (ISPA)

- Open to graduate students and fellows enrolled in Canadian Universities
- Rich research-focused interdisciplinary learning environment
- Opportunities to develop collaborative research
- Incorporation of KT and KE
- Partner with existing CIHR Strategic Training Programs
International Links

- Womens Health and Aging Study - USA
- Aging & Sexuality - USA
- HRS - USA
- British Birth Cohort - UK
- UK Biobank - UK
- ELSA - UK
- ALSPAC - UK
- Cohorte Constances - FRANCE
- LASA - Amsterdam
- ILSA - Italy
- InChianti - Italy
**Impact of infrastructure and research on key outcomes**

**INFRASTRUCTURE**

- Computer-Assisted Telephone Interview Centres
- Biological Processing Centre
- Genetics and Epigenetics Centre
- National Coordinating Centre
- Statistical Analysis Centre
- Data Collection Centres

**CLSA AREAS OF RESEARCH**

- Biological Function
- Physical Function
- Psychological Function
- Social Function

**KEY OUTCOMES**

- Creation of CLSA research platform for Research and Training
- Development of methodologies and tools
- Understanding the biological and psychosocial aspects of aging
- Better informed decision-makers
- Improved prevention, diagnosis and treatment of illness.
- Improved health for Canadians
Sources of Funding

- Major funding from:
  - CIHR, CIHR-IA
    - Other Funding Partners
      - FRSQ- Réseau Québécois de Recherche sur le Vieillissement
      - Michael Smith Foundation-BCNAR
      - OMHLTC-ORC
    - In kind Support
      - Statistics Canada, McMaster, McGill and Dalhousie
Website: www.CLSA-ELCV.ca

praina@mcmaster.ca
## Focus of Measurement

### Biomedical
- Activities of daily living/disability/injuries
- Frailty/co-morbidities
- Chronic diseases
- Cognitive function
- Mental Health
- Oral health
- Vision, hearing
- Medications
- Health Care Use
- Institutional care
- Genetics/Biology
  - Disease susceptibility/longevity genes
  - DNA repair
  - Antioxidant defence
  - Apoptosis, programmed cell death
  - Immunosenescence
  - Telomere loss
- Nutrition

### Psychosocial
- Lifestyle/behaviours
- Social networks and social support
- Care giving/Care receiving
- Social care
- Everyday competence, adaptive functioning, coping
- Personality, emotion, psychopathology
- Work to retirement transitions
- Structural inequalities
- Built environments/physical environment/Housing
- Economics/Wealth
- Demographics
- Healthy aging and well being
- Linkage to secondary data bases
  - Health care use
  - Disease registries e.g. Cancer
  - Drugs
  - Environmental