Advancing the Science of Population Health and Aging through Interdisciplinary Research

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Population aging

- Due to declining fertility and increasing longevity (demographic transition)
- Unprecedented, accelerating, shifts will be permanent
- Profound implications for human life, including health
Population Totals in Canada by Age Group and Year

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<th>FEMALES</th>
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1991 TOTALS | 13938100 | 28117600 | 14179500 |
Demographic Futures

- 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)
Projections

- In 1996/97 the number of beds required in LTC
  - 184,300

- In 2031 it is projected that it might be:
  - Lower end projections: 565,000 by 2031
  - Higher end projections: 746,000 by 2031

- What impact baby boomers will have on the system? Unknown..
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
Future of Research in Aging in Post-Genomic Era

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

Chronic diseases
diabetes, cancer, dementia
arthritis, cardio

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

Aging

Genetics

infections

Health Services Utilization

time
Future of Research 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
The Canadian Longitudinal Study on Aging (CLSA)

A key strategic initiative of CIHR

The Canadian Longitudinal Study on Aging

More than 160 researchers - 26 institutions

Multidisciplinary - biology, genetics, medicine, psychology, sociology, demography, economics, epidemiology, nursing, nutrition, health services, biostatistics, population health
CLSA- The Concept

The Vision

A research platform - infrastructure to enable state-of-the-art interdisciplinary population based research and evidenced-based decision making.

The Aim

To study aging as a dynamic process and the inter-relationship among intrinsic and extrinsic factors from mid life to older age.
Innovation - Cell to Society

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

- The progression of **health** from middle-age to early old age to older old age
- The determinants of **well-being and quality of life**
- Risk Factors (including genetics) of **Chronic diseases**
- **Cognitive functioning** and **mental health**
- **Disability** and the compression of morbidity
- The examination of socioeconomic and health **inequalities** in an aging population
- **Social participation, social relationships and care giving** in an aging population
- **Retirement** and **post retirement** labor market activity
CLSA Architecture

Inception Cohort: 50,000 (at 11 sites)

Questionnaires, Database linkage

Clinical, Biological, Physical

Follow-up over 20 years

Every 3 years age 45-85
Depth and Breadth of CLSA

**PHYSICAL & COGNITIVE MEASUREMENTS**
- Height, Weight
- Waist and hip measurements
- Bioimpedence
- Arterial pressure
- Mean heart rate
- Grip strength, timed up-and-go, chair raise, 4-m walk
- Standing balance
- Vision
- Hearing
- Spirometry
- Bone density
- Aortic calcification
- ECG
- Carotid intima-media thickness
- Cognitive Assessment

**HEALTH INFORMATION**
- Chronic disease symptoms (11 chronic conditions)
- Medication intake & Compliance
- Women’s health
- Self reported Health service use
- Oral health
- Preventative Health
- Administrative data Linkage Health Services & Drugs
- Other Administrative Data bases

**PSYCHOSOCIAL**
- Social participation
- Social networks and support
- Care giving and Care receiving
- Mood, Psychological distress
- Coping, Adaptation
- Work to retirement transitions
- Job-Demand/Effort Reward
- Retirement Planning
- Social Inequalities
- Mobility-Lifespace
- Built Environments
- Wealth

**LIFESTYLE & SOCIODEMOGRAPHIC**
- Smoking
- Alcohol consumption
- Physical activity
- Nutrition
- Birth location
- Ethnicity/Race/Gender
- Marital status
- Education
- Income
Biological Samples

BIOCHEMICAL & HEMATOLOGICAL ANALYSIS (50 ml Blood; Urine)

General Hematology
- Basophils
- Eosinophils
- Neutrophils
- Lymphocytes
- Monocytes
- White blood count
- Red blood cells
- Hemoglobin
- Platelets

Lipid Profile
- HDL-cholesterol
- LDL-cholesterol
- Tryglycerides
- Glucose
- Fasting blood sugar

Genetic and Epigenetic Markers
Participants (50,000)

Enrolled

Questionnaire Data (50,000)

Physical Exam and Biological Specimen (30,000)

Active Follow-up (F) Every 3 years
- Questionnaire
- Physical exam
- Biological samples

Maintaining Contact Interview (MC) mid-wave
- Update contact information
- Short Questionnaire

Passive Follow-up Every 3 years
- Health care utilization
- Disease registries
- Mortality databases

Data and Biological Sample Repositories

Researchers

Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement
Data Collection Overview

Potential Participants Sent Study Information

Participants Consent to Participate in CLSA

Participants Provide Questionnaire Data (n=50,000)

Physical/Psychological Data
- Neuropsychological Battery
- Performance Testing
- Anthropometric Measures
- Full body Bone Density
- Aortic Calcification
- ECG
- Carotid Intimal-Medial Thickness
- Pulmonary Function
- Vision and Hearing

Biological Data
- Blood
- Urine

Biological Data Stored in Biobank (BBC) and Biomarker analysis

Physical/Psychological Data Stored in (NCC/SAC)

n=30,000
Home Interview

n=20,000
Telephone Interview

Questionnaire Data Processed

Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement
Equipment and Infrastructure Supporting Research on Aging

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

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

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)

Statistical Analysis Centre
Assimilation, distribution and analysis of all CLSA data (located in Montreal)
Implementation Plans for Tracking Cohort of the CLSA (n=20,000)
Launch of the CLSA

- First selection of 20,000 started in late 2008 in collaboration with Statistics Canada CCHS Healthy Aging module (Tracking Cohort)
  - Approximately 12,500 have agreed to release their names to CLSA (currently being recruited)
- Remaining 8,000 for Tracking Cohort will be recruited in late 2010
- Remaining 30,000 will be recruited in late 2010 (Comprehensive Cohort)
  - Provincial Client Registries
Implementation Plans for Comprehensive Cohort of the CLSA (n=30,000)
Implementation Plan for the Comprehensive Cohort (n=30,000)

- Cohort of 30,000 persons to be recruited within 25 to 50 km radius of 11 data collection sites (DCS)
  - Victoria (3000), Vancouver (1500), Burnaby (1500), Calgary (3000), Winnipeg (3000), Hamilton (3000), Ottawa (3000), Montreal (3000), Sherbrooke (3000), Halifax (3000), St. John’s (3000)
Comprehensive Cohort Rolling Recruitment

- First batch of 1000 people to be recruited/site (mid-2011 to mid-2012)
  - Maintaining contact by phone (end of 2012-end 2013)

- Second batch of 1000 people to be recruited/site (mid-2012 to mid-2013)
  - Maintaining contact: (end of 2013-end of 2014)

- Third batch of 1000 people to be recruited/site (mid-2013 to mid-2014)
  - Maintaining contact: (end of 2014-end of 2015)
Future and Current Legacy of the CLSA Research Platform

Effective Design
- Multidisciplinary Team
- Key initiative of CIHR
- Governance Structure
- Longitudinal Design
- Random selection
- Extensive data
- Extensive feasibility work
- Transparent data access policies
- Simple IP policy
- Harmonization with international cohorts
- State of the art facilities
  - Bio-repository
  - High Throughput biomarker labs
  - Statistical Analysis centre
  - Bioinformatics
  - Fully equipped data collection facilities

Strong Scientific Program
- Healthy Aging
  - Association studies based on candidate genes & diseases-related QTs
- Unique Approach:
  - Chronic conditions as Precursor, mediator Outcome
  - Binary outcomes and quantitative traits
- Quality of life
- Chronic disease management
- Risk factor identification
- Psychosocial aspects of Health
- Environment & Health
- Methodological development
  - Statistical modelling
  - Biological sample collection and storage

Resource for the future
- CFI-funded research facilities
- Supporting biomarker discovery research
- Supporting and developing complex diseases screening methodologies
- Personalized medicine
- Informing health & Social care policy
- Commercialization
- Building research capacity
- Platform for sub-studies
- Advancing Science of Aging
- Improving the health of Canadians
Canadian Investment

$50M Canadian investment in national platform

- $23.5M CIHR for 5 Years
- $10M CFI for 5 Years
- $10M Provinces for 5 Years
- $6.5 M Universities and other partners**
- Invaluable in-kind contribution from Statistics Canada on design and recruitment
Discussion Points

Value of the CLSA platform

Data access and IP policies

Opportunities for collaboration for the core data collection CLSA

Opportunities for analyses of the data and biological samples

Opportunities for using CLSA facilities for non CLSA research

Opportunities for sub-studies