The Canadian Longitudinal Study on Aging

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on behalf of

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and the CLSA Research Team across Canada

*** Most of the slides were created by the CLSA and its participants**

Overview

- **Background**
- **Study Design**
- **Study Content and Data Collection**
- **Current Status**
- **Sample demographics**

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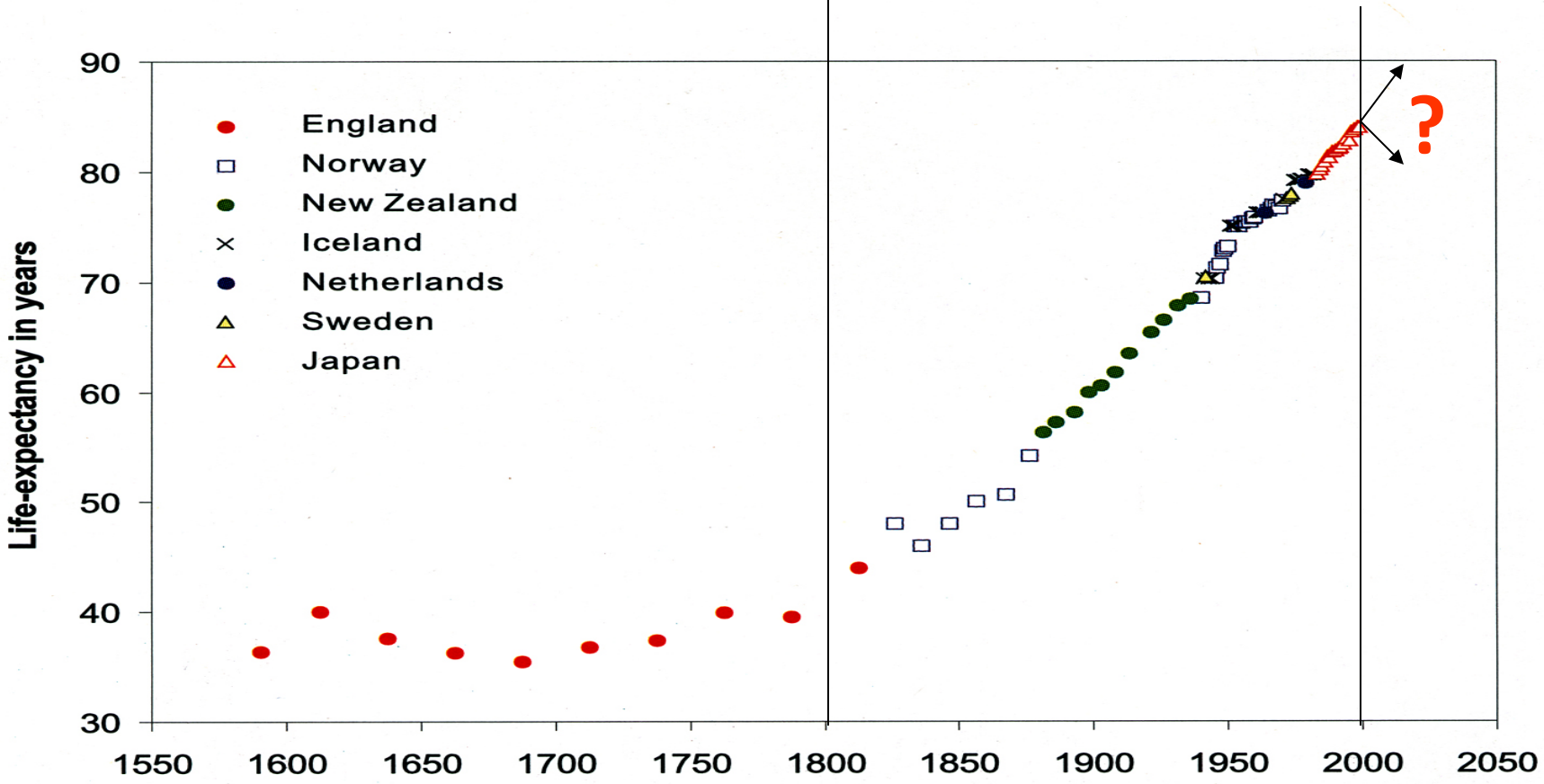
Increase in life expectancy, 1600 - 2000

Oepen and Vaupel, Science 2002; C Finch adaptation

Phase 1
early urban

Phase 2
sanitation-nutrition
modern medicine

Phase 3?
regeneration
Social Policy Innovation



Life expectancy, Brazil

Date	LE (years)
1900	32
1950	50.3
1975	61.8
2000	70.7
2015	74.4

Source: gapminder.org

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Total fertility rate, Brazil

Date	TFR
1900	5.9
1950	6.2
1975	4.5
2000	2.4
2015	1.8

Source: gapminder.org

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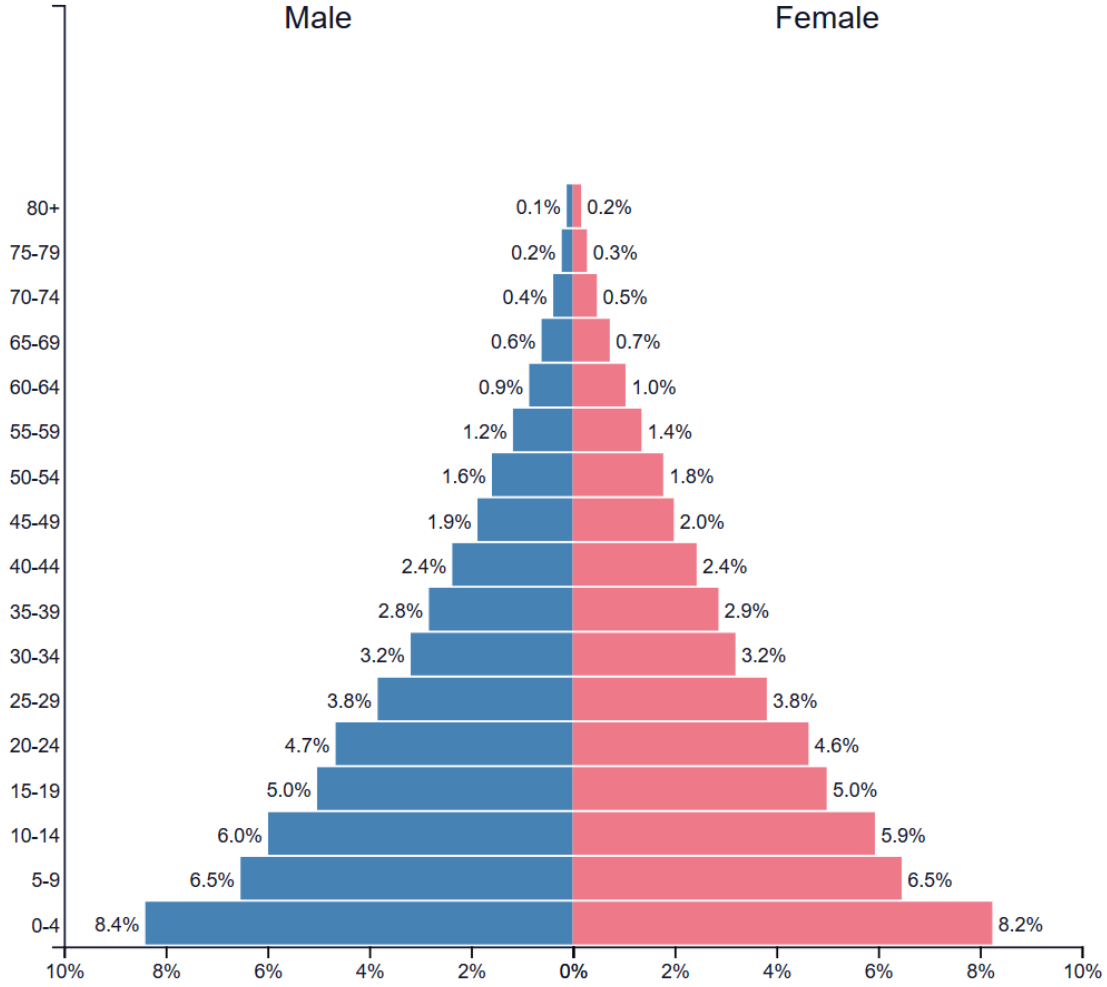
Brazil population pyramid 1950



Source: Populationpyramid.net

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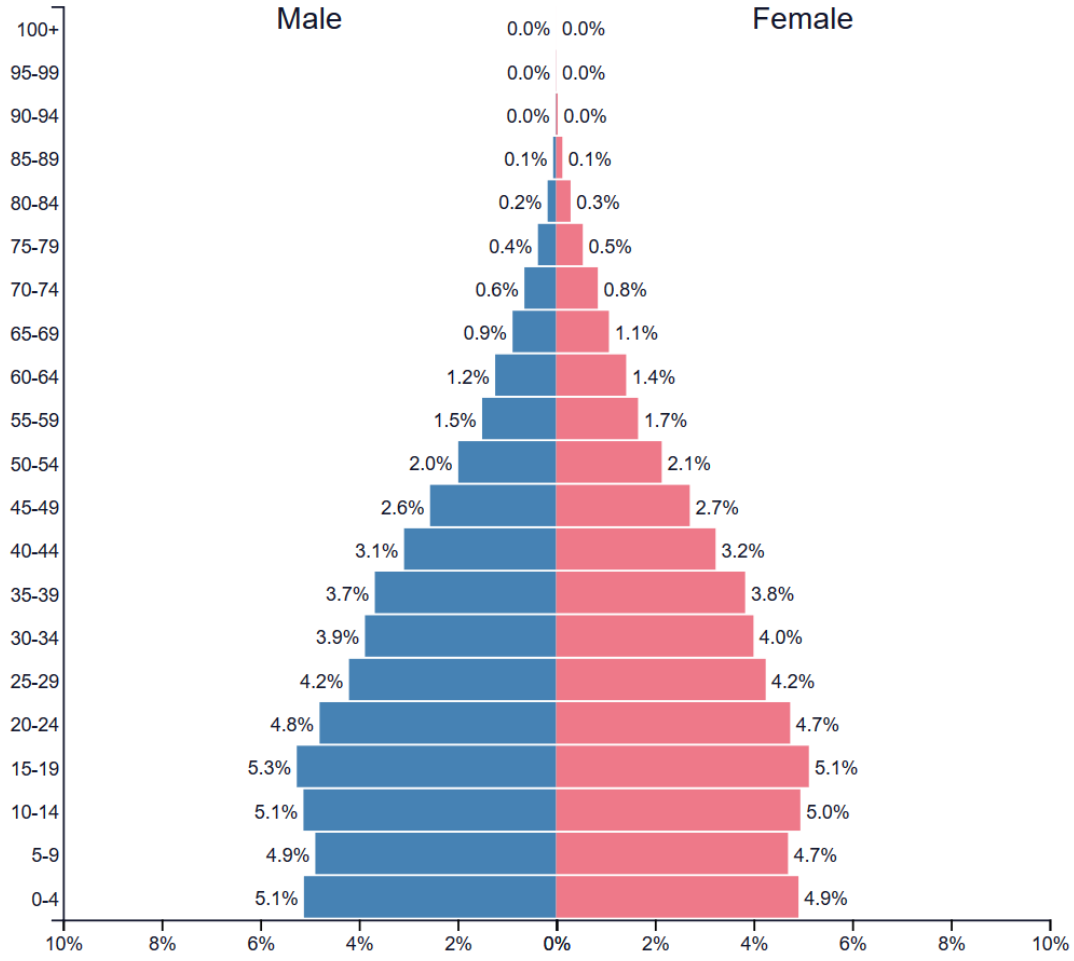
Brazil population pyramid 2000



Source: Populationpyramid.net

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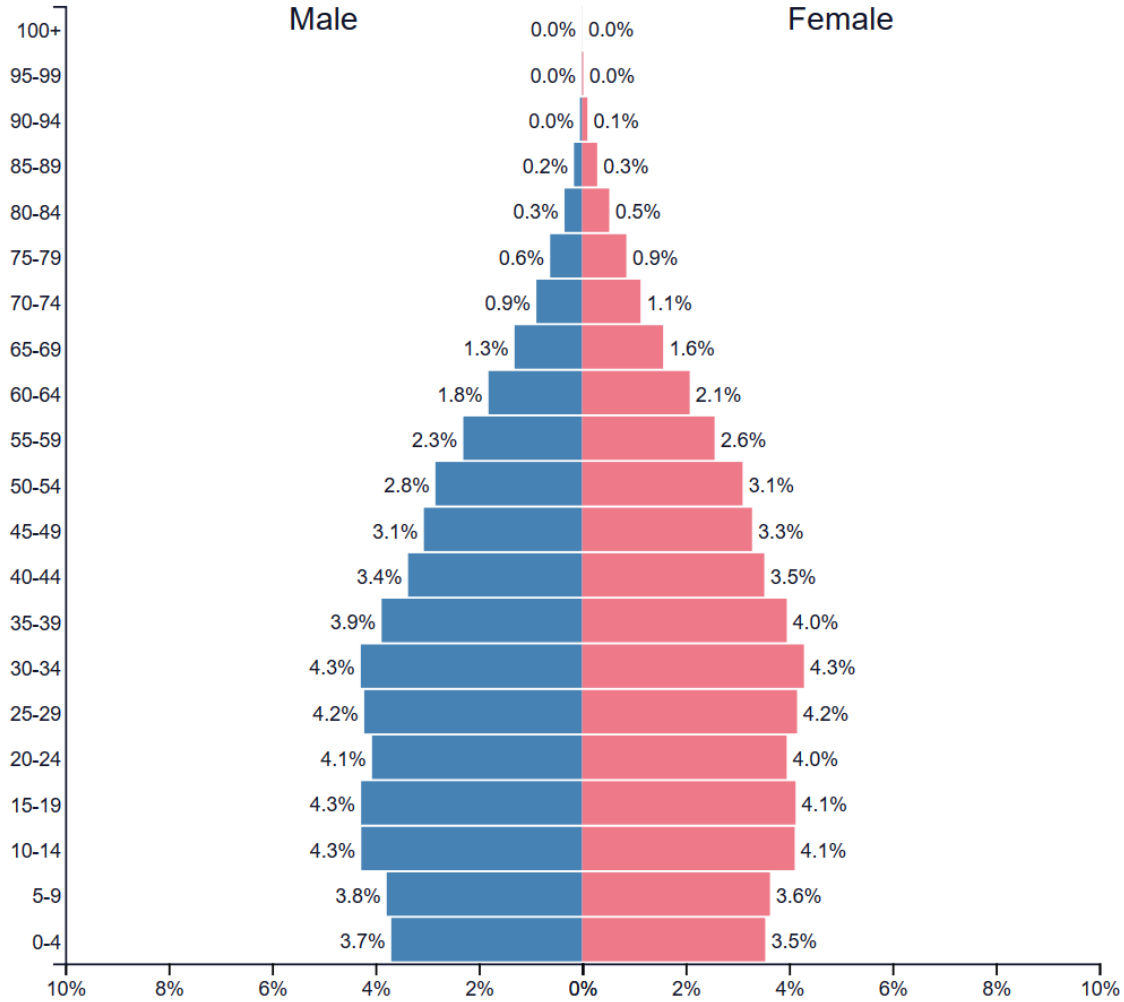
Brazil population pyramid 2015



Source: Populationpyramid.net

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Life expectancy world-wide

Sex	1980	1990	2000	2010	2015
Men	59.6	62.5	64.2	67.5	69.0
Women	63.7	67.1	69.1	72.9	74.8

Source: GBD 2015 Mortality and Causes of Death Collaborators. Lancet 2016

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Japan's doctors propose raising 'outdated' retirement age to 75

Campaigners say 65 to 74-year-olds should be classified as pre-old age to empower those who want to work or volunteer

theguardian.com 18 July 2017

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Canadian Longitudinal Study on Aging (CLSA)

- 3 co-principal investigators supported by 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 participants for ≥20 years

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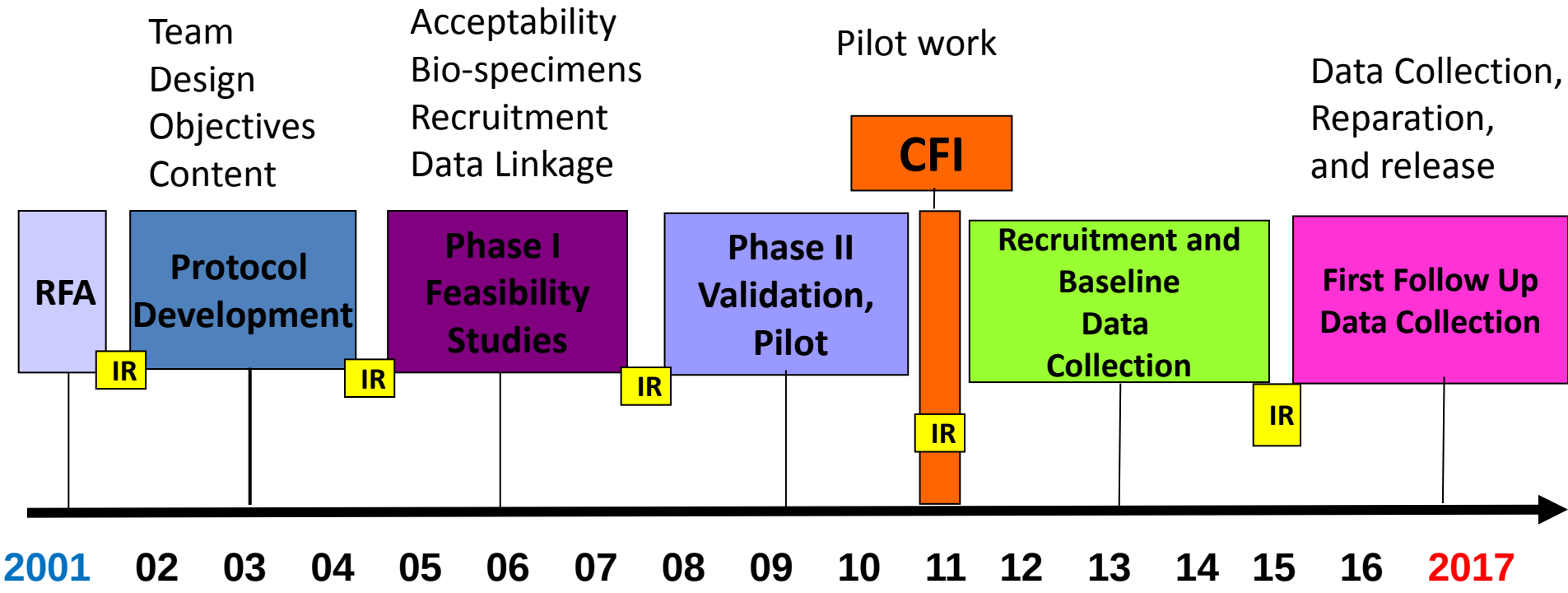
Aim and Vision

- AIM: To examine life/health transitions and capture trajectories to enable the *identification of modifiable factors with the potential to inform interventions* (prevention/treatment/impact) to improve the health of populations as they age

- VISION: To create a research *platform* infrastructure to enable state-of-the-art, interdisciplinary population-based research and evidenced-based decision-making that will lead to better health and quality of life for Canadians as they age.

The Journey so far…



IR **International peer review**

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Study Design

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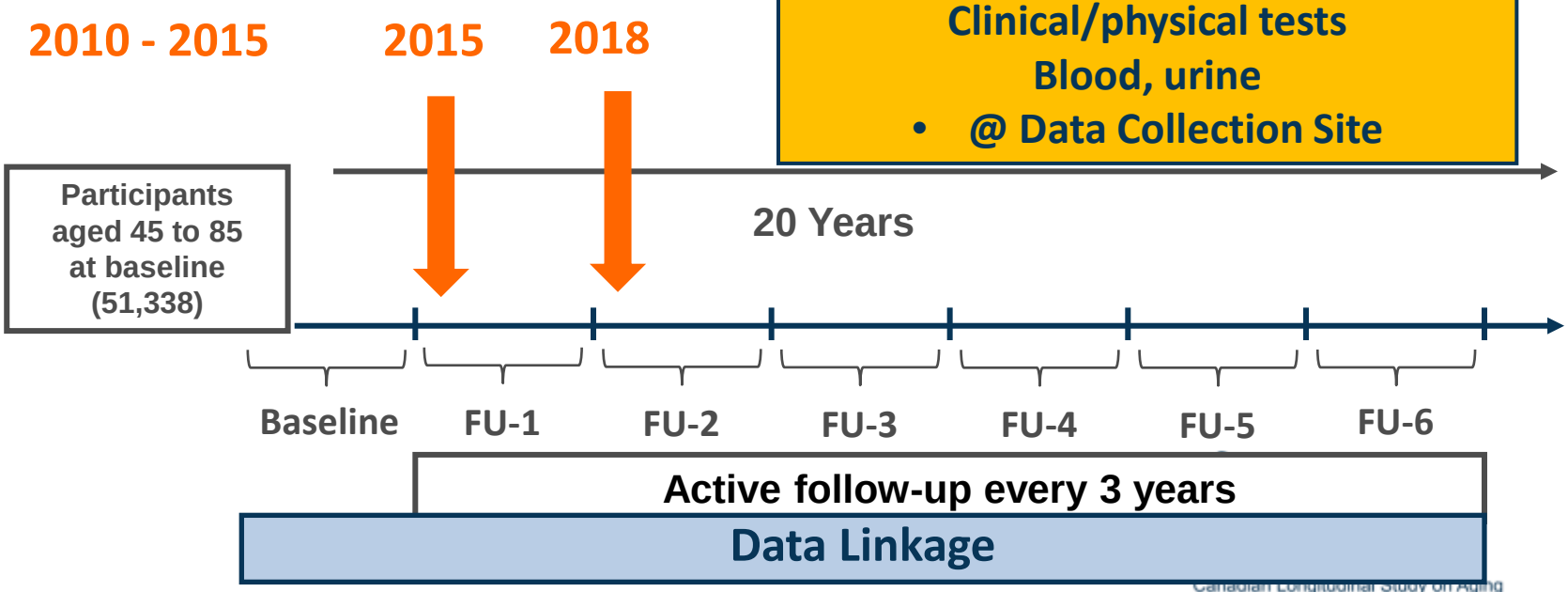
CLSA Research Platform

50,000 women and men aged 45 - 85 at baseline

Target: 20,000 Randomly selected within provinces	Target: 30,000 Randomly selected within 25-50 km of 11 sites

Questionnaire • By telephone (CATI)	Questionnaire • In person, in home (CAPI)

Clinical/physical tests
Blood, urine
- **@ Data Collection Site**



National in Scope

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Defining the cohort

- Men and women living in any of 10 provinces in Canada aged 45-85 at recruitment
  - Capturing baby boomers (born between 1946-1964) plus members of the “silent” generation (i.e. those born before 1945)

Recruiting the Cohort

1. Partnership with Statistics Canada
   - Canadian Community Health Survey 4.2 Healthy Aging (2008-09) CCHS 4.2
     - CCHS participant agreement to share contact information with the CLSA – *a first for Statistics Canada*
2. Partnership with provincial Ministries of Health (MOH)
   - Health Card Registration databases
   - Mailouts, return Consent-to-Contact form, CLSA follow up
3. Random Digit Dialing
   - Leger Marketing and CLSA CATI

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Cohort Exclusion Criteria at Baseline

Driven by CCHS 4.2 exclusion criteria 1. to 5.

1. Residents of the 3 territories
   - Northwest Territories, Nunavut, Yukon
2. Living in an institution
3. Living on a First Nation Reserve
4. Full time members of the armed forces
5. Temporary visa holders

CLSA Added Criteria

- Cognitively impaired (at baseline)
- Unable to communicate in French or English

1 to 5 exclude <4% of the target population

Terminology

- Tracking Cohort
  - Target - 20,000 participants from all 10 provinces, followed through Computer Assisted Telephone Interviews (60 minutes at baseline)
  - **21,241 recruited***
- Comprehensive Cohort
  - Target - 30,000 participants living within 25 km (or 50 km) of a CLSA Data Collection Site (DCS)
  - Followed through in-home interviews (60 minute) and physical assessments (2-3 hours) at a DCS
  - **30,097 recruited***

Study Content and Data Collection

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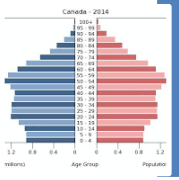
CLSA Questionnaire modules
All 51,338 participants

Demographic/Lifestyle



- Age
- Gender
- Education
- Marital status
- Sexual orientation
- Language
- Ethnicity
- Wealth/income
- Veteran Identifier
- Smoking, alcohol
- Nutritional risk
- Physical activity
- Health care utilization
- Medication use
- Supplement use

Health

- General health
- Women's health
- Chronic conditions
- Disease symptoms
- Sleep
- Oral health
- Injuries, falls
- Mobility
- Pain, discomfort
- Functional status
- ADL, IADL
- Cognition
- Depression
- PTSD
- Life Satisfaction

Social

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

Work-related content in CLSA

- Current or last job
- Duration in that job
- Main occupation through career
- Reasons for retirement (or ending retirement)
- Possible use of Job Exposure Matrices

CLSA Data Collection

Data Collection Site

Physical Assessments:

- Height, Weight, BMI
- Bone Density, Body Composition, Aortic Calcification
- Blood Pressure, ECG, c-IMT
- Pulmonary Function
- Vision & Hearing
- Performance testing

Biospecimen Collection:

- Blood
- Urine

Cognitive Assessments:

- Neuropsychological Battery
  - Memory
  - Executive function
  - Reaction time

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CORE BIOMARKERS: Baseline

	Category	N	Biomarkers
Available	**HEMATOLOGY** Data Collection Sites (DCS)	25,425	• Erythrocytes • Granulocytes • Hematocrit • Hemoglobin • Lymphocytes • Platelets • MCV • MCV • MCHC • MPV • RDW
Available mid-2018	**CHEMISTRY** Calgary Laboratory Services (CLS)	27,170	• Albumin • Alanine aminotransferase (ALT) • C-reactive protein (CRP) • Creatinine • Cholesterol • Ferritin • Free T4 • HDL • LDL • Non-HDL • Thyroid stimulating hormone (TSH) • Triglycerides • 25-Hydroxyvitamin D • Hemoglobin A1c (n = 26961)
	GENETICS Genetic and Epigenetic Centre (GEC)	10,000	• Genome-wide genotyping • DNA extracted from buffy coat on samples (n = 26,884) • 820K UK Biobank Axiom Array (Affymetrix)
	EPIGENETICS Genetic and Epigenetic Centre (GEC)	1,500	• DNA methylation • DNA extracted from PBMCs • 850K Infinium MethylationEPIC BeadChip (Illumina)
	METABOLOMICS Kyoto, Japan	1,000	• Mass spectrometry

Updated July 14, 2017

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Defining response rates

Response Rates: We defined response rates as the number of participants divided by the estimated number of those sampled who were eligible.

$$(A)\ Pre-Recruitment\ Rate = \frac{Number\ of\ Pre-Recruits}{Estimated\ Number\ Eligible\ in\ Sample}$$

$$(B)\qquad Conversion\ Rate = \frac{Number\ of\ Participants}{Number\ of\ Eligible\ Pre-Recruits}$$

$$Response\ Rate = A \times B$$

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Response rates

SAMPLING FRAME	Pre-recruitment Rate	Conversion Rate	Overall Response Rate
Provincial Health Registry Mail-Outs	0.10	0.58	**0.06**
Random-Digit Dialing	0.29	0.38	**0.11**

Also, recruitment cost per participant lower for RDD.

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Baseline Demographics

Socio-demographic Characteristics unweighted

	Tracking	Comprehensive	Total N=51,338
Age			
45-54	5,832 (27.5)	7,595 (25.2)	13,427 (26.2)
55-64	6,564 (30.0)	9,856 (32.7)	16,420 (32.0)
65-74	4,634 (21.8)	7,362 (24.5)	11,996 (23.4)
75-85	4,211 (19.8)	5,284 (17.6)	9,495 (18.5)
Sex			
Female	10,835 (51.0)	15,320 (50.9)	26,155 (50.9)
Male	10,406 (49.0)	14,777 (49.1)	25,183 (49.1)
Language			
English	17,483 (82.3)	24,291 (80.7)	41,774 (81.4)
French	3,758 (17.7)	5,806 (19.3)	9,564 (18.6)
Born in Canada	18,513 (87.2)	24,644 (81.9)	43,099 (84.1)

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CLSA Participants by Province unweighted

Province	Tracking	Comprehensive	Total
British Columbia	2613 (12.3)	6254 (20.8)	8867 (17.3)
Alberta	2103 (9.9)	2958 (9.8)	5061 (9.9)
Saskatchewan	1382 (2.7)	0	1382 (2.7)
Manitoba	1477 (7.0)	3114 (10.4)	4591 (9.0)
Ontario	4705 (22.2)	6417 (21.3)	11122 (21.7)
Quebec	3601 (17.0)	6057 (20.1)	9658 (18.8)
New Brunswick	1355 (2.6)	0	1355 (2.6)
Nova Scotia	1546 (7.3)	3075 (10.2)	4621 (9.0)
Prince Edward Island	1138 (2.2)	0	1138 (2.2)
Newfoundland	1251 (5.9)	2219 (7.4)	3470 (6.8)

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First Follow Up
2015-2018

First Follow-Up: New Content Added

- *Child maltreatment
- **Elder abuse
- Epilepsy screening
- Decedent interview
- Unmet health-care needs
- Preventive health behaviours (screening, vaccination, etc)
- Enhanced hearing, oral health and transportation modules
- Gender identity questions
- Subjective cognitive decline
- Loneliness

*Childhood Experiences of Violence Questionnaire. Walsh et al 2012
**National Initiative for the Care of the Elderly (NICE)

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Follow up considerations

- Keeping participants engaged
- Tracing participants who have moved
- Attention to changes in life circumstances that may affect ability to participate
  - Cognitive, sensory, mobility impairment
- Ensuring that changes in content permit the ongoing examination of transitions and trajectories

Passive Data Collection Work in progress

- Linkage is an important CLSA strategy
  - Great potential for collecting information that is difficult to get from participants due to time, accuracy limitations; and/or may even be unknown to participants
  - Potential to obtain historical data prior to CLSA entry
- Types of databases
  - Individual level administrative provincial health databases
  - Vital statistics/disease registries
  - Population level databases of community characteristics, climate, pollution

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Retention at first follow-up

Comprehensive cohort

Completed	**22179**
Withdrawn	**1018**
Died	**567**
TOTAL	**23764**

Retention = 22179 / (22179 + 1018) = 96%

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Retention at first follow-up

Tracking cohort

Completed	**X**
Withdrawn	**Y**
Died	**Z**
TOTAL	**X+Y+Z**

Retention = X / (X+Y) = R%

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CLSA Approved Projects

Selected Approved Projects

- Labour Force Participation: Retirement Transitions, Expectations and Planning
  University of Waterloo
- Measuring Frailty in Older Canadians: An Analysis of the Canadian Longitudinal Study on Aging (CLSA)
  McMaster University
- Factorial invariance of the CES-D
  University of Saskatchewan
- Sleep and its Covariates in the CLSA
  McGill University
- Social Support, Social Participation, and Depression among Caregivers and Non-Caregivers in Canada: A Population Health Perspective
  Western University
- Epidemiology of Menopause in Canada
  York University

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Selected Approved Trainee Projects 2017

- A Model of Health: Using data modelling techniques to improve health outcomes for older Canadian adults by optimizing the development and delivery of physical activity interventions
  Simon Fraser University
- Potential metabolic and functional benefits of a comprehensive evaluation of physical activities for Canadian adults
  University of New Brunswick
- Impact of the Lifestyle Factors on the Health Aging of Individual
  Simon Fraser University
- Examining multimorbidity among middle-aged Canadians
  University of Manitoba
- Frailty and mobility limitations in older Canadians with musculoskeletal diseases compared to other chronic medical conditions
  McMaster University
- Characterization of cardiovascular disease burden and health of Canadian cancer survivors
  University of Alberta

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CLSA Funders and Partners

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