Advancing the Science of Population Health and Aging through Interdisciplinary Research

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Demographic Trends

- Canadians are living longer and older people are making up a larger share of the population.

- Between 1980 and 1999, the average Canadian's life expectancy increased to 79 years from 75 years.

- By 2025, I out of every 5 Canadians (20%) will be 65 or older, compared to 1 in 8 (12%) in 2000.

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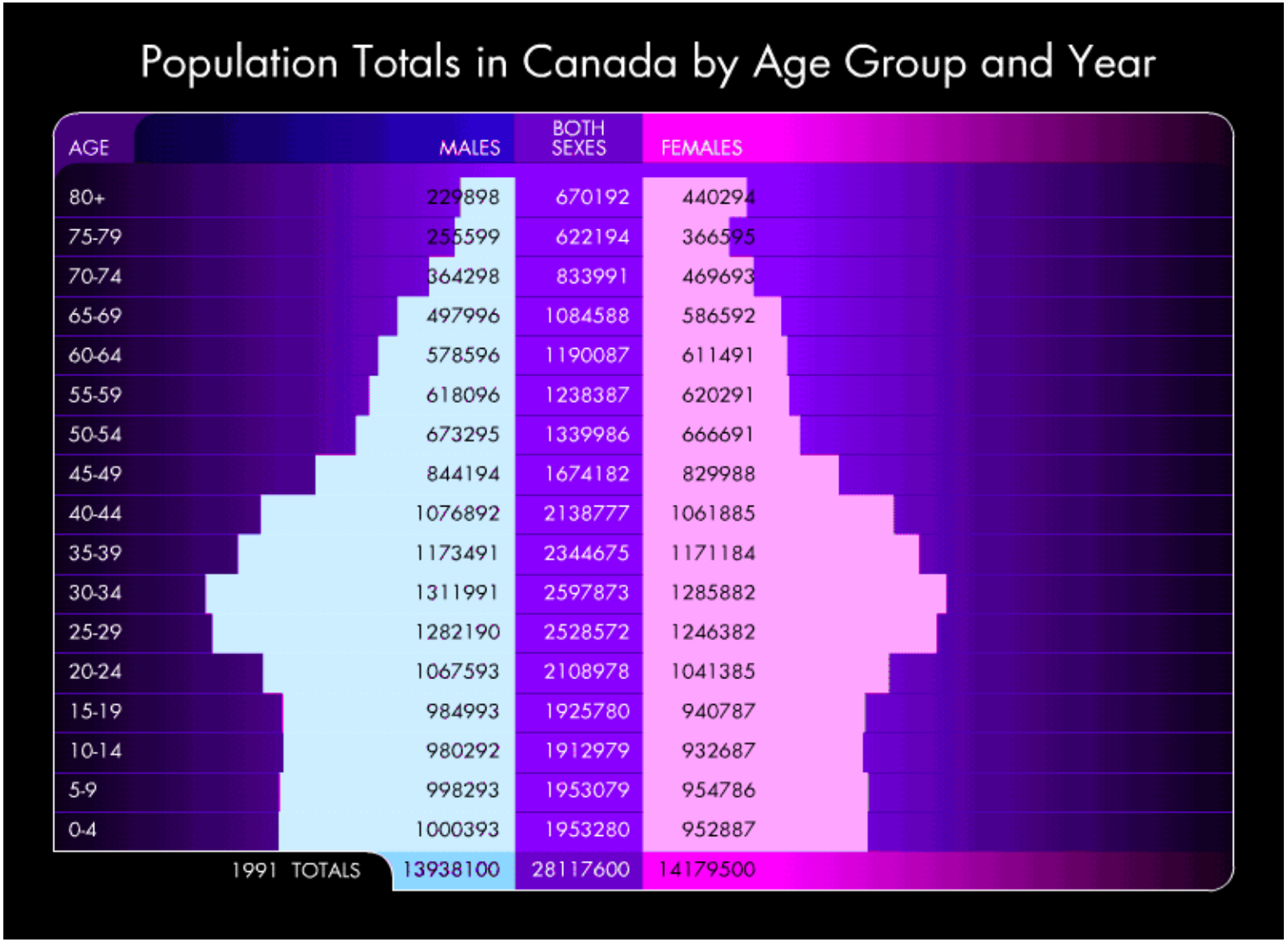
Population Totals in Canada by Age Group and Year



AGE	MALES	BOTH SEXES	FEMALES
80+	229898	670192	440294
75-79	255599	622194	366595
70-74	364298	833991	469693
65-69	497996	1084588	586592
60-64	578596	1190087	611491
55-59	618096	1238387	620291
50-54	673295	1339986	666691
45-49	844194	1674182	829988
40-44	1076892	2138777	1061885
35-39	1173491	2344675	1171184
30-34	1311991	2597873	1285882
25-29	1282190	2528572	1246382
20-24	1067593	2108978	1041385
15-19	984993	1925780	940787
10-14	980292	1912979	932687
5-9	998293	1953079	954786
0-4	1000393	1953280	952887
1991 TOTALS	13938100	28117600	14179500

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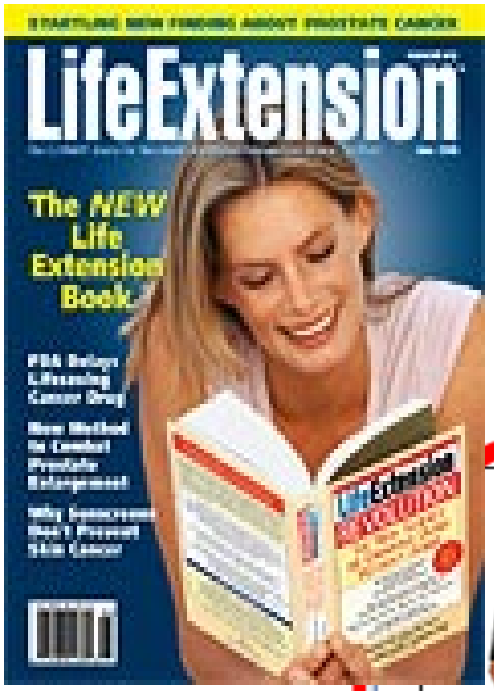
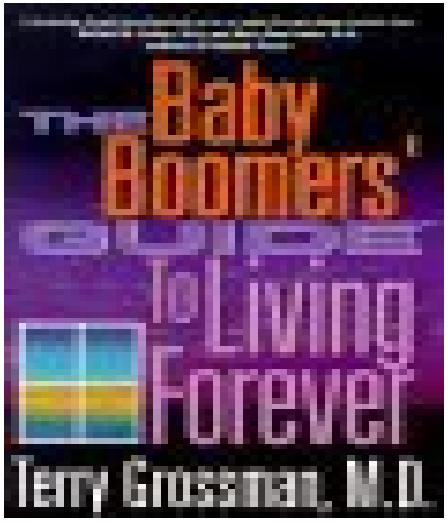
Healthy Aging or Anti-Aging?





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Healthy Aging or Anti-Aging?

The three basic rules of anti-aging medicine:

- Don’t get sick
- Don’t get old
- Don’t die

“Bridge the gap to Immortality” 羊by taking good care of your physical and mental self, you will be around to avail yourself of the latest biotechnological advancements to further optimize your life and achieve that triple-digit lifespan.

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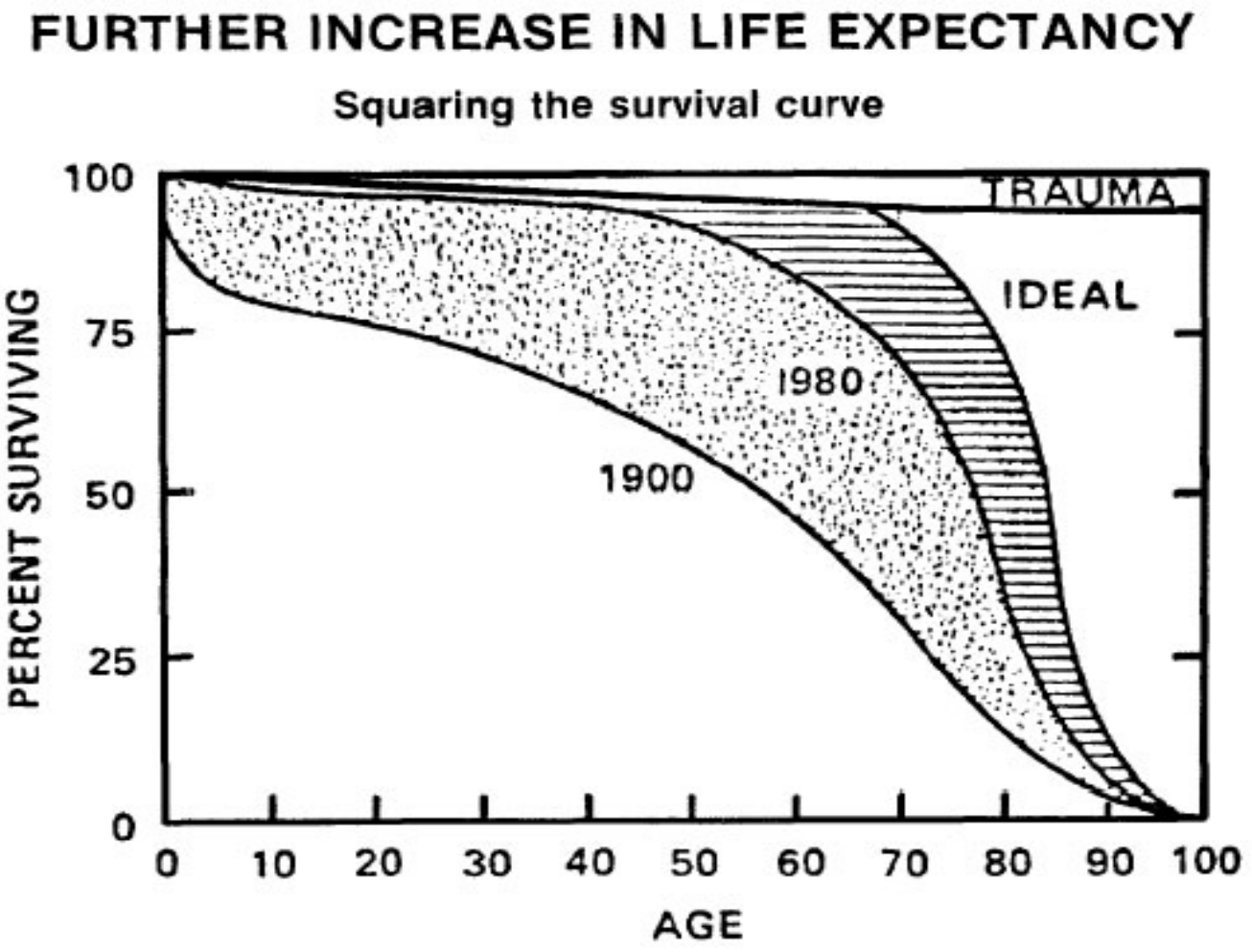
Rectangularization of the survival curve



JAMES F. FRIES, M.D., THE NEW ENGLAND JOURNAL OF MEDICINE, JULY 17, 1980.

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Compression of morbidity

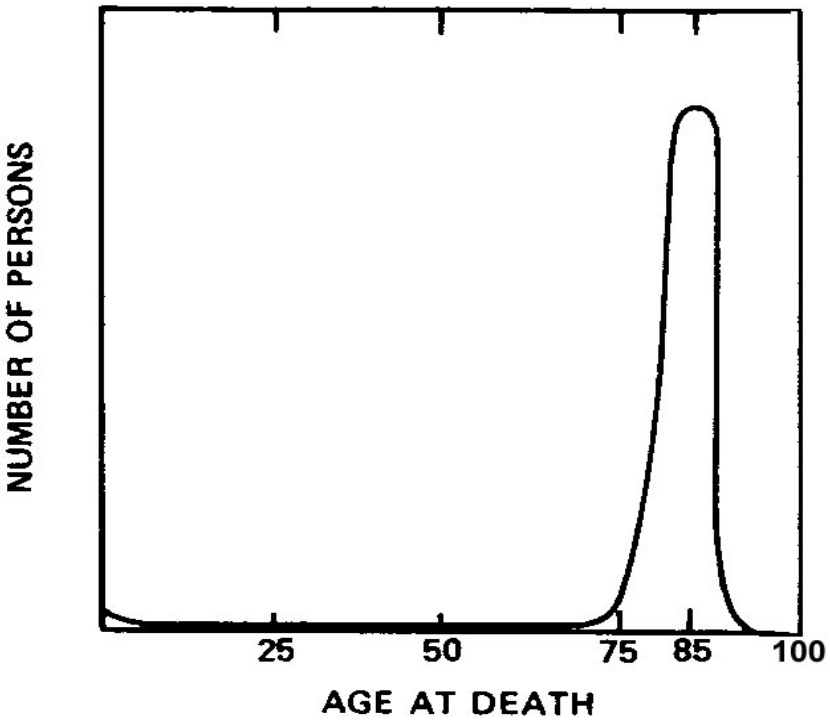

Figure: Mortality According to Age in the Absense of Premature Death

- Morbidity compressed into a short period prior to death
- Represented an important shift in thinking
- Departure from the medical model of aging, which assumed that death always occurred as a result of a disease process, and that older age was a period of inevitable decline

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Compression of morbidity

Fries' paradigm based on the premise that:

- The length of human life is fixed

  AND
- Chronic disease can be postponed

- Predicted that the increase in life expectancy would plateau in the coming decades, particularly life expectancy from age 65 which excludes early life mortality

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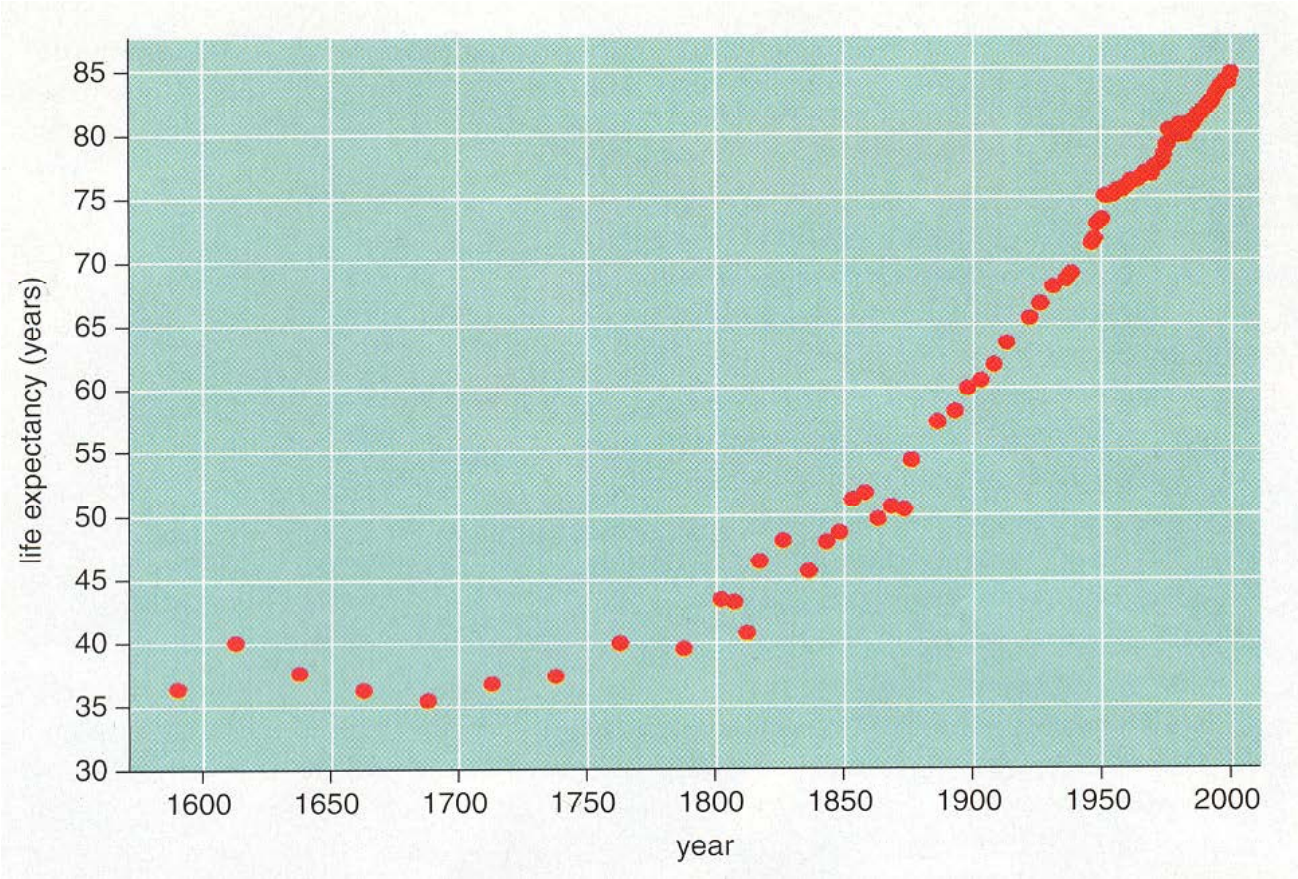
Life expectancy



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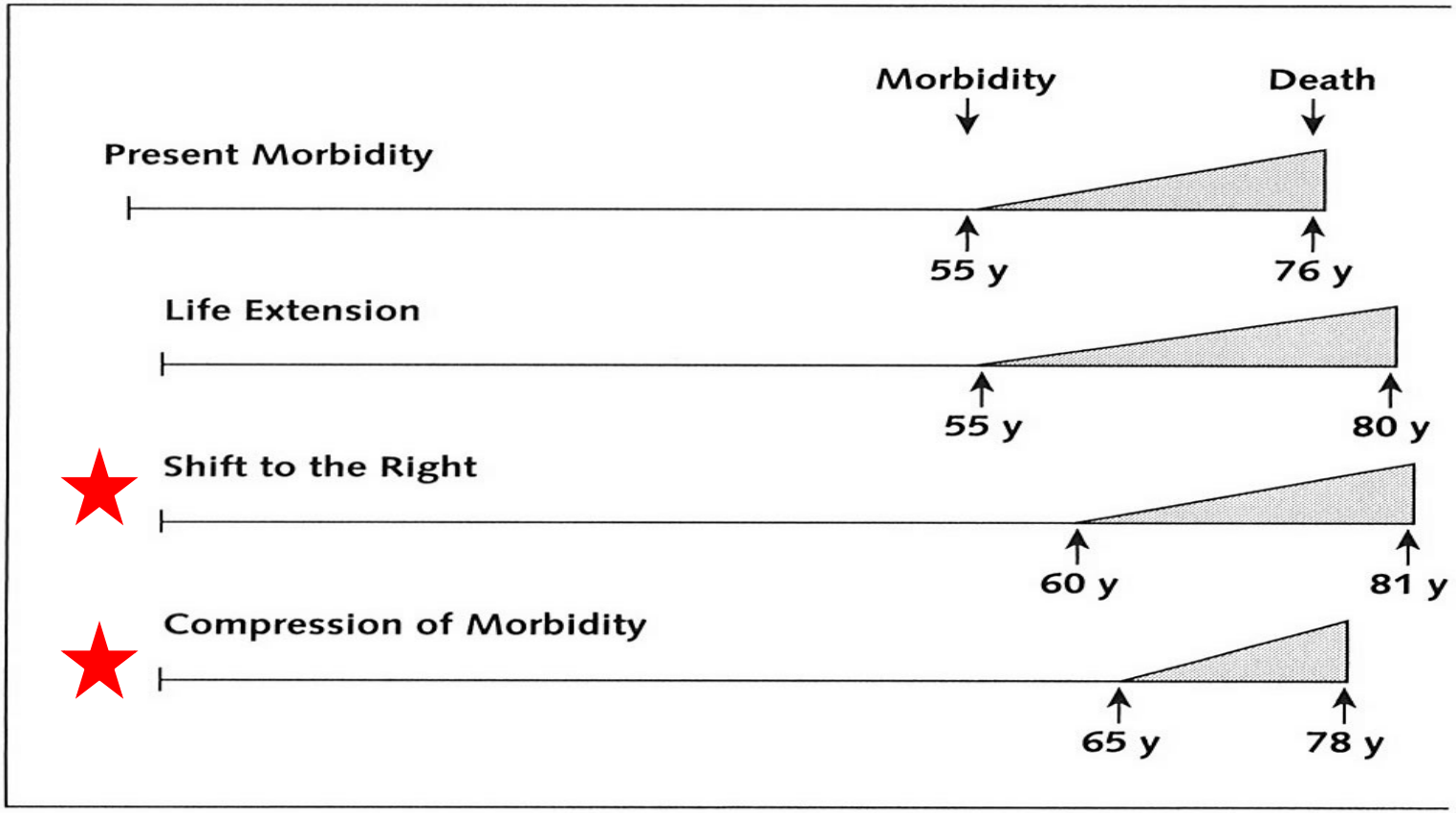
Fries potential scenarios



Aging Process

A shift in focus from “cause of death” patterns to “functional status” patterns of survivors:

- Mortality
- Morbidity
- Longevity

→

- Function
- Ability/Disability
- Well being

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Potential Determinants of Aging?

- Genes
- Biology
- Nutrition
- Lifestyle
- Environment
  - Physical
  - Social
  - Psychological
- Chance

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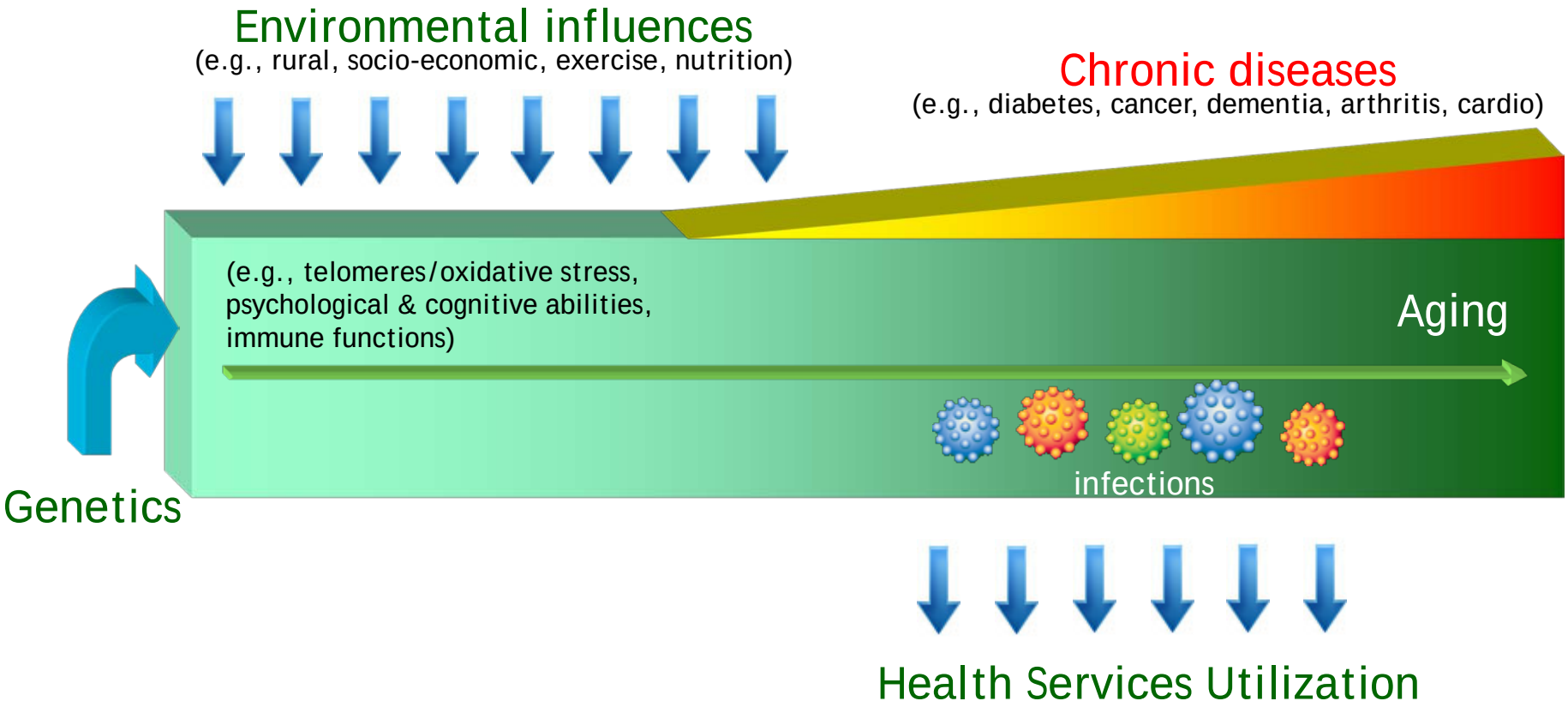
Innovation



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Scientific Evidence

- Our review identified around 70 longitudinal studies worldwide
  - Majority of these studies were studying people over the age of 65
  - Many of these 70 studies on aging collect lot of information on social factors or retirement but lack detailed information on health, especially clinical and biological measures or vice versa

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Scientific Evidence

- Very few studies have looked at the aging process from a mid-life to old age perspective
- Very few population-based studies that capture the changing individual within a changing context and incorporate multiple levels of inquiry, the cell, the individual and society
- Very few studies have focused on how individuals cope or adapt to changing circumstances and how it impacts their well-being

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Evidence

- 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

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The Canadian Longitudinal Study on Aging (CLSA)

- A key component of the Canadian Lifelong Health Initiative, a strategic initiative of CIHR
  - The Canadian National Birth Cohort
  - 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

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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.

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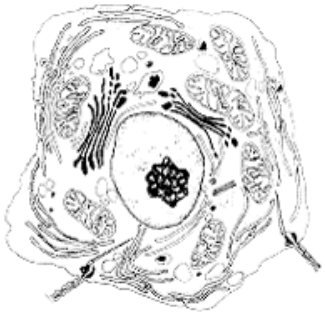
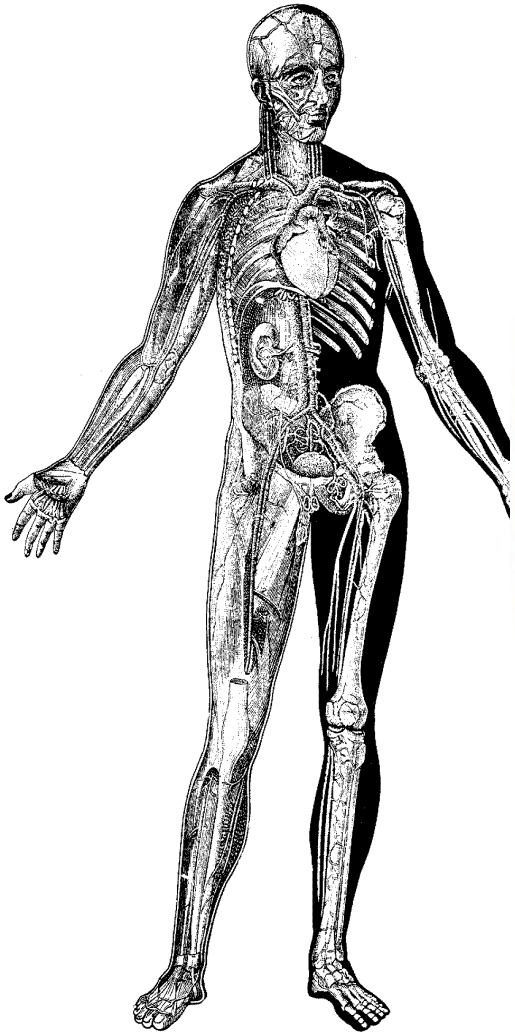


Innovation - Cell to Society

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



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Priority Areas for CLSA

- Cardiovascular
- Brain
- Musculoskeletal
- Respiratory
- Metabolic
- Psychosocial and behavioral environment
- Health and social care environment
- Economic environment

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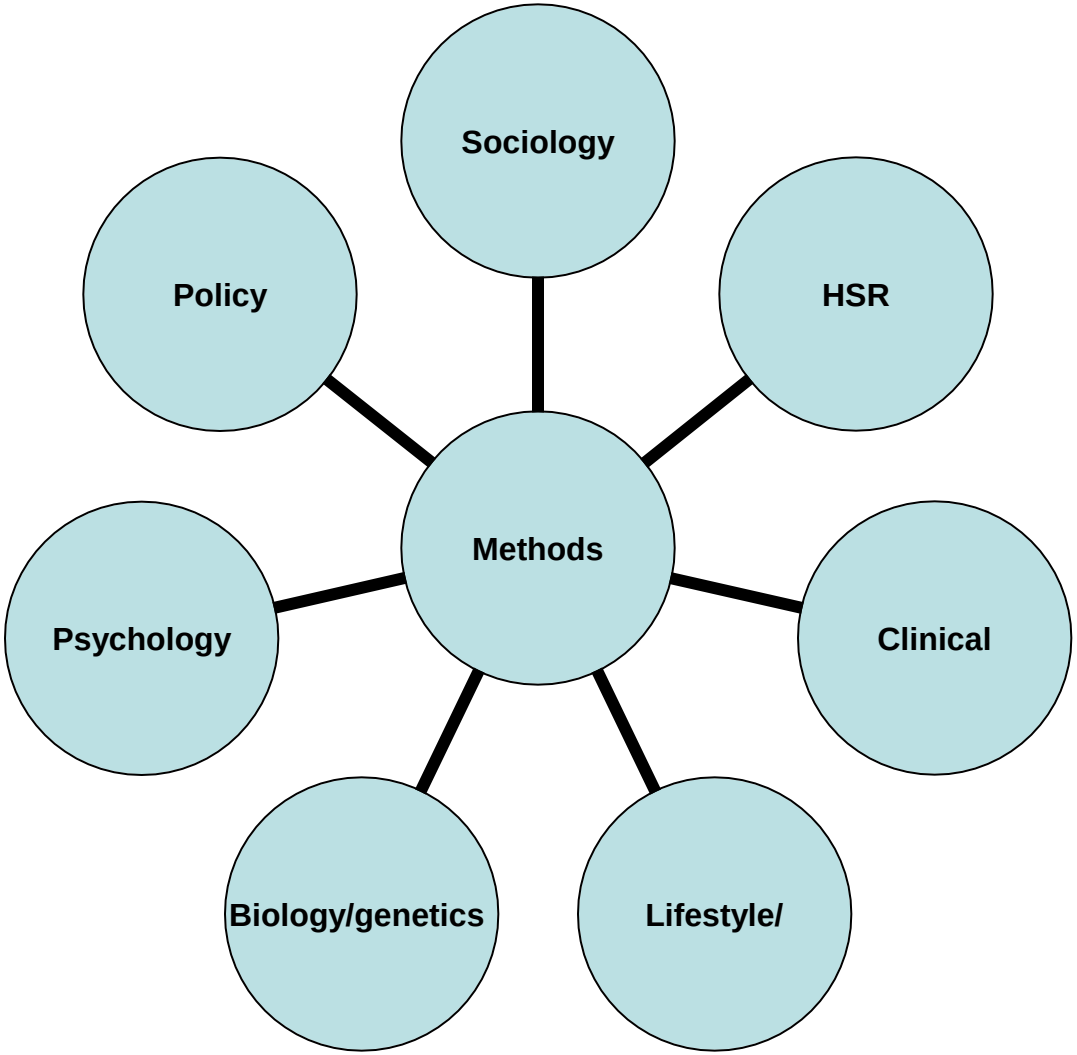
Content Working Groups



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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
- Values and meaning
- Everyday competence, adaptive functioning, coping
- Personality, emotion, psychopathology
- Work to retirement transitions
- Structural inequalities
- Built environments/physical environment
- Economics
- Healthy aging and well being
- Linkage to secondary data bases
  - Health care use
  - Disease registries
  - Drugs
  - Environmental

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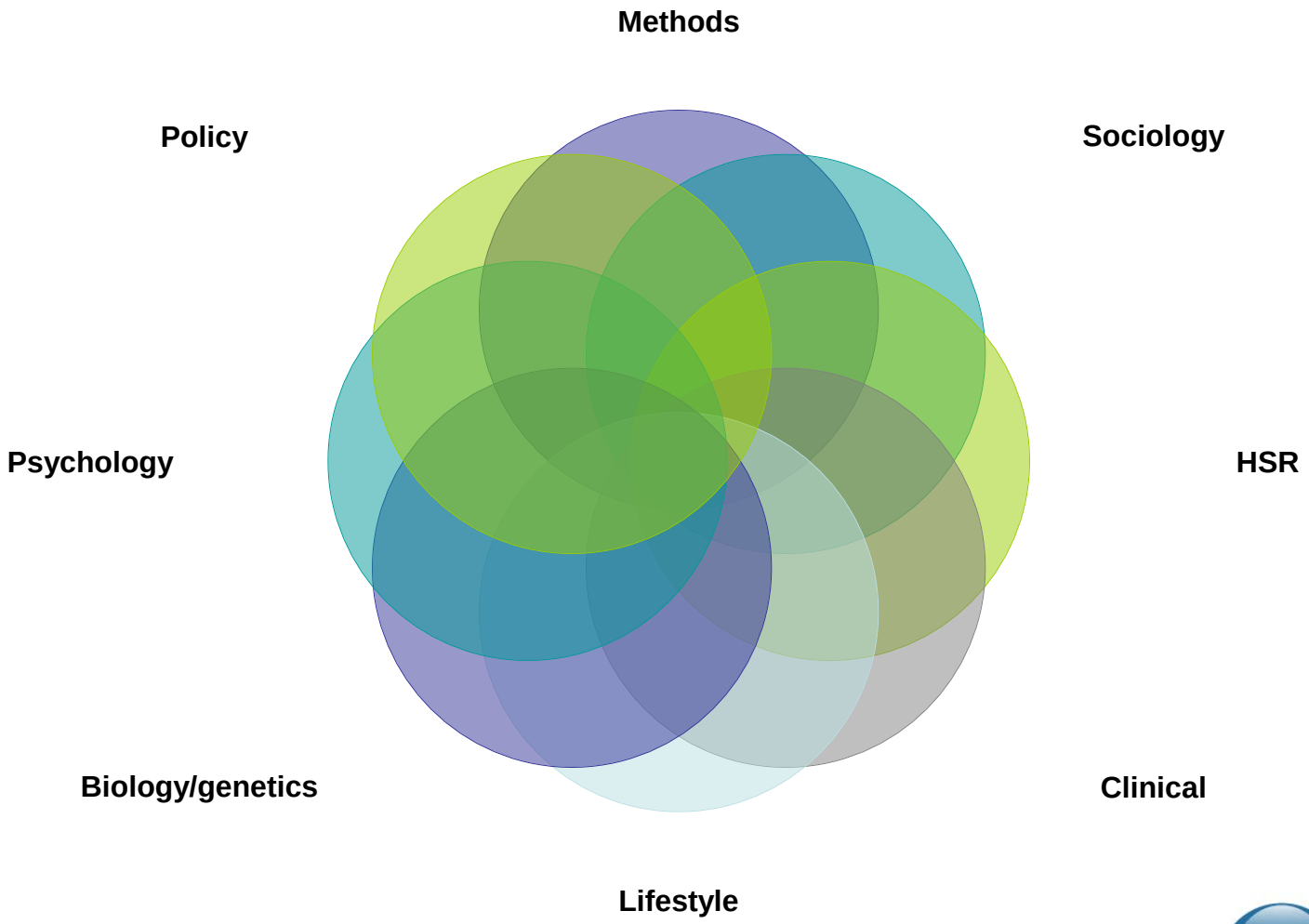
Interdisciplinary Research Agenda



Adult Development & Aging

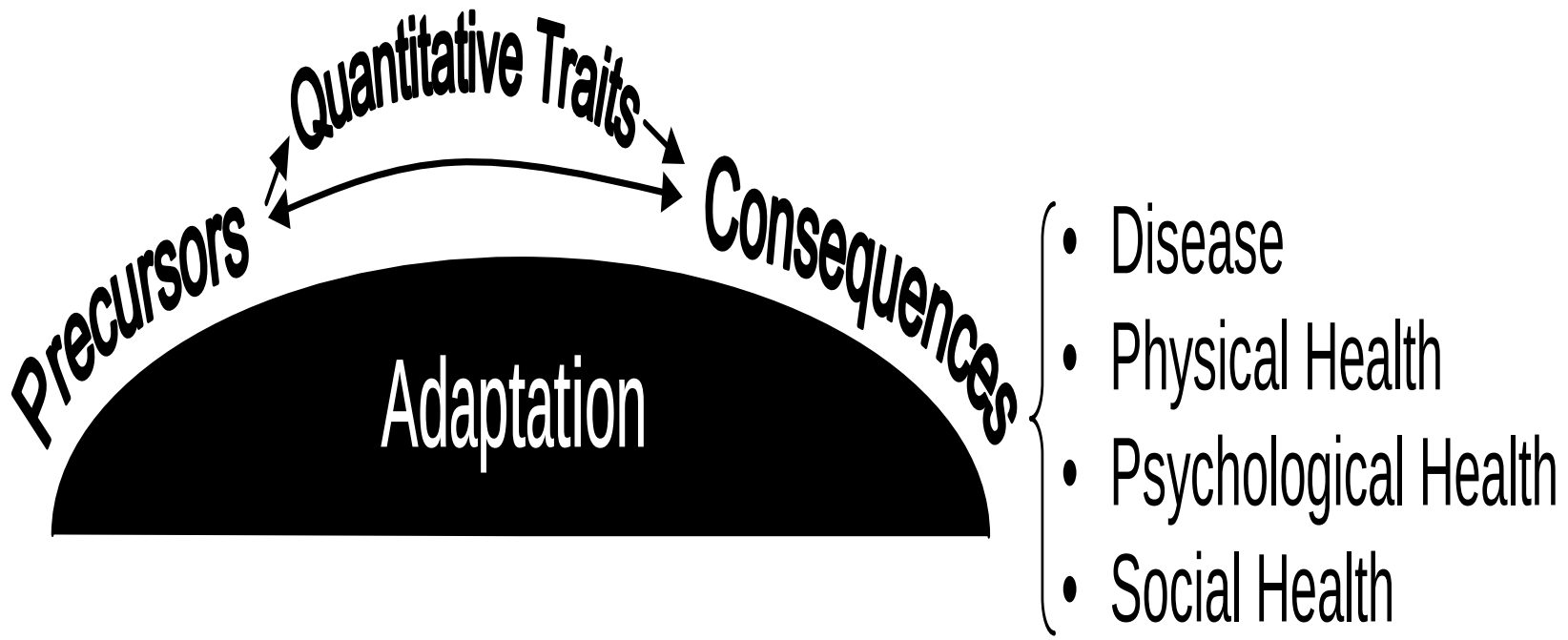


Figure 1. Model of the CLSA's research approach.

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Example Research Questions: Cognition as a Quantitative Trait

Cognition as a precursor:

- Is decline in cognitive functioning (memory, executive function and psychomotor speed) in mid and later life associated with subsequent adverse health related (or biological) outcomes?

- Is decline in cognition (memory, executive function and psychomotor speed) in mid and later life associated with changes in social participation?

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Example Research Questions: Cognition as a Quantitative Trait

- How do individuals with cognitive change adapt to maintain performance in everyday functioning?

- Are general lifestyle activities (e.g. physical activities, social activities, domestic activities, community service, etc) associated with cognitive functioning and/or change in cognition over time after adjustment for sensory impairment?

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Example Research Questions: Cognition as a Quantitative Trait

Cognition as a mediator

- How do cognitive functions mediate or moderate relations between biological/physical status and adaptive functioning and/or social participation?

Cognition as an outcome

- Are changes over time in cognition (memory, executive function and psychomotor speed) associated with specific biological states?

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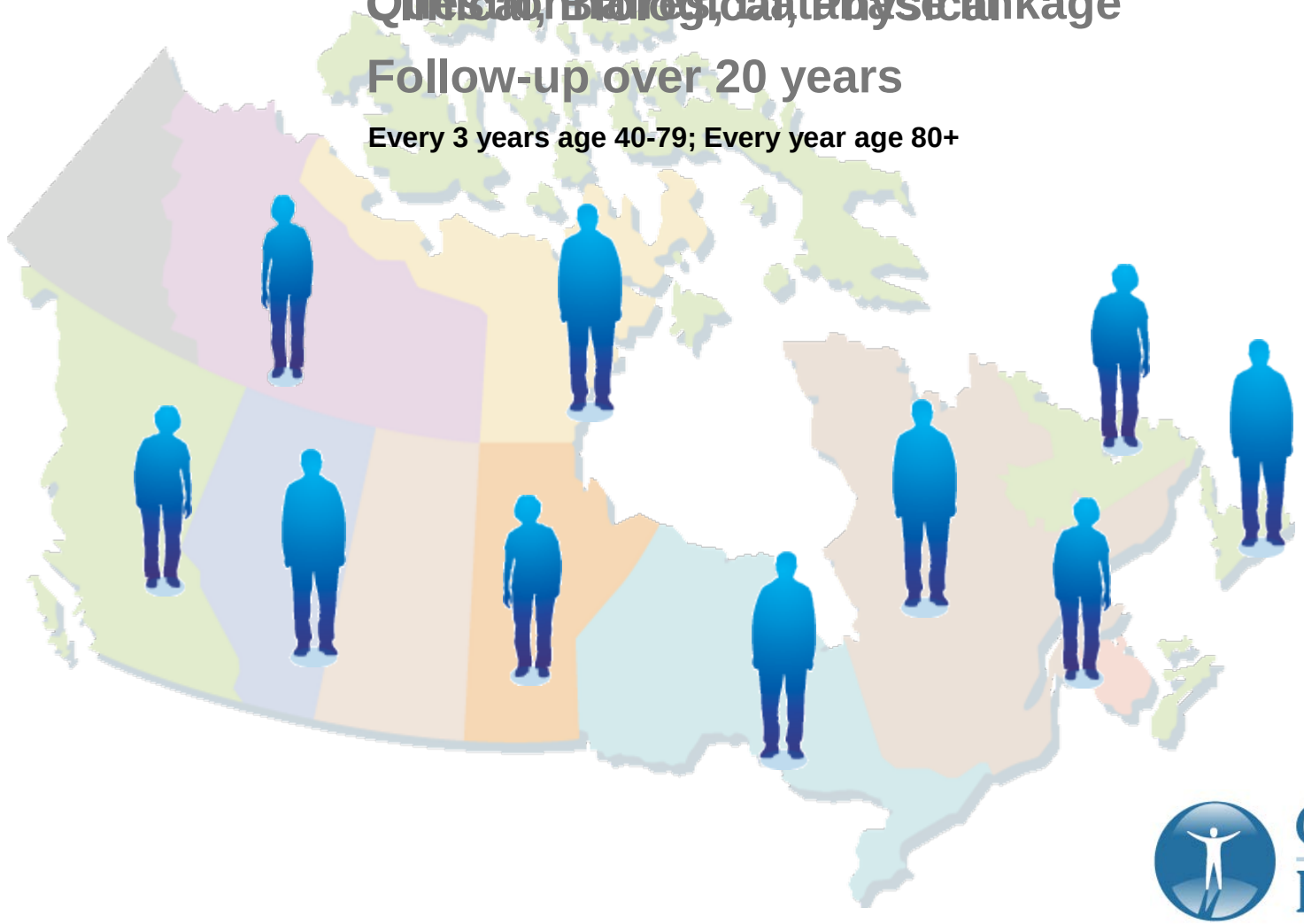
CLSA Architecture

- Participant recruited, 50,000 30,000 (at 10 sites)
- Interview, Biologic, Data, Physical
- Questionnaire, Biologic, Data, Physician
- Linkage
- Follow-up over 20 years
  - Every 3 years age 40-79; Every year age 80+



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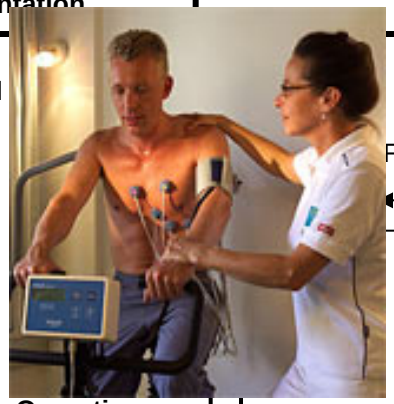
Core Network of Facilities

Operations Data / Measures / Analyses

Manage and Coordinate; Timelines; Develop Protocols, Procedures



Interim Follow Up

Operations Data

Operations

Operations Data

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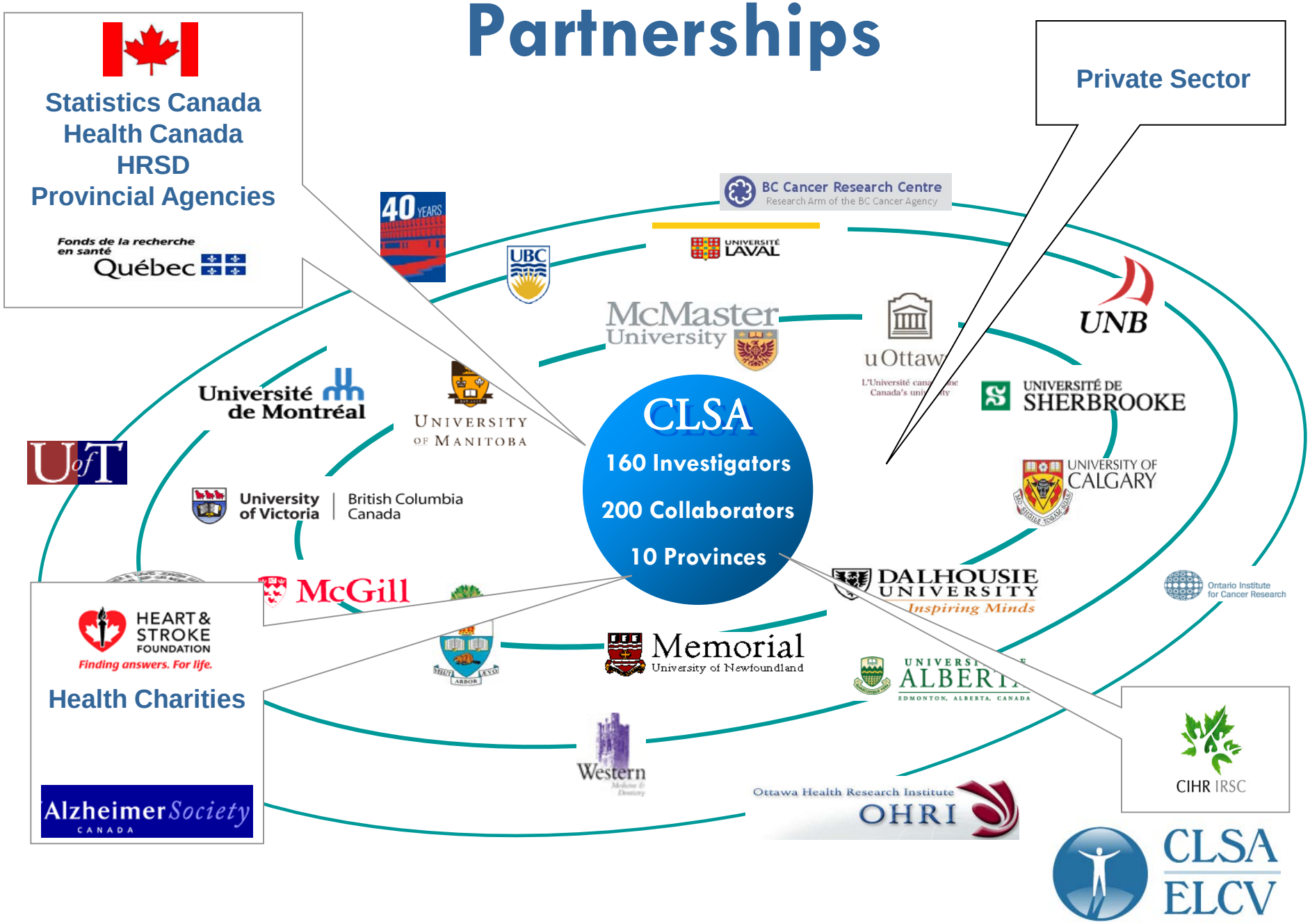
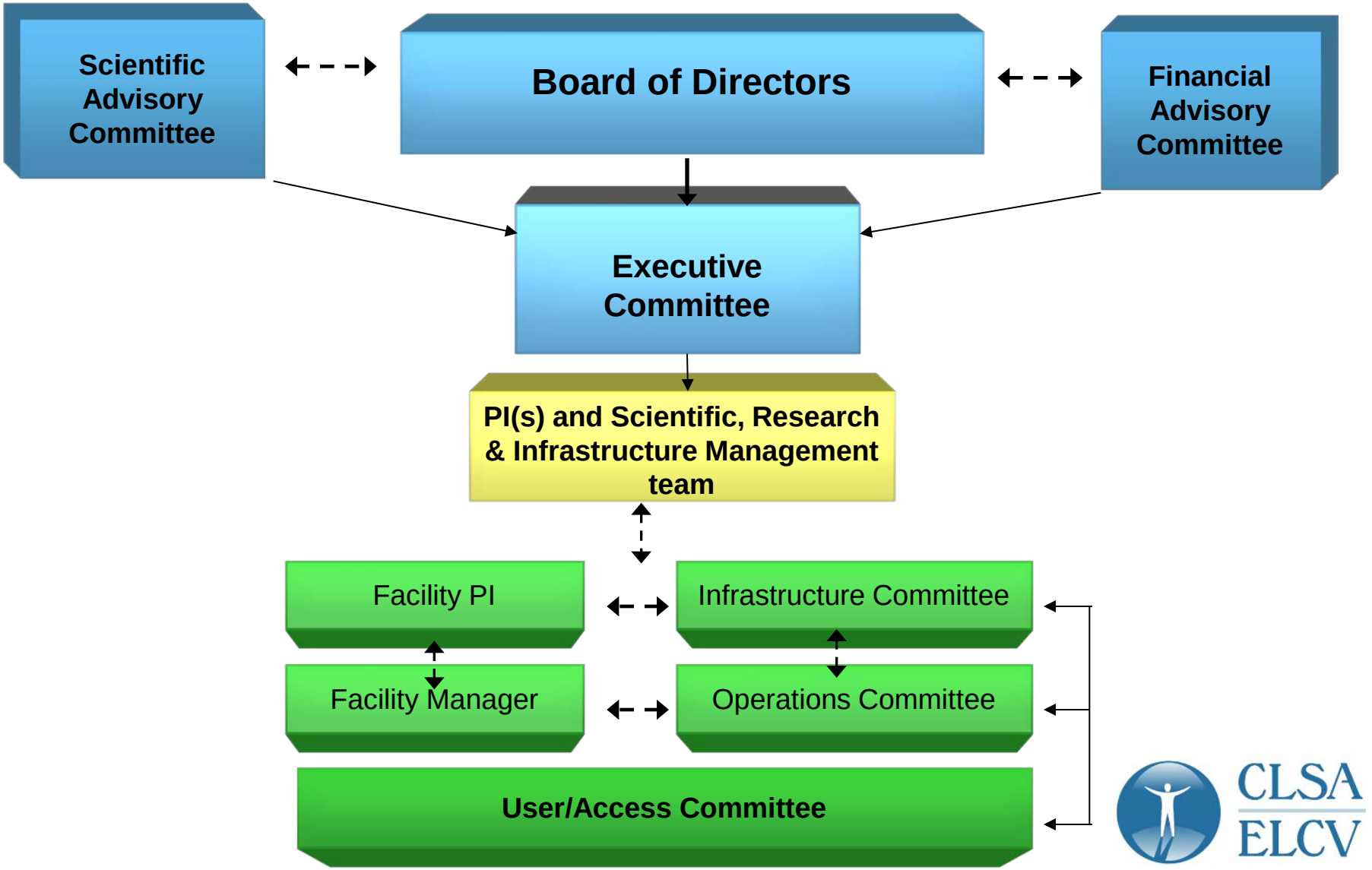
Partnerships



CLSA Management Structure



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Ethical, Legal, Societal Issues (ELSI)

- Lawyers
- Ethicists
- Philosophers
- Geneticists
- Epidemiologists
- Social scientists
- Privacy commissioner

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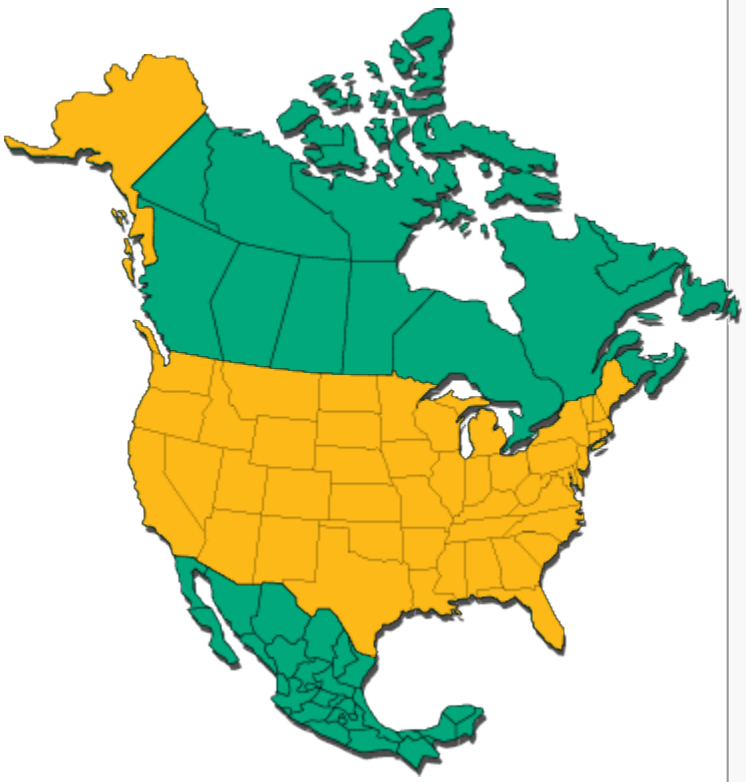
International Links



Womens Health and Aging Study - USA

Aging & Sexuality - USA

HRS - USA

British Birth Cohort - UK

UK Biobank - UK

ELSA - UK

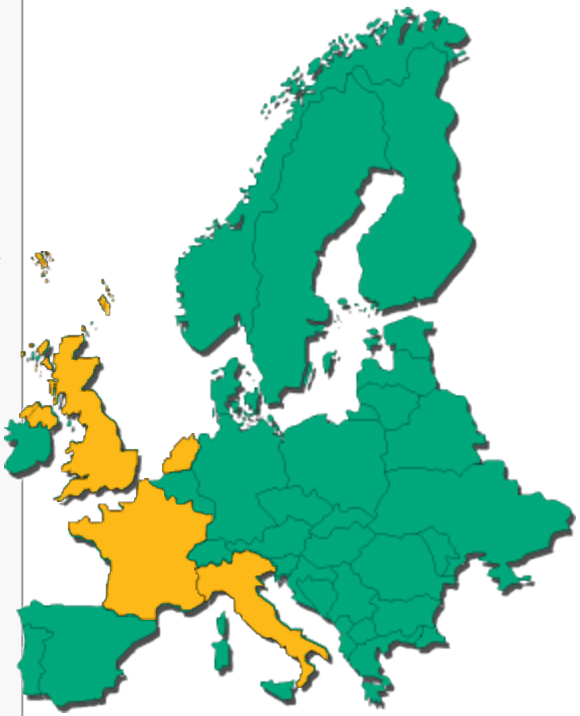
ALSPAC - UK

Cohorte Constances - FRANCE

LASA - Amsterdam

ILSA - Italy

InChianti - Italy



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Canadian Cohort Network

- Large cohorts in development stages - CIHR
  - Canadian National Birth Cohort
  - Asthma/Allergy Birth Cohort
  - Cancer/chronic disease cohort
  - Multi-generational cohort
- Large population based research
  - Canadian Multicentre Osteoporosis Study (CaMos)
  - Prospective Urban and Rural Epidemiology Study (PURE)
  - Epidream
  - Panel Study of Lifecourse Dynamics (PSLD)

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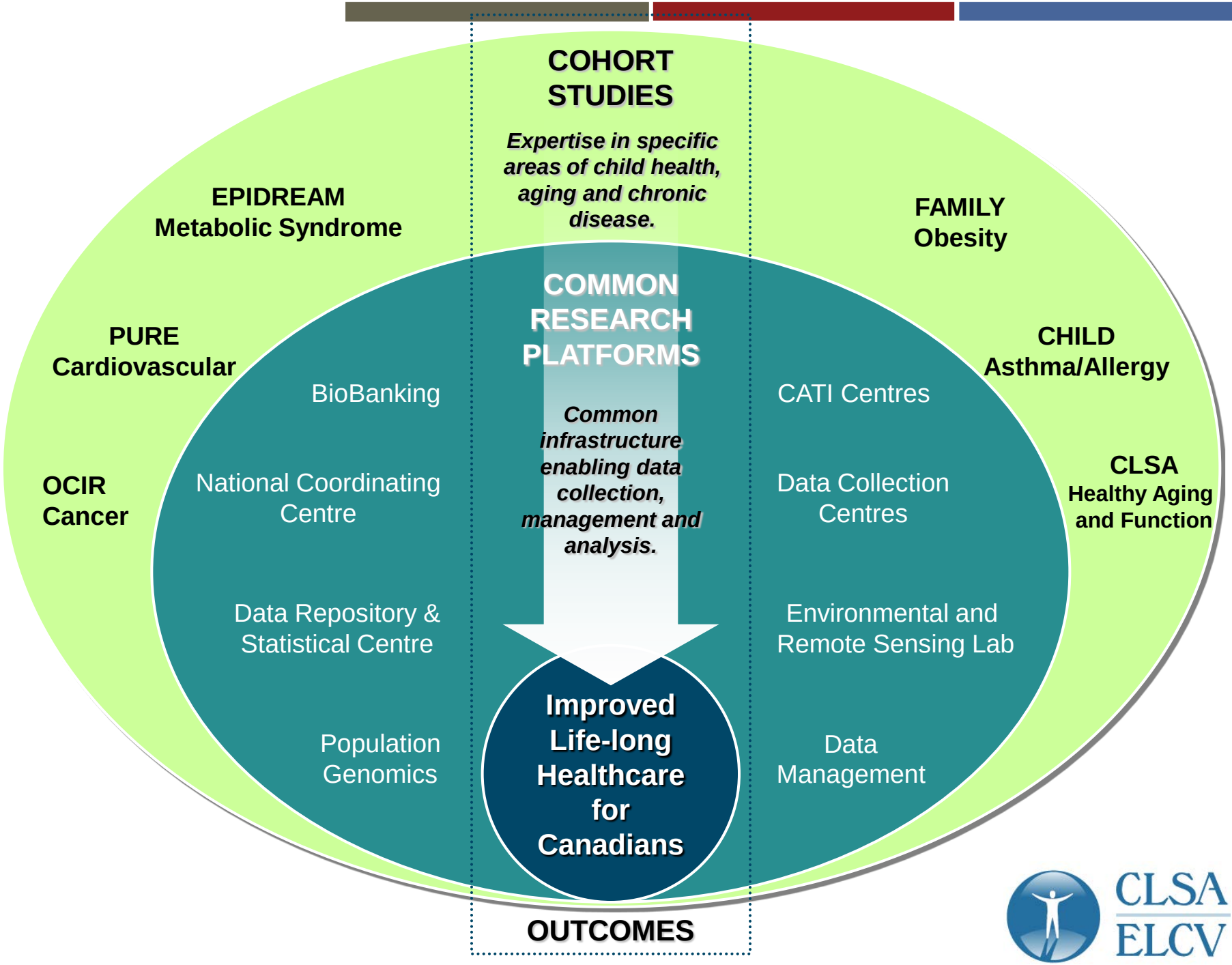
COHORT STUDIES
Expertise in specific areas of child health, aging and chronic disease.
EPIDREAM
Metabolic Syndrome
FAMILY
Obesity
COMMON RESEARCH PLATFORMS
PURE
Cardiovascular
CHILD
Asthma/Allergy
BioBanking
CATI Centres
Common infrastructure enabling data collection, management and analysis.
OCIR
Cancer
National Coordinating Centre
Data Collection Centres
CLSA
Healthy Aging and Function
Data Repository & Statistical Centre
Environmental and Remote Sensing Lab
Improved Life-long Healthcare for Canadians
Population Genomics
Data Management
OUTCOMES

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