



Transforming Everyday Life into Extraordinary Ideas




Advancing the Science of Population Health and Aging through Interdisciplinary Research

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Étude longitudinale canadienne sur le vieillissement

Historians may well conclude that the most significant event of the 20th century was ...?

the growth of world population.

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DEMOGRAPHY AND AGING

"Population aging is unquestionably the most important demographic force of the first half of the twenty-first century".

(Schoeni FR, Ofstedal MB. *"Key Themes in research on the Demography aging"* Demography, 47, 2010: S5-S15)

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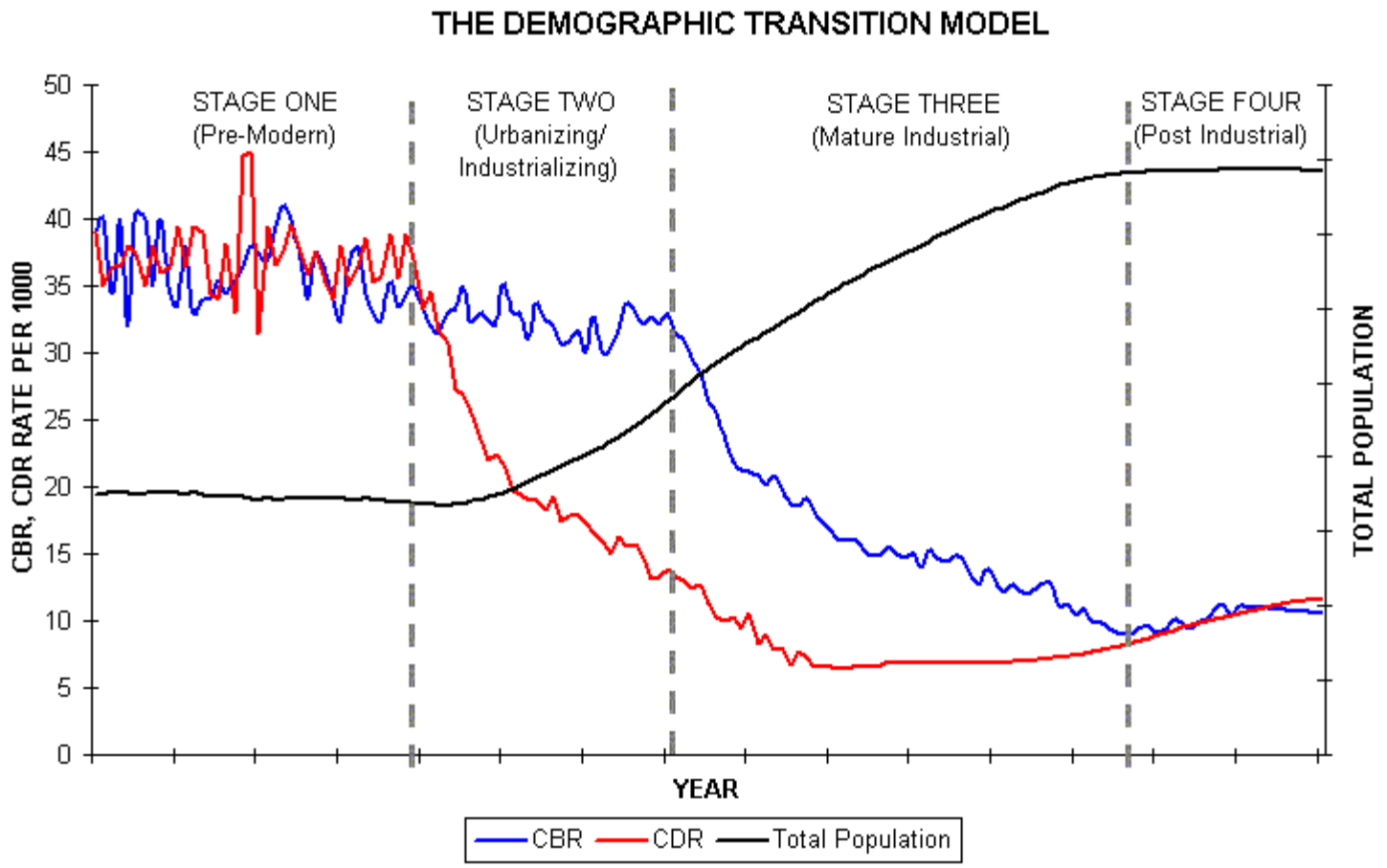
THE DEMOGRAPHIC TRANSITION



(www.marathon.uwc.edu)

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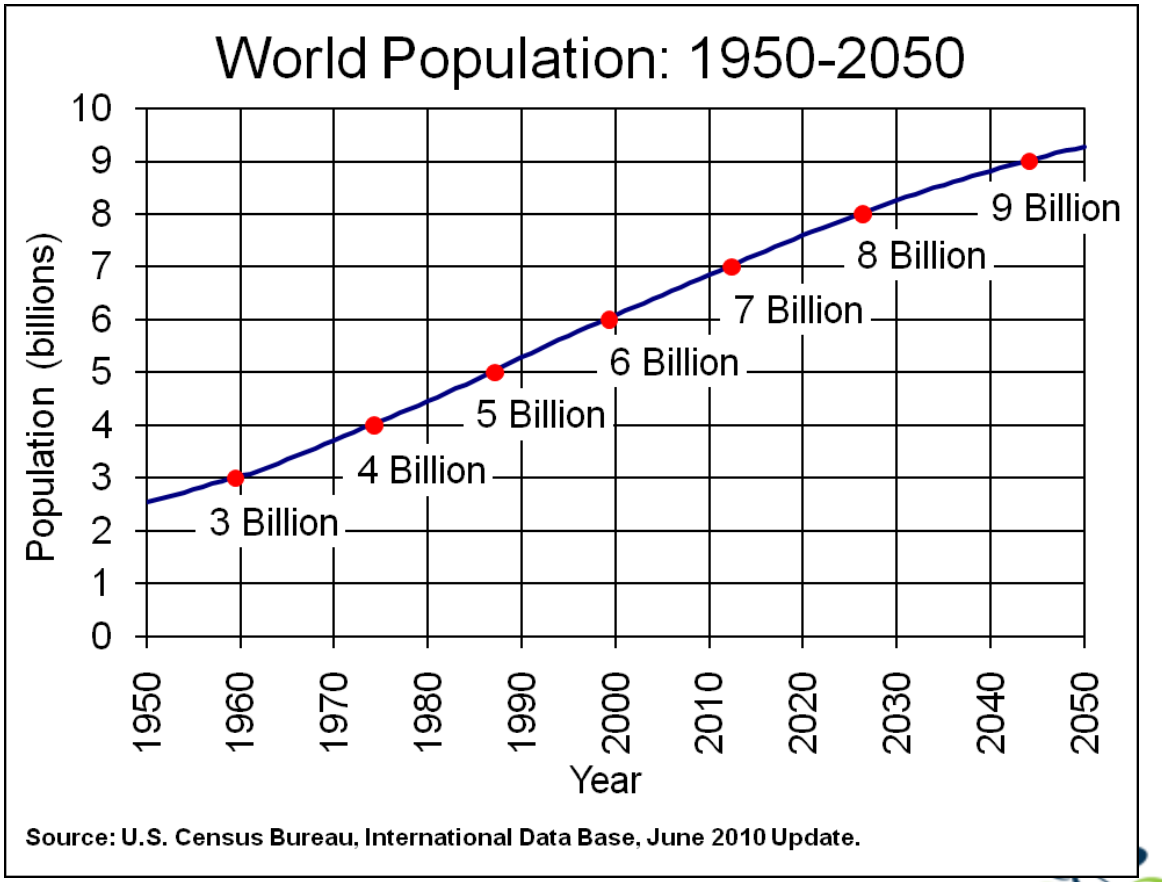
WORLD POPULATION

The world population is rapidly growing:



WORLD POPULATION AGING

- World population is especially growing older:

  ➔ the share of the population aged 65+ is expected to double between 2010 and 2040, from 7.8% to 14.7%

  ➔ the number of older people will increase from 530 million in 2010, to 1.3 billion by 2040.

(U.S. Census Bureau, International Data Base)

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WORLD POPULATION AGING

- Another aspect of world population aging is the aging of the older population; the share of the older at ages 80+ (the “oldest-old”) is growing more rapidly than the older population itself.

- This growth will translate into a large increase of oldest-old within the world’s older population, from 16% in 2000 to 24% in 2040.

(U.S. Census Bureau, International Data Base)

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Gender and Aging

- NUMBERS
- MORBIDITY
- POVERTY

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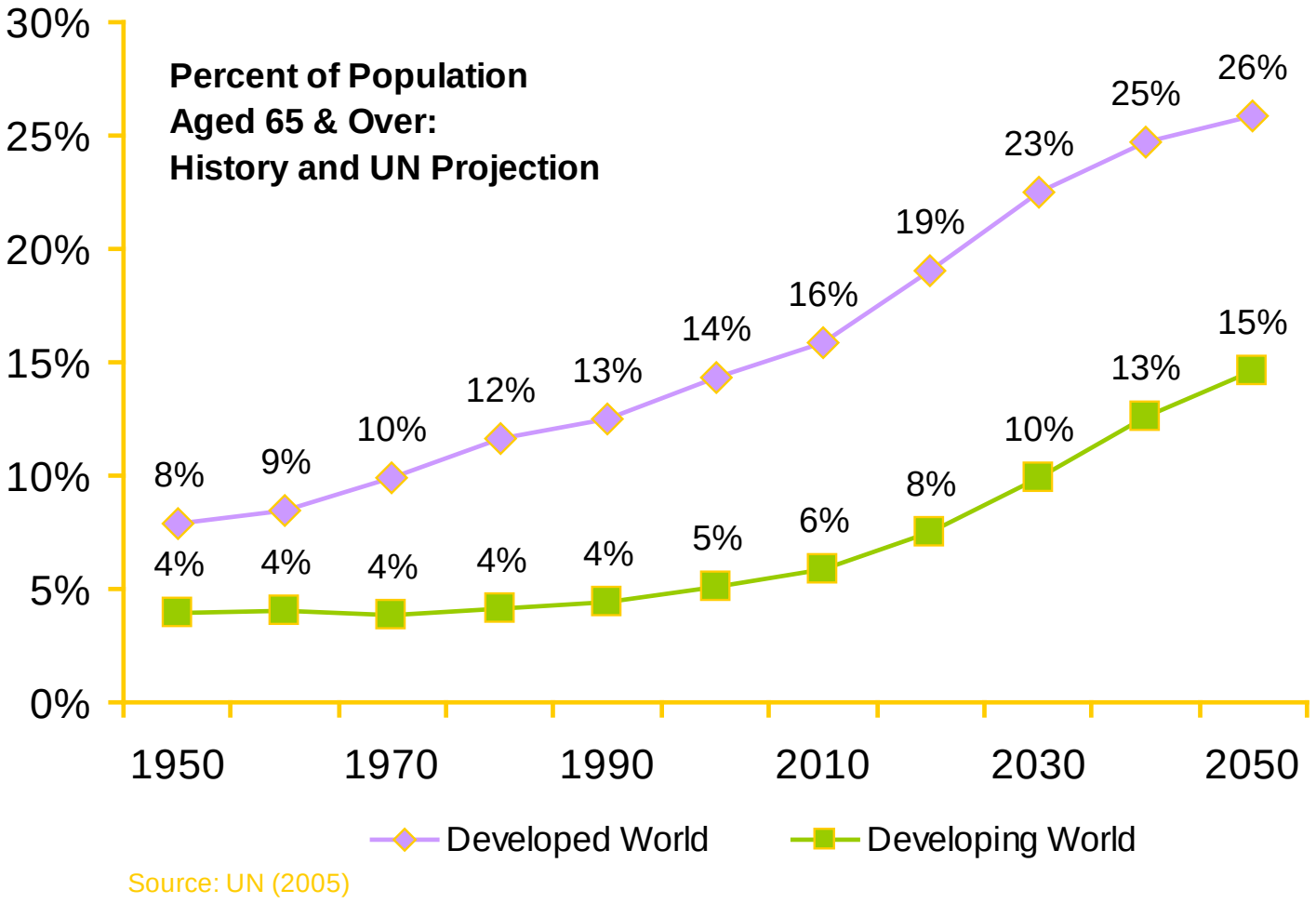
Trends in Global Aging



Source: UN (2005)

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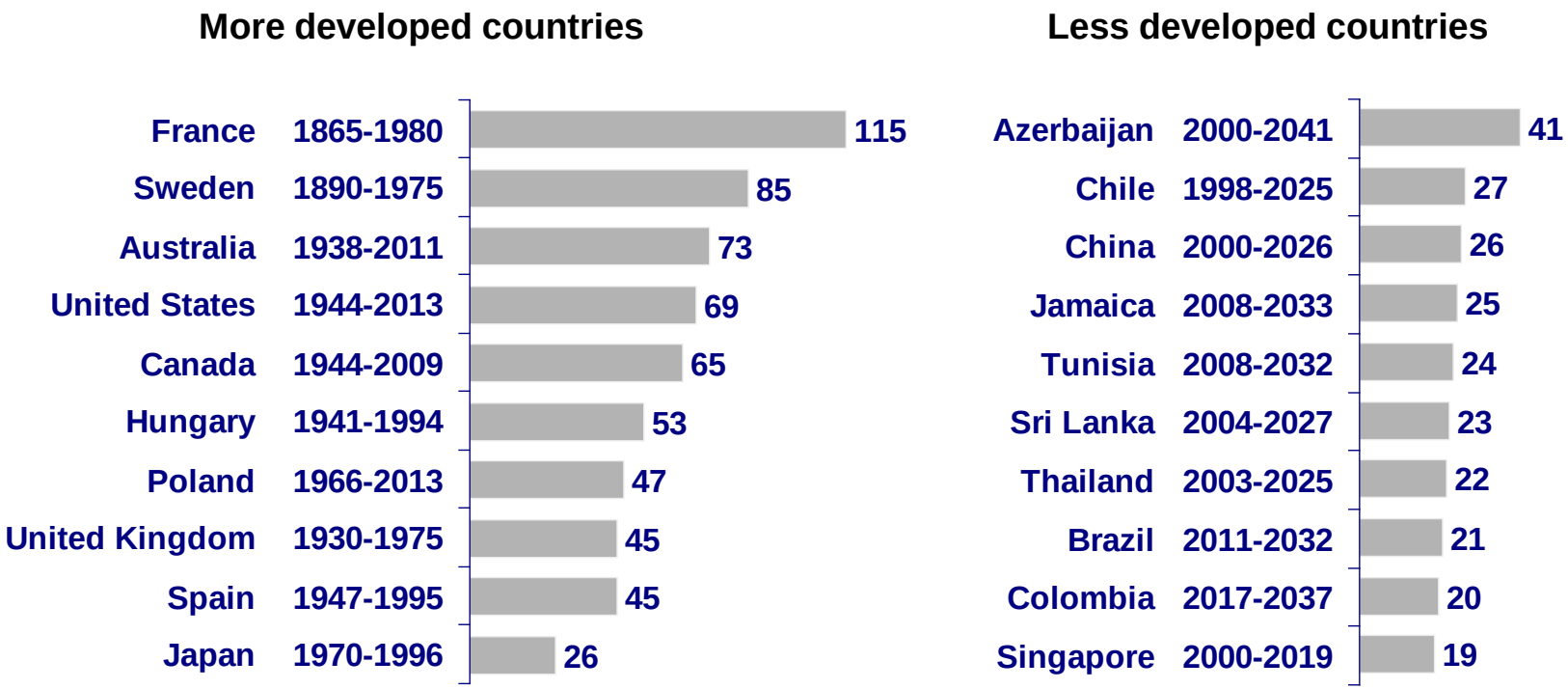
Number of Years for Percent of Population Age 65 or Older to Rise from 7% to 14%



*** Dates show the span of years when percent of population age 65 or older rose (or is projected to rise) from 7 percent to 14 percent.**

Source: K. Kinsella and Y.J. Gist, *Older Workers, Retirement, and Pensions: A Comparative International Chartbook* (1995) and K. Kinsella and D. Phillips, "The Challenge of Global Aging," *Population Bulletin* 60, no. 1 (2005).

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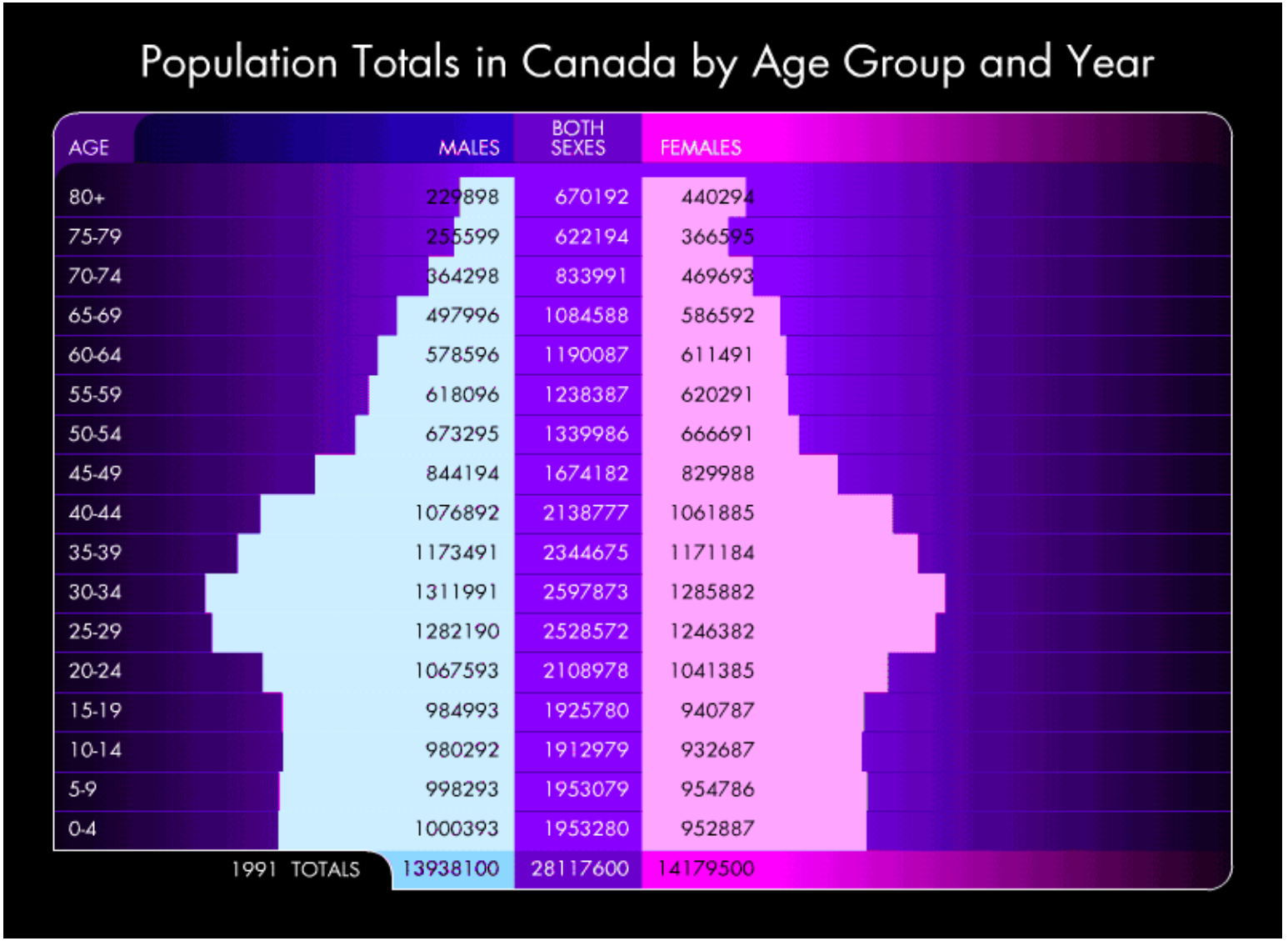
Population Totals in Canada by Age Group and Year



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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EPIDEMIOLOGY OF AGING: DISEASES

- The leading cause of death among elderly:
  - heart disease
  - cancer
  - stroke
  - chronic lower respiratory tract disease
  - Alzheimer's disease

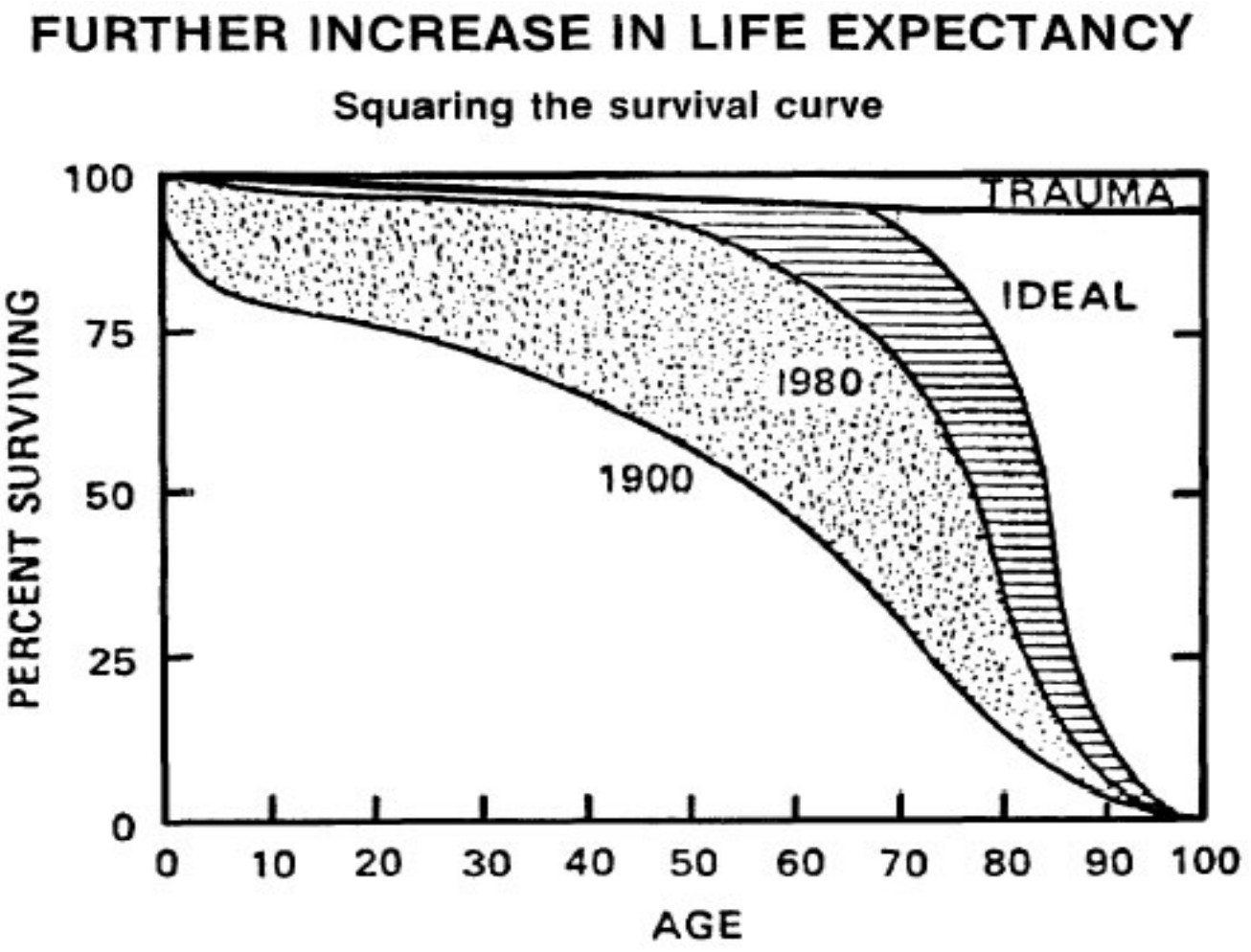
(Minino et al. National Vital Statistics Reports 2007; 55(9):1-120)

EPIDEMIOLOGY OF AGING: DISEASES

The leading Causes of Morbidity:

- Hypertension
- Osteoprosis
- Osteoarthritis
- Vision/Hearing Problems
- Falls and Fractures
  - Disease in older population is the norm
    - And many have multiple morbidities: Need more research in this area
  - Use of multiple medications

Rectangularization of the survival curve



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

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

Evidence suggests otherwise

- Is average life expectancy approaching an upper limit to life expectancy?
  - the evidence that the average life span is 80 years is unconvincing
  - there is no evidence for further rectangularization of survival curves
- Will age at first infirmity increase?
  - there is no evidence for over-all declines in incidence of morbidity: on the contrary
  - evidence for actual “(de)compression” of morbidity is ambiguous

EPIDEMIOLOGY OF AGING: DISABILITY

- A large body of epidemiologic studies allowed a greater understanding of occurence, determinants, and consequences of disability in the older population.
- Epidemiologic studies have clearly identified disability as the most powerful markers in predicting adverse outcomes. Disability measures are able to capture the presence and the severity of multiple pathologies, including physical, cognitive, psychological conditions.

EPIDEMIOLOGY OF AGING

- Martin et al, considering data from the NHANES and the NHIS, conclude that health and disability of elderly improved during the last two decades of 20th century. At the same time, population aged 40-64 years has not shown a consistent improvement and there is some evidence of increase in disability in this age group.

  (Martin LG, Schoeni RF, Andreski PM. Demography 2010; 47:S41-S64)

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RESEARCH ON AGING

- The demographic causes of aging of the population, in terms of fertility rates and mortality rates, are generally predictable. A variety of population projections are available, prepared by UN, EU and National Statistic Institutes.

- What is less predictable is the interaction of these forces with social context, health status, economic changes, cultural influences and hence international migrations.

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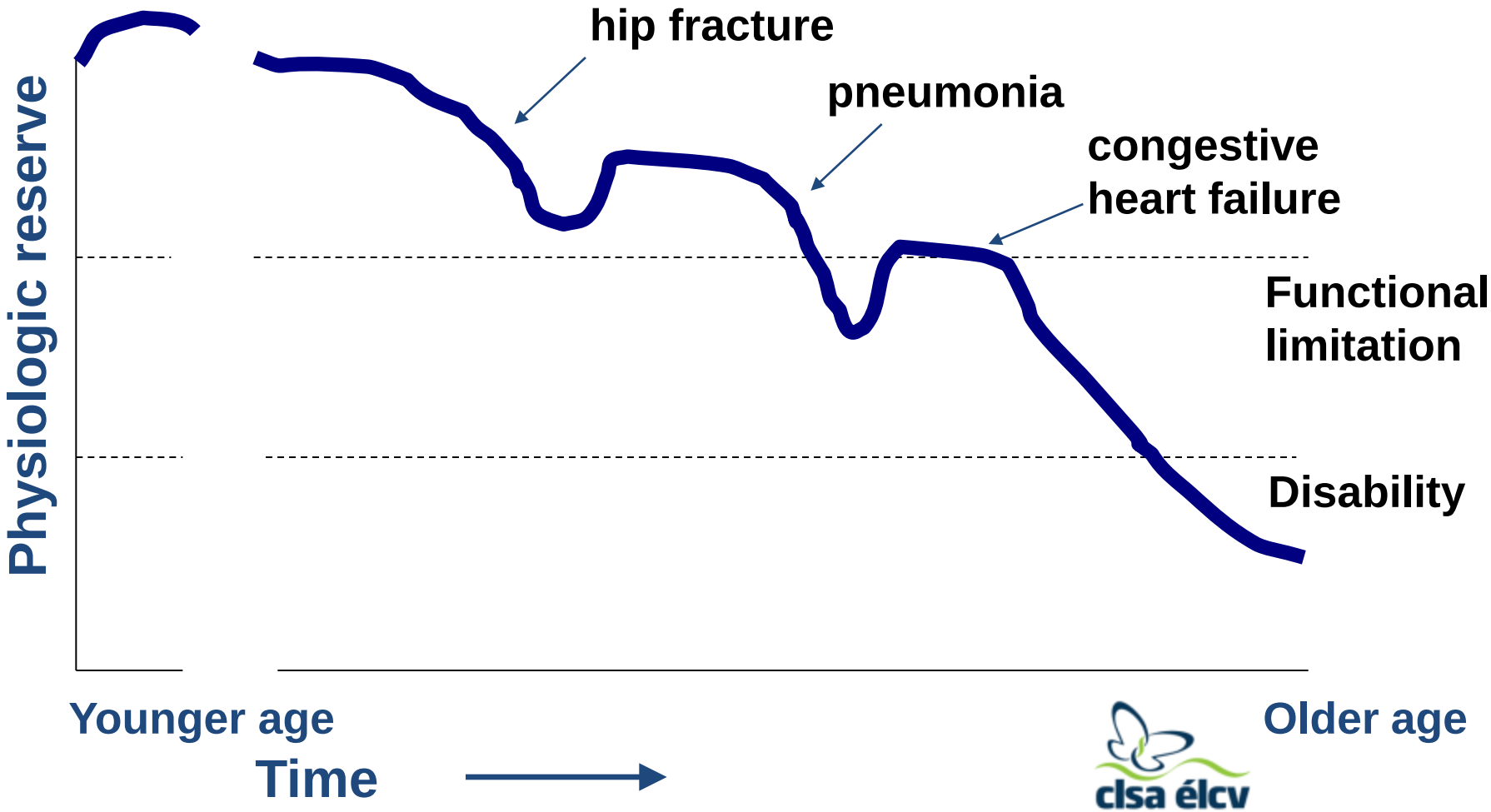
Physiologic reserve - Hypothetical Trajectory to Illness, Functional Limitation & Disability



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RESEARCH ON AGING

- For this reason further research on biodemography, dynamic of health, epidemiology, economics, psychology, social sciences and aging are needed.
- Longitudinal data are essential in order to sort causal relationships among demographic, biological, psychosocial and economic factors, and health.
- Cross-national comparison are important, considering variability across societies, in terms of status and well-being of older persons, experiences of health and mortality, family and social support.

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CLSA Research Team

Lead Principal Investigator
Parminder Raina (McMaster)

Co-principal Investigator
Christina Wolfson (McGill)

Co-principal Investigator
Susan Kirkland (Dalhousie)

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CLSA Core Research Team

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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

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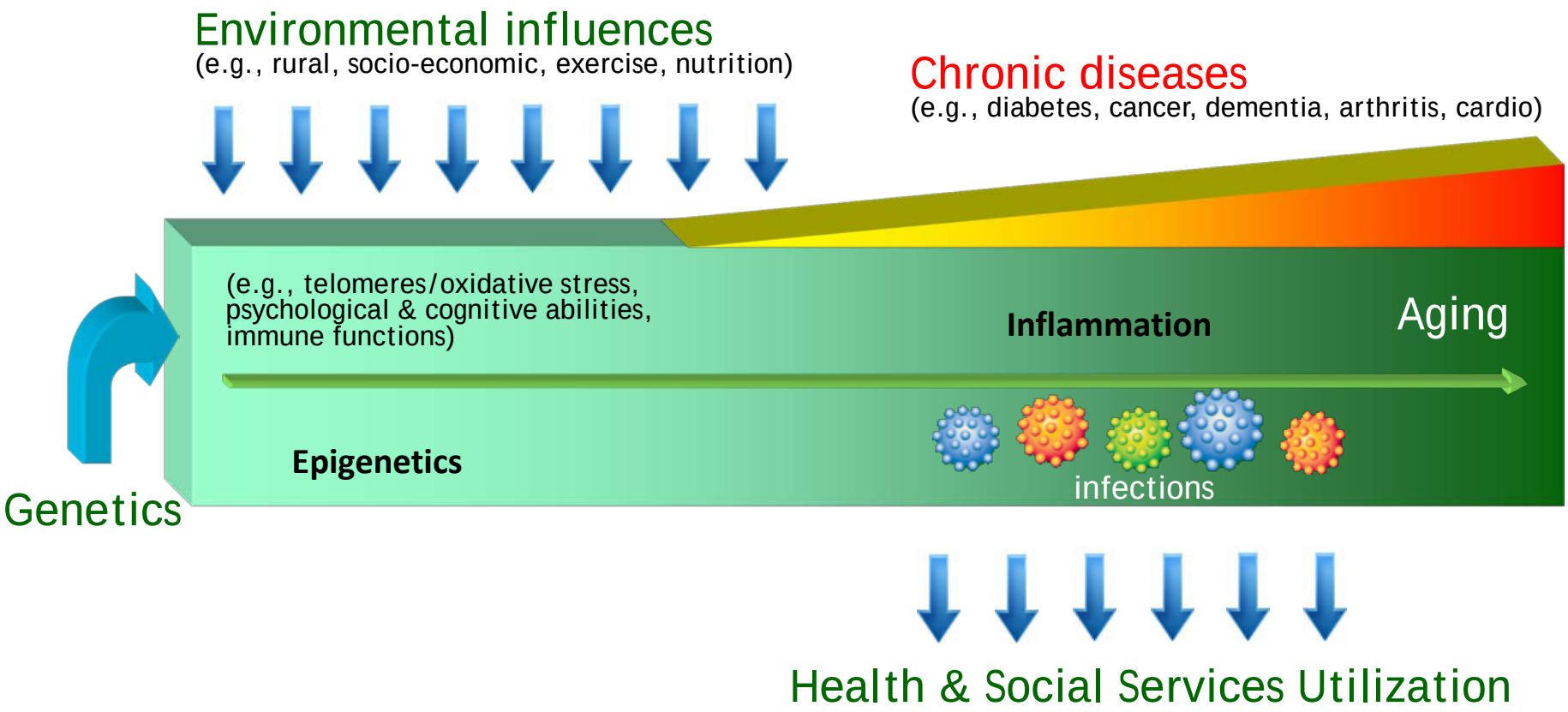
Canadian Longitudinal Study on Aging (CLSA)

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.

Intrinsic and Extrinsic Factors



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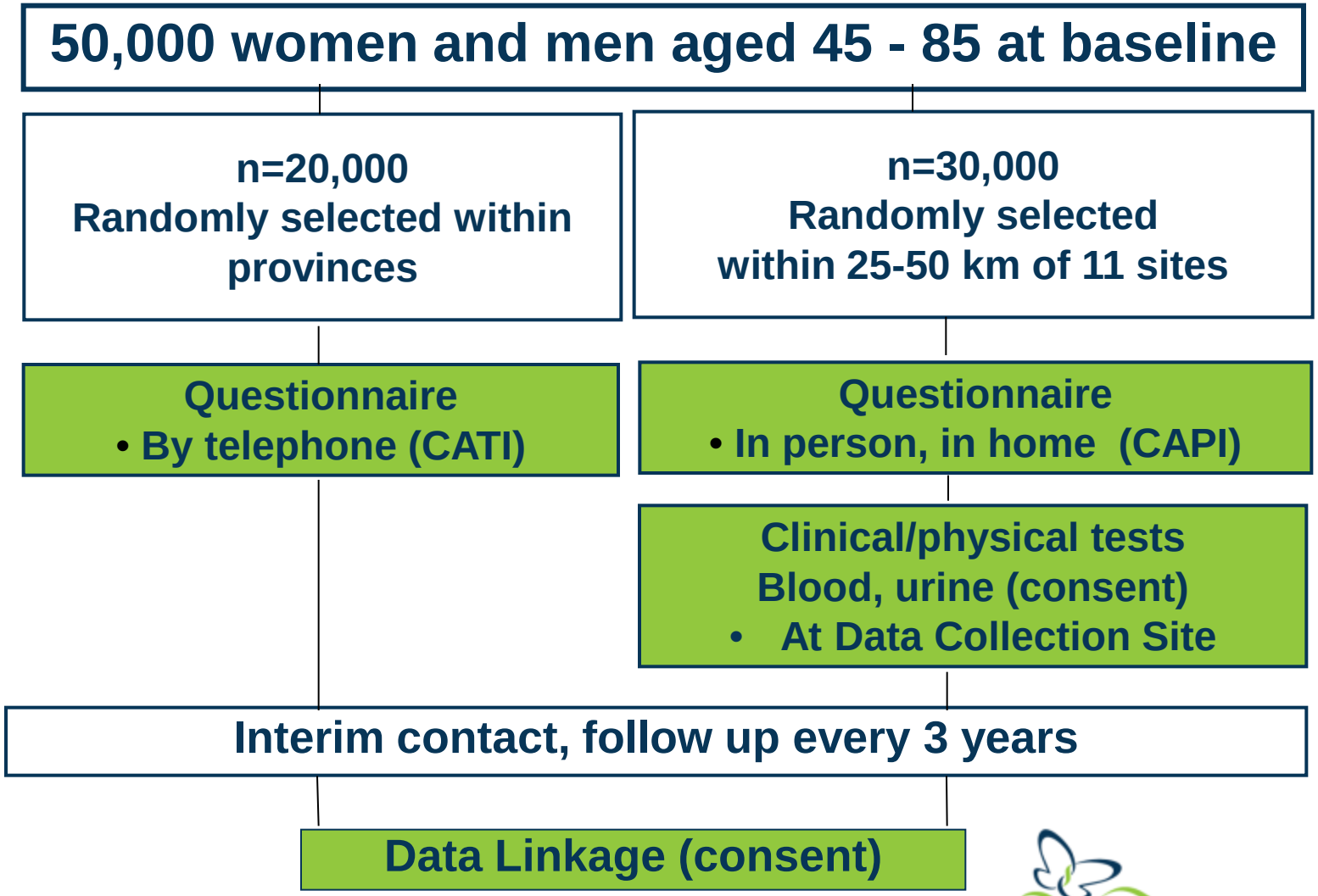
Study Overview



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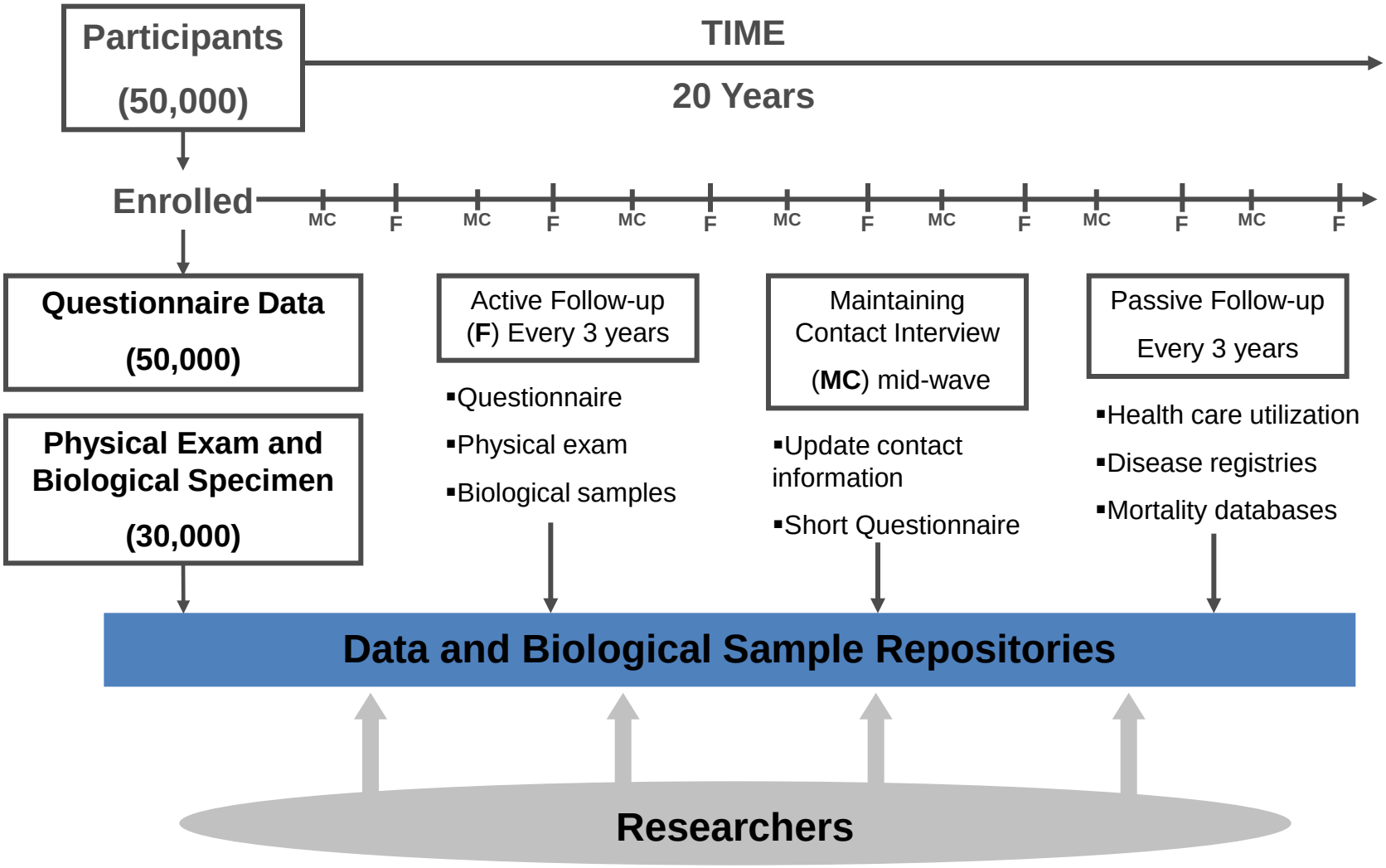

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Depth and Breadth of CLSA

PHYSICAL & COGNITIVE MEASUREMENTS

- Height & weight
- Waist and hip measurements
- Blood Pressure
- Grip strength, timed up-and-go, chair raise, 4-m walk
  Standing balance
- Vision (retinal imaging, Tonometer & visual acuity)
- Hearing (audiometer)
- Spirometry
- Body composition (DEXA)
- Bone density (DEXA)
- Aortic calcification (DEXA)
- ECG
- Carotid Plaque sweep (ultrasound)
- Carotid intima-media thickness (ultrasound)
- Cognitive assessment (30 min. battery)

HEALTH INFORMATION

- Chronic disease symptoms **(disease algorithm)**
- Medication and supplements intake
- Women's health
- Self-reported health service use
- Oral health
- Preventative health
- **Administrative data linkage health services & drugs & other administrative databases**

PSYCHOSOCIAL

- Social participation
- Social networks and support
- Caregiving and care receiving
- Mood, psychological distress
- PTSD
- Coping, adaptation
- Injuries and consumer products
- Work-to-retirement transitions
- Retirement planning
- Social inequalities
- Mobility-lifespace
- Built environments & Contextual Factors
- Income, Wealth and Assets

LIFESTYLE & SOCIODEMOGRAPHIC

- Smoking
- Alcohol consumption
- Physical activity (PASE)
- Nutrition (nutritional risk and food frequency)
- Birth location
- Ethnicity/race/gender
- Marital status
- Education

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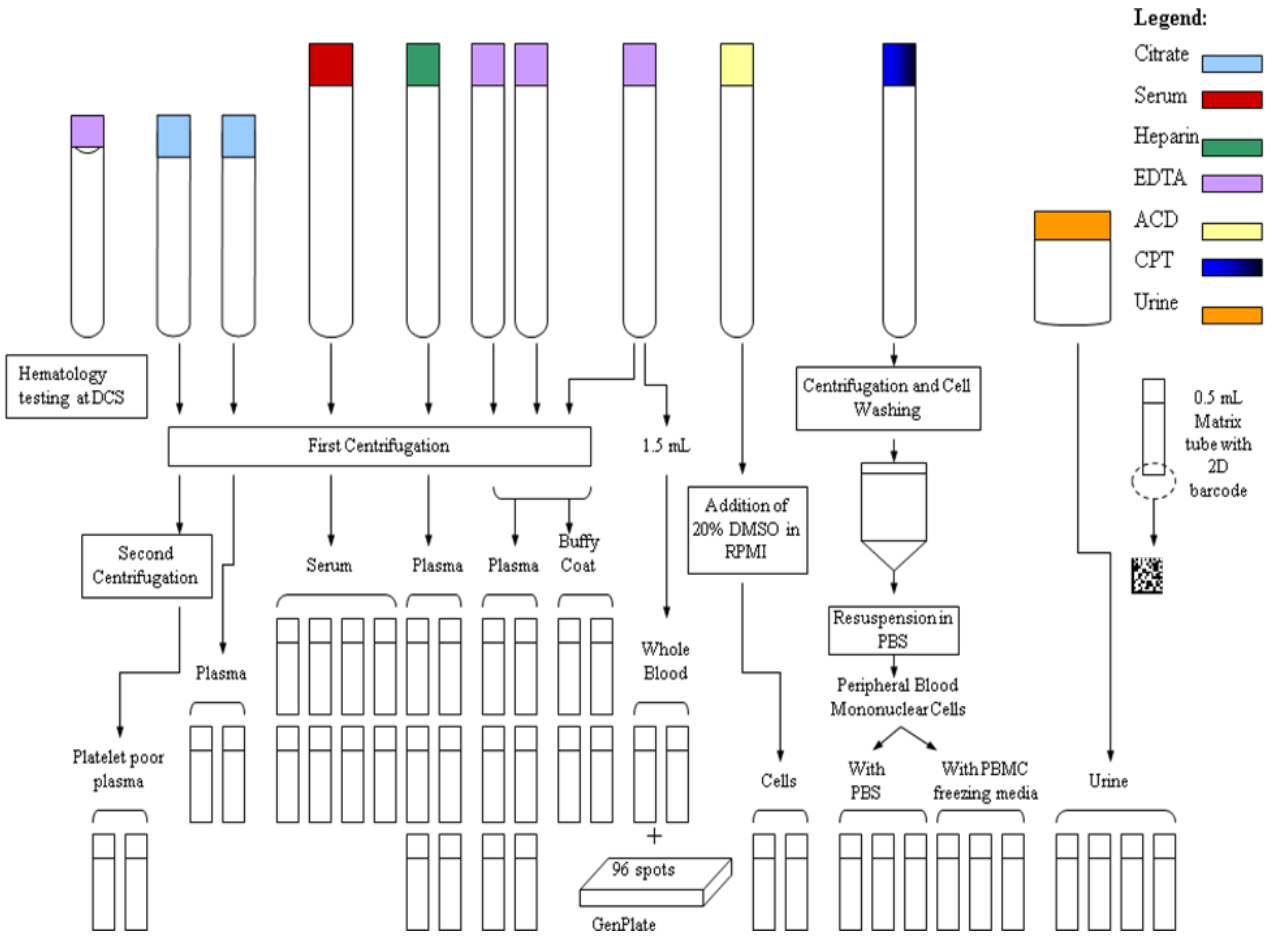
Biospecimens
42 aliquots per participant



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Analysis of Baseline Biomarkers

- We have completed Complete Blood Count on all fresh samples
- albumin, ALT, creatinine, CRP, ferritin, HbA1C, lipids panel, TSH, freeT4, Vitamin D on all 30,000 baseline participants
- Gene Wide Genotyping: Affymetrix UK Biobank Array on 10,000 participants
- Targeted age-associated CpG methylation on 5,000 participants

CLSA as Platform for Interdisciplinary Research: Few Examples

- Biomarkers, mobility and Muscle Health
- Sex Hormones and Aging
- Hearing and Cognition
- Volunteerism, social engagement and baby boomers
- Falls and Consumer Products
- Air pollution and chronic diseases
- Veteran's Health and PTSD
- *CLSA-Brain sub-study*
- MINDMAP-Urbanization and Mental Health (EU-Horizon2020)
- PathAge-Social, Lifestyle and Biological Mechanisms of Multimorbidity in Aging Population (EU-Horizon2020)
- Epigenetic Clock and Healthy Aging
- Genetics, Environment (metals) and Chronic Disease
- Inflammation and Cognitive Aging
- Metabolomics and Pre-diabetes sub-study

Recruitment & Data Collection
Telephone Interviews

- Recruitment of 21,241 participants for telephone interviews:
  - ✓ Statistics Canada CCHS on Healthy Aging
  - ✓ Provincial Health Care Registries
  - ✓ Random Digit Dialing
- **Baseline data collection is completed!**
- **Data is now available to researcher community**
- Maintaining contact interviews initiated in 2013 (**>13,000 completed, current retention rate 96%**)
- First follow-up begins 2015

Recruitment & Data Collection

Home Interviews and Data Collection Site Visits

- Recruitment of 30,000 for Home Interviews and Data Collection Site Visits:
  - ✓ Provincial Health Care Registries
  - ✓ Random Digit Dialing
- Baseline data collection 2012 to 2015: **Data collection completed on almost all 30,000**
- **Initial Data release for 30,000 planned for end of 2015**
- Maintaining Contact Interviews initiated in 2014 (**>9000 completed, current retention rate 96%**)
- First follow-up begins 2015

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Mining the CLSA data: Data and Biospecimen Access

- Fundamental tenets: rights and privacy of participants, confidentiality and security of data and biospecimens, optimal use to benefit all Canadians

- Application process via CLSA website portal
- Review: Administrative, Data and Sample Access Committee recommendation
- Approval, data/biospecimen sharing agreements
- Raw data and/or biospecimens to investigator
- Return of derived variables to CLSA dataset

Recruitment and Baseline Data Collection Data Release

- DataPreview Portal soft launch June 2014
- Gateway to access for data* and biospecimens
  - Meta data: data dictionaries, data collection tools
  - Documentation and application form
  - Variable search mechanism providing simple descriptive statistics for selected variables

*Currently available for alphanumeric data

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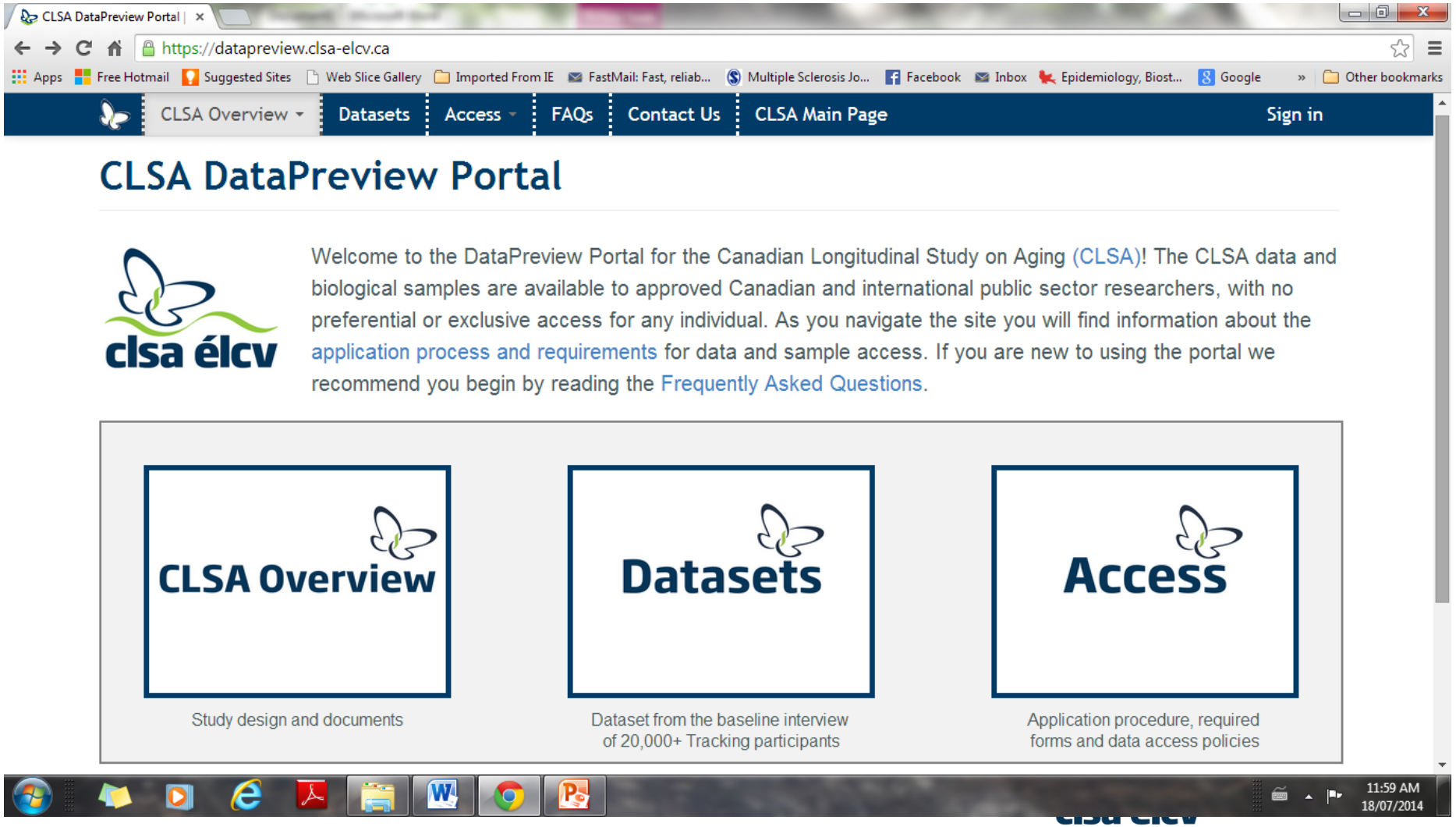
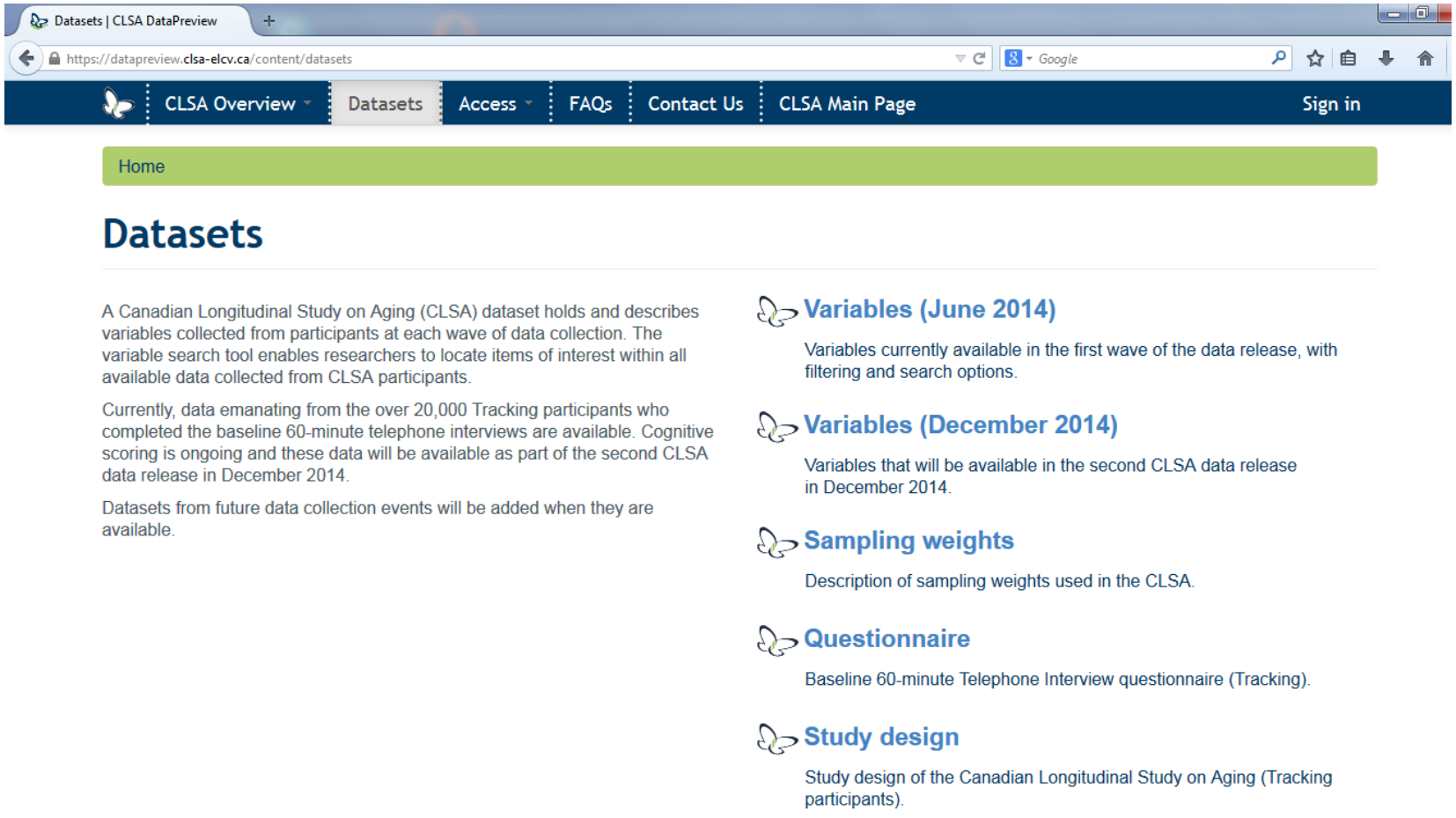
DataPreview Portal



DataPreview Portal



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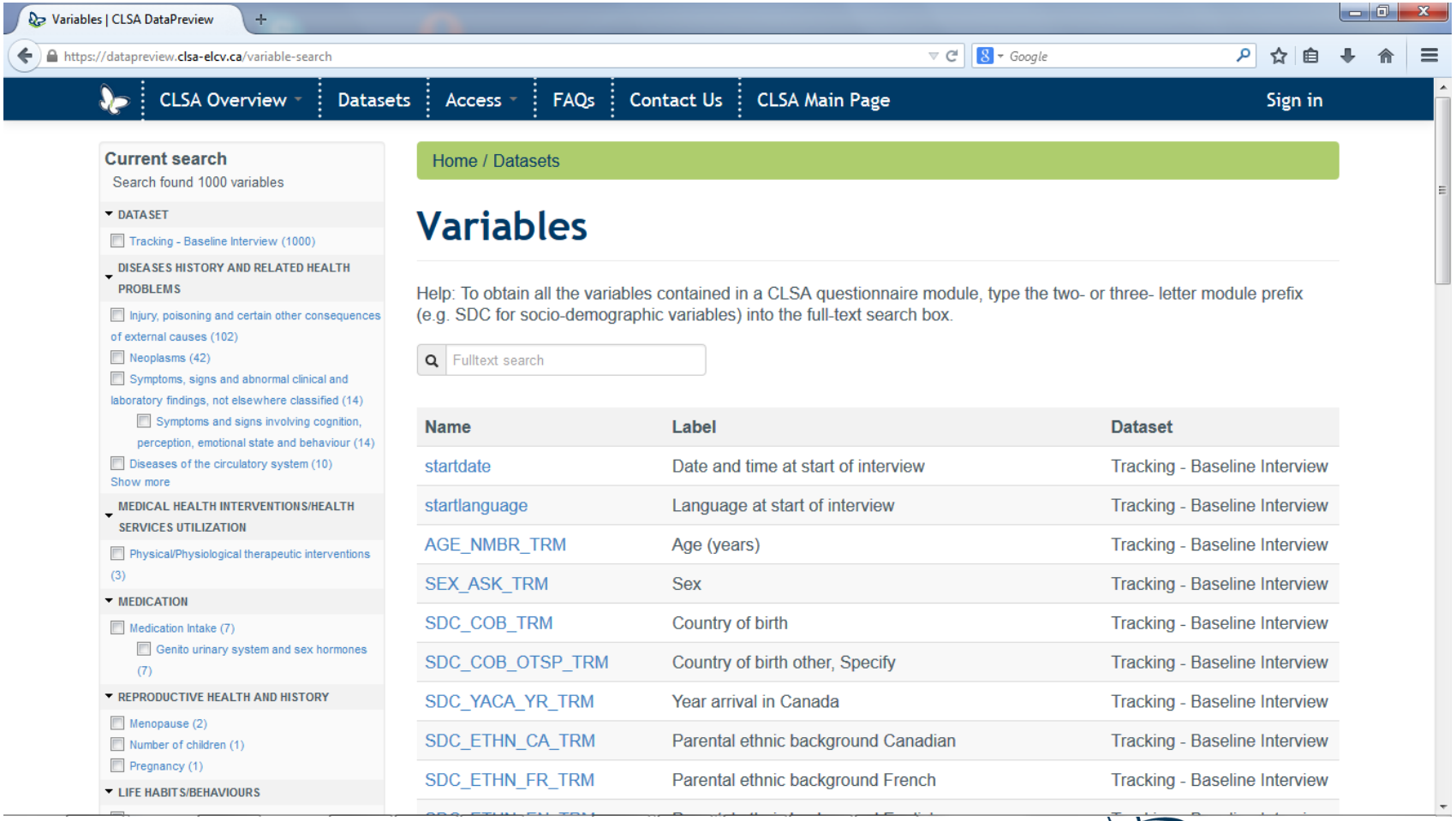

Example page of DataPreview

https://datapreview.clsa-elcv.ca

GEN_OWNAG_TRM

In terms of your own healthy aging, would you say it is excellent, very good, good, fair, or poor?

Description

Label:
Self-rated healthy aging

Dataset:
Baseline interview (tracking participants)

Value Type:
Text

Repeatable:
No

Categories

Name	Label	Missing
1	Excellent	
2	Very good	
3	Good	
4	Fair	
5	Poor	
8	[DO NOT READ] Don't know/No answer	✔
9	[DO NOT READ] Refused	✔

Domains

Data Source:
Questionnaire

Perception of Health/Quality of life:
Perception of health

Statistics

Value	CLSA
Excellent	3931 (18.8%)
Very good	8513 (40.8%)
Good	6276 (30.1%)
Fair	1731 (8.3%)
Poor	419 (2%)
[DO NOT READ] Don't know/No answer	53
[DO NOT READ] Refused	2
All	20925

Follow-up One of the CLSA (2015-2018)

- Will commence in Summer of 2015
- Focus on retention
- Renewal funding has been approved
- Proxy protocols
- In home assessments (shorter version)

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Follow-up One of the CLSA (2015-2018) Contd…

- Child Maltreatment and adverse events
- Elder Abuse
- Epilepsy, Aortic Stenosis
- Enhanced Hearing, Oral Health, and Transportation modules
- Decedent Information
- Workability
- Subjective Cognitive Decline and Meta Memory
- Preventive Health Behaviours
- Sexual orientation and Gender Identity

Global Observatory on Aging

- EU FP7 funded Project: Creating a network of about 30 cohorts across Canada, Europe, Israel, China, and USA
  - CHANCES: Healthy Aging (already funded)
    - 10 Cohorts
  - MINDMAP: Urbanization and Mental Health
    - 30 Cohorts
- Collectively~200,000-300,000 participants
- CONSTANCE and CLSA Collaboration
- Potential to Harmonize PURE and CLSA
- Lead for Harmonization~ Isabel Fortier
  - Methods and Tools for Harmonization of data
  - Data sharing and Ethical issues

CLSA CORE TEAM

Lead PI	Parminder Raina **(McMaster)**
Co-PI	Christina Wolfson **(McGill)** and Susan Kirkland **(Dalhousie)**
Key Site Co-Investigators	Gerry Mugford and Patrick Parfrey **(Memorial)**, Hélène Payette **(Sherbrooke)**, Ron Postuma, Brent Richards, Mark Lathrope **(McGill)**, Larry Chambers and Vanessa Taler **(Ottawa)**, Lauren Griffith, Harry Shannon, Cynthia Balion, Mike Veall, Christopher Patterson, **(McMaster)**, Andrew Patterson **(Toronto),**Mary Thompson and Chang Bo **(Waterloo)**, Debra Sheets, Holly Tuokko and Lynne Young **(Victoria)**, Verena Menec **(Manitoba)**, David Hogan, Eric Smith and Marc Poulin **(Calgary)** , Max Cynader, Teresa-Liu Ambrose and Michael Kobor **(UBC)** and Andrew Wister and Scott Lear **(SFU)**
Scientific Working Group	**See our website – www.clsa-elcv.ca**

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CLSA Funders and Partners

Veterans Affairs Canada

Anciens Combattants Canada

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CIHR IRSC
Canadian Institutes of Health Research
Instituts de recherche en santé du Canada

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CLSA funded by the Government of Canada through CIHR and CFI, and provincial governments and universities

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Sampling Weights

- Data weighted to represent the Canadian (and provincial) population between 45-85 years old
- A survey weight corresponds to the number of persons in the entire population that an individual respondent represents
- Weighting is necessary because the probability of selecting individuals from certain sub-groups of the population varied

CLSA Tracking Telephone Interviews N=21,208

	Count	Percent	Weighted Percent
Age			
45-54	5826	27.5	38.2
55-64	6554	30.9	31.2
65-74	4525	21.8	18.8
75-85	4203	19.8	11.8
Sex			
Male	10387	49.0	48.3
Female	10821	51.0	51.7
Language			
English	17457	82.3	75.9
French	3751	17.7	24.1
Born in Canada	18486	87.2	84.5

CLSA Tracking Telephone Interviews N=21,208

Province	Count	Percent	Weighted Percent
British Columbia	2619	12.4	13.8
Alberta	2110	10.0	9.3
Saskatchewan	1388	6.5	2.9
Manitoba	1472	6.9	3.3
Ontario	4722	22.3	38.3
Quebec	3603	17.0	24.7
New Brunswick	1350	6.4	2.4
Nova Scotia	1564	7.4	3.1
Prince Edward Island	1132	5.3	0.5
Newfoundland, Lab	1248	5.9	1.7

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CLSA Tracking Telephone Interviews N=21,208

Chronic Condition	Count	Percent	Weighted Percent
Arthritis	8194	38.9	35.1
Asthma	2344	11.1	11.7
COPD	1433	6.8	5.8
Hypertension	8090	38.2	33.4
Diabetes	3542	16.7	15.1
Heart disease	2189	10.3	9.0
Angina	1149	5.4	4.3
Heart attack	1299	6.2	4.9
Stroke	388	1.8	1.5
Dementia/AD	43	0.2	0.2
Parkinson's, Parkinsonism	78	0.4	0.3
Cancer	3262	15.4	13.2
Osteoporosis	2008	9.5	8.7

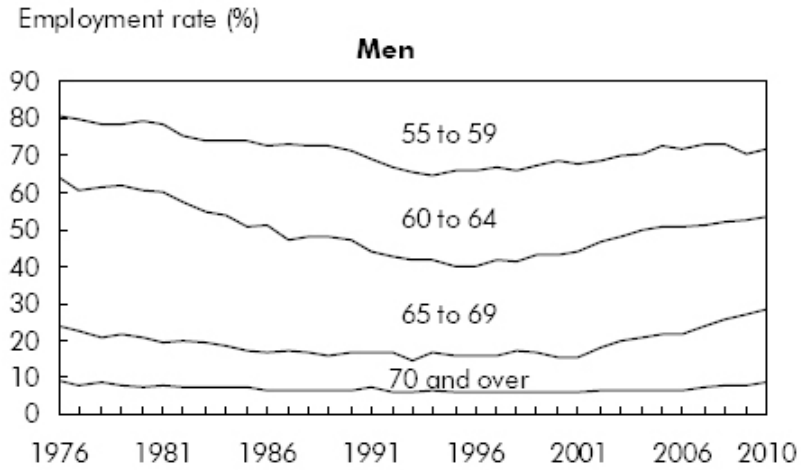
CLSA Tracking Telephone Interviews N=21,208

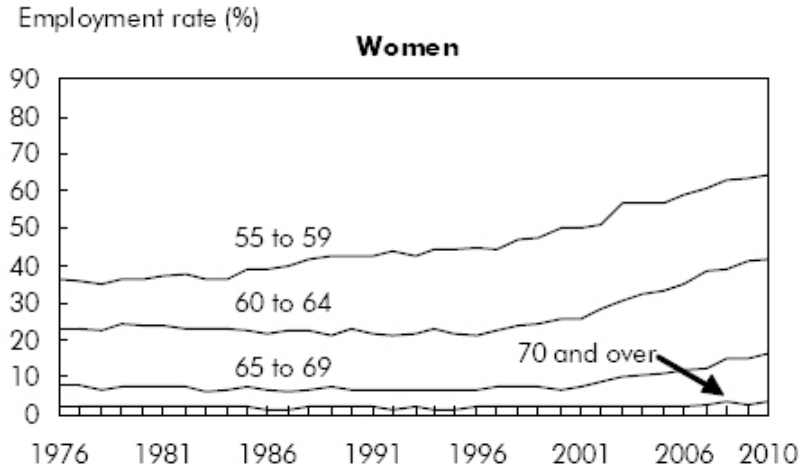
	Count	Percent	Weighted Percent	CCHS Weighted Percent
Marital status				
Single/Never married	1694	8.0	8.4	7.0
Married/Common Law	14586	68.8	73.0	73.8
Widowed	2355	11.1	7.3	8.4
Divorced	1988	9.4	8.5	2.7
Separated	579	2.7	2.7	8.2
Education				
Less than Secondary	1978	9.3	7.0	20.4
Secondary School	2875	13.6	12.8	19.1
Some Post-Secondary	1622	7.7	7.6	5.2
Post Secondary Degree/ Dipl	14650	69.1	72.2	55.3
Annual Household Income				
Less than $20,000	1341	6.8	5.5	9.0
$20,000 - $50,000	5841	29,4	23.9	29.1
$50,000 - $100,000	7212	36.3	35.9	36.2
$100,000 - $150,000	3212	16.2	19.4	16.2
Greater than $150,000	2237	11.3	15.4	9.4

CLSA Tracking Telephone Interviews N=21,208

	Count	Percent	Weighted Percent	CCHS Weighted Percent
Self Rated General Health				
Excellent	3972	18.8	20.8	20.5
Very Good	8115	38.3	38.3	33.8
Good	6249	29.5	28.7	30.4
Fair	227	10.5	9.6	11.5
Poor	624	2.9	2.7	3.9
Self reported Weight Status				
Overweight	11188	53.0	52.1	60.5
Underweight	432	2.0	1.9	1.3
Just about right	9492	45.0	46.0	38.2
Satisfaction with Life				
Dissatisfied	2068	9.8	9.8	9.3
Neutral	850	4.0	4.5	2.7
Satisfied	18264	86.2	85.6	88.0

Canadian Workforce





Source: Statistics Canada, Labour Force Survey, 1976 to 2010.

The employment rate of individuals 55 years or older has gone up significantly in the recent years

Statistics Canada comparing 1997 to 2010

- **9% increase for men**
- **13% increase for women**

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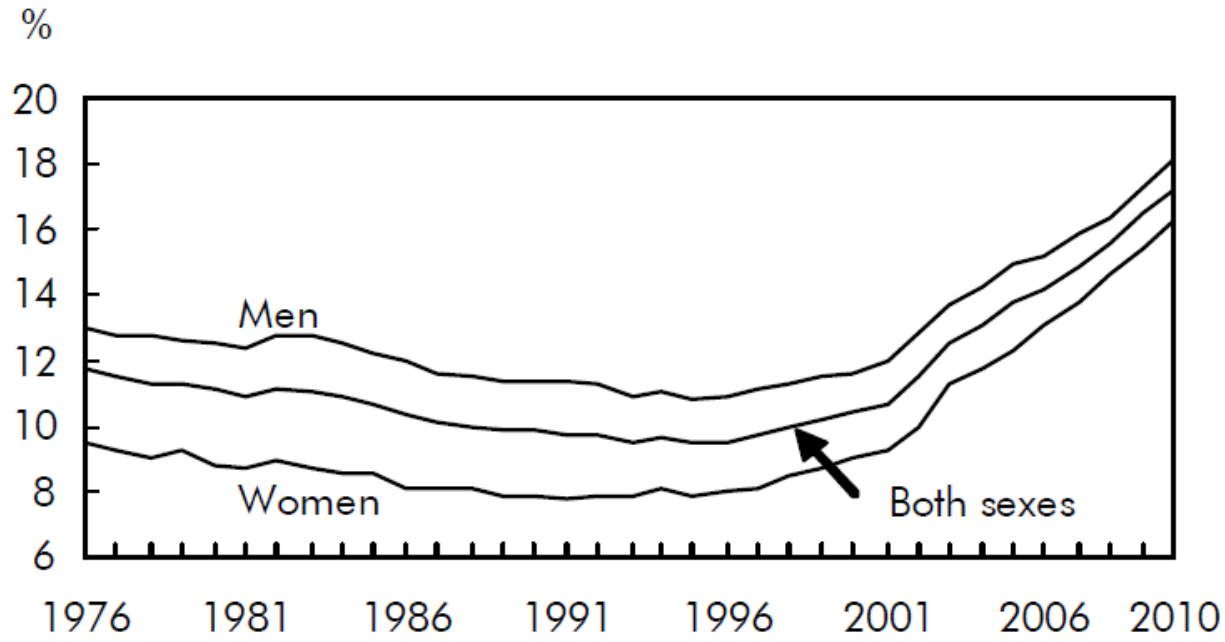
The expected number of years a 50 year old could expect to work:

1997 → 14

2010 → 16



Source: Statistics Canada, Labour Force Survey, 1976 to 2010.

Percent of workers 55 years and older is on the rise

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Canadian Workforce

Globe and Mail, Jan 28, 2014

THE GLOBE AND MAIL

“Canada’s boomers woefully short of hitting retirement goals: report”

“As Canada’s Baby Boomers prepare to head into their retirement years, many are discovering they don’t have the funds they had hoped would be available and now face the reality that they have little time to play catch-up,” said Chris Buttigieg, senior manager of wealth planning strategy at BMO Financial Group.

Strategies to generate more income include delaying retirement; taking on a part-time job to earn extra money after retirement; selling off collectibles, antiques and other possessions; selling the home or renting out part of it.

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Financial Post, Jan 28, 2014

An extensive study by Statistics Canada shows that of those Canadians who exited a long-term job at age 55 to 59, 60% were re-employed within 10 years. Fotolia

"Most older workers who leave career jobs return to work within a decade:
Statistics Canada"

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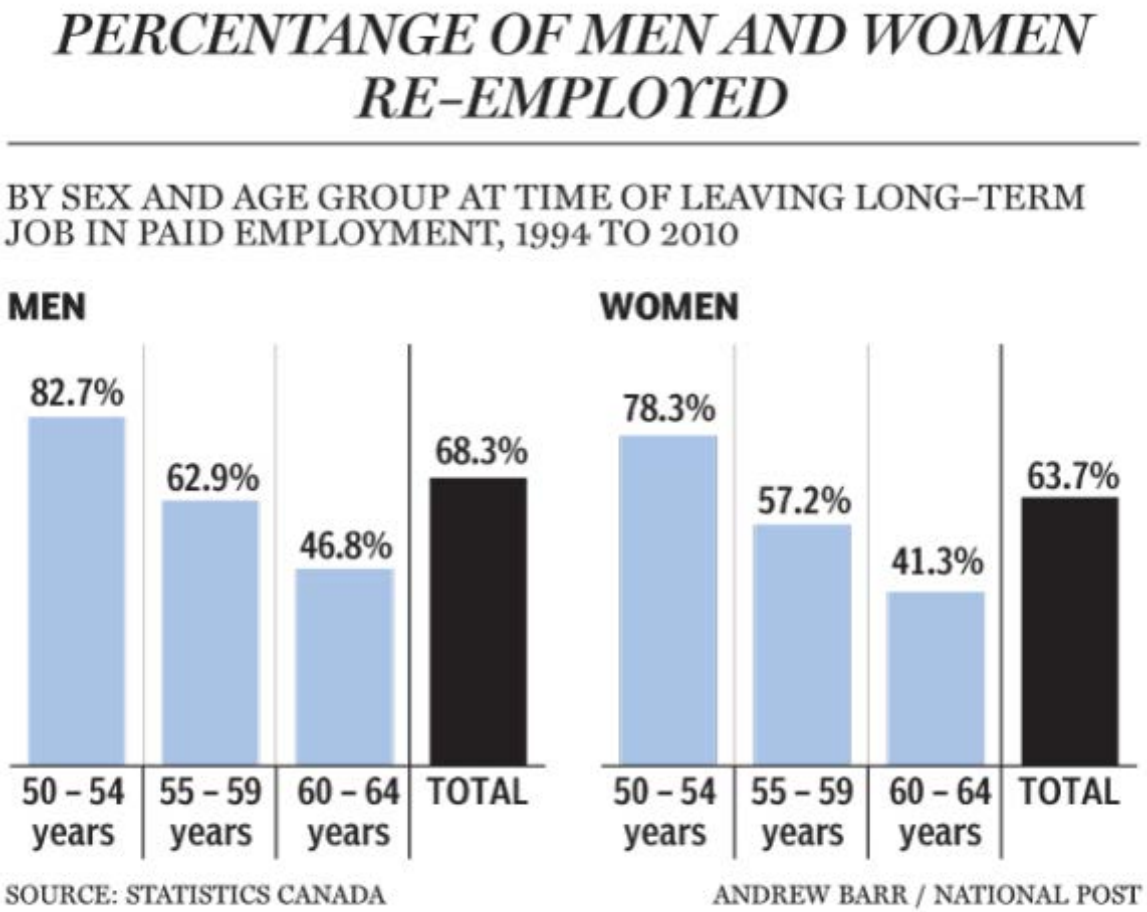
Financial Post, Jan 28, 2014



"Most older workers who leave career jobs return to work within a decade: Statistics Canada"

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Changing Canadian Workforce

CBC News, Aug 17, 2011

5 ways Canada's workforce will change in 20 years

Canada's statistics agency projected 20 years into the future… "The projections also [are] that … the labour force will become older and increasingly ethnoculturally diverse," as the agency put it.

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CLSA Data Available

Telephone-Administered Questionnaire

Total Sample n = 21,241

Completely Retired	**n = 9,899**
Partly Retired	**n = 2,254**
Retired and Returned to Work	**n = 2,993**

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CLSA Data Available

Telephone-Administered Questionnaire
Weighted Results

Retirement Status	45-64		65-85	
	Male	Female	Male	Female
Completely Retired	17.0%	22.9%	74.6%	84.7%
Partly Retired	8.8%	8.2%	16.0%	8.3%
Not Retired	74.2%	68.8%	9.5%	7.0%

	45-64		65-85	
	Male	Female	Male	Female
Retired and Returned to Work	7.8%	7.2%	26.5%	16.9%

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CLSA Data Available

Telephone-Administered Questionnaire

Of those Retired:

- **Retirement voluntary** **n = 9,683 (78%)**
- **Health/Disability/Stress contributed to decision to retire** **n = 2,935 (24%)**

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CLSA Data Available

Telephone-Administered Questionnaire

Of those not retired and ever worked

Currently working **n = 8,085 (91%)**

Of those currently working

- **Currently >1 job** **n = 1,351 (15%)**

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CLSA Data Available

Telephone-Administered Questionnaire
Weighted Results

Of Those Not Retired	45-64		65-85	
	Male	Female	Male	Female
Currently Working	92.2%	89.4%	96.7%	72.5%
More than 1 job	15.0%	15.5%	19.5%	11.1%

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Richness of CLSA Data

Extensive Work and Retirement Modules

Retirement Module

- **Age of retirement**
- **Spouse's retirement status**
- **Reasons for retirement**
- **Preparation for retirement**
- **Return to work after retirement**
- **Reasons for return**
- **Full-time/Part-time, type of work**

Richness of CLSA Data

Extensive Work and Retirement Modules

Labour Force Participation Module*

- **Current working status****
- **Characteristics of current/most recent job**
  - **Hours worked**
  - **Work schedule**
  - **Occupation, Industry**
  - **Duration of employment**
- **Characteristics of longest held job**
- **Reasons for not working (if not currently employed and if never worked)****

*Current or prior to retirement

**Only asked of those currently working

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Richness of CLSA Data

Extensive Work and Retirement Modules

Retirement Planning Module

- **Age plan to retire**
- **Preparation for retirement**
- **Contribution to pension**
- **Adequacy of income/investments to maintain standard of living**
- **Reasons for planned retirement**

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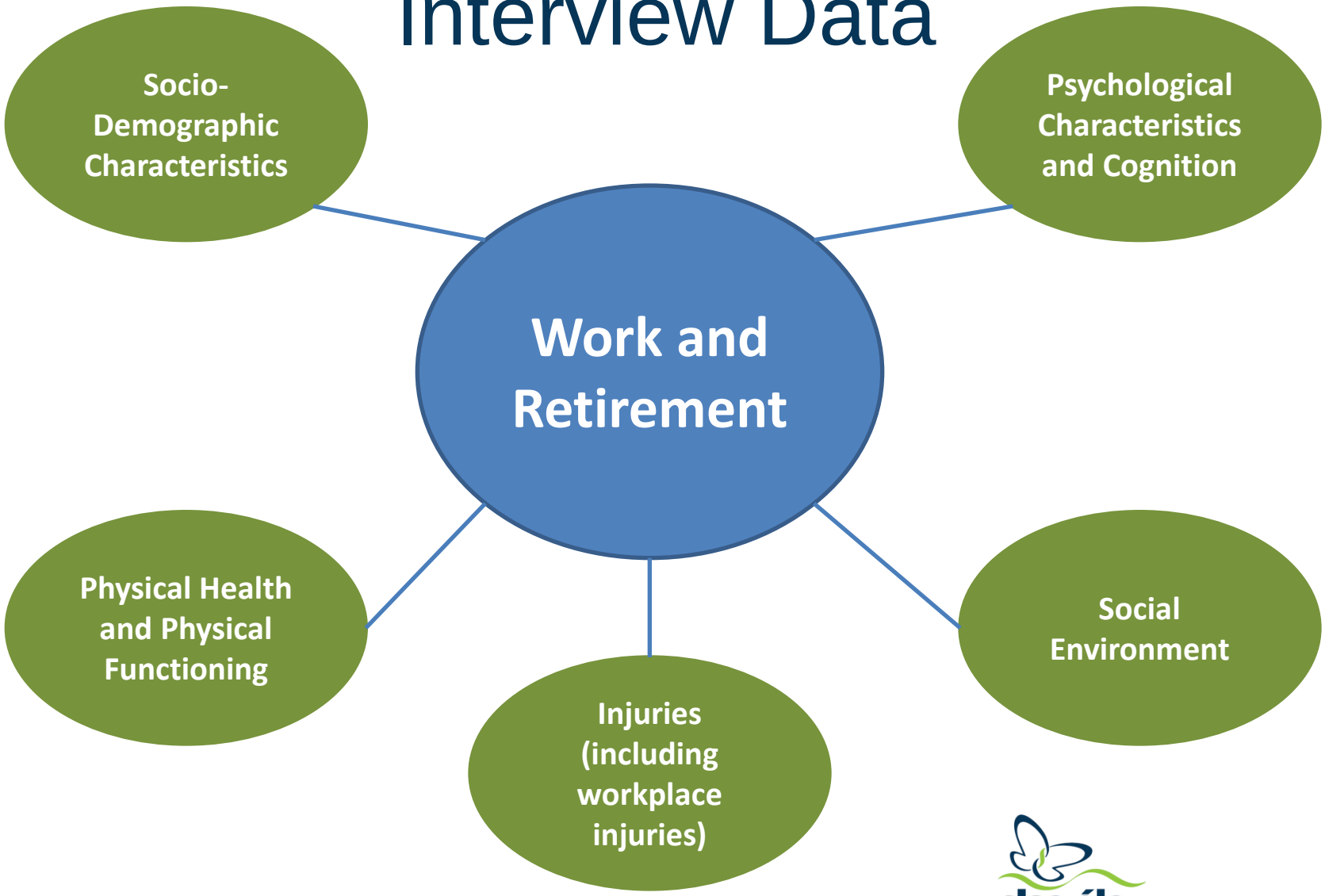
Richness of CLSA Telephone-Interview Data



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Sample Research Topics

- Disability in retirees and occupational history
- Correlates of health-related job loss
- Cognition and function in retirement in relation to occupational history
- Cognition and function related to work injury in younger and older workers
- Health status and return to work after retirement
- Informal caregiving and work