


Introduction to Design and Planning Longitudinal Studies

First Up….

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Inspiring Minds

Summer Program on Aging
May 3, 2021

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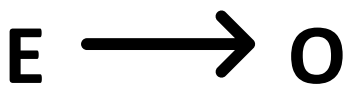
Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

My focus in the next 15 mins…

- An overall introduction to longitudinal designs panel designs, and cohort studies
- Introduce design considerations from a conceptual perspective
- Consider design implications, especially for analyses
- Present the design of the CLSA
- Future design considerations for the CLSA

What is a longitudinal study?

- Observational study
  - Non-experimental design, “observe” individuals without exposure manipulation or intervention
- Prospective cohort study
  - Follow a defined population of interest over time
  - Exposure information is collected, followed until a specified outcome(s) occurs, or exit
- Longitudinal study
  - Repeated (panel) assessments of exposures and outcomes in the same individuals
  - Specialized methods of analysis



Strengths of Longitudinal Design

- Allows for prospectively investigating the synergistic influences of multiple conditions (genetic, biological, behavioural, social, environmental) —both risk and protective—over time
- Compare influences at different phases of development
- Identify potentially sensitive developmental periods
- Characterize longitudinal health trajectories as they unfold

Key considerations for longitudinal study designs

- Making choices about which features are important depends on the questions you want to answer - what the intended analytical outcomes are,
- Balance and tension between breadth, depth, size, and length
  - Breadth in terms of the range of contributing factors to be assessed
  - Depth regarding the intensity of assessment
  - Size in terms of the number of participants enrolled
  - Length in terms of how long participants are followed for
- Studies can range from hundreds (BASE) to hundreds of thousands (UK Biobank) of participants
- Trade-offs between statistical power and richness of data

Review of 70 longitudinal studies on aging worldwide

- Majority studied people over the age of 65; very few look at the aging process from mid-life to old age
- Many collected information on social factors or retirement but lack information on physical health, or vice versa
- Very few captured the changing individual within a changing context and incorporate multiple levels of inquiry: the cell, the individual and society
- Very few focused on how individuals cope or adapt to changing circumstances and how it impacts their well-being
- Aging research in the genomics era: development of large biobanks

CLSA: A Lifecourse Approach

- Human development
- At the level of the cell, individual, society
- Notion of plasticity
- Pathways, trajectories
- Complex interplay of factors at multiple levels

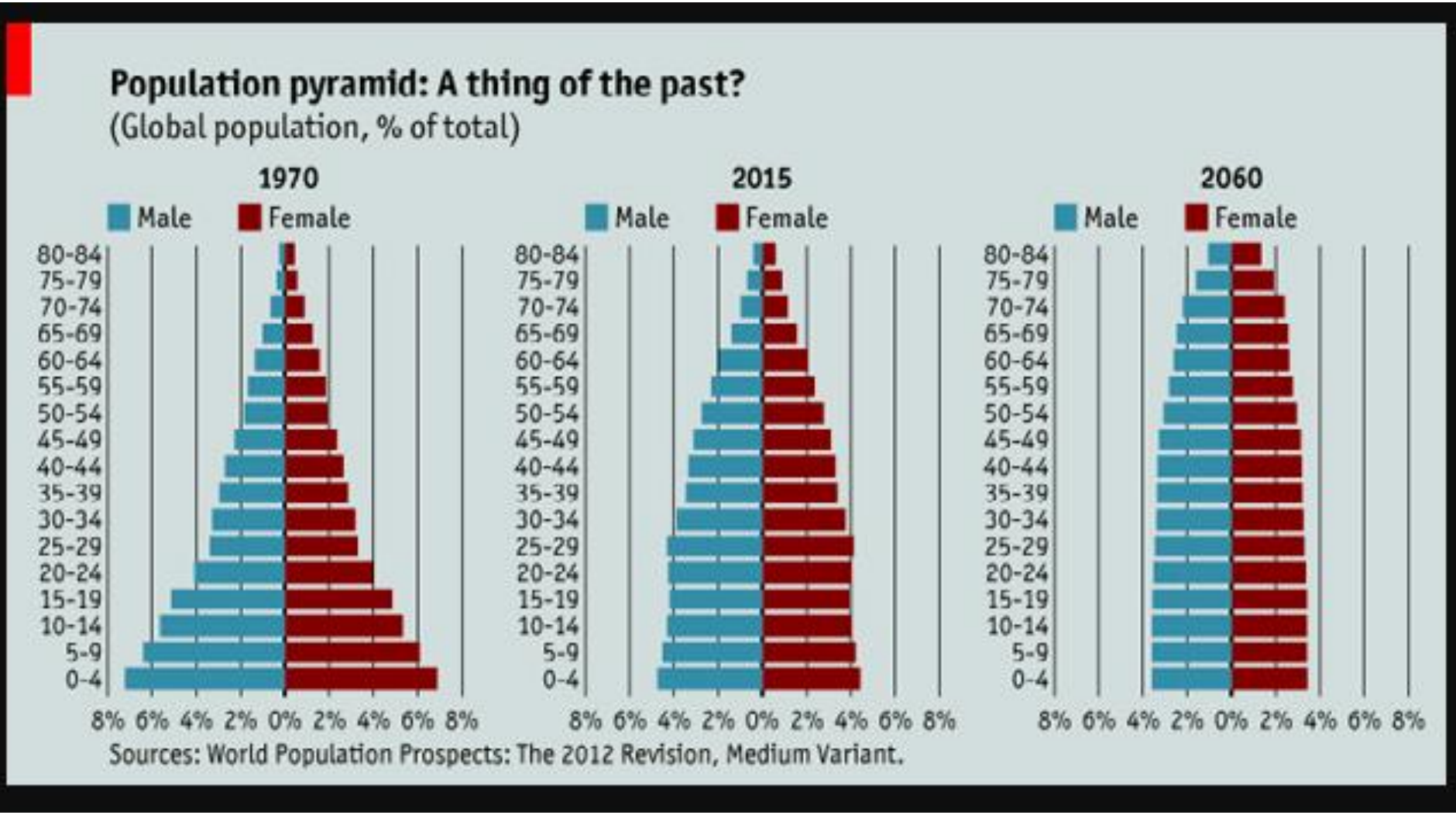
Embracing Complexity

- Complexity - how aging and adult development is dependent upon complex reciprocal interactions between individuals and their physical, natural, and social environments.
- To appropriately study complexity, a broad array of individual and environmental factors must be measured.
- Epidemiologic methods allow for the assessment of interactions and multiple interactions to determine the multiple complex developmental trajectories that may eventually contribute to an outcome.
- Bi-directional relationships between individual and environmental characteristics are also important to consider.
- However, the number of variables and interactions assessed is inversely related to the resulting level of statistical power and directly related to the number of type II or false-positive findings.

Overall Aims of the CLSA

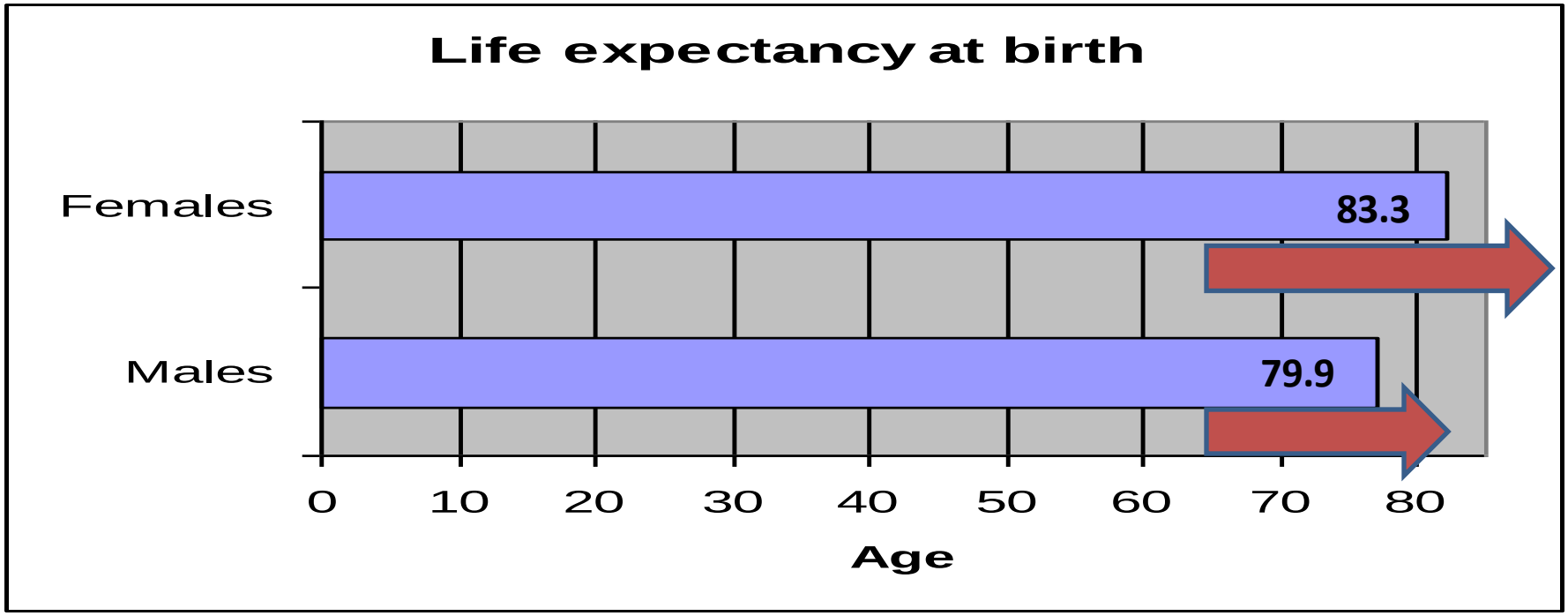
- To examine aging as a dynamic process
- To investigate the inter-relationship among intrinsic and extrinsic factors from mid life to older age
- To capture the transitions, trajectories and profiles of aging
- To provide infrastructure and build capacity for state-of-the-art, interdisciplinary, population-based research and evidenced-based decision making

Global Population Aging



Life expectancy in Canada

Statistics Canada



In Sweden: Females 84.3 years, Males 80.8

In Canada:
At age 65: Women 21.6 years (86.6)
At age 65: Men 18.5 years (83.5)

Challenge: Live long AND well

Need to shift our focus:

- Mortality
- Morbidity
- Longevity

→

- Function
- Ability/Disability
- Well being
- Quality of life
- Autonomy/Independence

We require high quality data in order to understand and address evolving needs

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Key Study Design Considerations

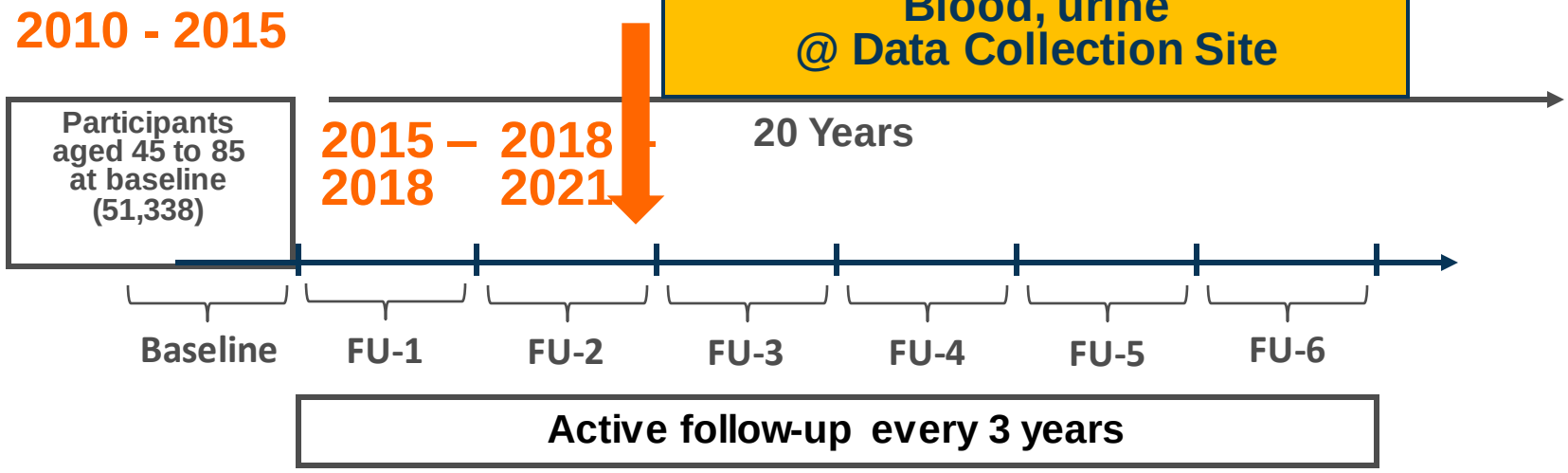
- What are the parameters of the study group to be under observation?
  - Geography
  - Age
  - Sex
  - Any other characteristics?
- Ethnicity/Race
  - Indigenous groups
  - Ethic and racial groups

CLSA Research Platform

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

TRACKING	COMPREHENSIVE
Target: 20,000 Actual: 21,241 Randomly selected within provinces	Target: 30,000 Actual: 30,097 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



Active follow-up every 3 years

Inclusion Criteria at CLSA Recruitment

- Residing in a Canadian province
- Not living on reserve or federal lands
- Not a full time member of the Canadian Armed Forces
- Able to complete interviews in English or French
- Community dwelling
- Cognitively competent

The CLSA includes….

- Veterans
- Indigenous peoples living off reserves
- Francophone population
- Ethnic groups
- Urban and rural populations
- People living with chronic diseases
- Caregivers
- Retirees

….. And many more subgroups of the population

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Going forward…

- A key consideration for the CLSA going forward is whether to replenish (refresh) the study sample
- As participants die or are lost to follow up, the statistical power diminishes
- In a single longitudinal cohort design there is no way to measure cohort effects separately from time effects
- A split panel design introduces a new set of participants into the study
- Potential to introduce a split panel design into the CLSA in future waves (Under consideration for FU4 in 2024)

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Panel design added to a longitudinal cohort

- Cohort studies aim to explain the effect of age (time) on the life course
- Panel studies can monitor change *and* take a cross-sectional snapshot of the population
- Allows the CLSA to retain sample size, incorporate changes to the Canadian population
- How should the sample be replenished?
  - Replace within age and sex strata?
  - Replenish the youngest age group?
- Stay tuned, discussions underway…

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Thanks,
and over to Dr. Lauren Griffith
to talk about
Sampling