PHI Applied Research Fellows 2023 Intro to Demography

Jessica Godwin

June 23, 2023

Introduction

What is Demography?

What is Demography?

$$P_{t+1} = P_t + B_t - D_t + IM_t - OM_t$$

- Fertility, mortality, migration, population size
  - The balancing equation
- How these processes work together in a population
- Break it all down by age and sex and ...

Why is Demography?

Why is Demography?

- Understand a population's make up today
- Targeted intervention
- Projections allow planning for future population
- Historical demography
- Social demography

The main textbooks

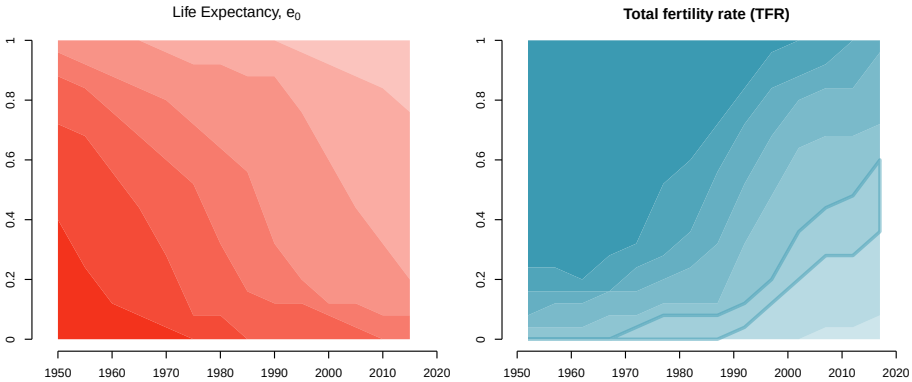
- Demography: Measuring and Modeling Population Processes
  - Samuel Preston, Patrick Heuveline, Michel Guillot
- Essential Demographic Methods
  - Kenneth Wachter
- Tools for Demographic Estimation
  - IUSSP (many prominent world demographers)

The Demographic Transistion Theory

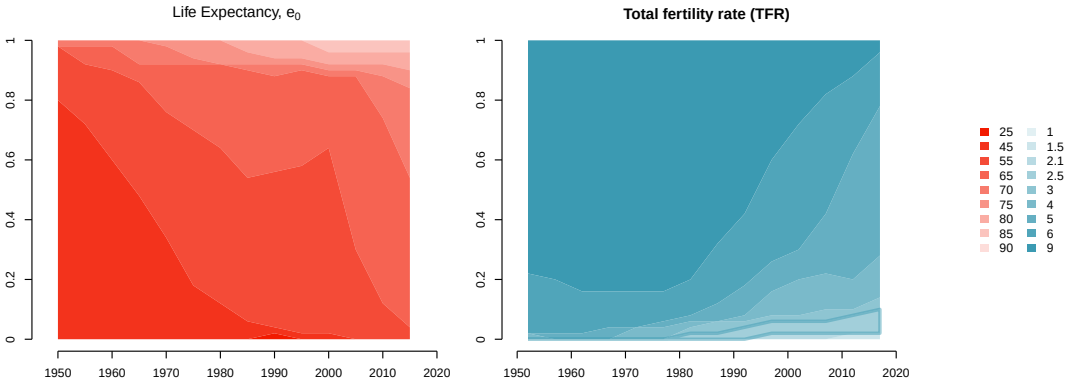
The Demographic Transistion Theory

- Mortality begins to decrease $\rightarrow$
- Fertility begins to decrease $\rightarrow$
- In countries that have already experienced the transition, to below "replacement level" $\approx$ 2.1 children per parents $\rightarrow$ rise to and fluctuation around this point
- behind model in WPP (Alkema et al., 2011)
- Is this true in places where TFR remains high? Is all "high" fertility a result of unmet family planning needs?
- This really succinct amazing graphic on Wikipedia

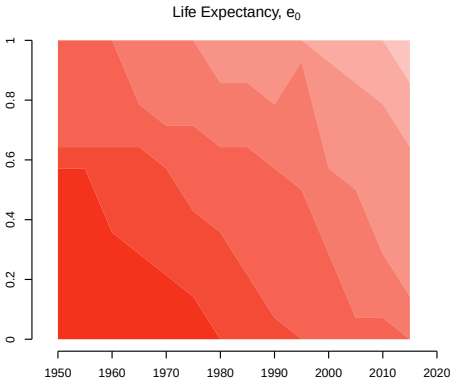
N Africa & West Asia: 1950-1955 to 2015-2020

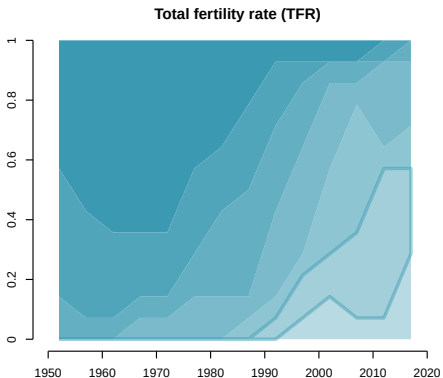


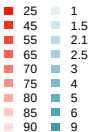
Sub-Saharan Africa: 1950-1955 to 2015-2020



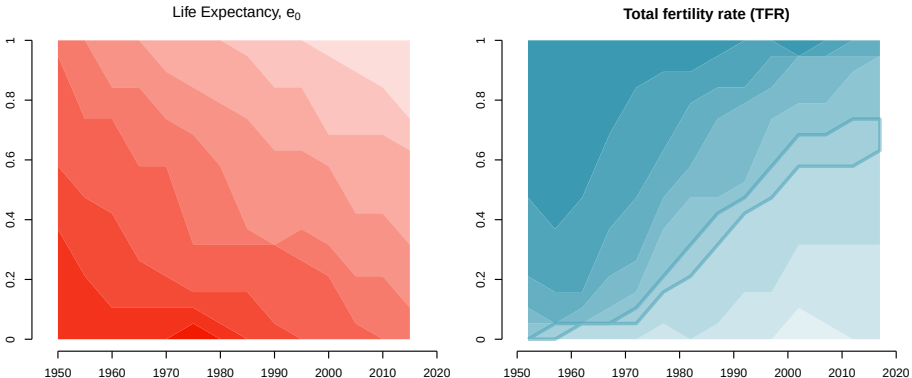
Central & South Asia: 1950-1955 to 2015-2020



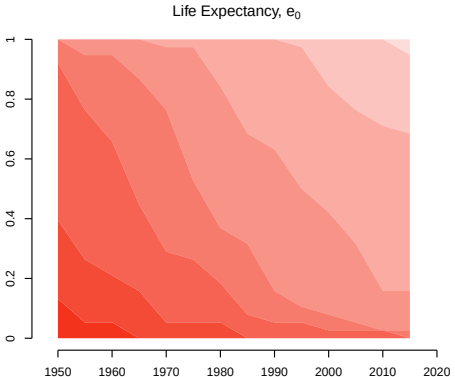


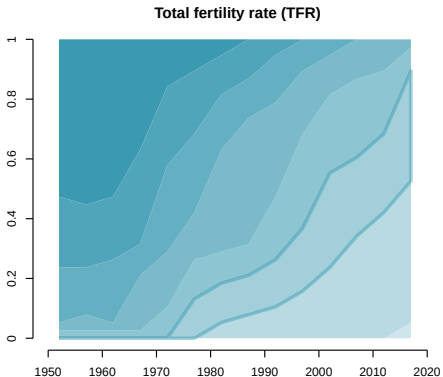


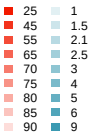
East & South-Eastern Asia: 1950-1955 to 2015-2020



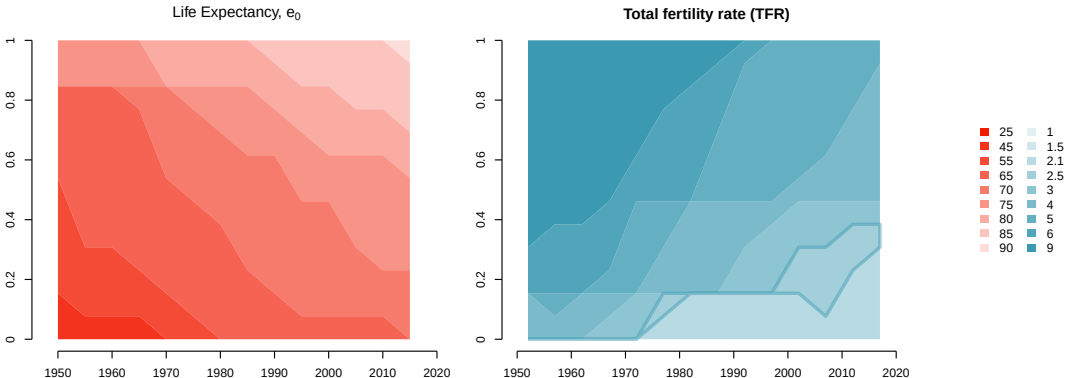
Latin America & the Caribbean: 1950-1955 to 2015-2020



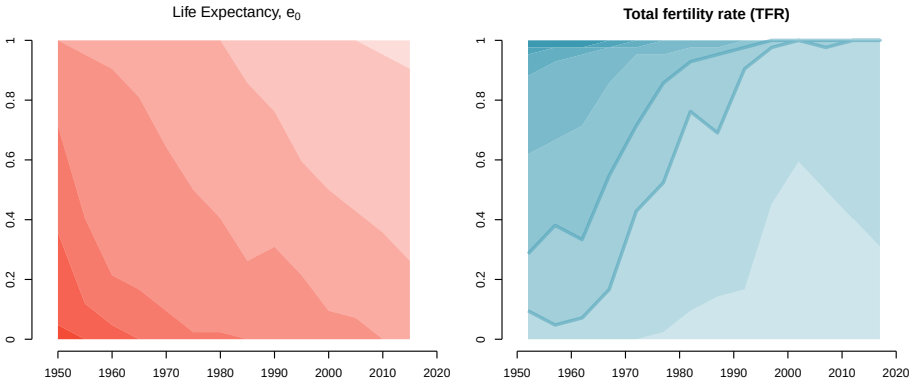




Australia, New Zealand, Oceania: 1950-1955 to 2015-2020

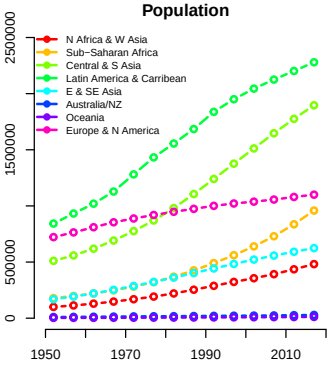


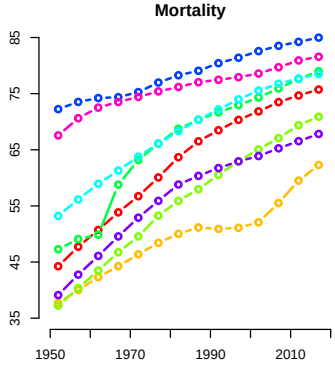
Europe & North America: 1950-1955 to 2015-2020

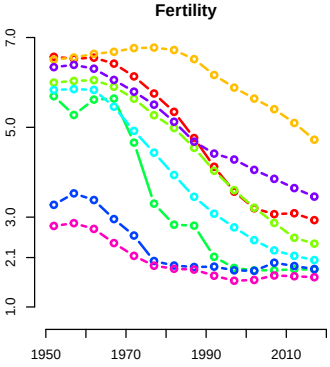


Population Size

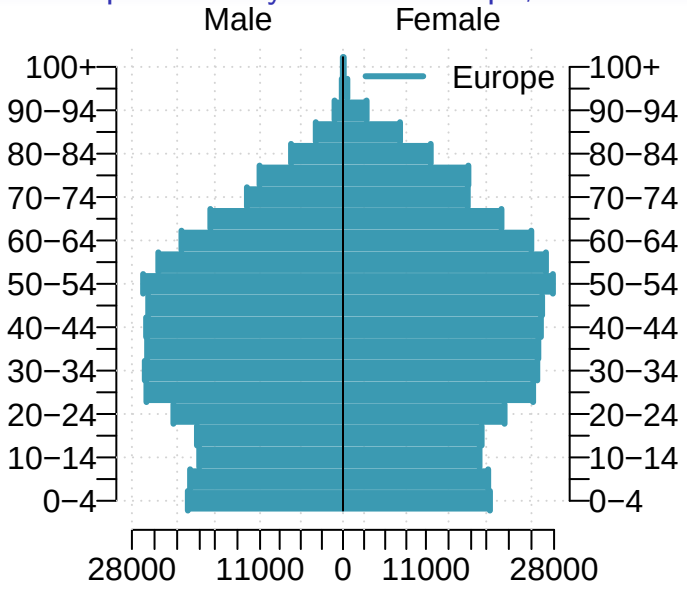
Population Growth by Continent



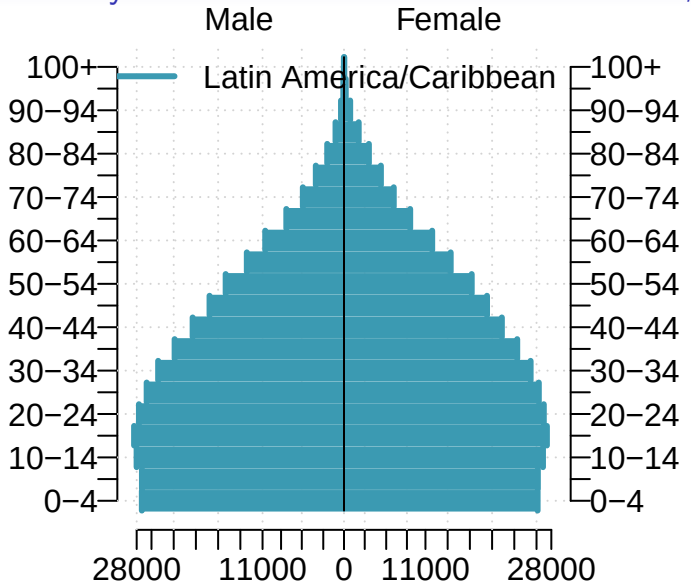




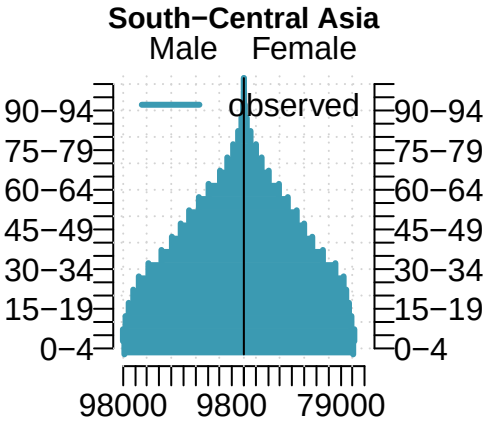
Population Pyramids: Europe, 2015

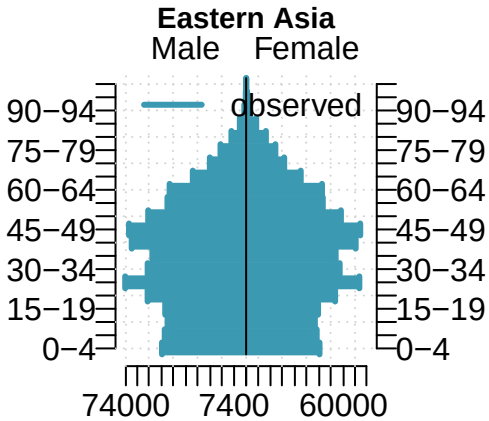


Population Pyramids: Latin America & Caribbean, 2015

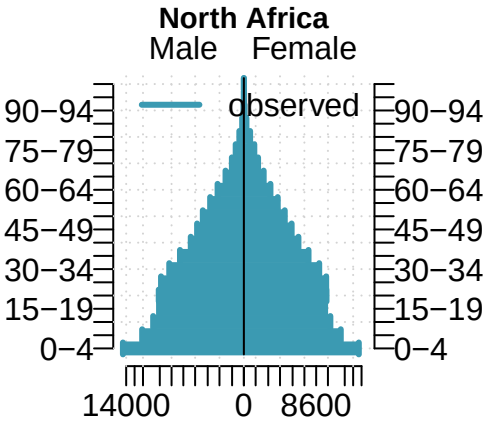


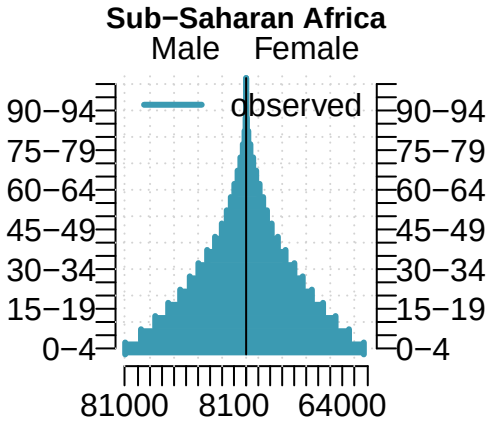
Population Pyramids: Asia, 2015





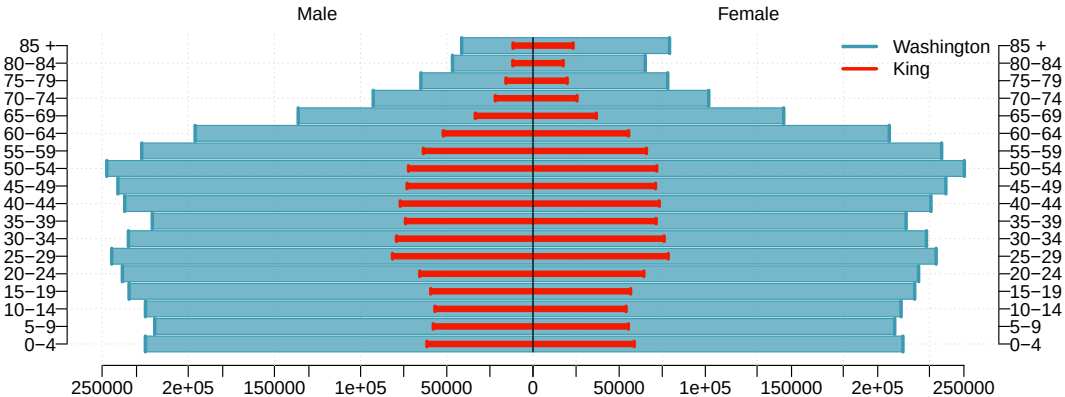
Population Pyramids: Africa, 2015



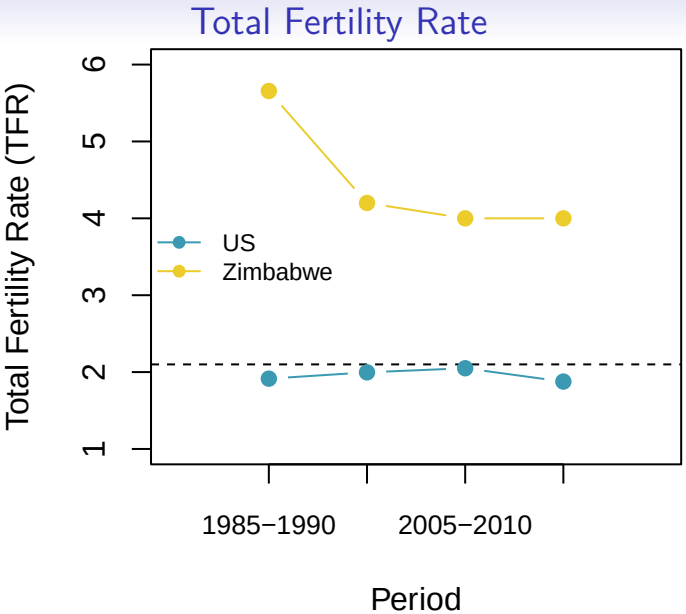


Population Pyramids: WA, 2011

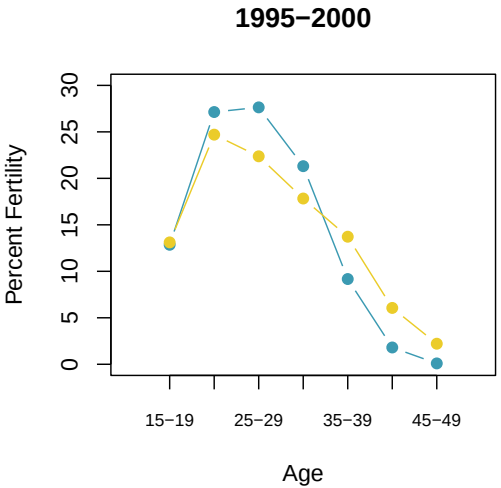
- Over time from WA OFM

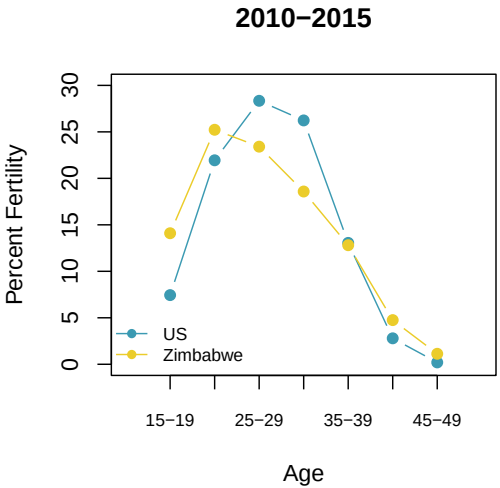


Fertility


Total Fertility Rate
Total Fertility Rate (TFR)
1
2
3
4
5
6
US
Zimbabwe
1985−1990
2005−2010
Period

Age-specific Fertility Rates

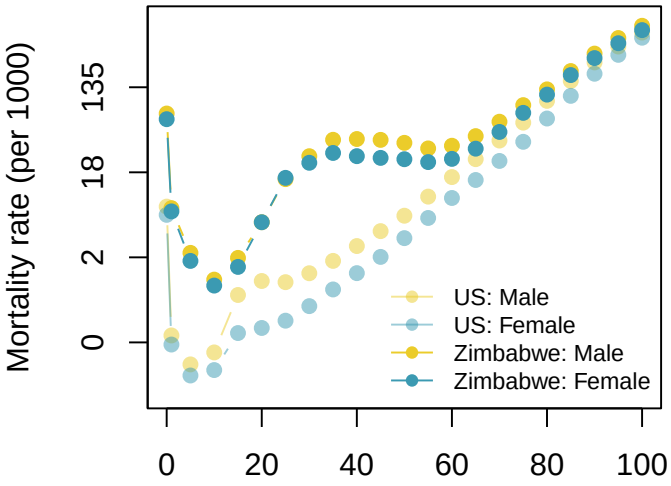




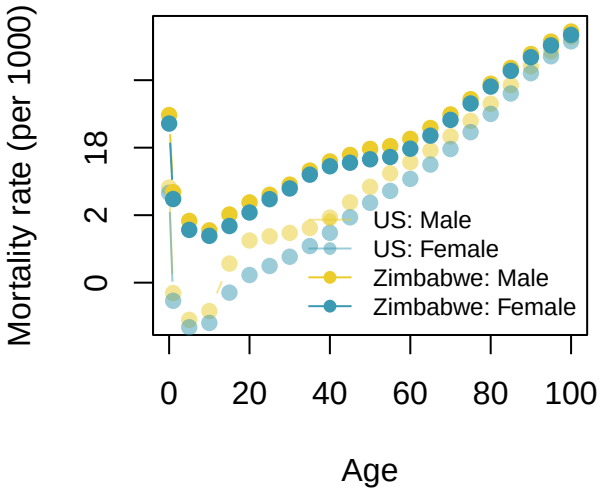
Mortality

Age-specific Mortality

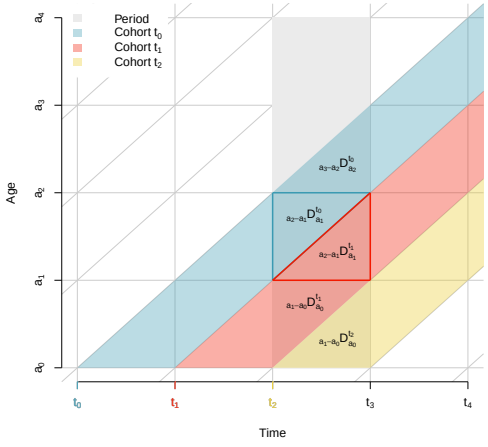
1995–2000



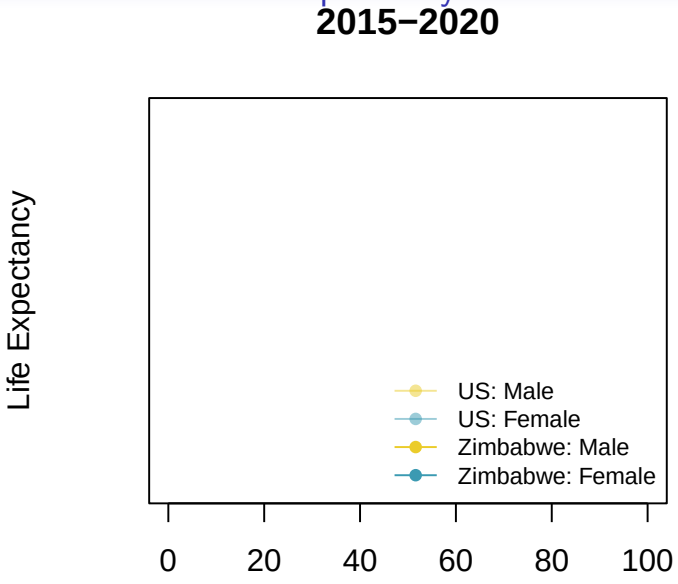
Age-specific Mortality
2015–2020



The Lexis Diagram: Age-Period-Cohort



Life Expectancy



Migration

Measurement

Migration is notoriously hard to measured or estimate, and even harder to project into the future.

- **Migration flows**: between each pair $i \neq j$ of geographic or political regions, we know who traveled $i \to j$ and $j \to i$ between time t and $t+1$
- **Migration stock**: the number of individuals residing in geographic or political region i from all other region $j \neq i$ at time t
- **Net migration** or the **residual method**: we know the population in region i at time t and $t+1$, as well as the births and deaths that occured in region i between time t and $t+1$

$$P_{t+1} - [P_t + B_t - D_t] = I_t - O_t$$

So, what's the problem?

- **Migration flows**: require sharing of information between all regions i and j, which may be unreasonable or impossible
- **Migration stock**: doesn't necessarily capture in-migration or out-migration (it's cross-sectional), require sharing of information between all regions i and j, which may be unreasonable or impossible
- **Net migration**: often the most accessible, but does not help to quantify in-migration and out-migration as two separate population processes
- What are regions i and j? Nations? States? Counties? Neighborhoods?
  - The answer to this question will determine the extend to which systems even exist to observe and record migration
- For calculating **rates** or **probabilities** what is the denominator for in-migration?