# PHI Applied Research Fellows 2021 Intro to Demography

Jessica Godwin

June 23, 2021

# 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

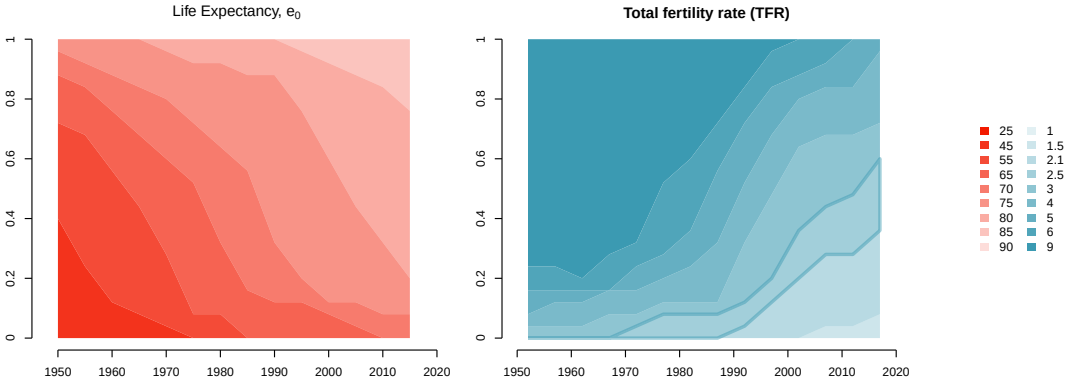
# The main textbooks

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

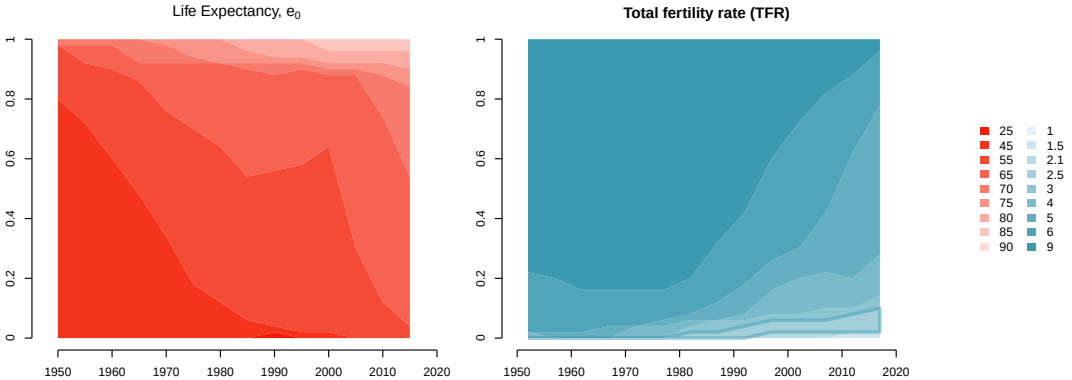
# The Demographic Transistion Theory

- 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

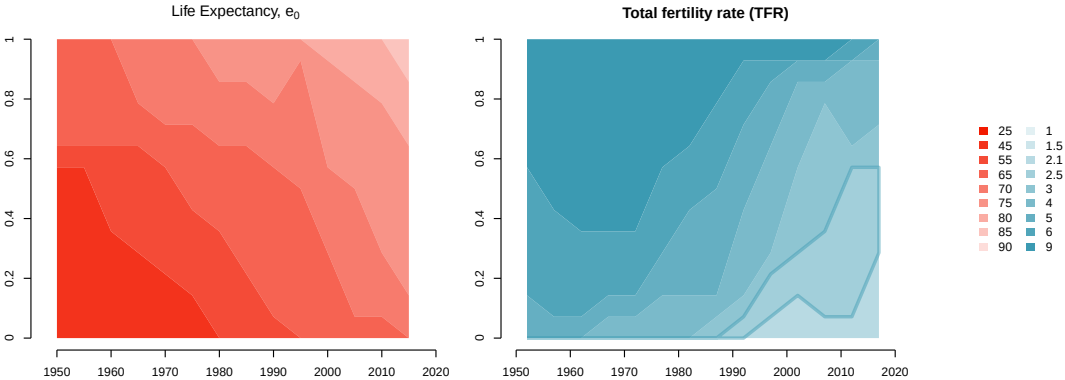
# N Africa & West Asia: 1950-1955 to 2015-2020



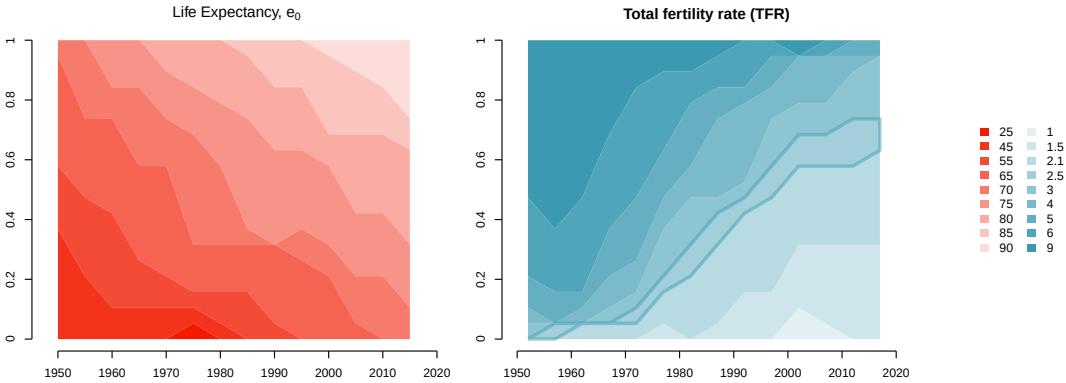
# Sub-Saharan Africa: 1950-1955 to 2015-2020



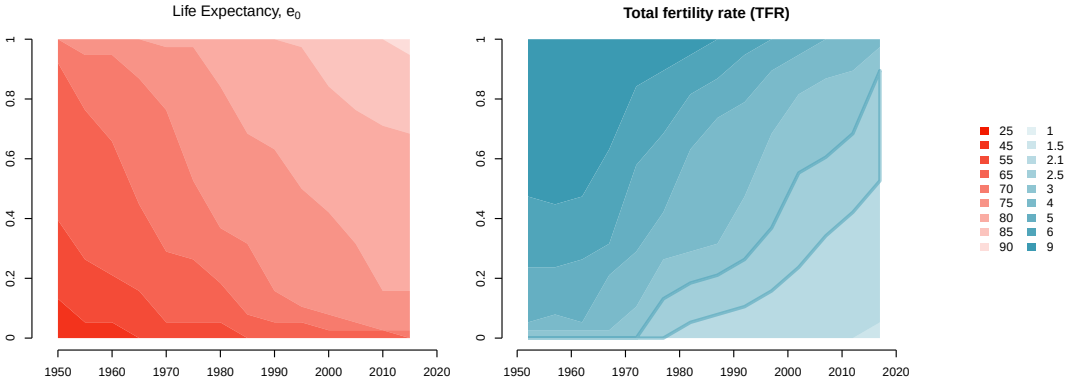
# Central & South Asia: 1950-1955 to 2015-2020



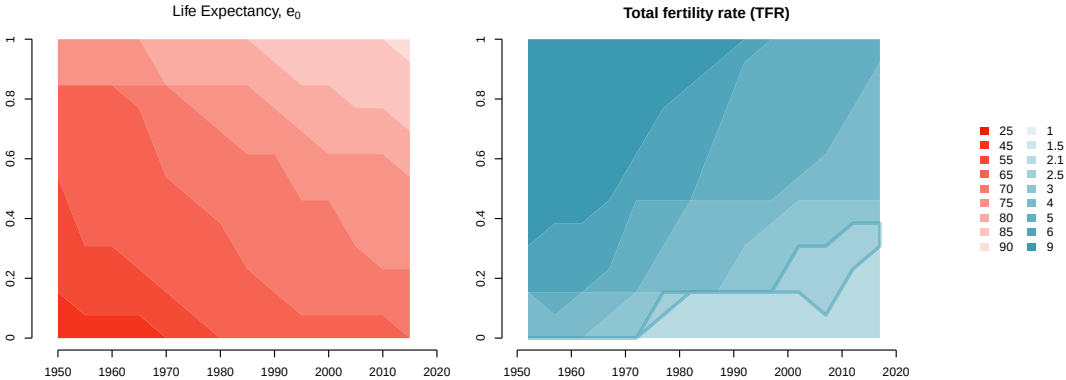
# East & South-Eastern Asia: 1950-1955 to 2015-2020



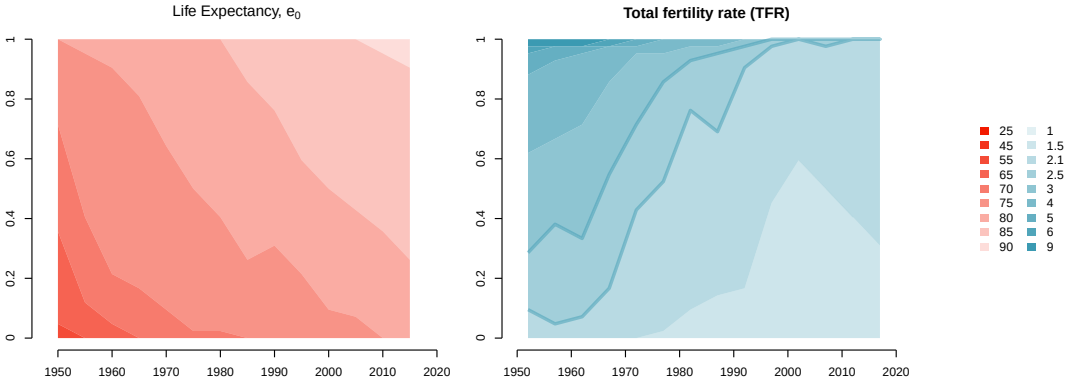
# Latin America & the Caribbean: 1950-1955 to 2015-2020



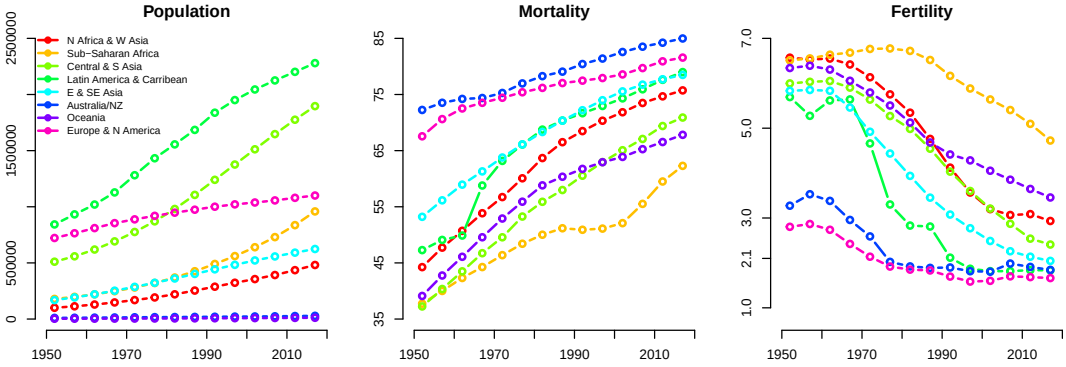
# Australia, New Zealand, Oceania: 1950-1955 to 2015-2020



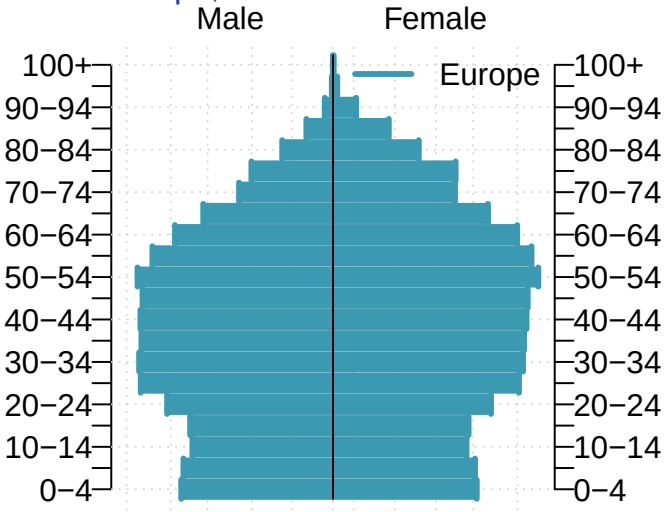
# Europe & North America: 1950-1955 to 2015-2020



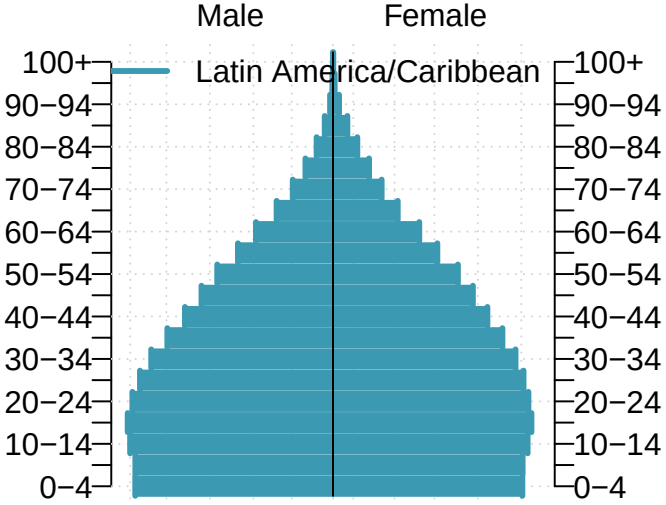
# Population Growth by Continent



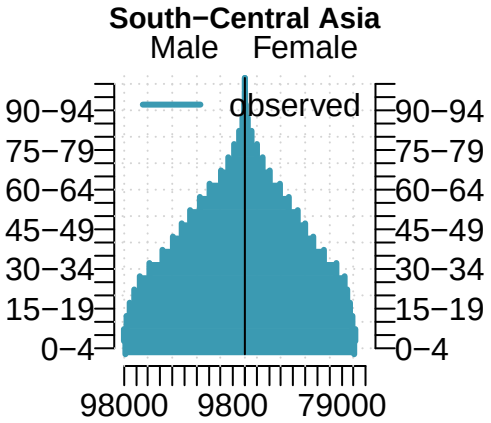
# Population Pyramids: Europe, 2015

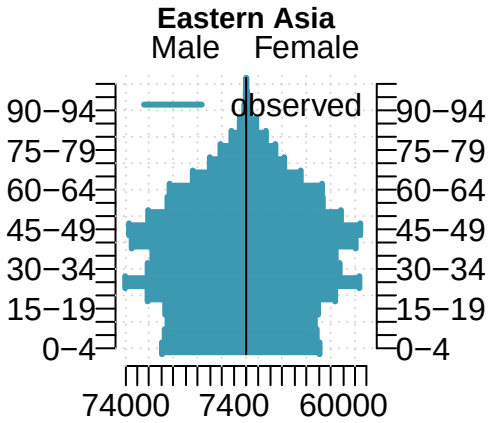


# Population Pyramids: Latin America & Caribbean, 2015

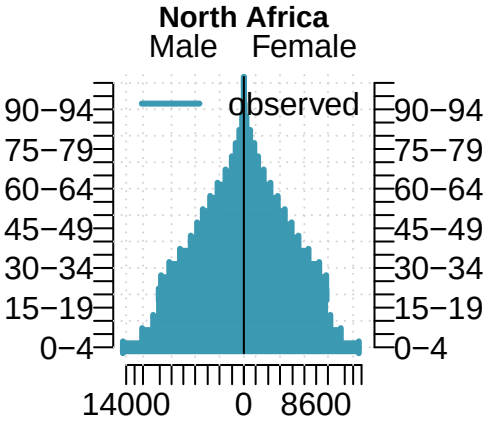


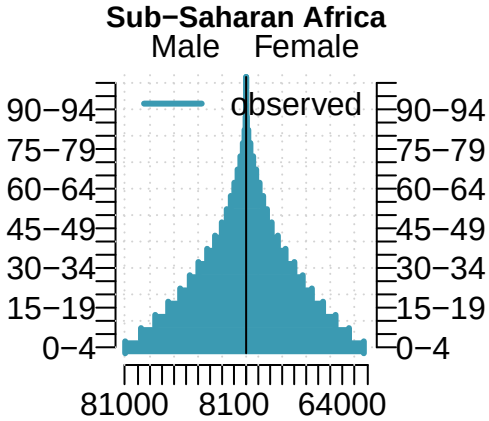
# Population Pyramids: Asia, 2015



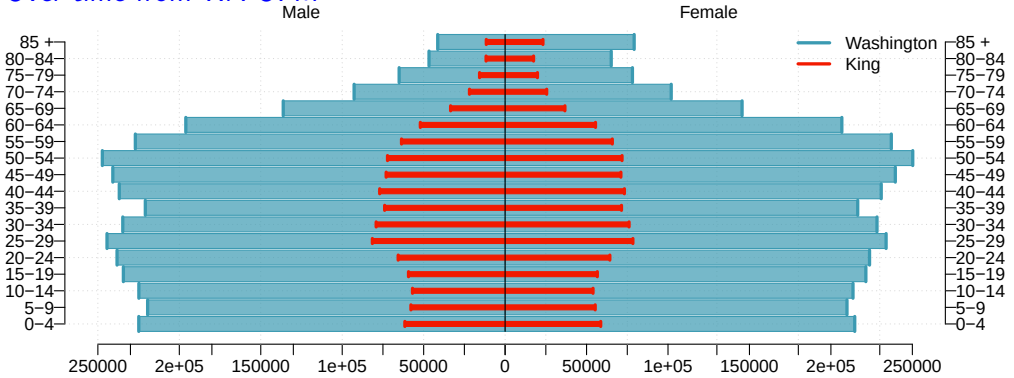
# Population Pyramids: Africa, 2015



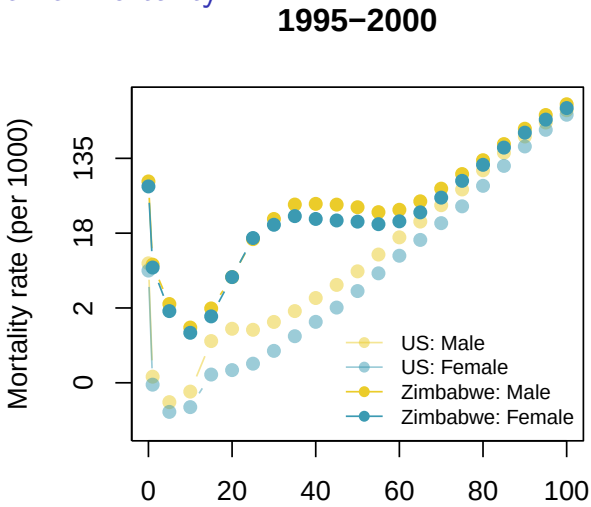



# Population Pyramids: WA, 2011

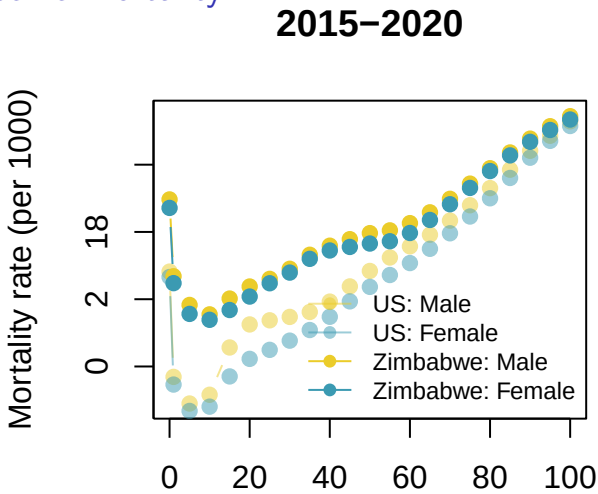
- Over time from WA OFM



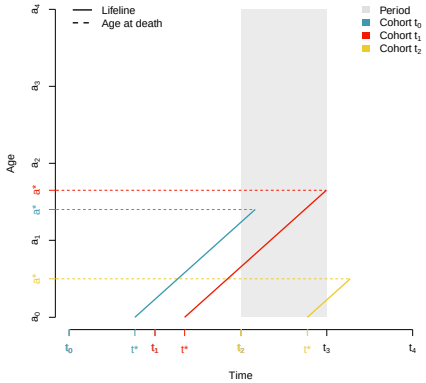
# Mortality: Age-specific Mortality



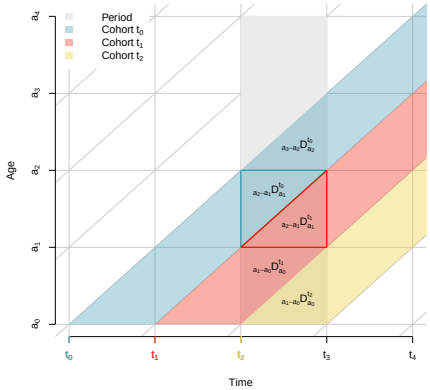
# Mortality: Age-specific Mortality



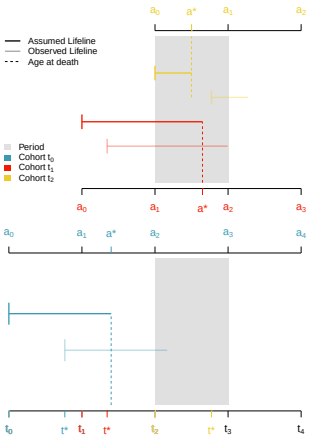
# The Lexis Diagram: Age-Period-Cohort



# The Lexis Diagram: Age-Period-Cohort



# The Life Table: Age-Period-Cohort



# The Life Table: Age-Period-Cohort

| $x$ | $l_x$ | ${}_nd_x$ | ${}_nq_x$ | ${}_nL_x$ | ${}_nm_x$ |
|---|---|---|---|---|---|
| $a_0$ | $l_0$ | ${}_{a_1-a_0}D^{t_2}_{a_0}$ | $\frac{{}_{a_1-a_0}D^{t_2}_{a_0}}{B^{t_2}_{a_0}}$ | $(a_1-a_0)\times(B^{t_2}_{a_0}-\frac{1}{2}D^{t_2}_{a_0})$ | $\frac{{}_{a_1-a_0}d_{a_0}}{{}_{a_1-a_0}L_{a_0}}$ |
| $a_1$ | $l_0-{}_{a_1-a_0}d_{a_0}$ | ${}_{a_2-a_1}D^{t_1}_{a_1}$ | $\frac{{}_{a_2-a_1}D^{t_1}_{a_1}}{B^{t_1}_{a_1}}$ | $(a_2-a_1)\times(B^{t_1}_{a_1}-\frac{1}{2}D^{t_1}_{a_1})$ | $\frac{{}_{a_2-a_1}d_{a_1}}{{}_{a_2-a_1}L_{a_1}}$ |
| $a_2$ | $l_{a_1}-{}_{a_2-a_1}d_{a_1}$ | ${}_{a_3-a_2}D^{t_0}_{a_2}$ | $\frac{{}_{a_3-a_2}D^{t_0}_{a_2}}{B^{t_0}_{a_2}}$ | $(a_3-a_2)\times(B^{t_0}_{a_2}-\frac{1}{2}{}_{a_3}D^{t_0}_{a_2})$ | $\frac{{}_{a_3-a_2}d_{a_2}}{{}_{a_3-a_2}L_{a_2}}$ |
| $a_4$ | $l_\infty$ | $l_\infty$ | 1 | | |