PHI Applied Research Fellows 2021 Intro to Demography

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What is Demography?

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

- ▶ 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

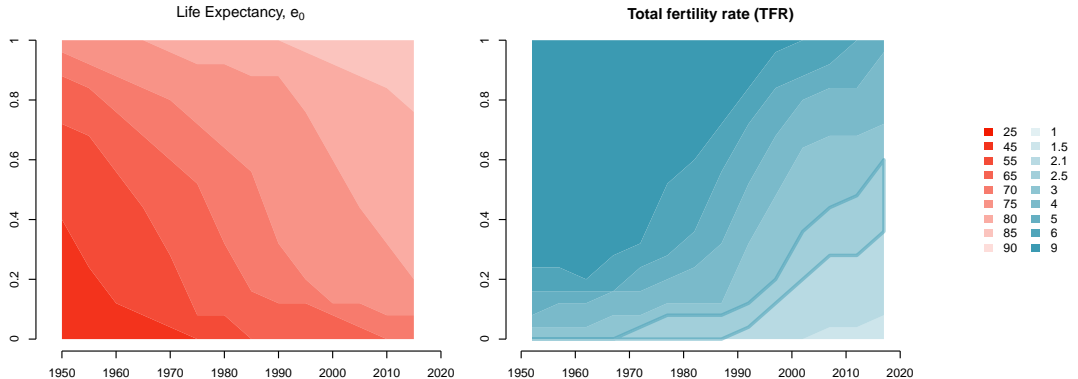# The main textbooks

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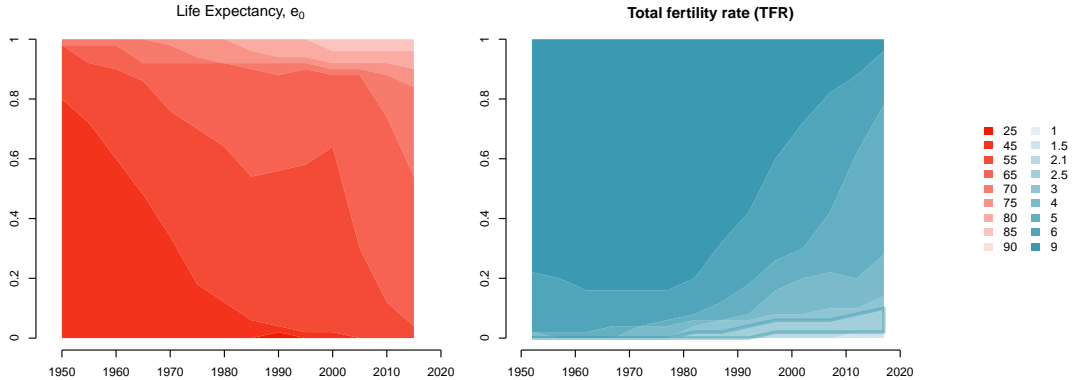- IUSSP (many prominent world demographers)

The Demographic Transistion Theory

- Mortality begins to decrease →
- Fertility begins to decrease →
- In countries that have already experienced the transition, to below "replacement level" ≈ 2.1 children per parents → 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?
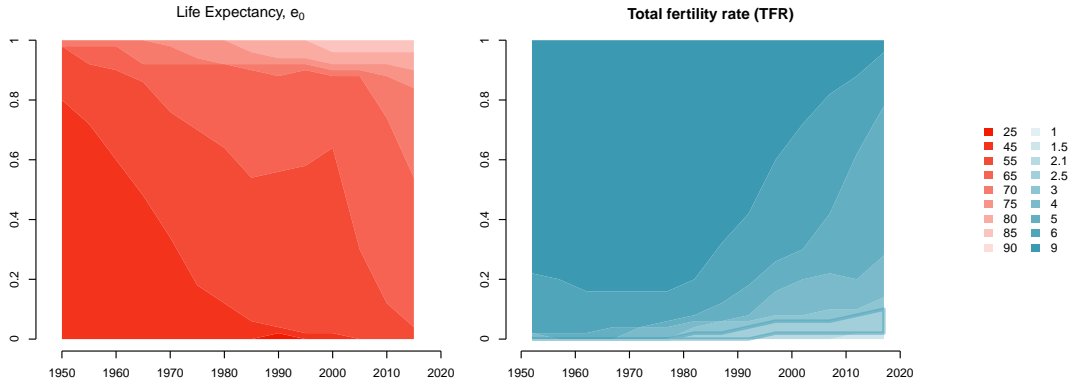- This really succinct amazing graphic on Wikipedia

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

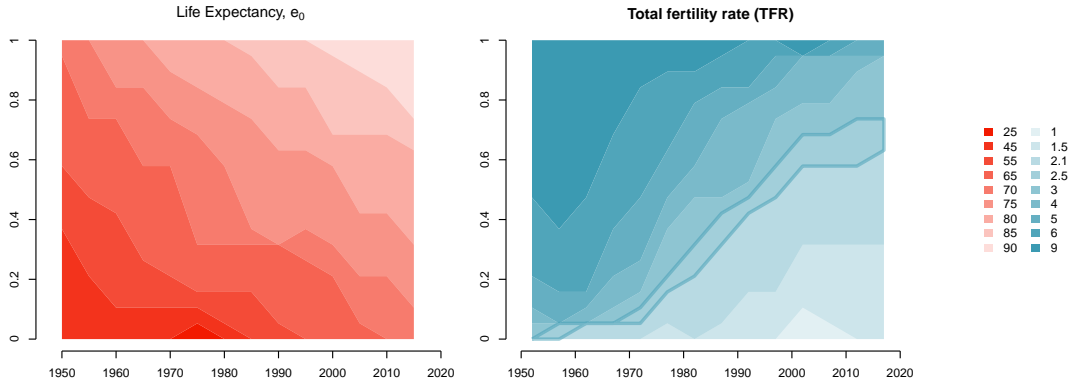Life Expectancy, e_0

Total fertility rate (TFR)

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

Life Expectancy, e_0

Total fertility rate (TFR)

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

Life Expectancy, e_0

Total fertility rate (TFR)

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

Life Expectancy, e_0

Total fertility rate (TFR)

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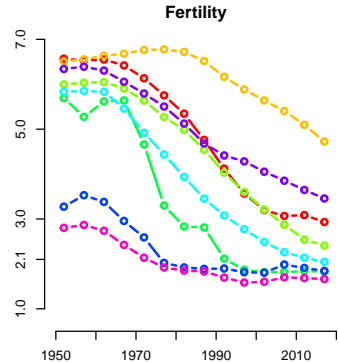

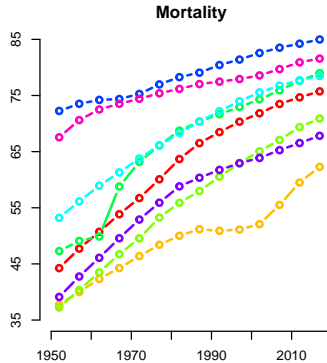Life Expectancy, e₀

Total fertility rate (TFR)
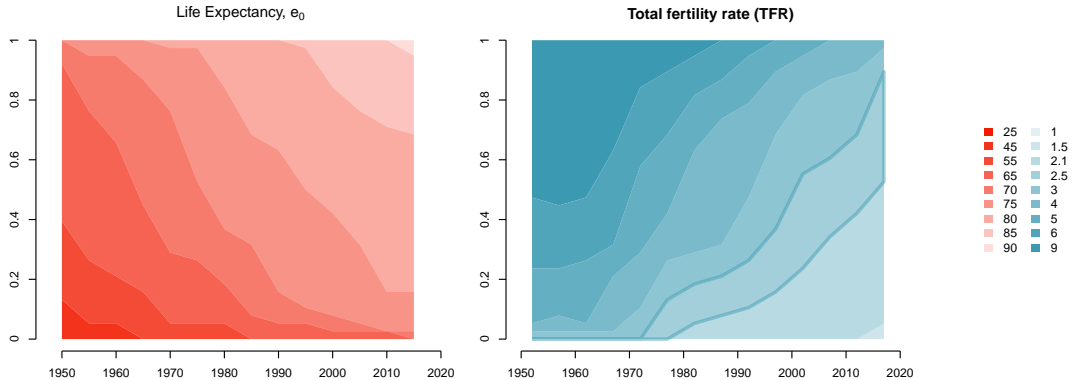
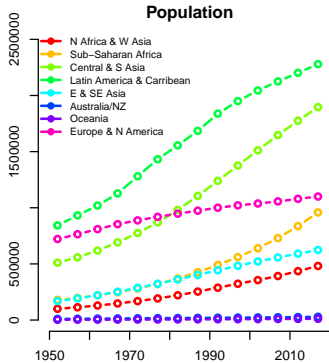# Australia, New Zealand, Oceania: 1950-1955 to 2015-2020
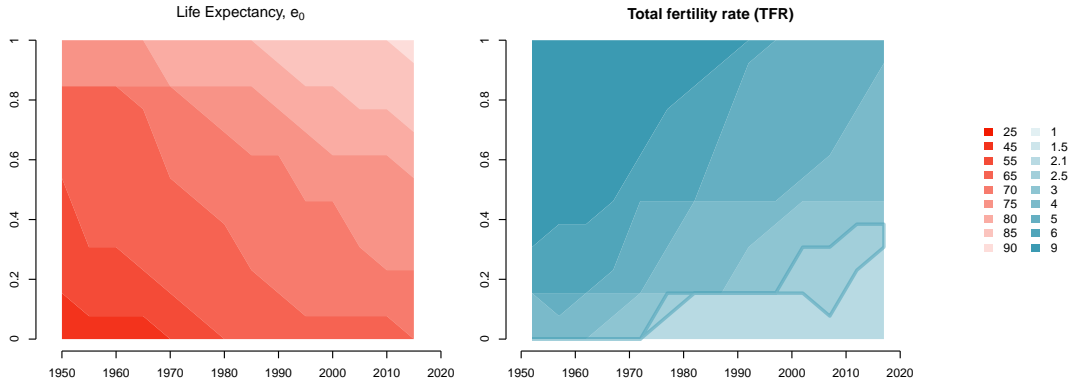
Europe & North America: 1950-1955 to 2015-2020

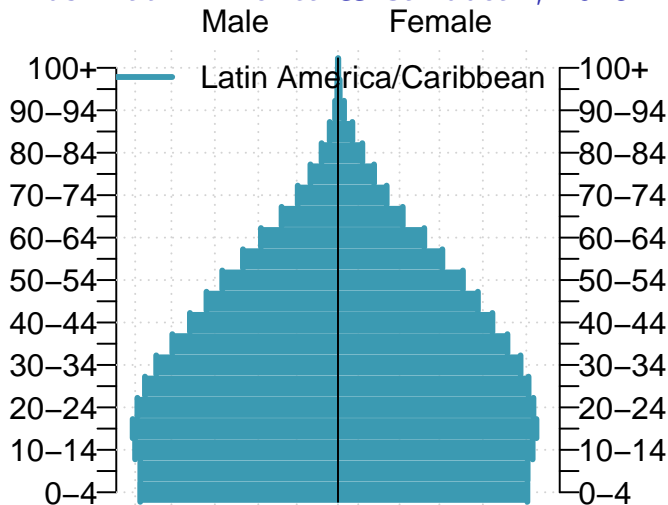Life Expectancy, e_0

Total fertility rate (TFR)
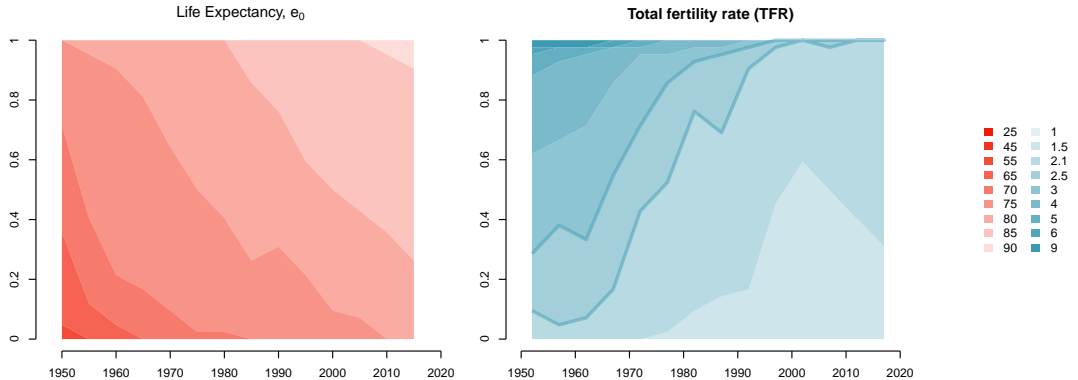
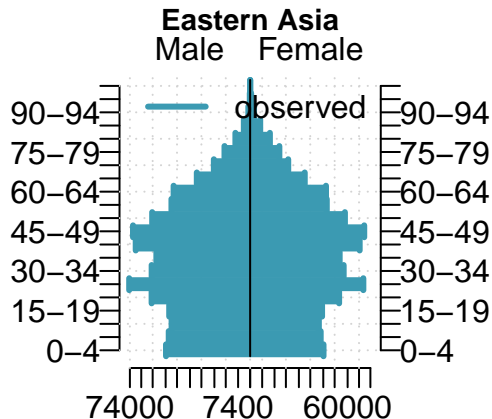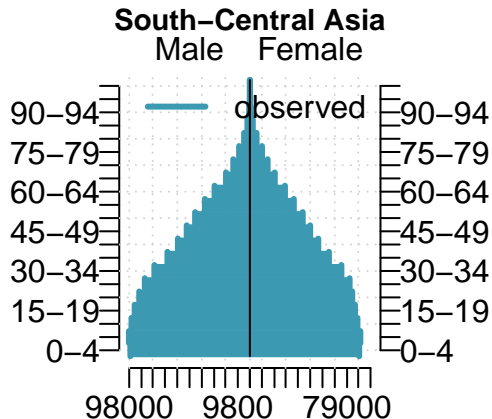# Population Growth by Continent

Population Pyramids: Europe, 2015
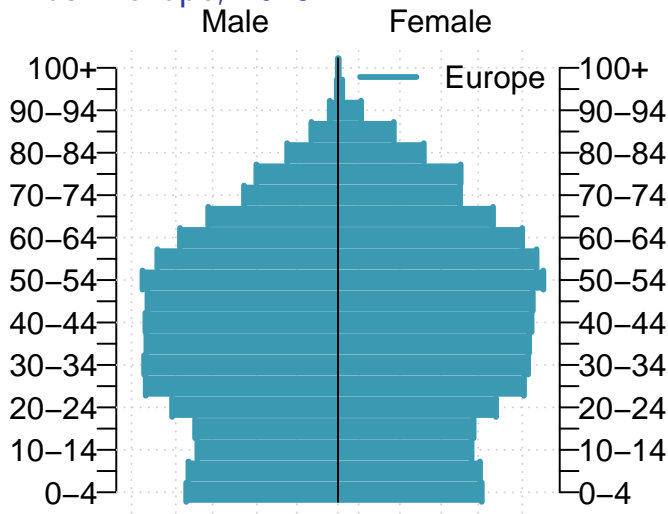
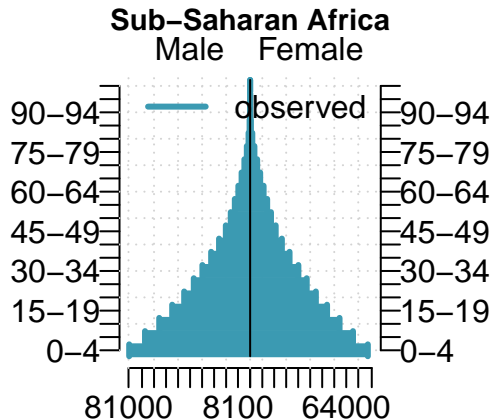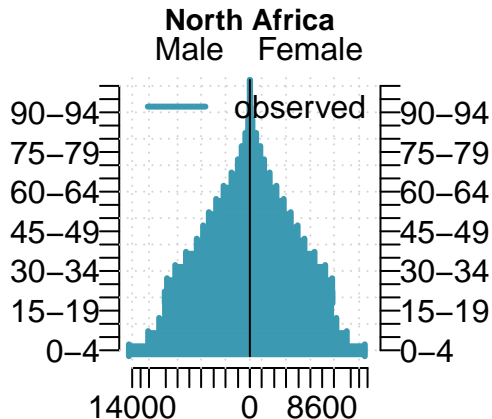# Population Pyramids: Latin America & Caribbean, 2015

Population Pyramids: Asia, 2015

South–Central Asia
Male   Female

observed

90–94
75–79
60–64
45–49
30–34
15–19
0–4

98000   9800   79000

Eastern Asia
Male   Female

observed

90–94
75–79
60–64
45–49
30–34
15–19
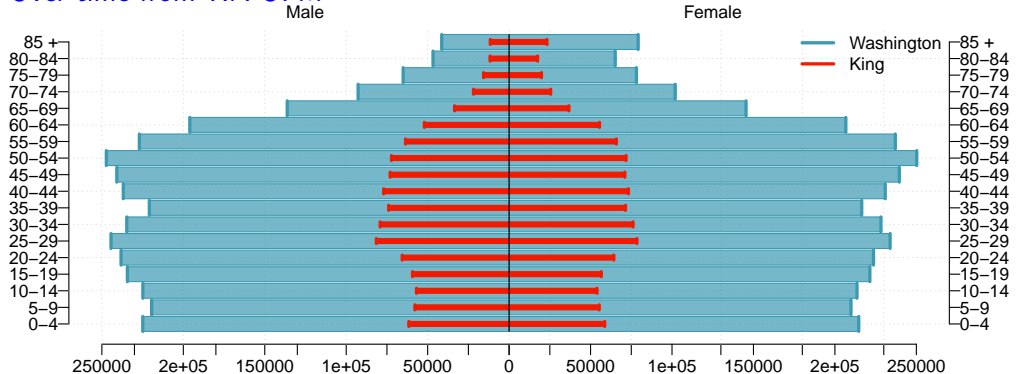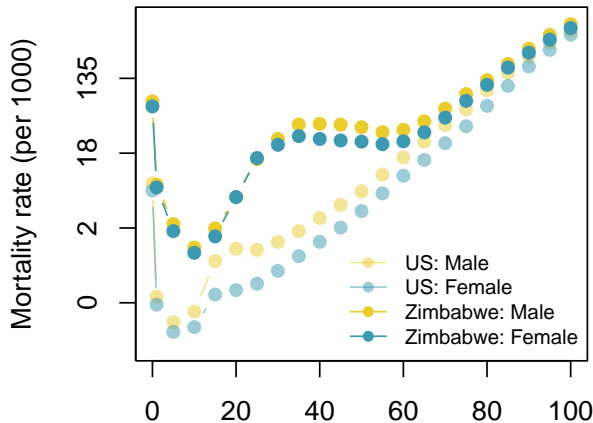0–4

74000   7400   60000

Population Pyramids: Africa, 2015

Population Pyramids: WA, 2011

▶ Over time from WA OFM

Mortality: Age-specific Mortality

1995–2000
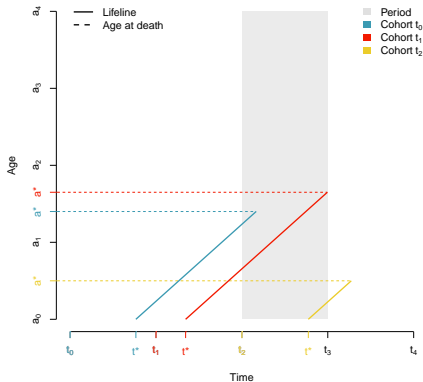
Mortality rate (per 1000)

- US: Male
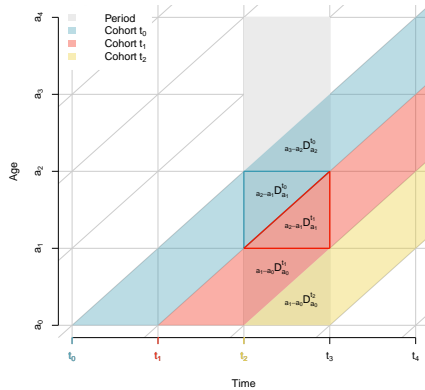- US: Female
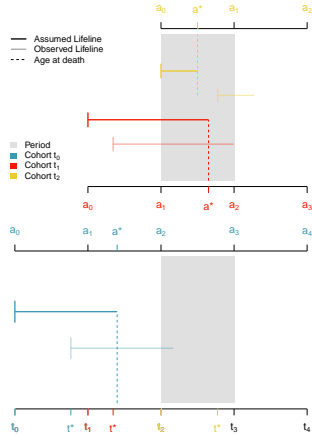- Zimbabwe: Male
- Zimbabwe: Female

2015–2020
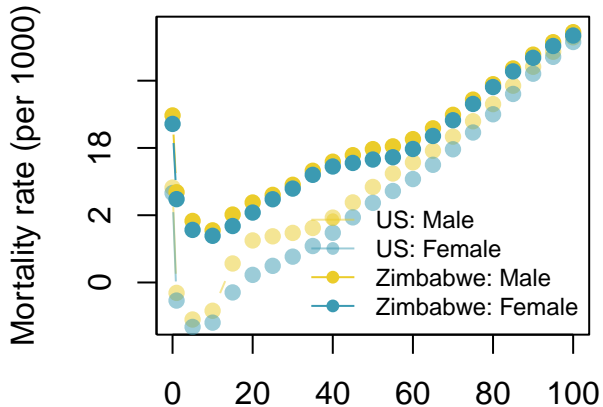
The Lexis Diagram: Age-Period-Cohort

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The Life Table: Age-Period-Cohort

The Life Table: Age-Period-Cohort

x	l_x	$_n d_x$	$_n q_x$	$_n L_x$	$_n m_x$
a_0	l_0	$_{a_1-a_0}D_{a_0}^{t_2}$	$\dfrac{_{a_1-a_0}D_{a_0}^{t_2}}{B_{a_0}^{t_2}}$	$(a_1-a_0)\times(B_{a_0}^{t_2}-\tfrac{1}{2}D_{a_0}^{t_2})$	$\dfrac{_{a_1-a_0}d_{a_0}}{_{a_1-a_0}L_{a_0}}$
a_1	$l_0 - {}_{a_1-a_0}d_{a_0}$	$_{a_2-a_1}D_{a_1}^{t_1}$	$\dfrac{_{a_2-a_1}D_{a_1}^{t_1}}{B_{a_1}^{t_1}}$	$(a_2-a_1)\times(B_{a_1}^{t_1}-\tfrac{1}{2}D_{a_1}^{t_1})$	$\dfrac{_{a_2-a_1}d_{a_1}}{_{a_2-a_1}L_{a_1}}$
a_2	$l_{a_1} - {}_{a_2-a_1}d_{a_1}$	$_{a_3-a_2}D_{a_2}^{t_0}$	$\dfrac{_{a_3-a_2}D_{a_2}^{t_0}}{B_{a_2}^{t_0}}$	$(a_3-a_2)\times(B_{a_2}^{t_0}-\tfrac{1}{2}{}_{a_3}D_{a_2}^{t_0})$	$\dfrac{_{a_3-a_2}d_{a_2}}{_{a_3-a_2}L_{a_2}}$
a_4	l_∞	l_∞	1		