MAIN FEATURES OF GLOBAL POPULATION TRENDS

John Wilmoth, Director
Population Division, DESA, United Nations

Seminar on Population Projections and Demographic Trends
Eurostat, Luxembourg, 13 November 2018

Population Division
United Nations, Department of Economic and Social Affairs

History

- First session of the Population Commission was held in February 1947 in Lake Success, New York

- Report of the Secretary-General, on the UN's need for demographic information:

  "Nearly every branch of the Organization and of the specialized agencies requires prompt and reliable information on the number and characteristics of people in different parts of the world and on the manner in which their numbers are changing by birth, death and migration. We need accurate human accounting."

Mission of the Population Division

- Facilitate access to information on population trends, their demographic components and their interrelationships with social and economic development

- Produce the official United Nations estimates and projections of the global population, which serve as a consistent standard for use throughout the UN system

- Provide substantive support to intergovernmental bodies, including the Commission on Population and Development

- Strengthen the capacity of Member States for the analysis of demographic information and for its use in the formulation of government policies and programs

Collaboration

- UN system (including agencies, funds and programmes)
- University researchers, academic and policy institutes
- UN Member States (permanent missions in New York, other Government offices)
- News media

Areas of expertise

- Population estimates and projections
- Fertility and reproductive health
- Mortality and health across the life span
- Internal and international migration, and urbanization
- Population dynamics and their consequences
  - population growth/decline
  - economic and environmental impacts
  - changing age structures, including population ageing
  - social security and age-based transfer systems
- Population policies

Five flagship datasets

- **World Population Prospects**
  Estimates and projections of population size and demographic components of change (fertility, mortality and net migration)

- **World Urbanization Prospects**
  Estimates and projections of urban percentage of countries or areas, and of population size for cities of at least 300,000 inhabitants

- **International Migrant Stock**
  Numbers of foreign or foreign-born persons living in a country or area in a given year, by age, sex and country/area of origin

- **Family Planning Indicators**
  Measures of contraceptive use, unmet need, demand satisfied

- **World Population Policies**
  Policies on population dynamics, reproductive health and migration

Four demographic mega-trends

- Population growth

- Population ageing

- International migration

- Urbanization

Population growth of large geographic regions
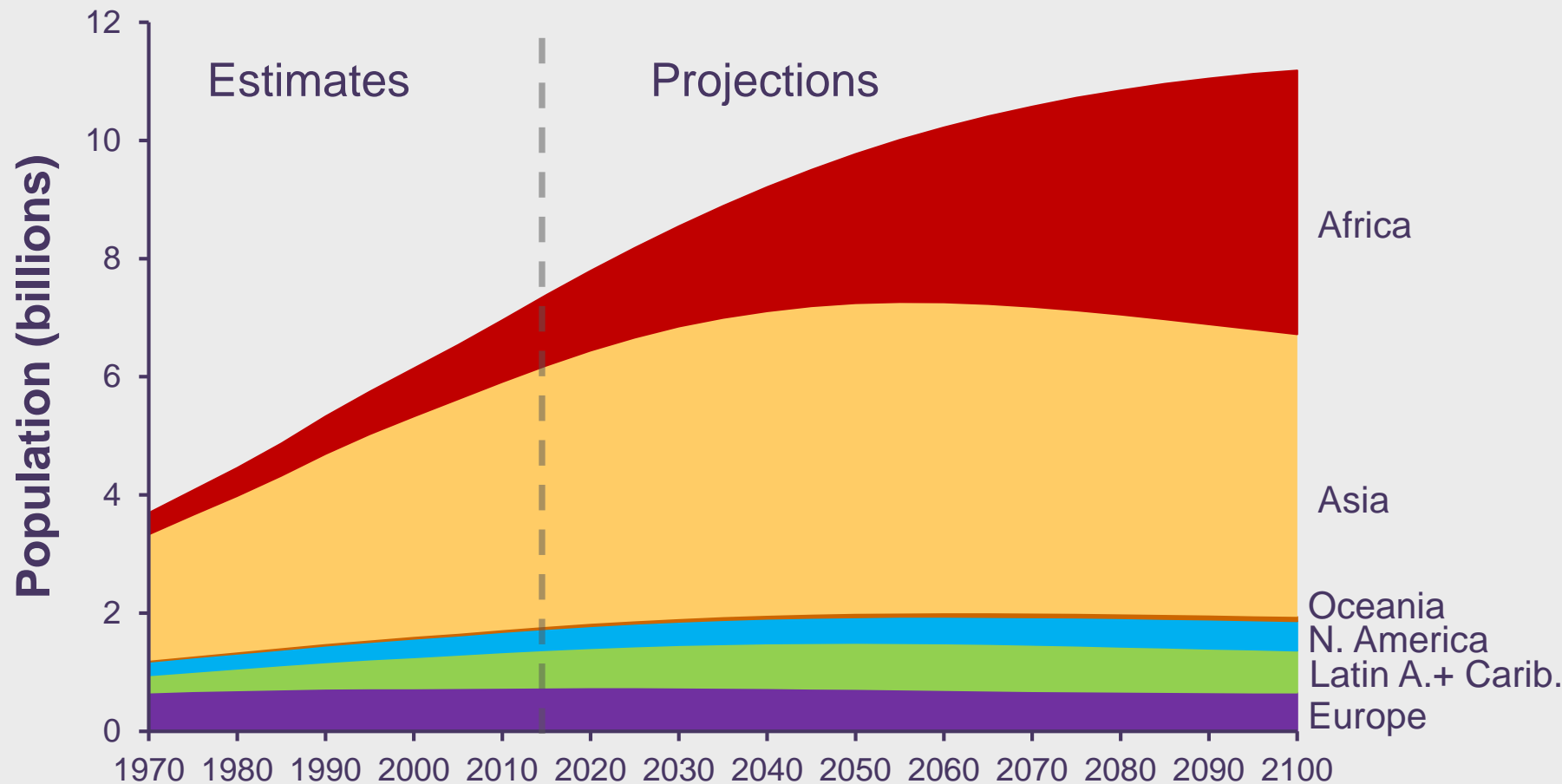

Estimates | Projections

Population (billions)

Africa

Asia

Oceania
N. America
Latin A.+ Carib.
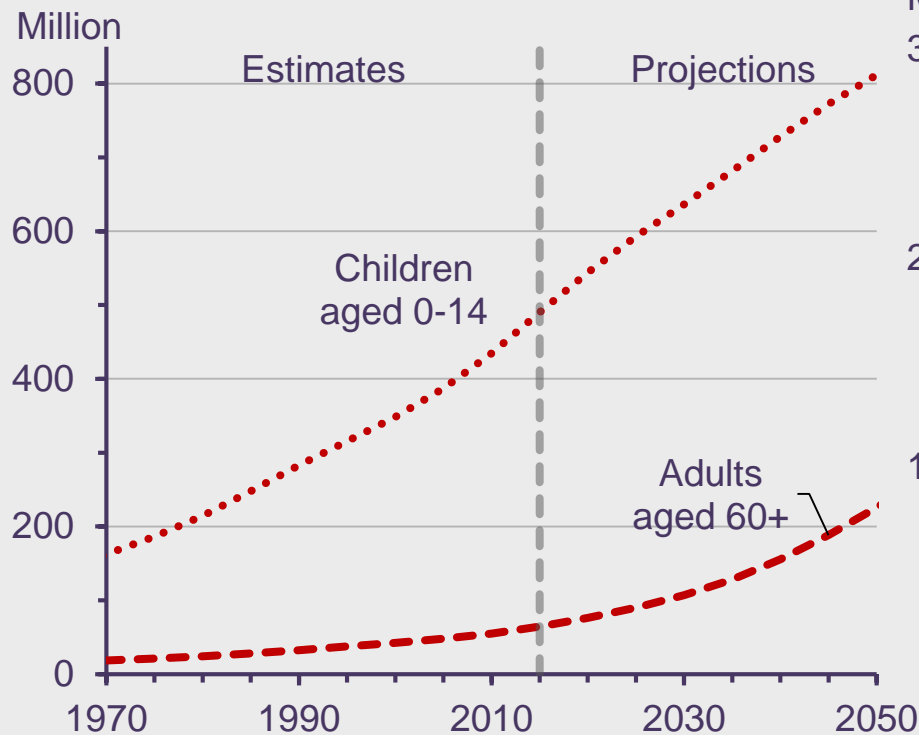Europe

Source: World Population Prospects: The 2017 Revision

Population Division
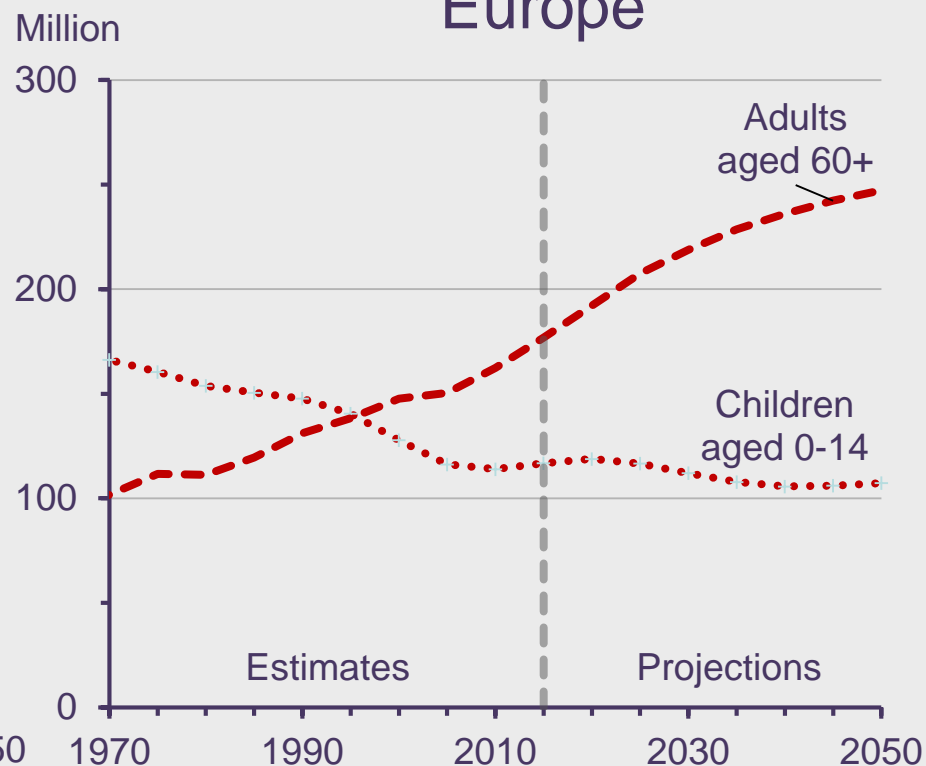United Nations, Department of Economic and Social Affairs

Shifting age distribution: Children and older persons in Africa and Europe

Source: World Population Prospects: The 2017 Revision

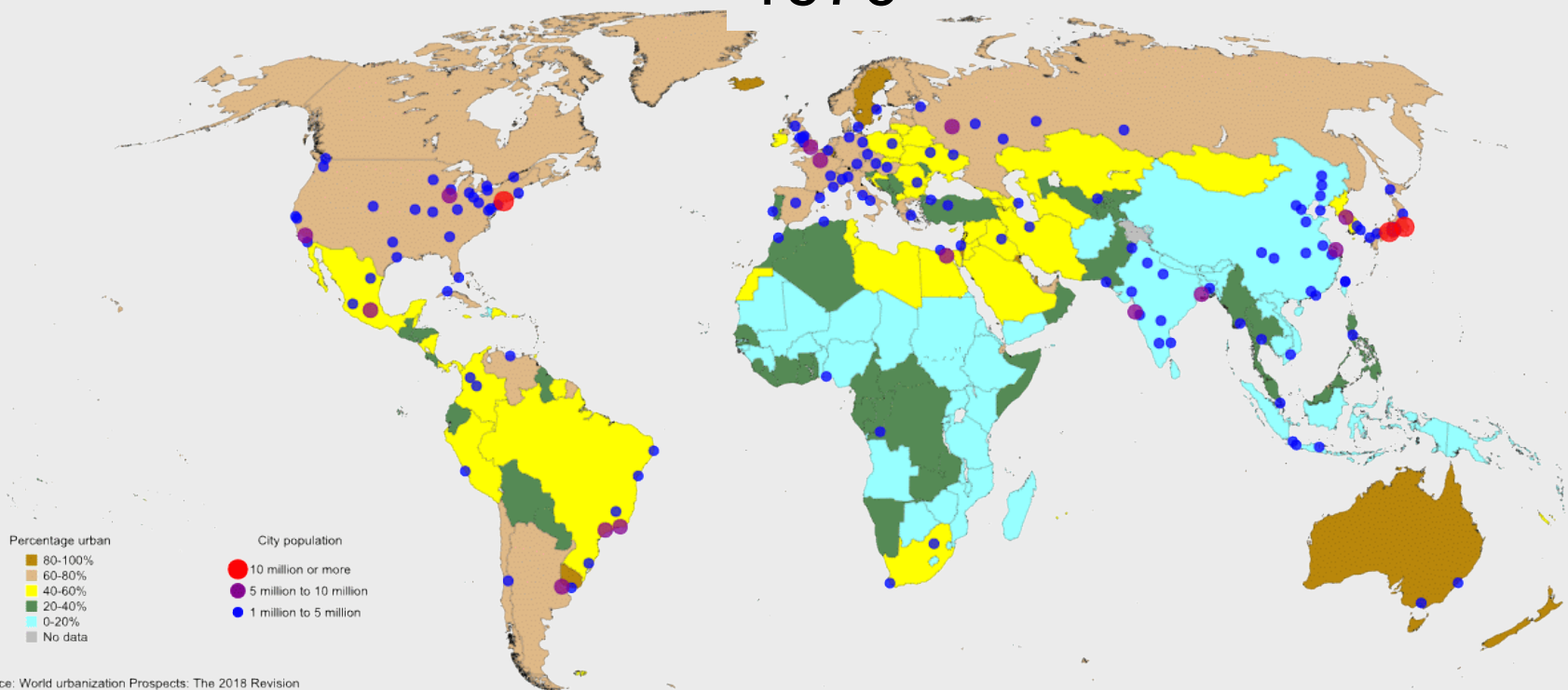Population Division
United Nations, Department of Economic and Social Affairs

Urban percentage and cities > 300,000

1970

Percentage urban
- 80-100%
- 60-80%
- 40-60%
- 20-40%
- 0-20%
- No data

City population
- 10 million or more
- 5 million to 10 million
- 1 million to 5 million

Data source: World urbanization Prospects: The 2018 Revision
The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).
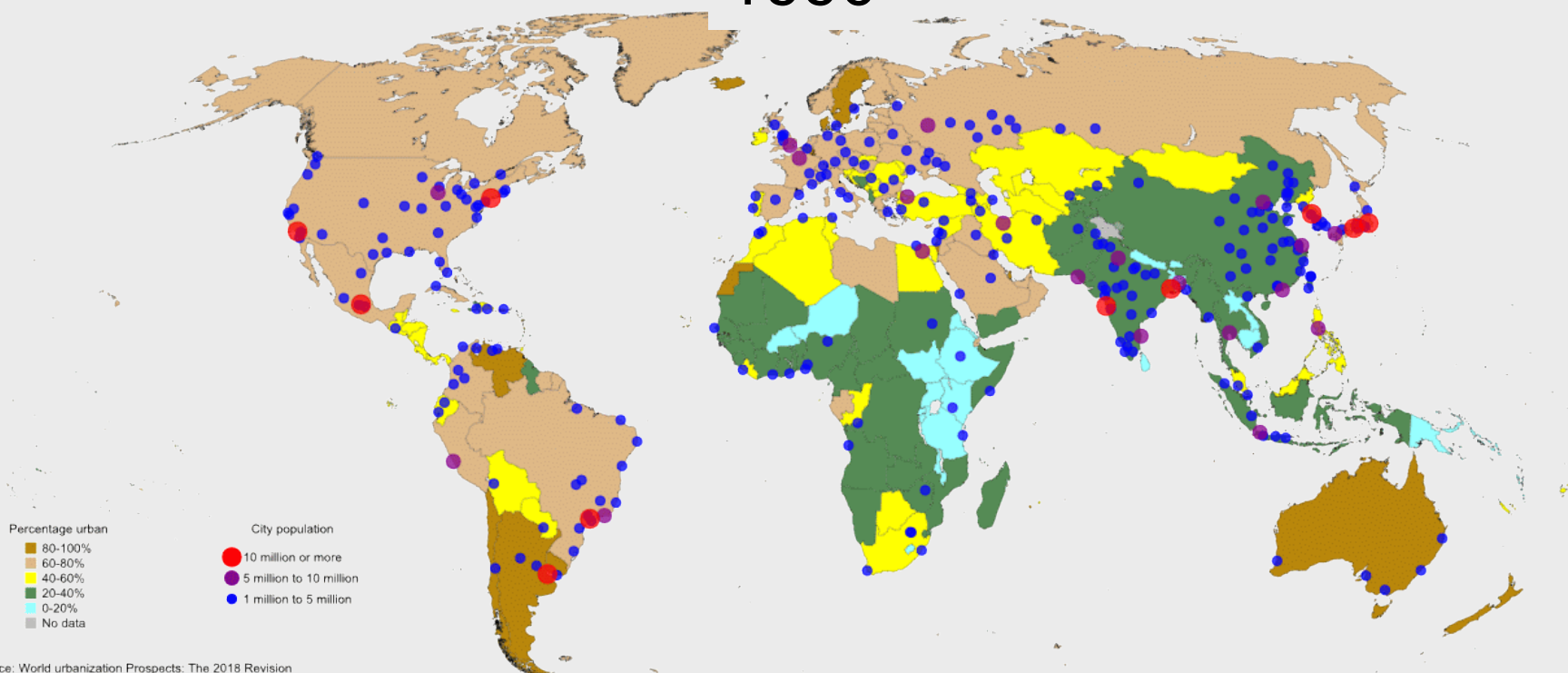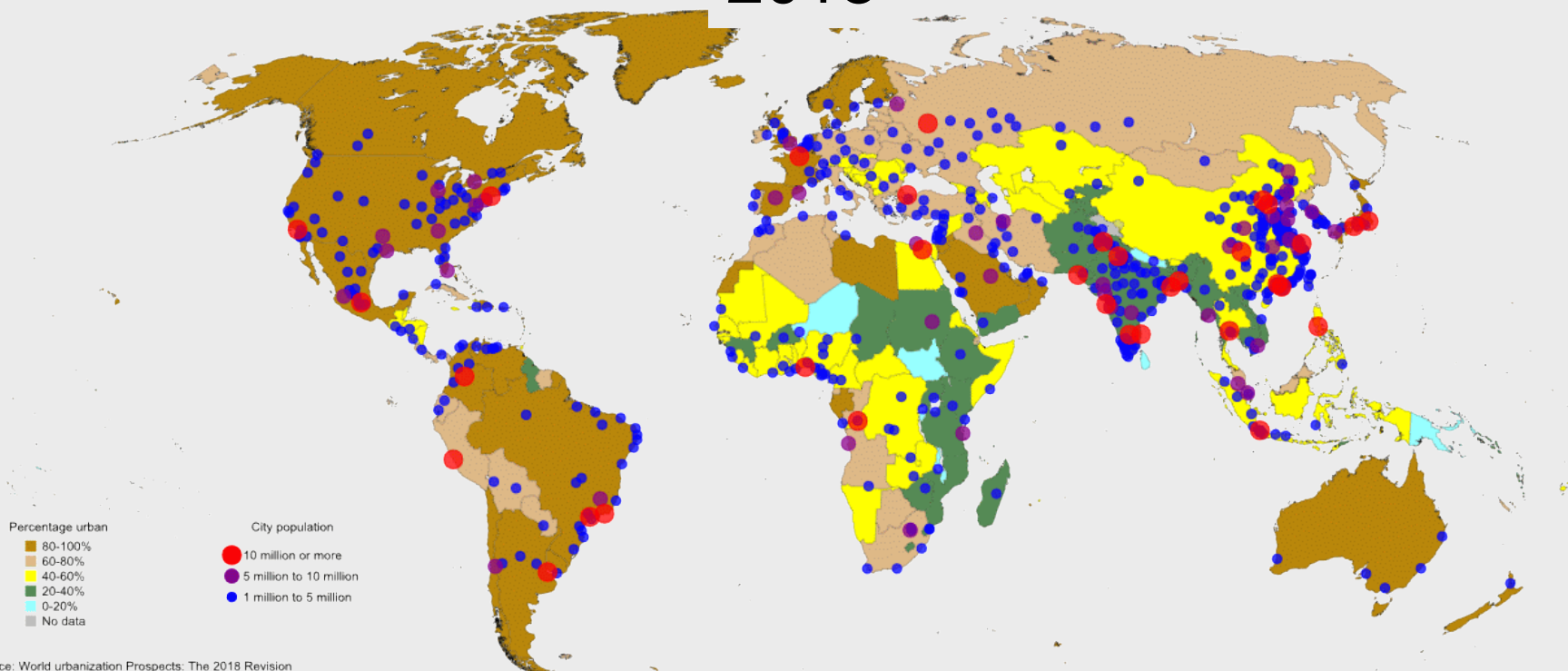
Source: World Urbanization Prospects: The 2018 Revision

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Urban percentage and cities > 300,000

1990

Percentage urban
- 80-100%
- 60-80%
- 40-60%
- 20-40%
- 0-20%
- No data

City population
- 10 million or more
- 5 million to 10 million
- 1 million to 5 million

Data source: World urbanization Prospects: The 2018 Revision
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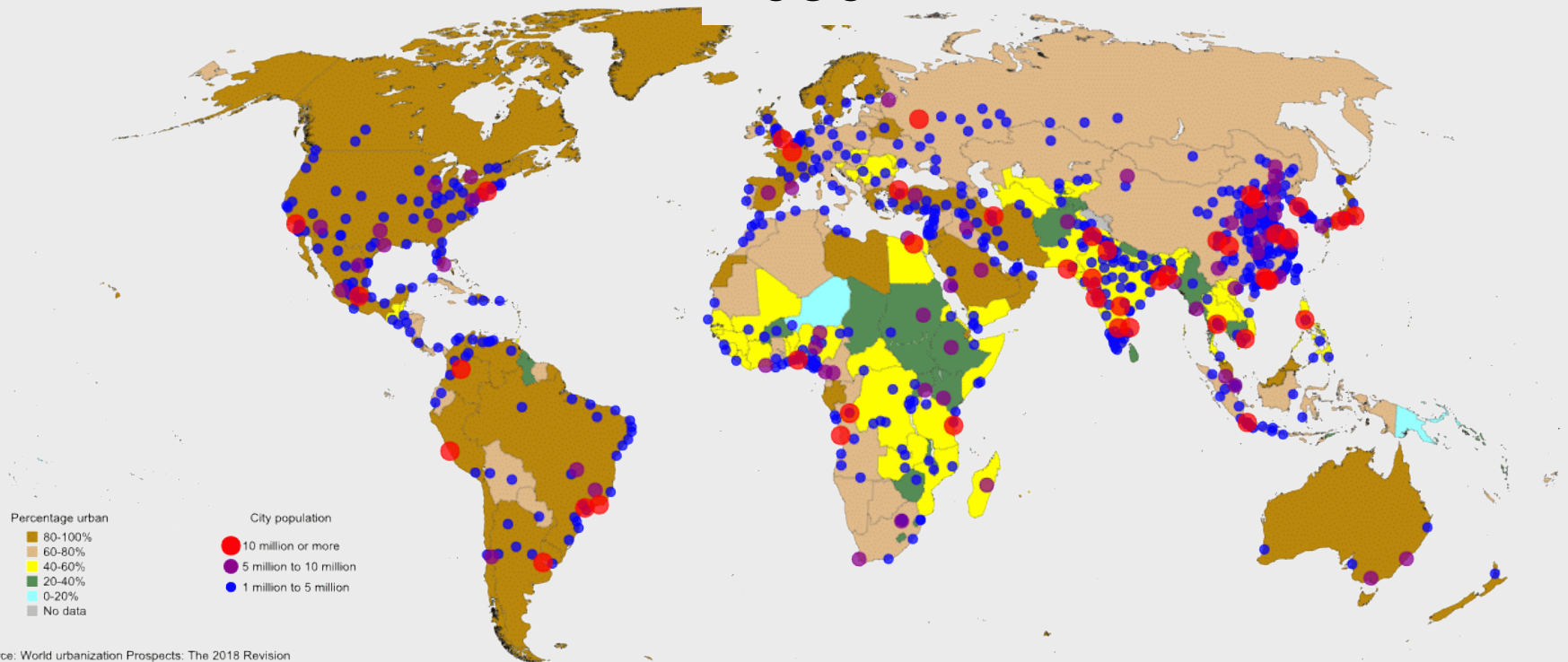
Source: World Urbanization Prospects: The 2018 Revision

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Urban percentage and cities > 300,000

2018

Percentage urban
- 80-100%
- 60-80%
- 40-60%
- 20-40%
- 0-20%
- No data

City population
- ● 10 million or more
- ● 5 million to 10 million
- ● 1 million to 5 million

Data source: World urbanization Prospects: The 2018 Revision
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Source: World Urbanization Prospects: The 2018 Revision

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Urban percentage and cities > 300,000

2030

Percentage urban
- 80-100%
- 60-80%
- 40-60%
- 20-40%
- 0-20%
- No data

City population
- 10 million or more
- 5 million to 10 million
- 1 million to 5 million

Data source: World urbanization Prospects: The 2018 Revision

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

Source: World Urbanization Prospects: The 2018 Revision

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International migrants by regions of origin and destination, 2017
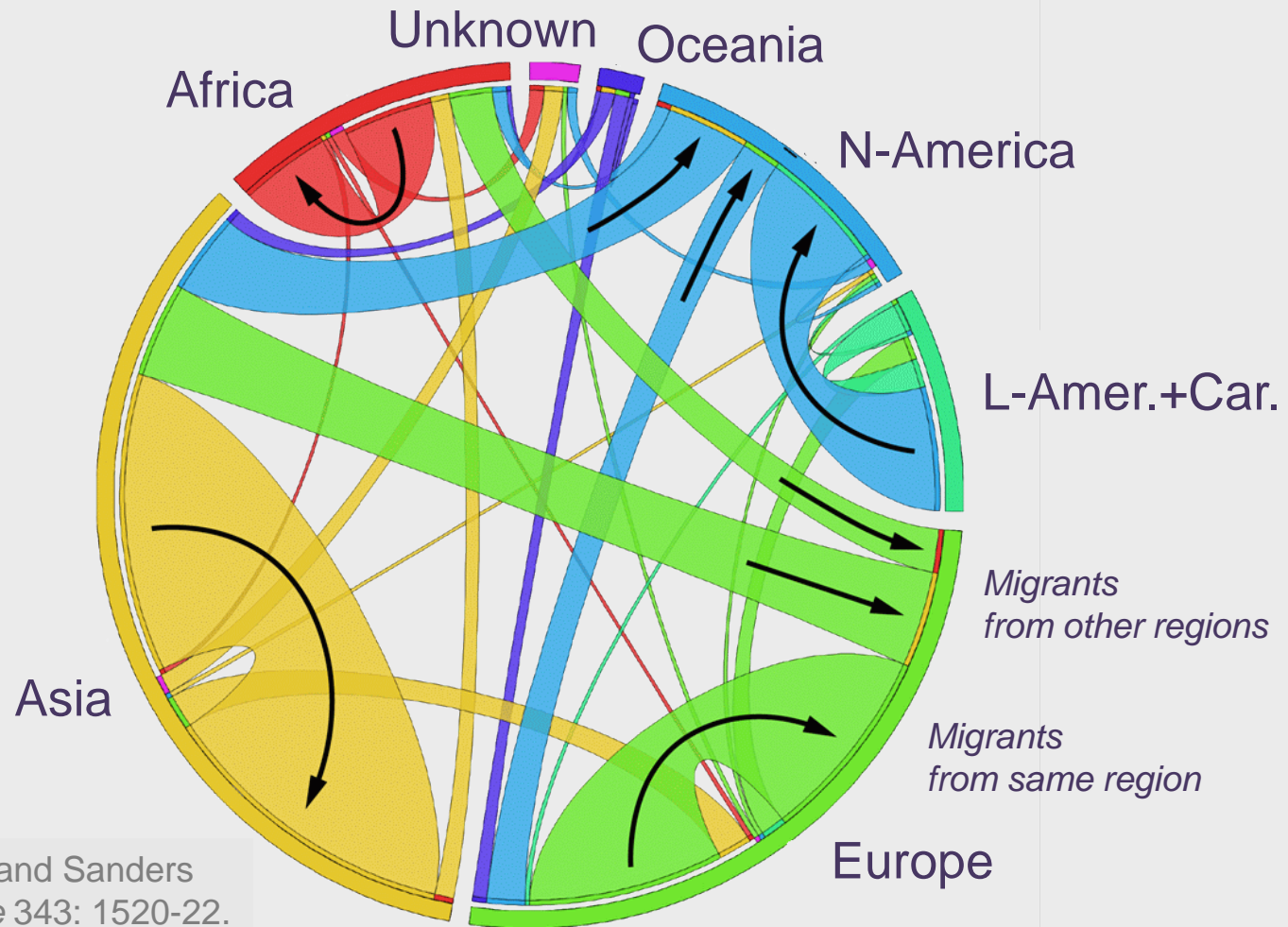
Based on Abel and Sanders (2014), *Science* 343: 1520-22.

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History of UN population projections

- The United Nations has produced 25 sets of population projections since 1951

- Early projections were for the world or large regions only

- In 1968, the United Nations began making population projections for individual countries

- The latest set (2017 Revision) includes projections from 2015 to 2100 for 233 countries or areas

Methods of UN population projections

- Calculations using a cohort-component approach
- Assumptions about future trends of fertility and mortality are:
  - Derived primarily from past trends for a given country
  - Also informed by theories of demographic change and by historical experience of other countries
- Alternative future trends have traditionally been described using variants and scenarios
- Alternative future trends are now also depicted using a probabilistic model

Using historical evidence

- UN projections of fertility and mortality are guided by historical trends in those same variables

- Regularities in historical trends have led to theories of demographic change, which give structure to the projection model

- Model is calibrated for each country using an estimation procedure that relies primarily on data for that country

- Data for other countries influence estimates especially for countries in which the transition is less complete

Theory-based methods

- Theories of the demographic transition share certain common points about the historical decline of fertility and mortality, which are reflected in the structure of the United Nations projection model

- For fertility, there is a transition from high to low values of TFR, typically followed by fluctuations and a modest recovery (below 2.0)

- For mortality, the increase of life expectancy at birth follows an S-curve (slow-rapid-slow change), which remains positive and roughly linear in the final phase

Three phases of fertility trend: Pre-decline, decline, post-decline

Source: World Population Prospects: The 2017 Revision, Methods report
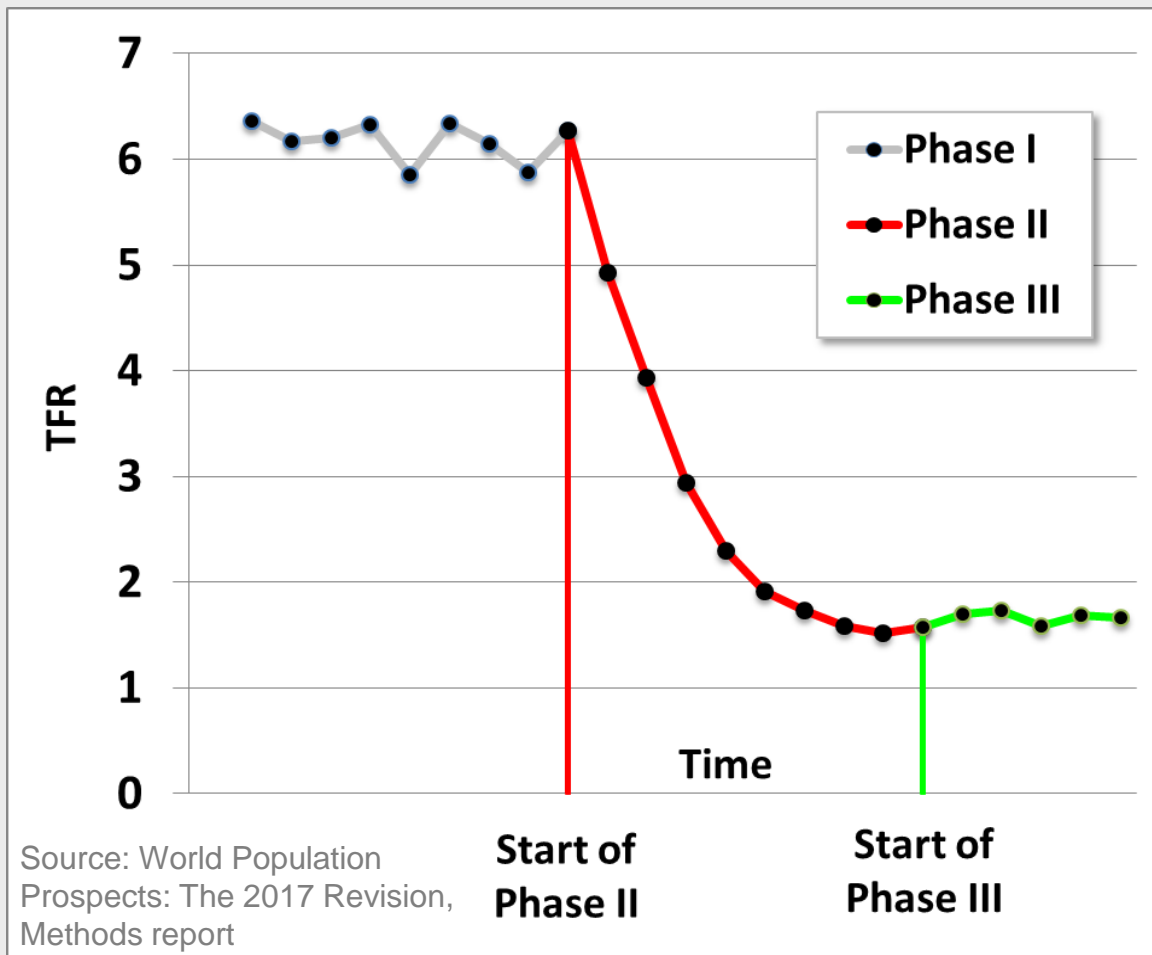
Phase I: High-fertility, pre-transition phase. Not modelled.

Phase II. Fertility transition phase, modelled by double-logistic function using a Bayesian hierarchical model.

Phase III. Low-fertility, post-transition phase, modelled with a first-order auto-regressive time series model, AR(1), in a Bayesian hierarchical framework.

Model of historical trend in life expectancy at birth
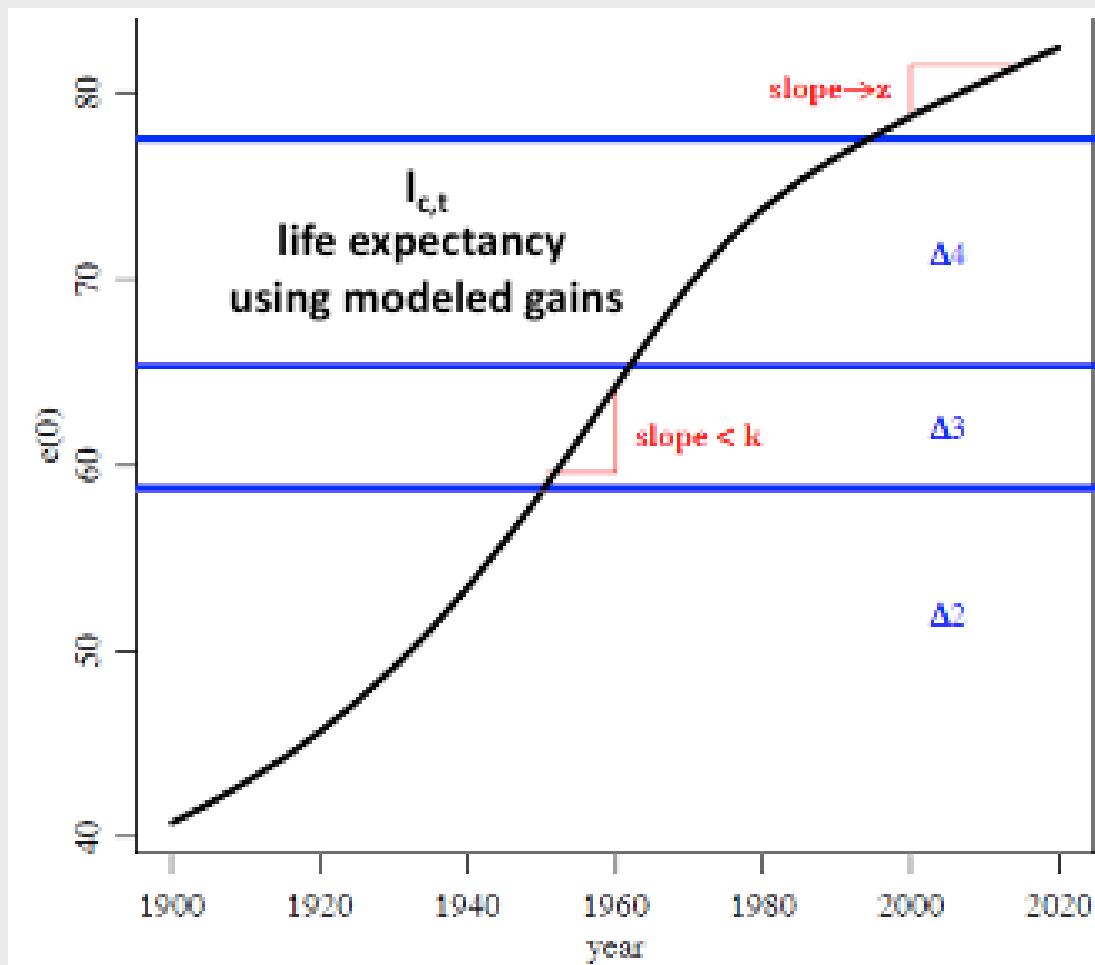
Phase II: Fertility decline model

- Rate of TFR decline depends on level of TFR

- Peak rate of decline when total fertility rates is around 5 or 6

- Slower decline for TFR > 6 or TFR < 5

- Rate of decline in the TFR, as a function of its current level, is modeled using a double-logistic function, which has an inverted U-shape

- Bayesian hierarchical model used to estimate model for the world and for each country

- In addition, standard time series methods are used to project future trends

Fertility projection for Bangladesh

TFR: Rate of decline function   Probabilistic TFR projections
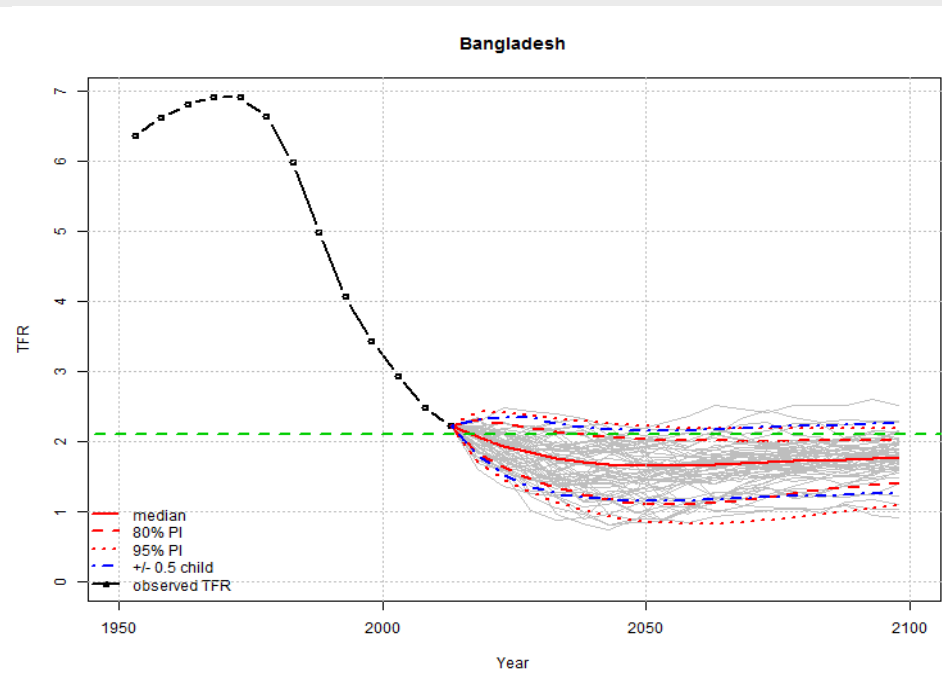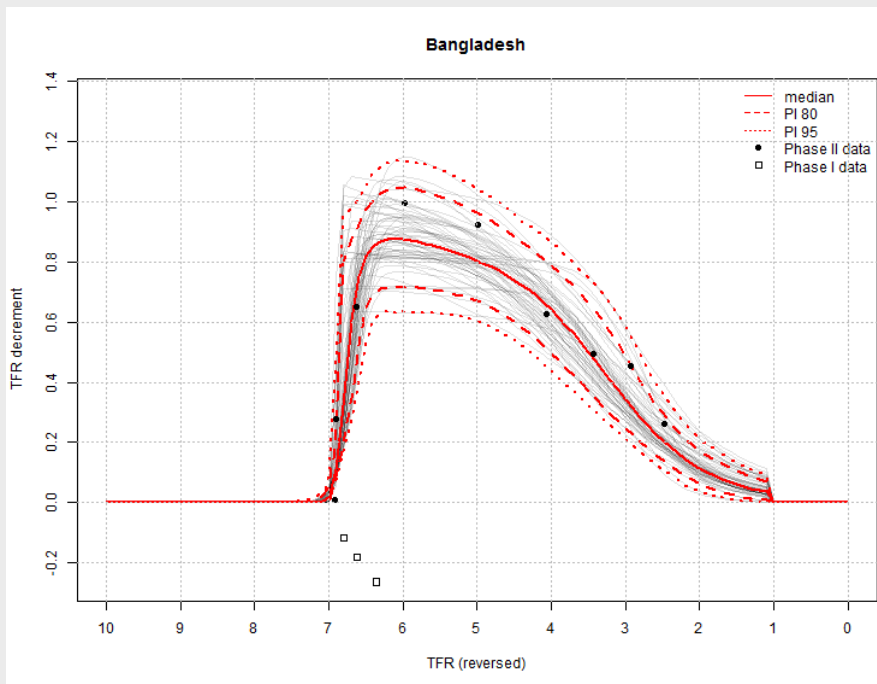
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Country-specific estimates of double-logistic TFR decline function
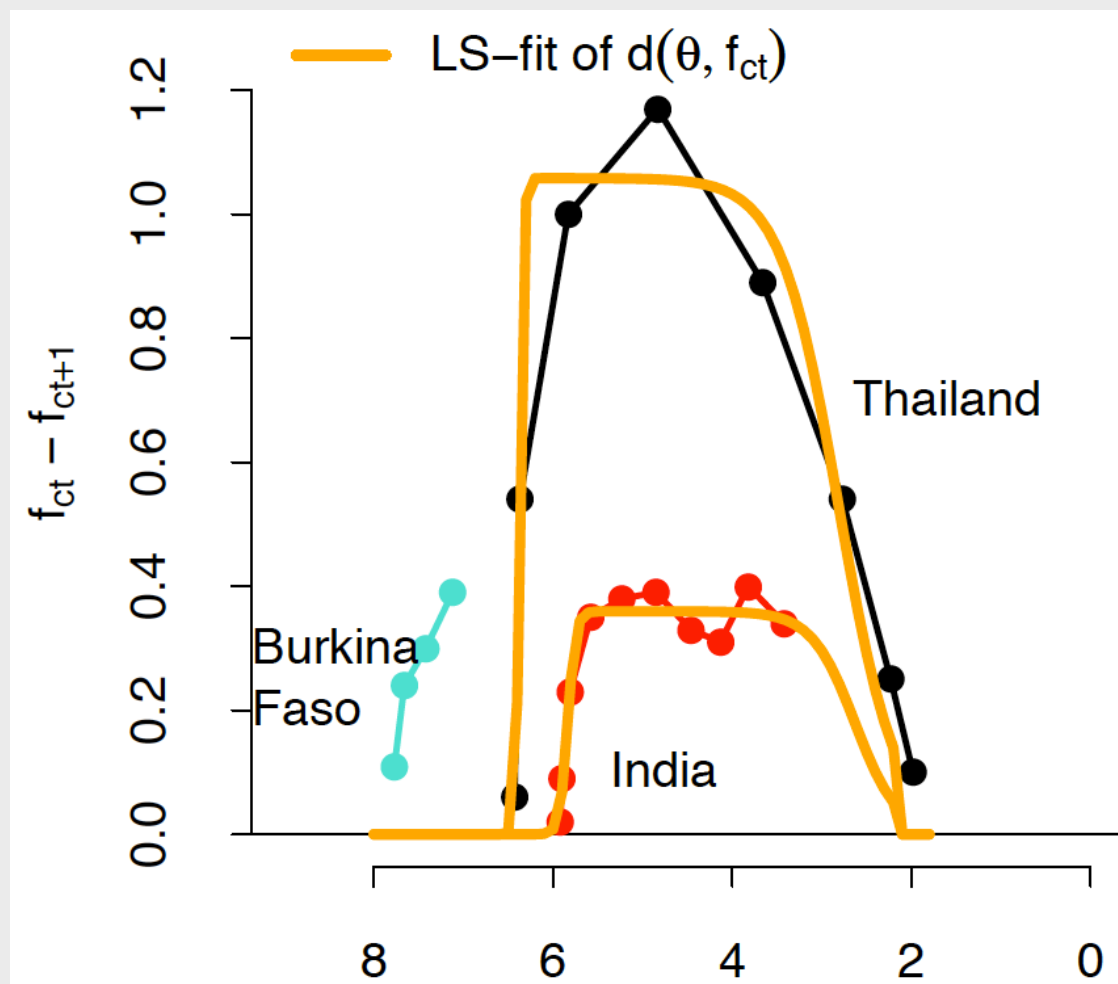
Phase III: Post-transition fertility rebound

Netherlands
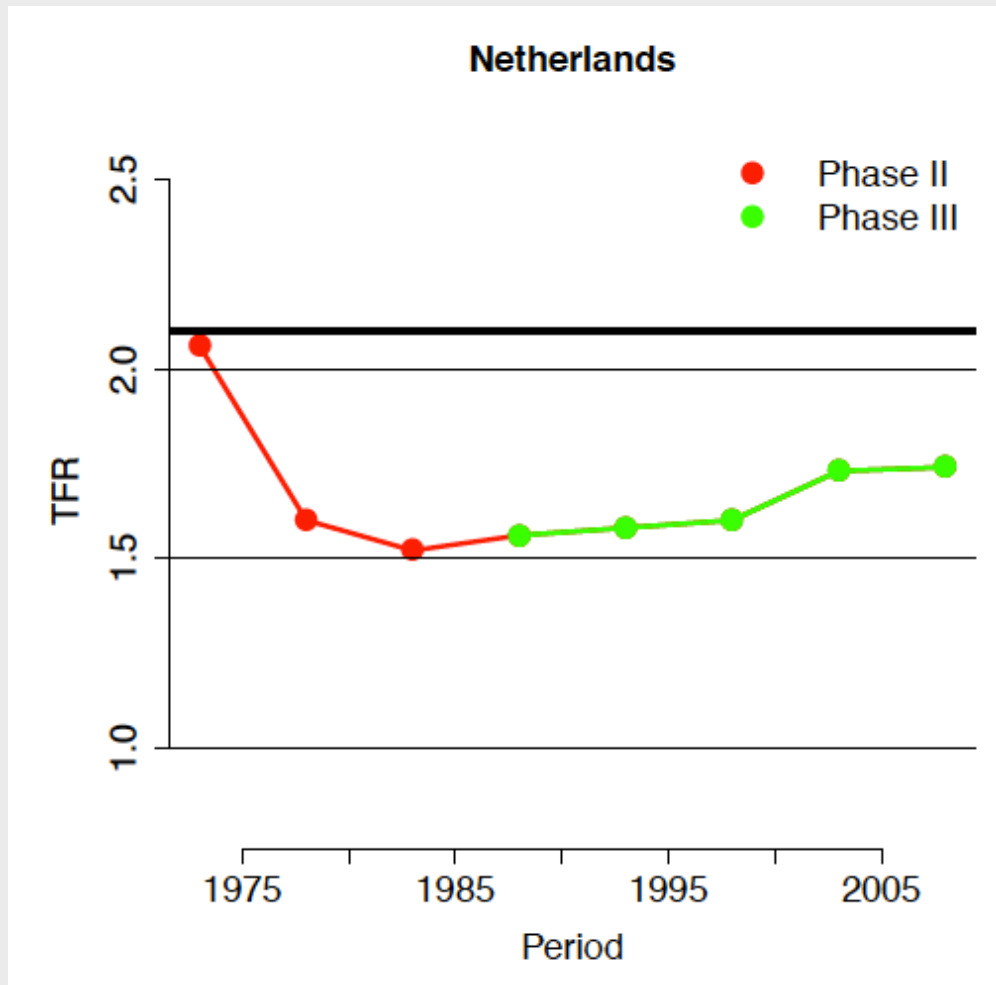
Start of Phase III defined by two earliest consecutive 5-year increases when TFR < 2

Has been observed in 36 countries or areas

Future trends are uncertain

- Traditionally, UN projections have included several variants or scenarios:
  - Variants describe future trends produced by varying key assumptions (e.g., fertility), illustrating sensitivity of results
  - Scenarios describe hypothetical future trajectories, illustrating core concepts such as population momentum
- Bayesian hierarchical model of past trends, combined with time series model of future trends, yields probabilistic depiction of plausible future outcomes

World population projection

World: Total Population

World population projection

World: Total Population

World population projection

World population projection

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World population projection

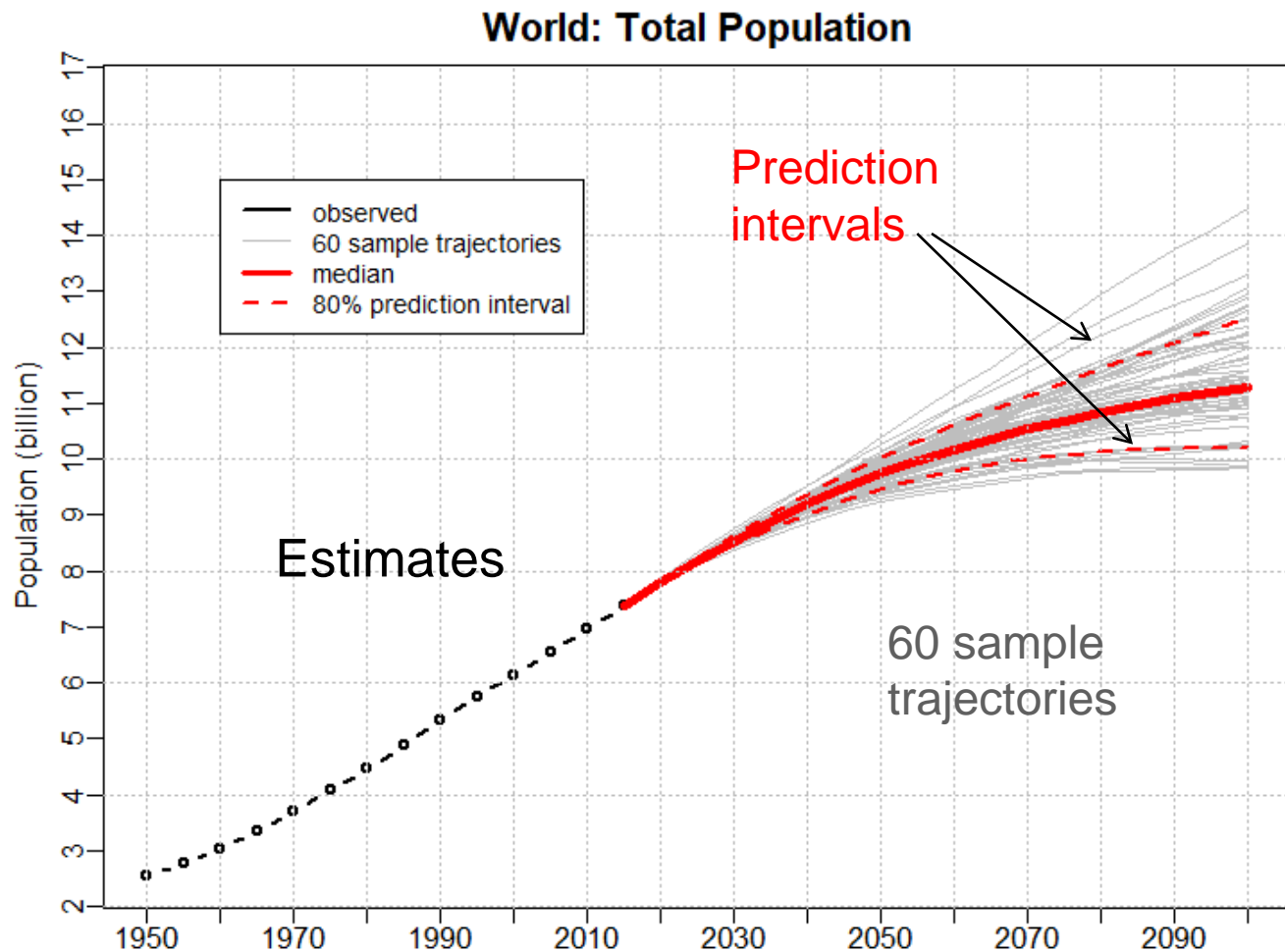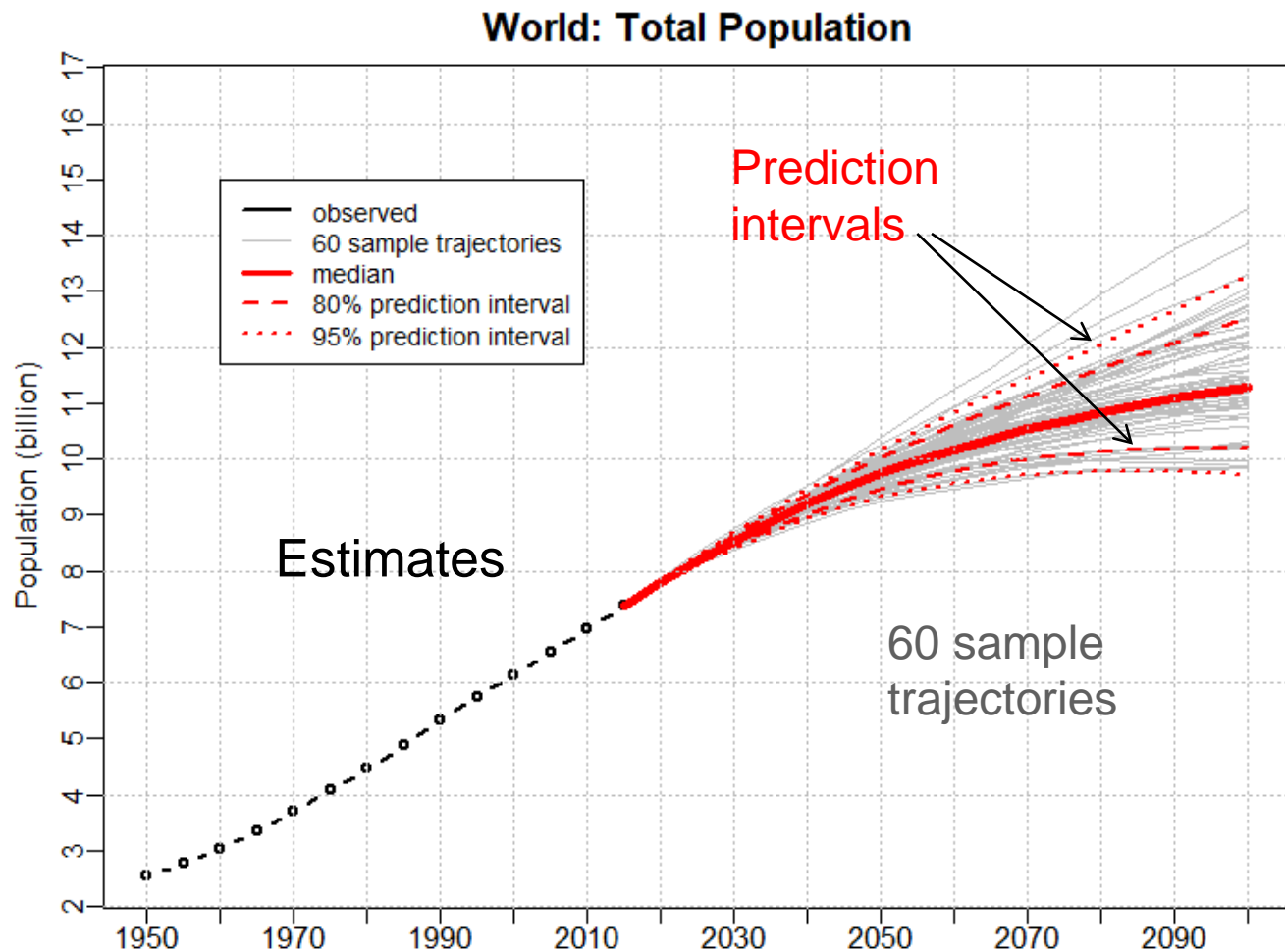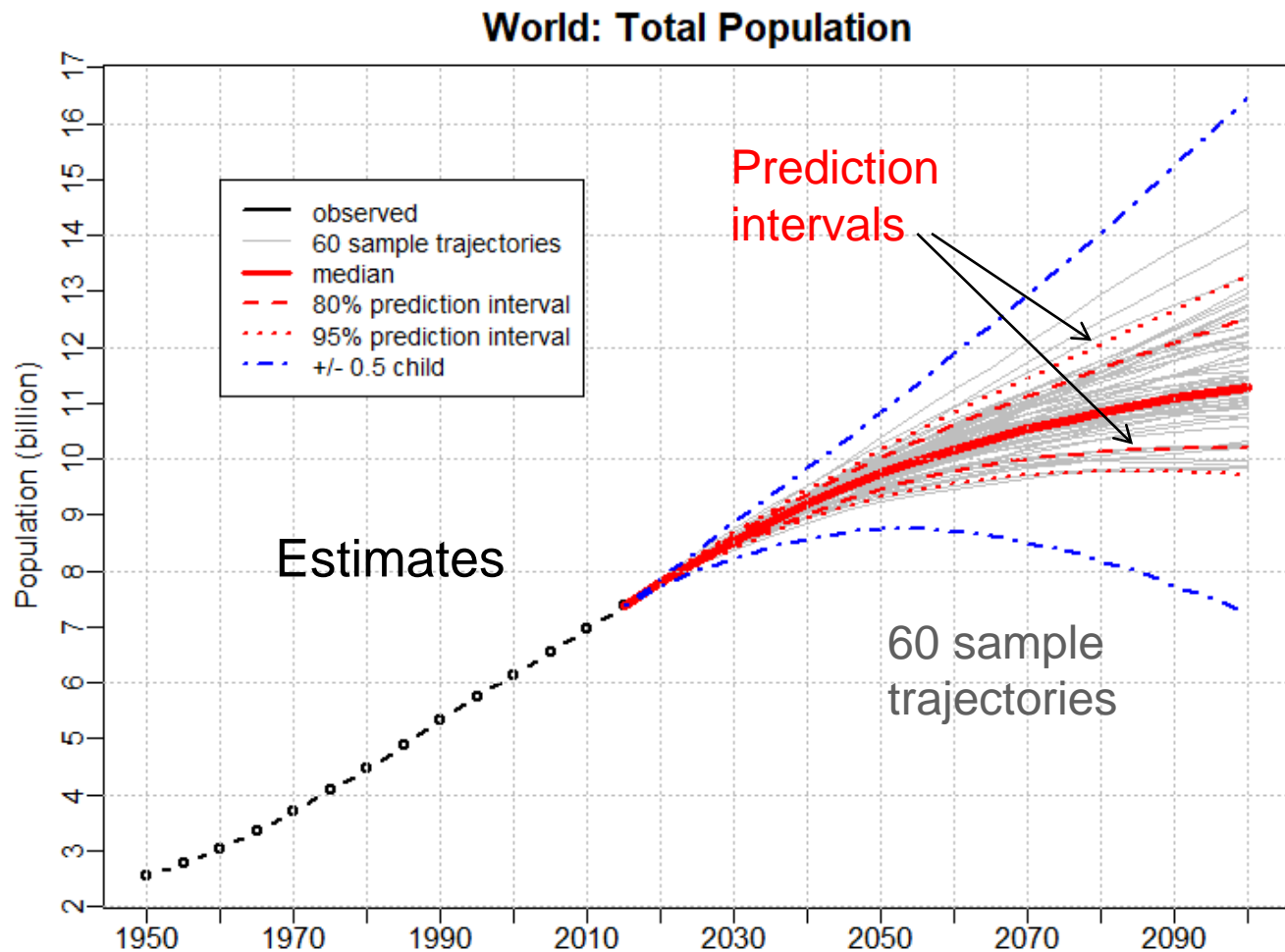World: Total Population

World population projection

World: Total Population

What have we learned from the probabilistic projections?

Traditional fertility variants (+/- half child):

- Overstate the plausible range of future trends at the global level, and also for some low-fertility countries (TFR < 2)

- Understate the plausible range of future trends for medium- and high-fertility countries (TFR > 3)

World population growth:

- 95% prediction interval for 2050: 9.4 – 10.2 billion

- 95% prediction interval for 2100: 9.6 – 13.2 billion

- Population stabilization unlikely in this century, but not impossible (probability ~27%)
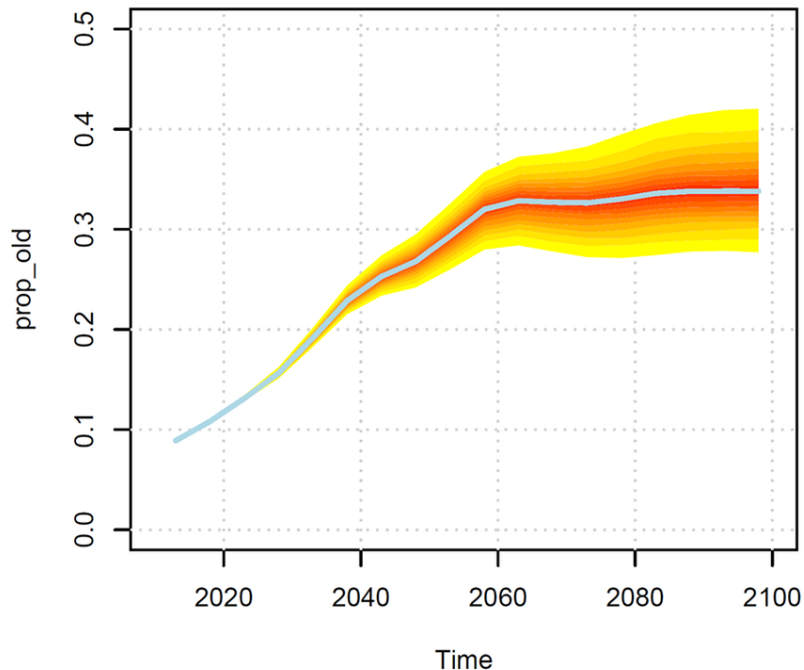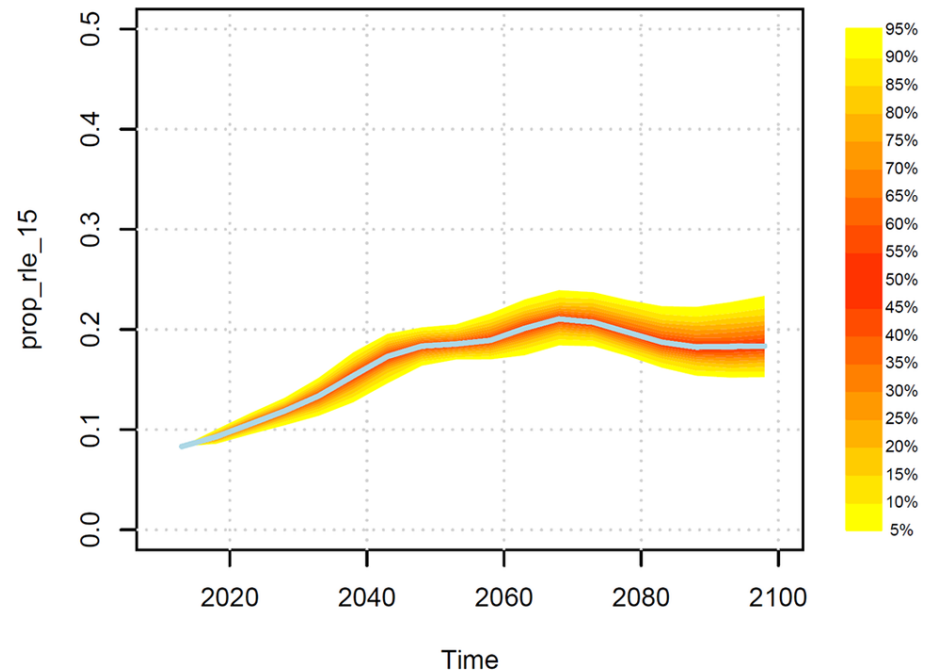
What else have we learned?

It is possible to design policies that limit the uncertainty of relevant outcomes that is caused by uncertainty in future demographic trends.
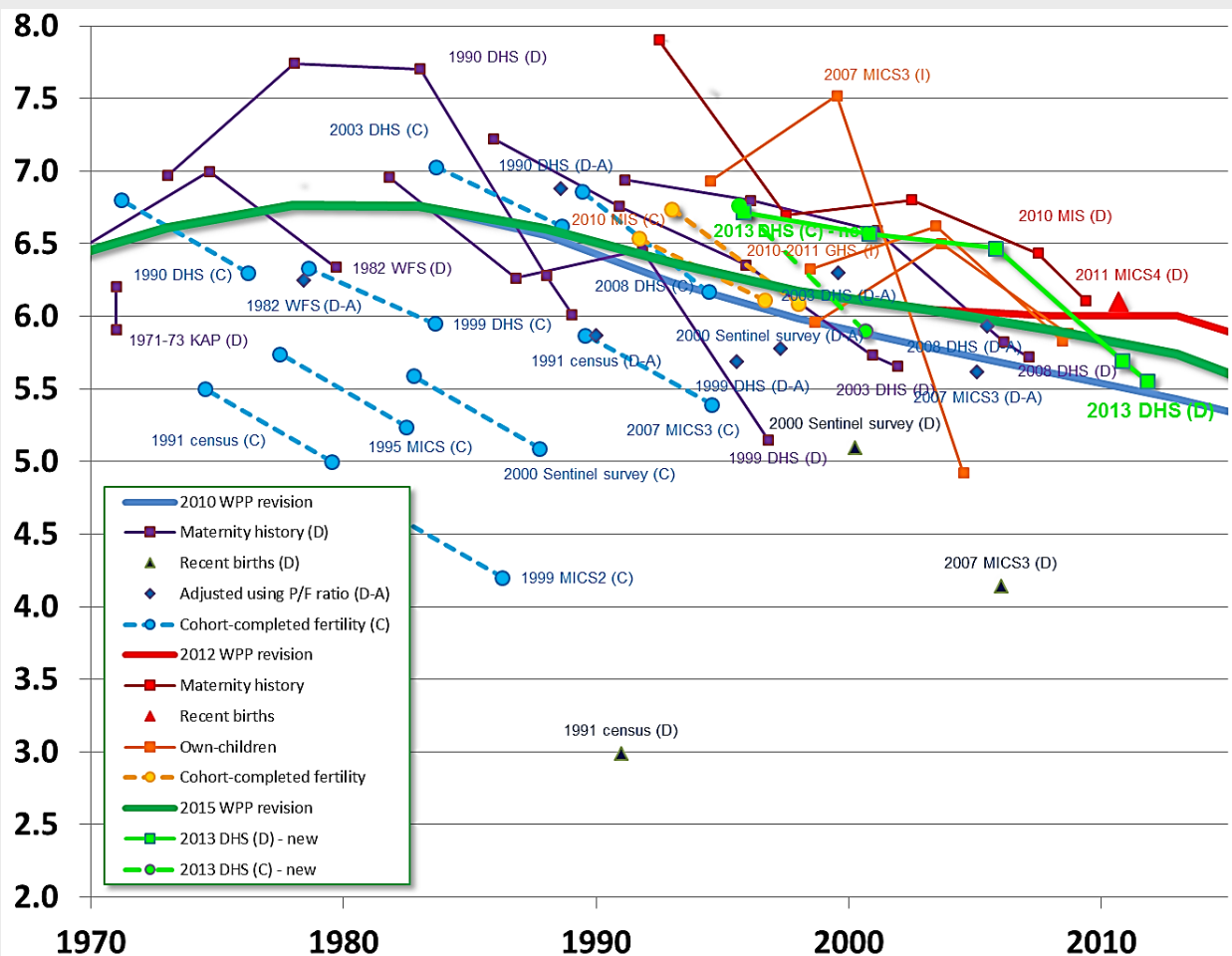

Note: RLE = remaining life expectancy

Source: Sanderson, Scherbov and Gerland (2017), PLOS ONE 12(6): e0179171.

Additional sources of uncertainty: Past and current levels of fertility (Nigeria)

Source: World Population Prospects: The 2017 Revision, Methods report

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Summary

- Population projections by the United Nations are derived using models of future trends in the demographic components of change, in particular fertility and mortality

- UN projection models have a strong basis in demographic theory; for each country, models are calibrated primarily using data from each country, with data from other countries filling information gaps

- Potential range of future trends is reflected in traditional variants and scenarios; a new method based on statistical models yields probabilistic statements about plausible future trends

- Work on the probabilistic assessment of uncertainty is ongoing and could benefit from further efforts to incorporate additional sources of uncertainty (especially, current fertility and future migration)

THANK YOU