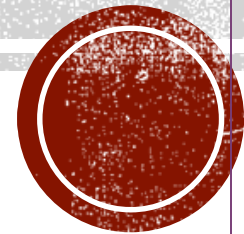
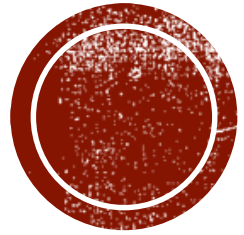


SEMINAR 2: DEMOGRAPHIC PROCESSES

Chen Luo (l.chen7@uw.edu.pl)

Interdisciplinary Centre for Labour Market and Family Dynamics (LABFAM)
Faculty of Economic Sciences
University of Warsaw





WORLD POPULATION

The road to 8 million

WORLD POPULATION

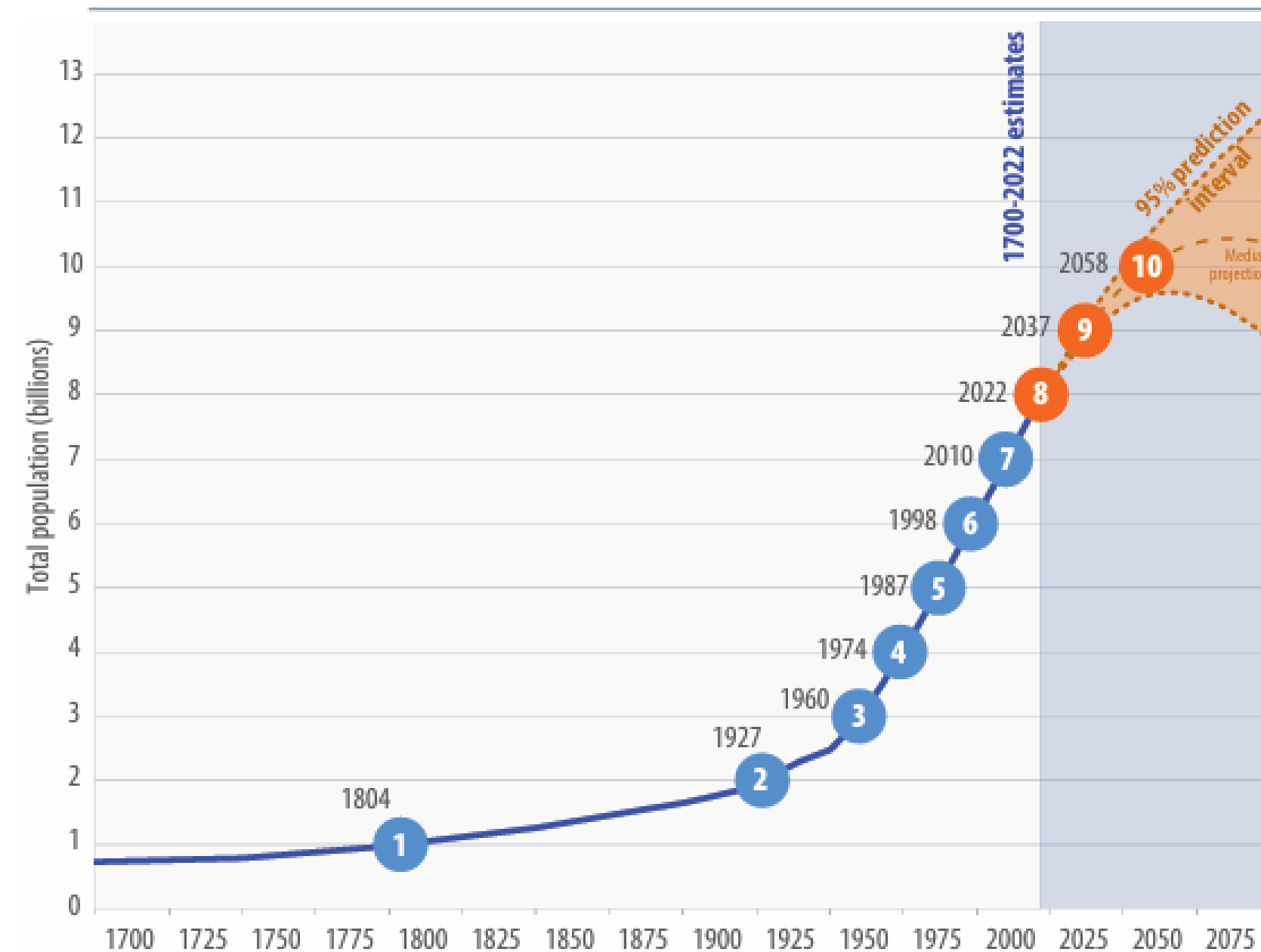
- An overview of human population history <https://youtu.be/vJ5p3pZlBi4>
- What can we learn from this video?
 - What are the factors driving changes in population size?



WORLD POPULATION

- Diseases / Plague
 - Natural Disasters
 - Farming (agricultural revolutions)
 - Transportation Technologies
 - Medicines/ vaccine
 - The emergence and spread of culture, religions
 - The rise of civilizations and empires
- ✓ *Population changes are both causes and consequences of technological progress and social development!*





WORLD POPULATION

Figure 1. Global population size: estimates for 1700-2022 and projections for 2022-2100

Source: UN (2022) *World population prospects*.

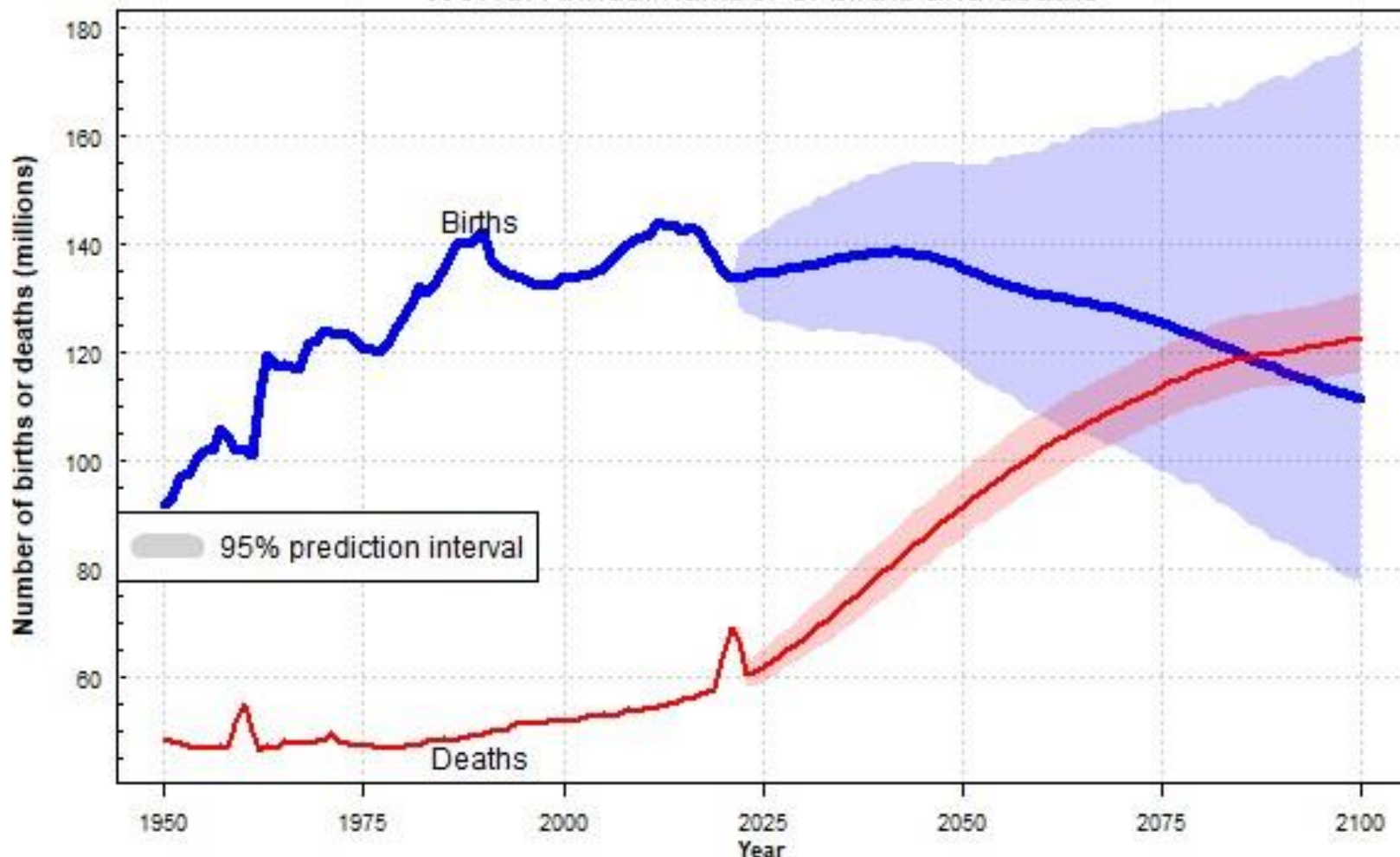


WORLD POPULATION

- So what's happening now?
- [A world of 8 billion - YouTube](#)



World: Annual number of births and deaths



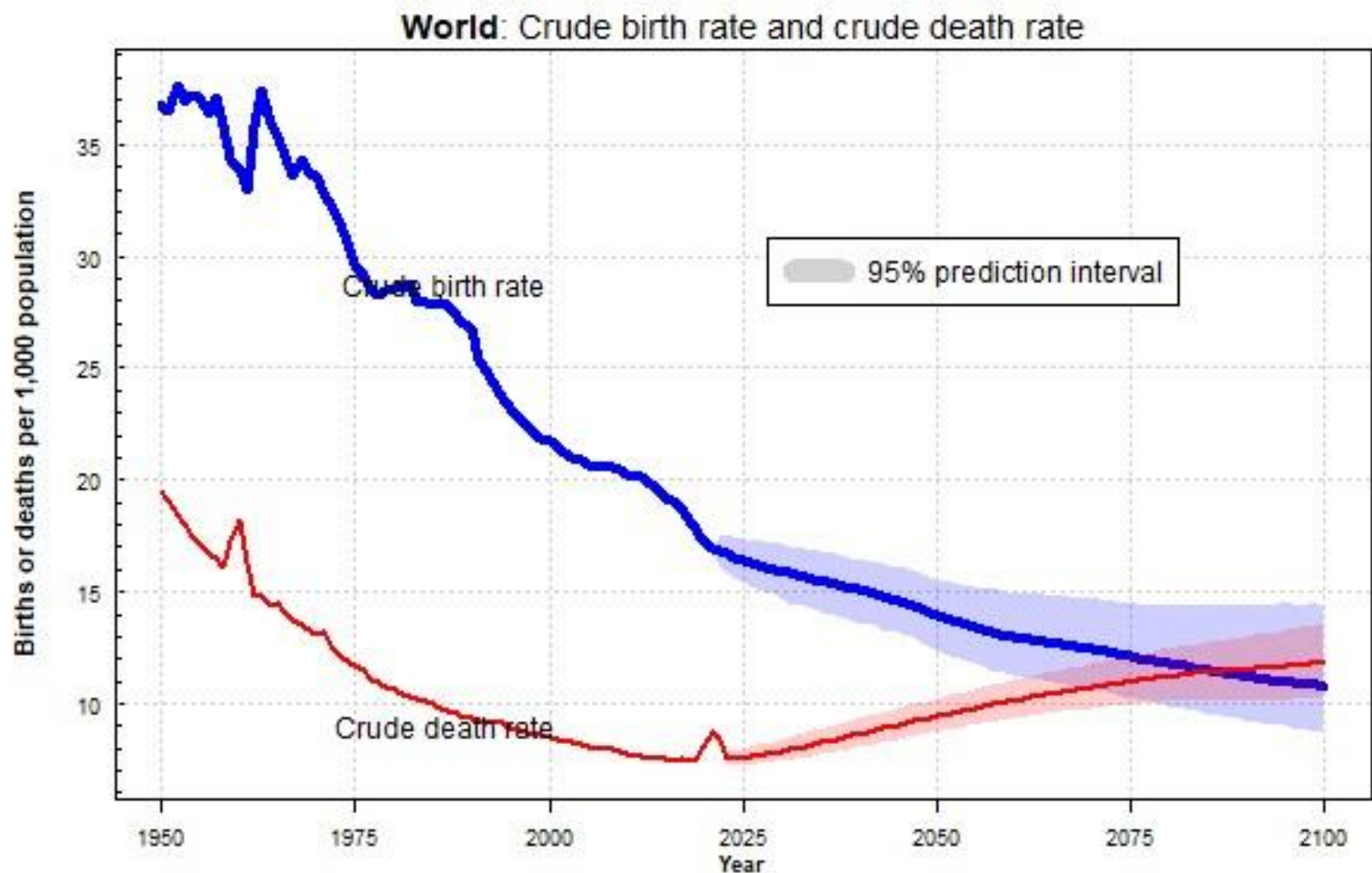
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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

WORLD POPULATION BIRTHS AND DEATHS

Figure 2. Births and deaths,
1950-2100

- Why has the annual number of deaths increased since the 1980s?
- Based on this figure, when is the world population expected to reach its peak?





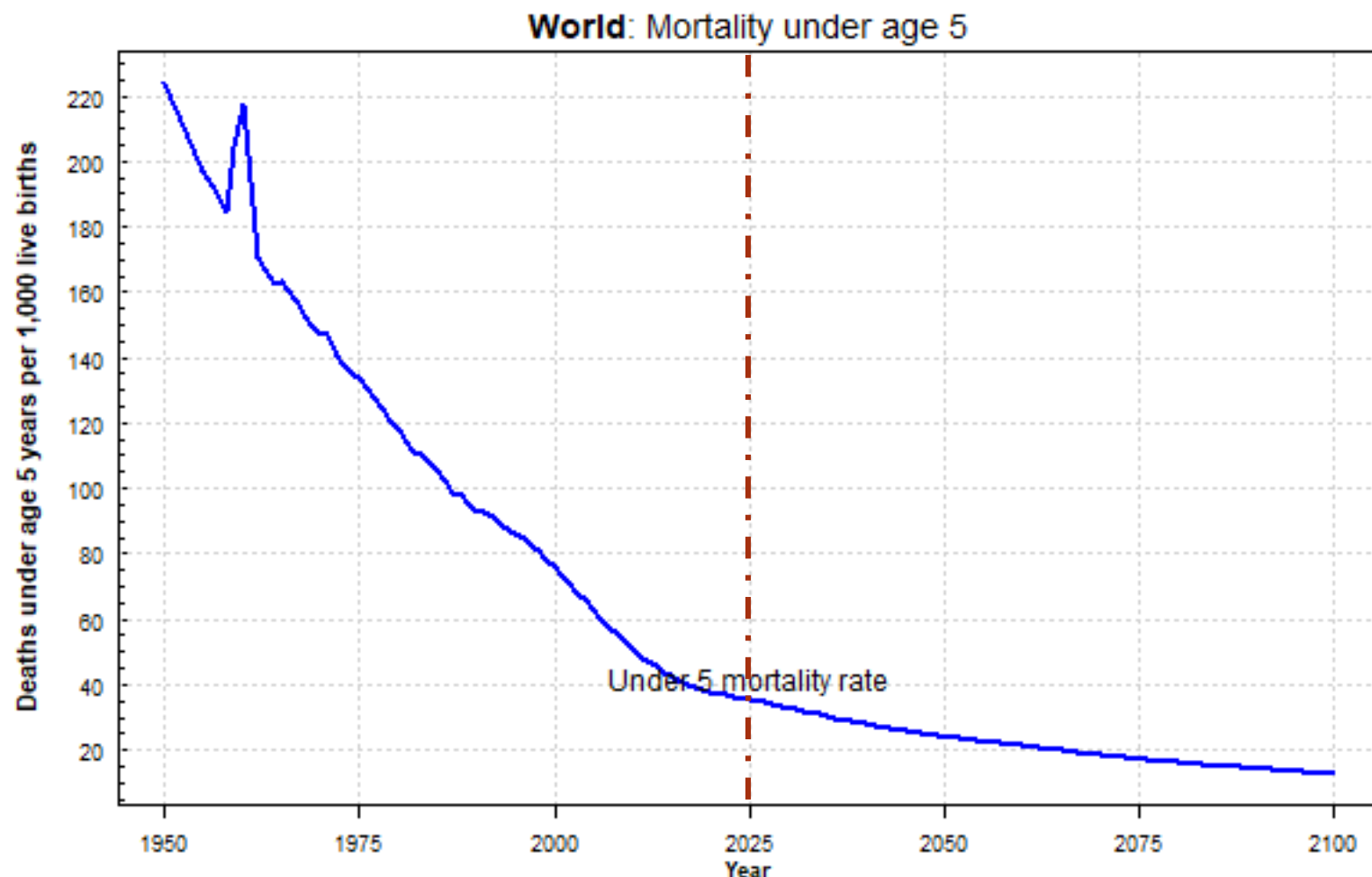
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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

WORLD POPULATION BIRTHS AND DEATHS

Figure 3. Crude birth rate
crude death rate, 1950-
2100



WORLD POPULATION BIRTHS AND DEATHS



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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

Figure 4. Mortality under age 5, 1950-2100



WORLD POPULATION BIRTHS AND DEATHS

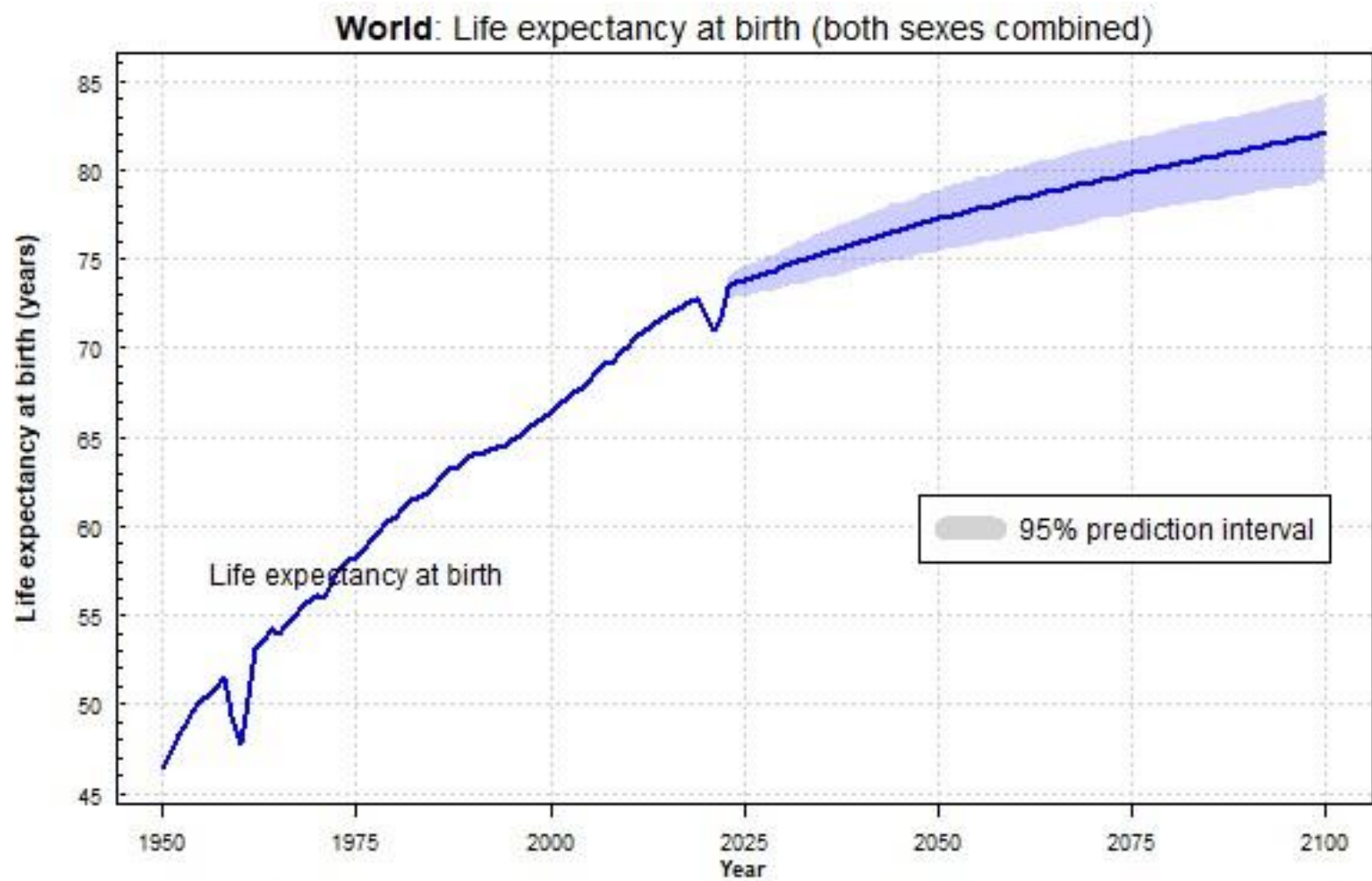


Figure 5. Life expectancy at birth, 1950-2100

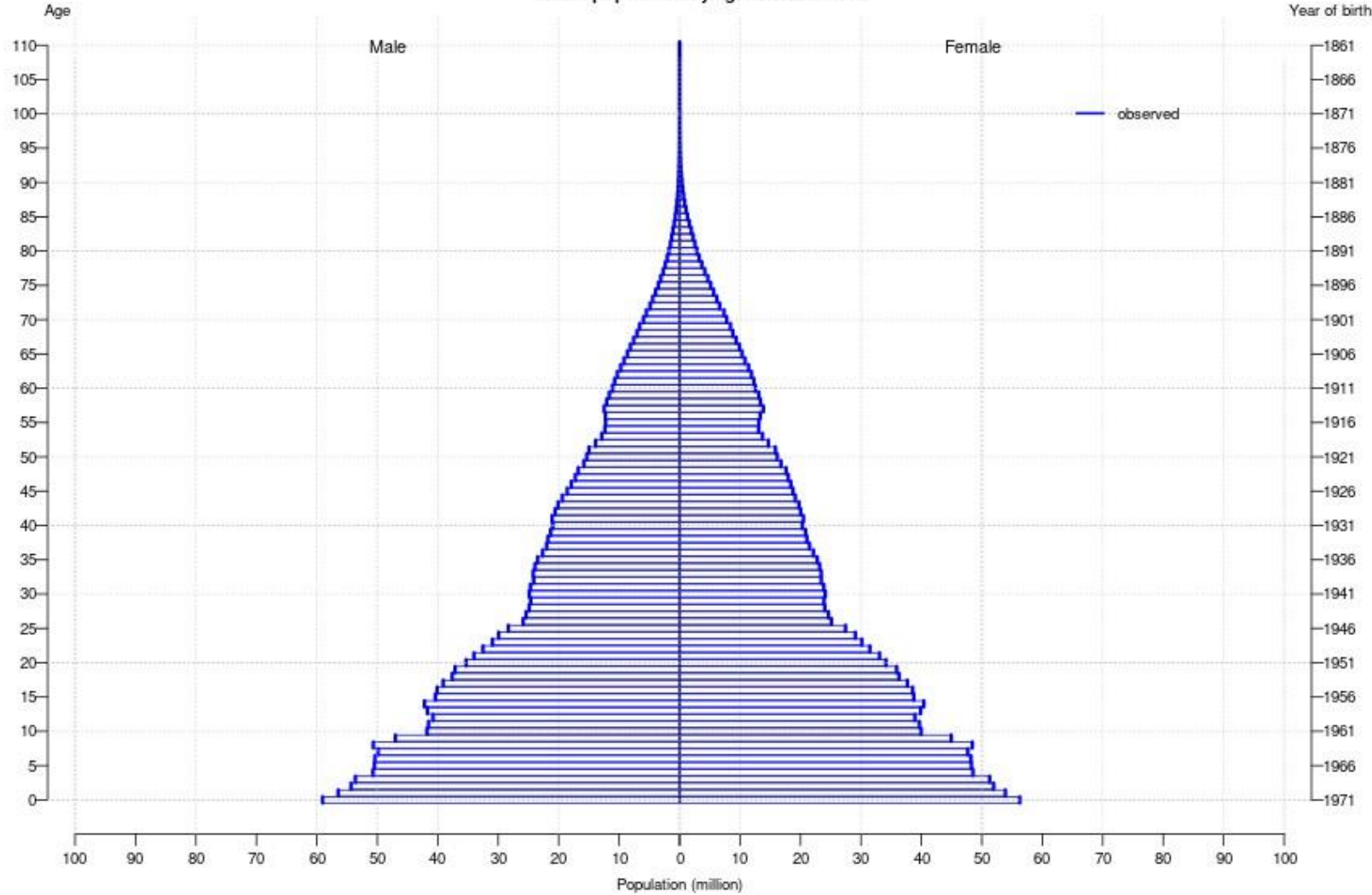
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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>



Age

Year of birth

World population by age and sex: 1972



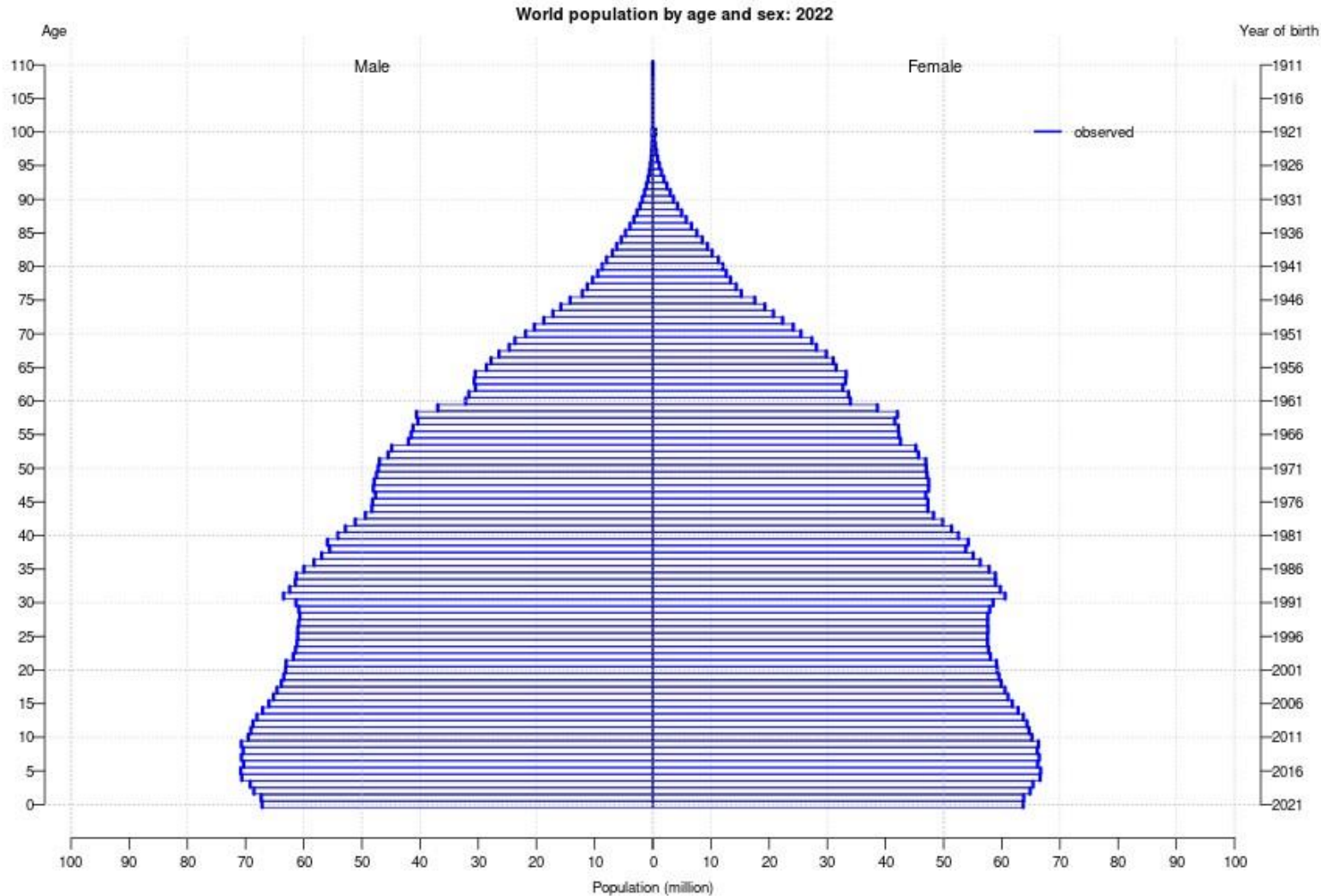
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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

Population (million)

WORLD POPULATION: POPULATION PYRAMID

Figure 6. World population
by age and sex, 1972





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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

WORLD POPULATION: POPULATION PYRAMID

Figure 67 World population
by age and sex, 2022



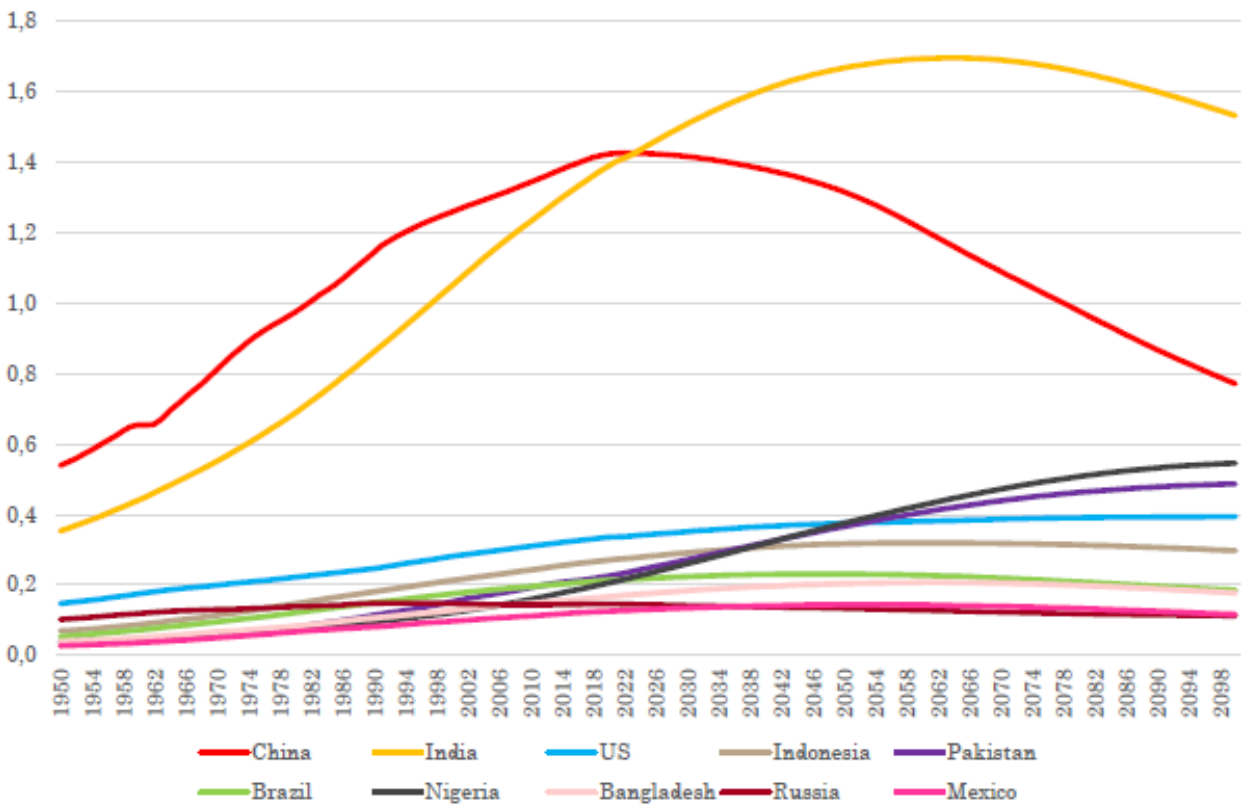
WORLD POPULATION BY COUNTRY

Figure 8. Cartogram of the World Population in 2018



WORLD POPULATION BY COUNTRY

Figure 9. Population of 10 most populous countries in the world, 1950-2100 (in million)

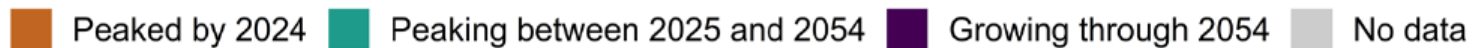


Country	Population
China	1,439 mln
India	1,380 mln
US	331 mln
Indonesia	274 mln
Pakistan	221 mln
Brazil	213 mln
Nigeria	206 mln
Bangladesh	165 mln
Russia	146 mln
Mexico	129 mln

Source: UN (2022) World population prospects, Mathematica database



Figure 10. Countries and areas by timing of the observed or projected population peak

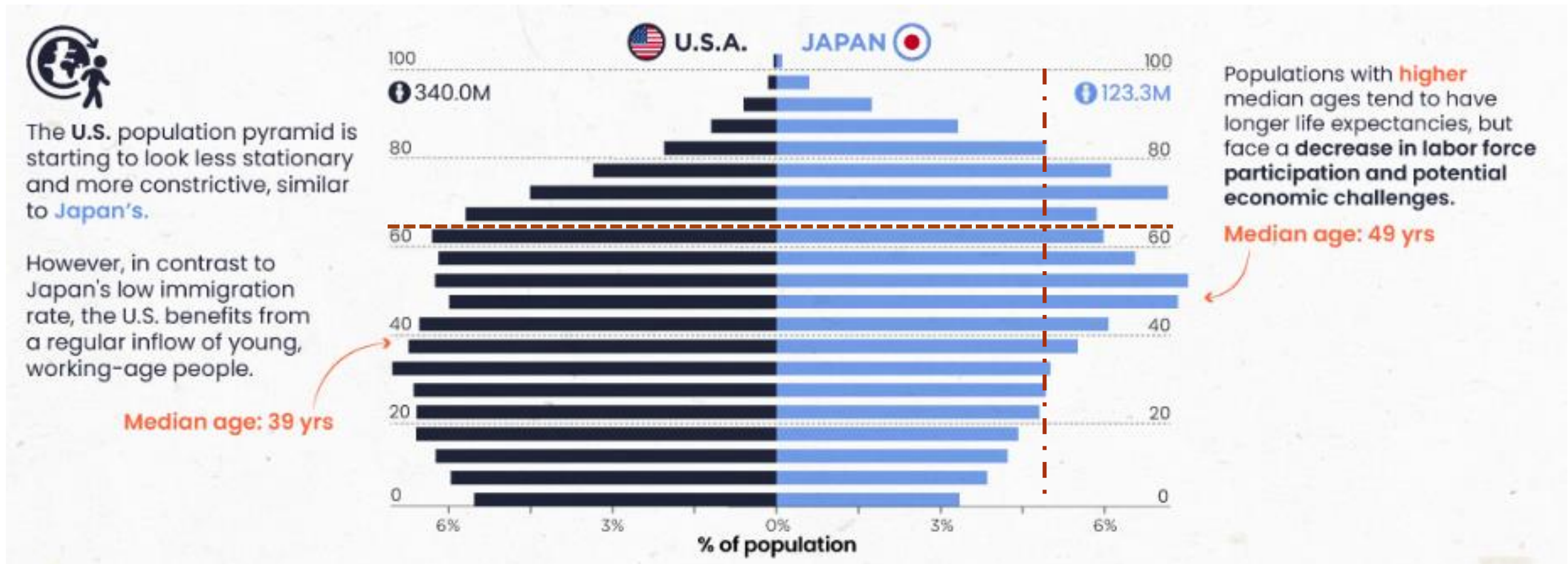


Source: United Nations (2024). World Population Prospects 2024: Summary of Results. UN DESA/POP/2024/TR/NO. 9. New York: United Nations.



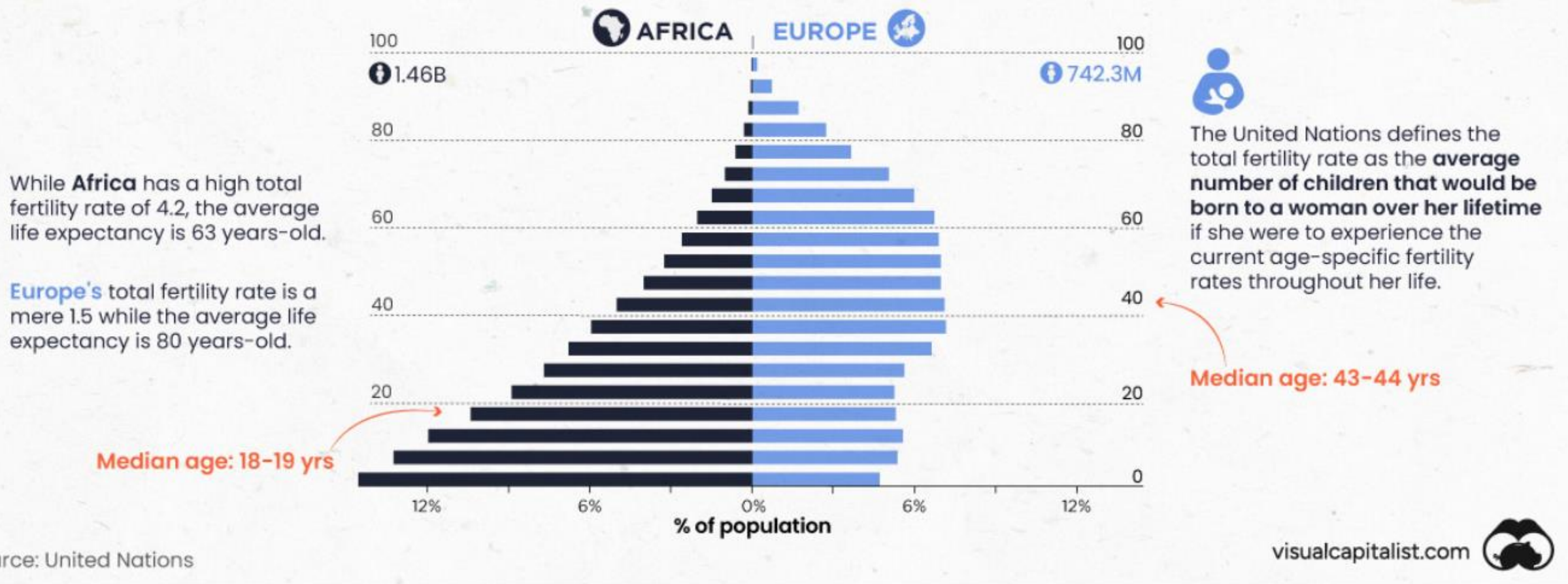
WORLD POPULATION BY COUNTRY

- Figure 11. Population Pyramids of the US and Japan



WORLD POPULATION BY COUNTRY

Figure 12. Population Pyramids of Africa and Europe



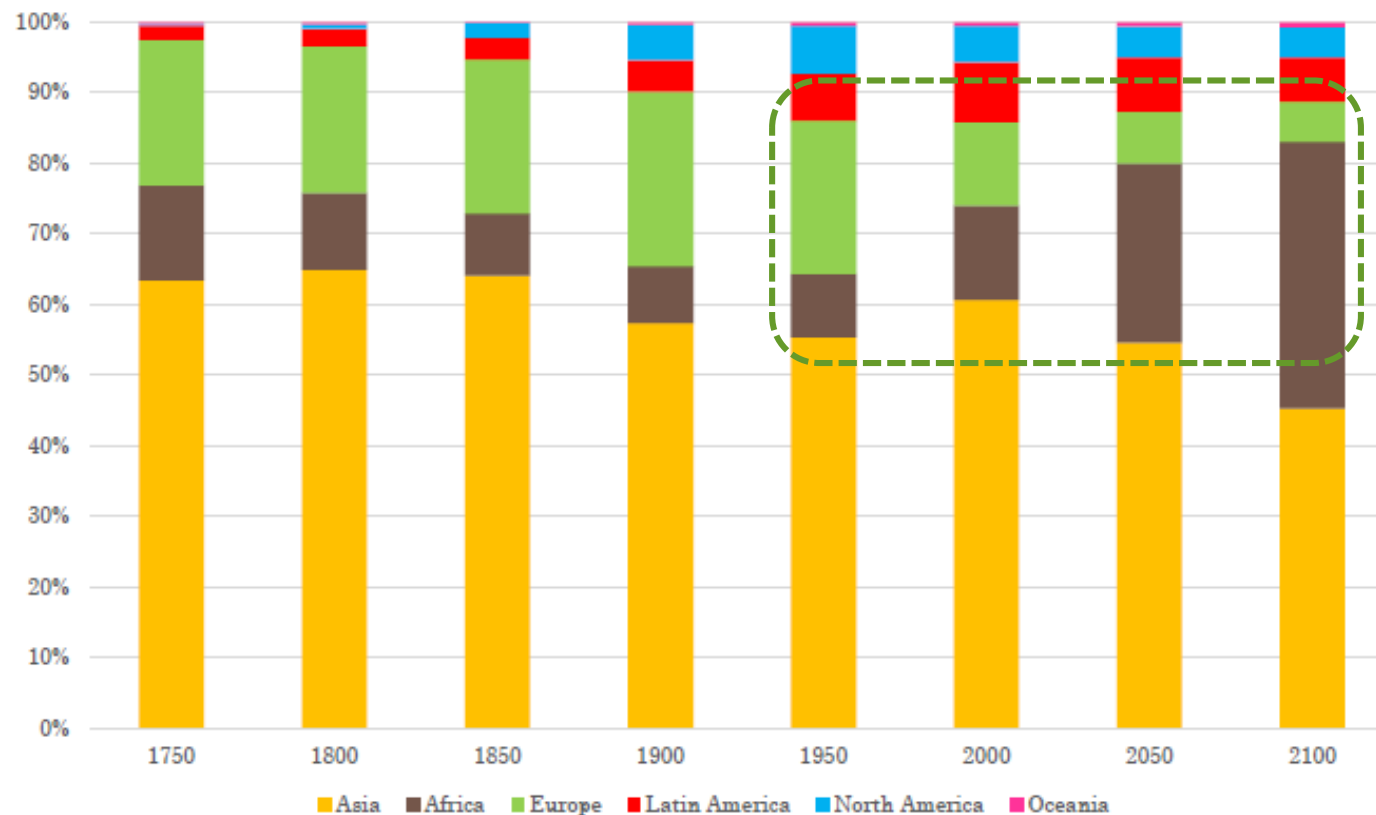
Comparing population pyramids.

Image: Data: United Nations; Infographic: Visual Capitalist

Source: <https://www.weforum.org/stories/2023/06/visual-guide-global-population-pyramids-demographics/>

WORLD POPULATION BY REGION

- Figure 13. Shares of continents in the world population, 1750-2100



Source: UN (1999) *The world at six billion*; UN (2022) *World population prospects*.

Do you think the decline in Europe's share of the global population is a problem? Why?



WORLD POPULATION BY INCOME GROUP

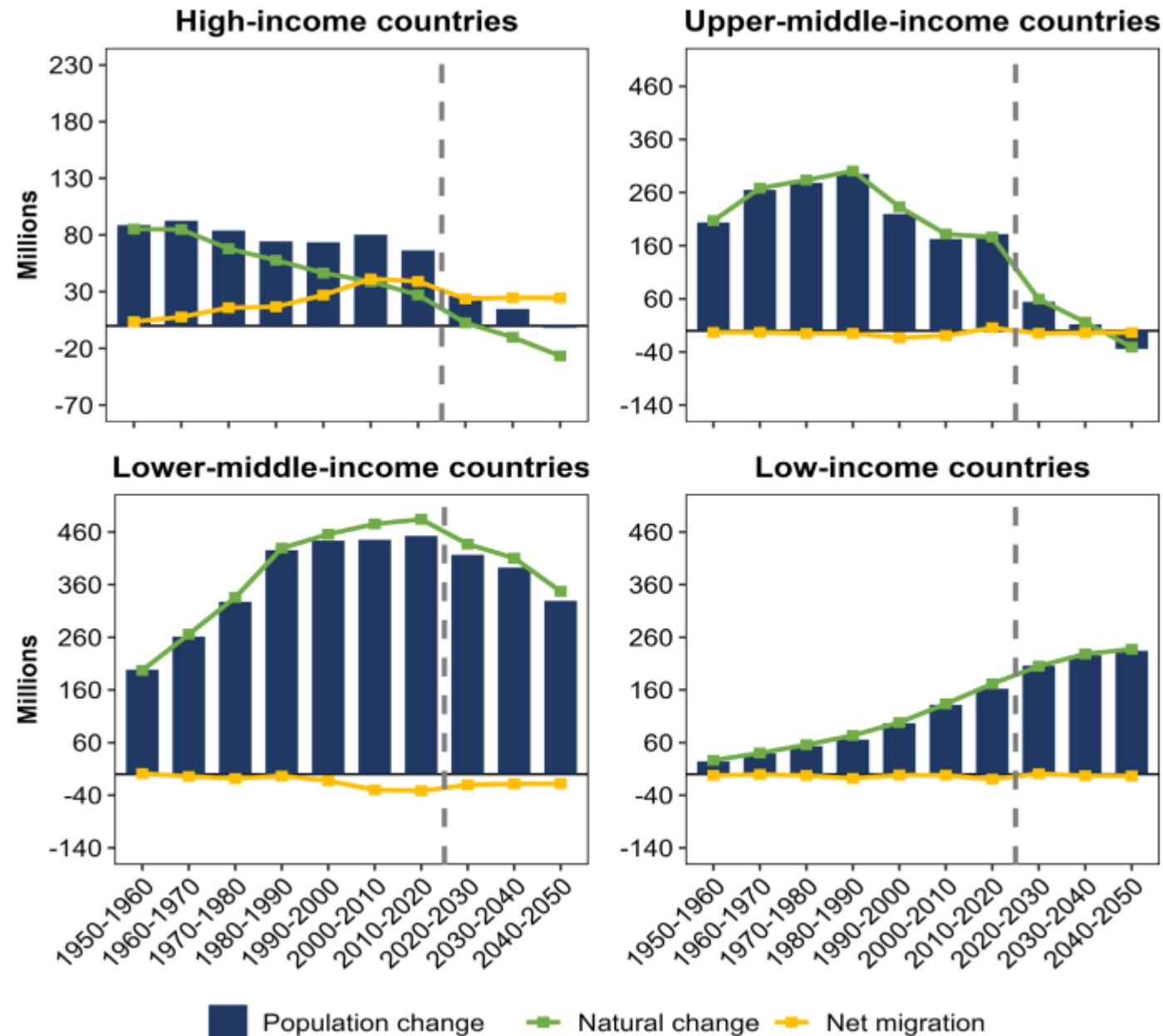


Figure 14. Contributions to total population change of the balance of births over deaths and of immigration over emigration, by income group, from 1950-1960 to 2040-2050

Source: UN (2022) *World population prospects*.



WORLD POPULATION BY REGION

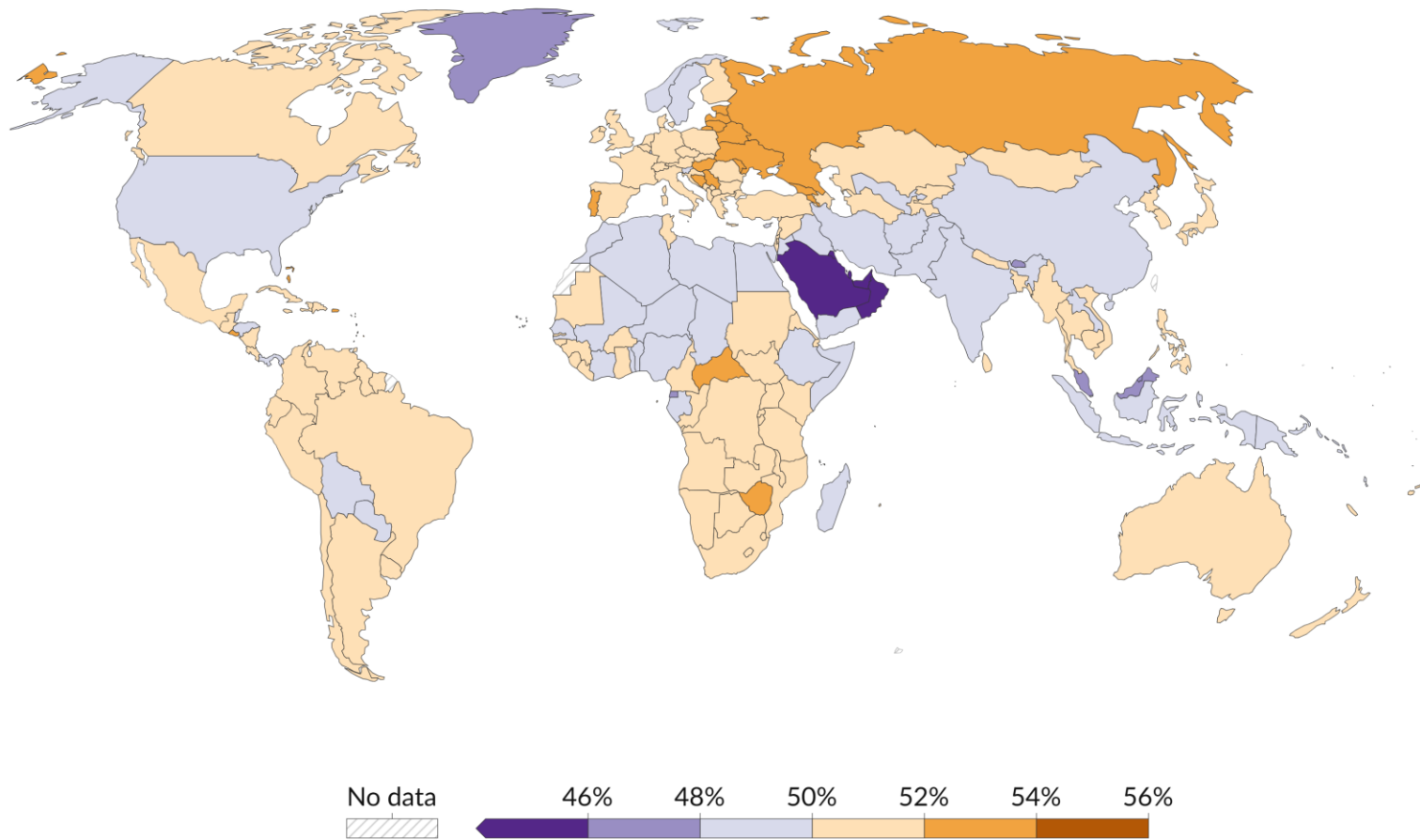
Table 1. Main demographic characteristics of the world and its regions, 2021

Region	Population (in million)	Annual population growth rate (in %)	e(0)	Median age (in years)	Share of people aged 65 years and more (in %)	Mean age of childbearing	TFR
World	7,942	0,82	71,0	30,3	9,7	28,2	2,32
Sub-Saharan Africa	1,152	2,51	59,7	17,6	3,0	29,1	4,59
Northern Africa and Western Asia	549	1,45	72,1	25,7	5,5	29,1	2,81
Central and Southern Asia	2,075	0,93	67,7	26,5	6,4	27,8	2,25
Eastern and South- Eastern Asia	2,342	0,2	76,5	36,2	12,7	28,6	1,50
Latin America and Caribbean	658	0,59	72,2	30,3	9,1	27,5	1,86
Europe and North America	1,120	-0,01	77,2	40,5	18,7	30,0	1,54
Australia/New Zealand	31	1,03	84,2	36,9	16,6	31,1	1,63
Oceania	14	1,76	67,1	22,5	3,9	29,2	3,14

Source: UN (2022) World population prospects.



Share of the population that is female, 2023



WORLD POPULATION BY SEX

Figure 15. Share of the population that is female, 2023

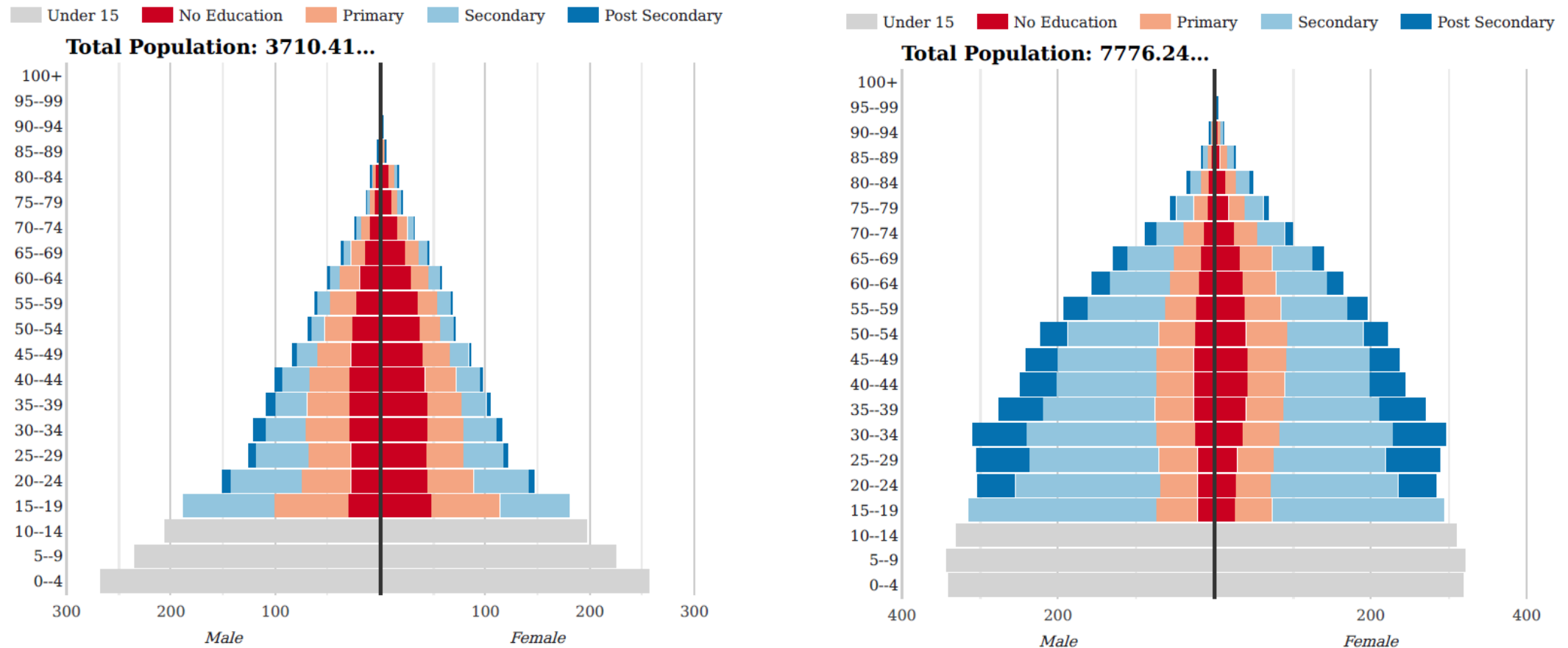
Source: Our World in Data

Data source: World Bank based on data from the UN Population Division (2025) OurWorldinData.org/gender-ratio | CC BY
Note: Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.



WORLD POPULATION BY EDUCATION

Figure 16. World population and educational attainment, 1970 and 2020



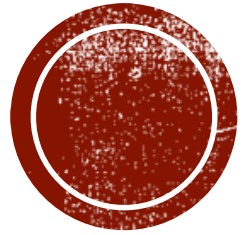
Source: Wittgenstein Centre for Demography and Global Human Capital, 2018



WORLD POPULATION: DEMOGRAPHIC STRUCTURES

- Until the 18th century, the demographic structures were **similar** all over the world
 - People aged 65+ accounted for less than 1/100 of the population
 - The number of men was equal to or higher than the number of women
- Currently, there is a **large difference** between populations
 - The share of children and youth is significantly **smaller**, and the share of people aged 65+ is much **higher** than before
 - The number of men is still greater than the number of women (102:100), but the regional variations are large:
 - Arab countries (120:100)
 - Former USSR countries (85-87:100)
- Large differences between the developed and developing countries. Less developed countries (according to the UN classification) were populated by
 - 68% of world population in 1950
 - 76% of world population in 1980
 - 83% of world population in 2017





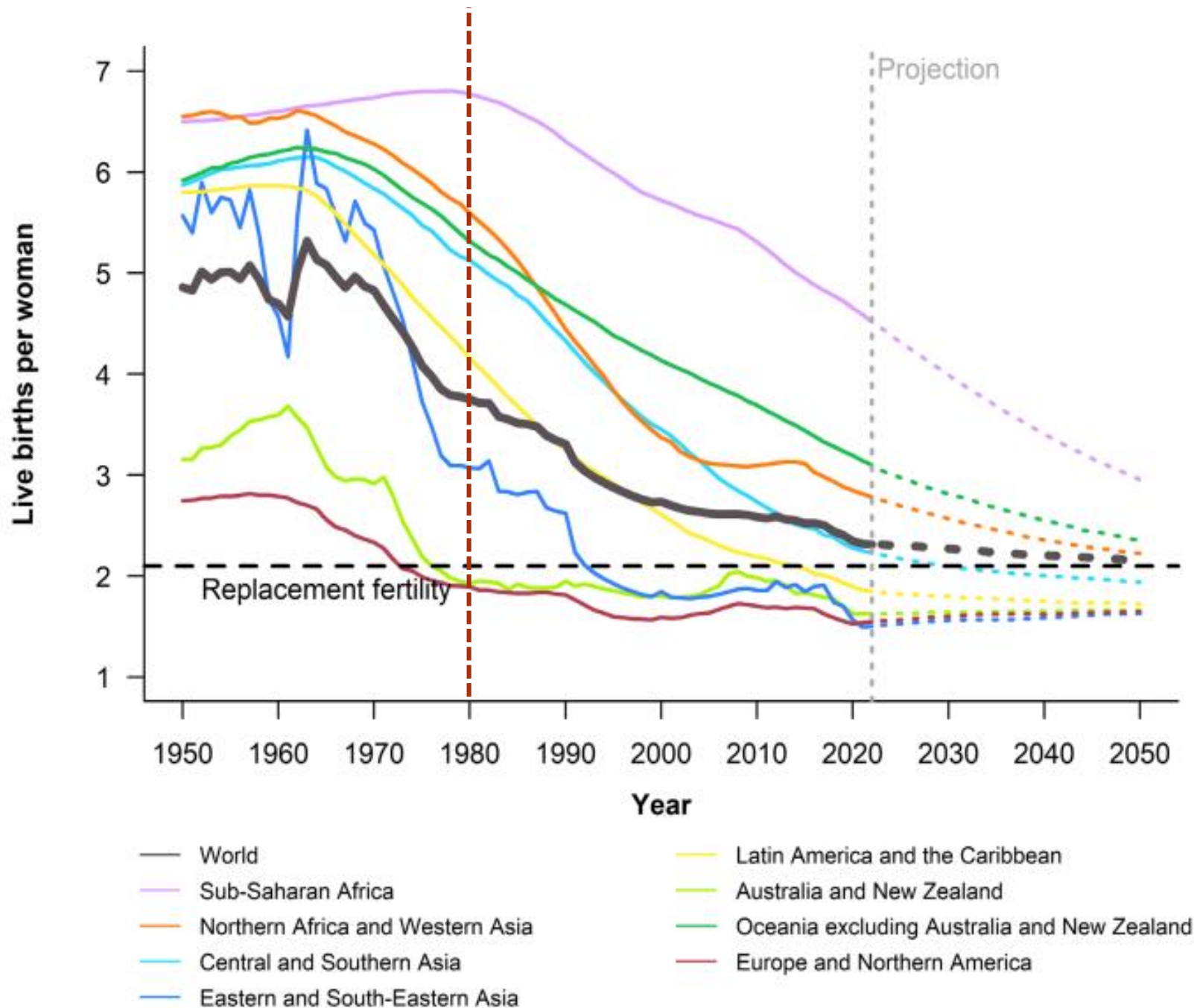
FERTILITY



FERTILITY

- Fertility is decreasing all over the world
 - Globally, the current total fertility rate (TFR) is 2.3
 - In 1965-1970, it was 5
- Differences between continents are narrowing, with Africa lagging behind with significantly higher fertility (TFR = 4.31)
- Differences between countries are significant
 - 10 countries with the highest fertility: $\text{TFR} > 6$
 - 10 countries with the lowest fertility: $\text{TFR} < 1,35$
- The causes of low fertility are complex, and the consequences as well



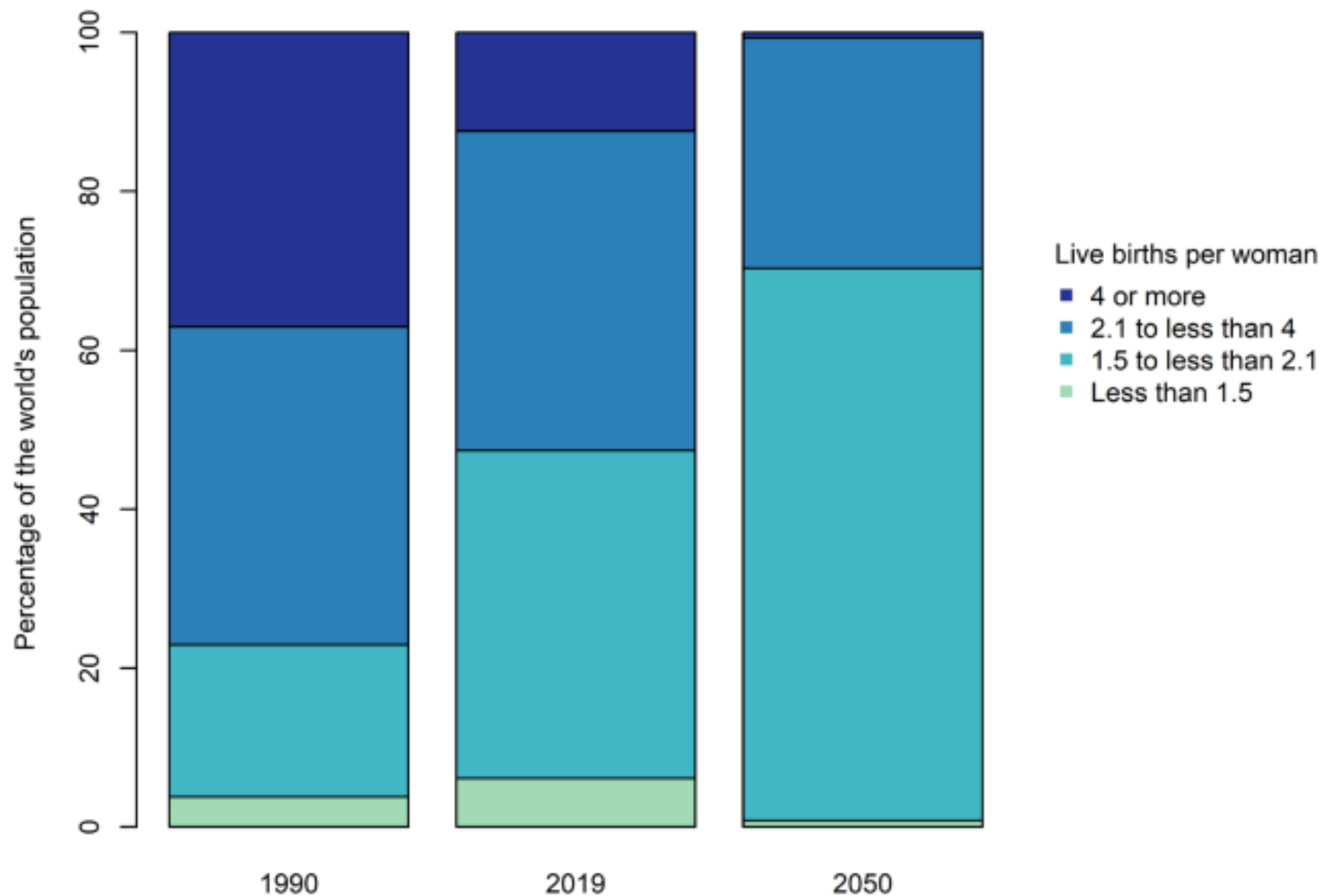


FERTILITY

Figure 17. Total fertility rate: estimates, 1950-2021, and medium scenario, 2022-2050

Source: UN (2022) *World population prospects*.





FERTILITY

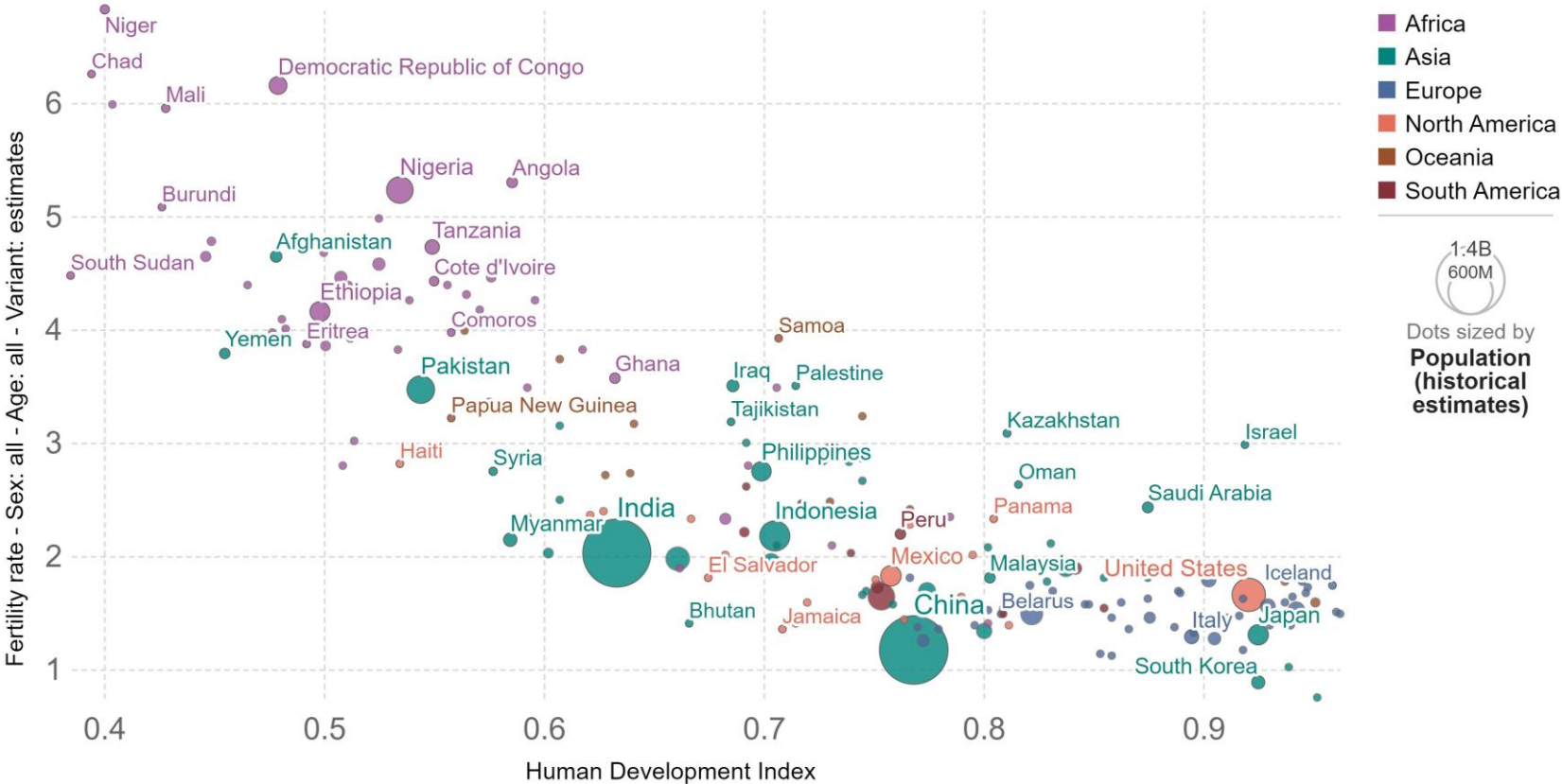
Figure 18. Distribution of the world's population by level of total fertility, 1990, 2019, and 2050, according to the medium-variant projection

Source: UN (2019) *World population prospects*.



Children per woman vs. Human Development Index, 2021

The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and a decent standard of living.



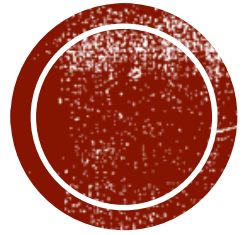
FERTILITY

Figure 19. Children per women vs. Human Development Index, 2021

Source: Our World in Data

Source: UN, World Population Prospects (2022); UNDP, Human Development Report (2021-22)
Note: The total fertility rate is the number of children that would be born to a woman if she were to live to the end of her child-bearing years and give birth to children at the current age-specific fertility rates.
OurWorldInData.org/fertility-rate • CC BY





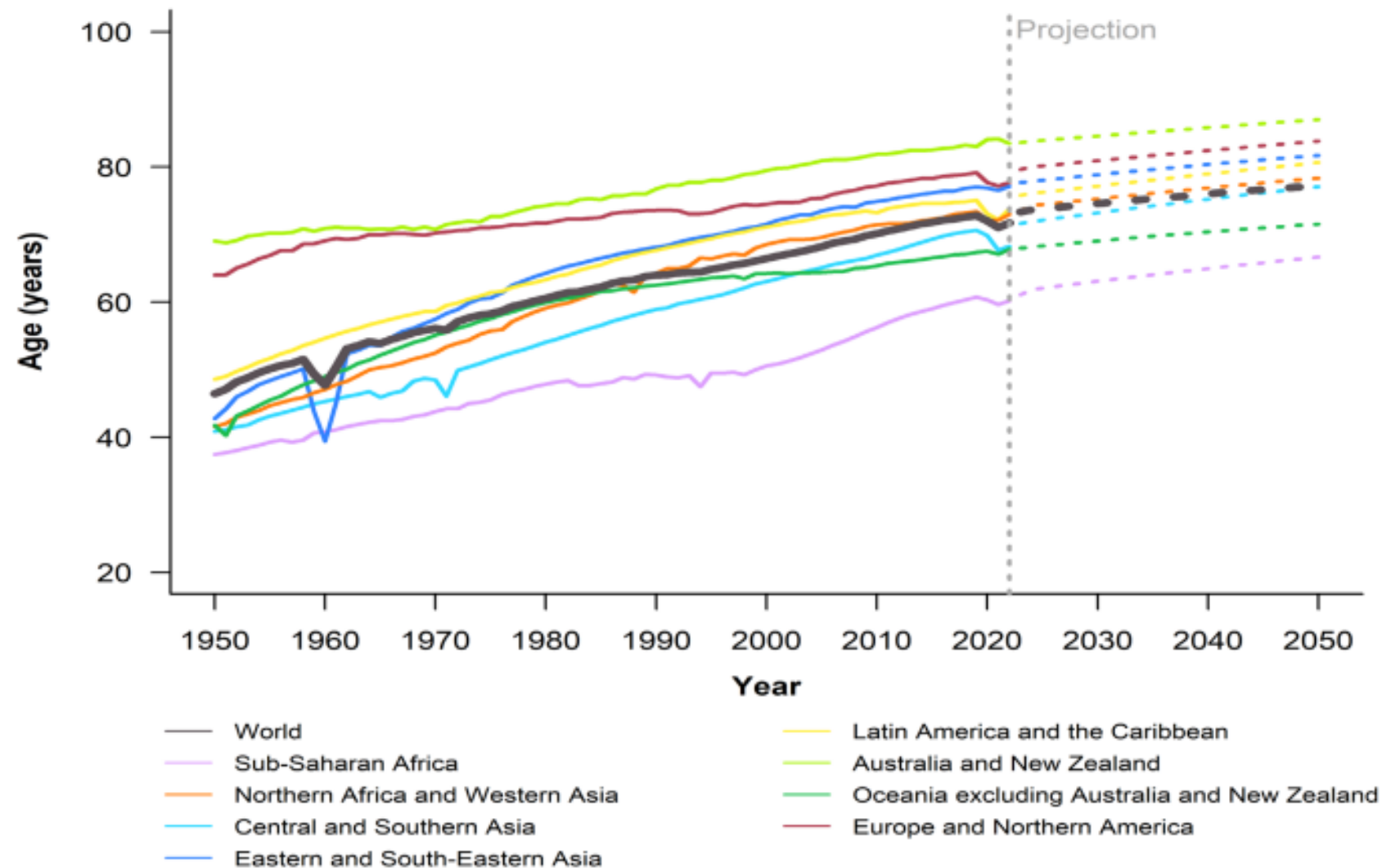
MORTALITY



MORTALITY

- A measure of mortality – life expectancy of a newborn $e(0)$ – everywhere in the world is close to 70 years
 - Exception: Africa (60 years)
- Variation is more pronounced in terms of infant mortality
 - The gap between regions is several-fold compared to the leading continents.
 - In Africa, the difference exceeds ten-fold.
- Differences between countries in the life expectancy of a newborn is high
 - Highest in Asian (Japan, Israel) and European countries (Switzerland, Italy), and in Australia ($e(0) > 80$)
 - Lowest in African countries (Central African Republic, Sierra Leone, Zimbabwe, Zambia) and in Afghanistan ($e(0) < 49$)





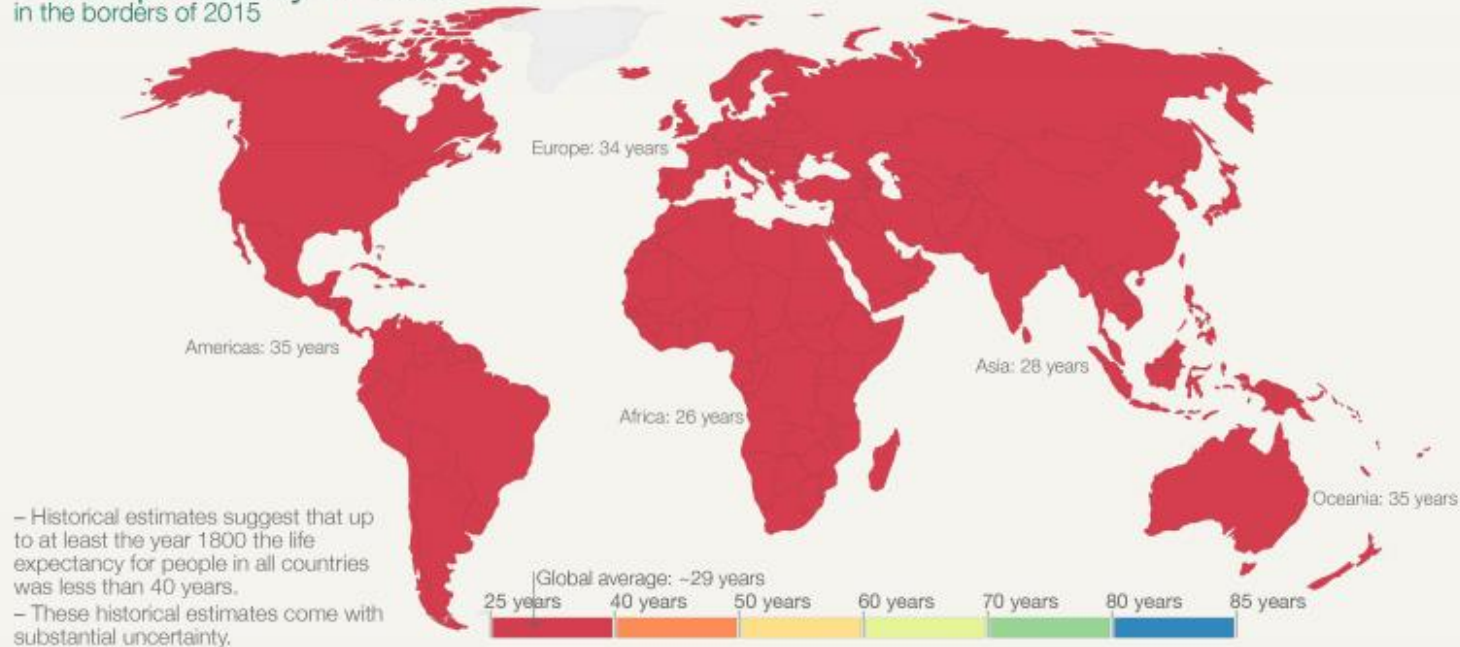
MORTALITY

Figure 20. Life expectancy at birth: estimates, 1950-2021, and medium scenario, 2022-2050, by region

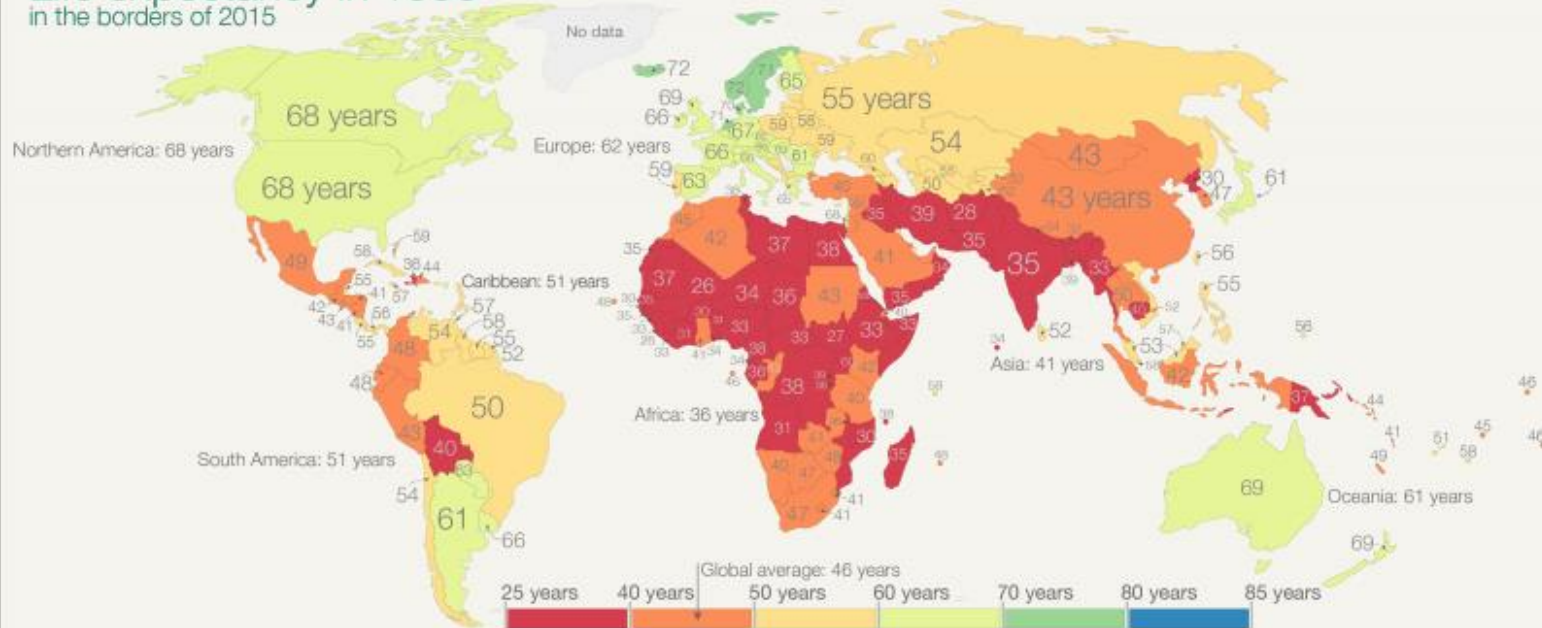
Source: UN (2022) *World population prospects*.



Life expectancy in 1800 in the borders of 2015



Life expectancy in 1950 in the borders of 2015



MORTALITY

Figure 21. World life expectancy in 1800 and 1950

Source: Our World in Data



World population by level of child mortality rate over time (1800-2013) – By Max Roser

The child mortality rate is the share of children born alive dying before reaching the age of 5.

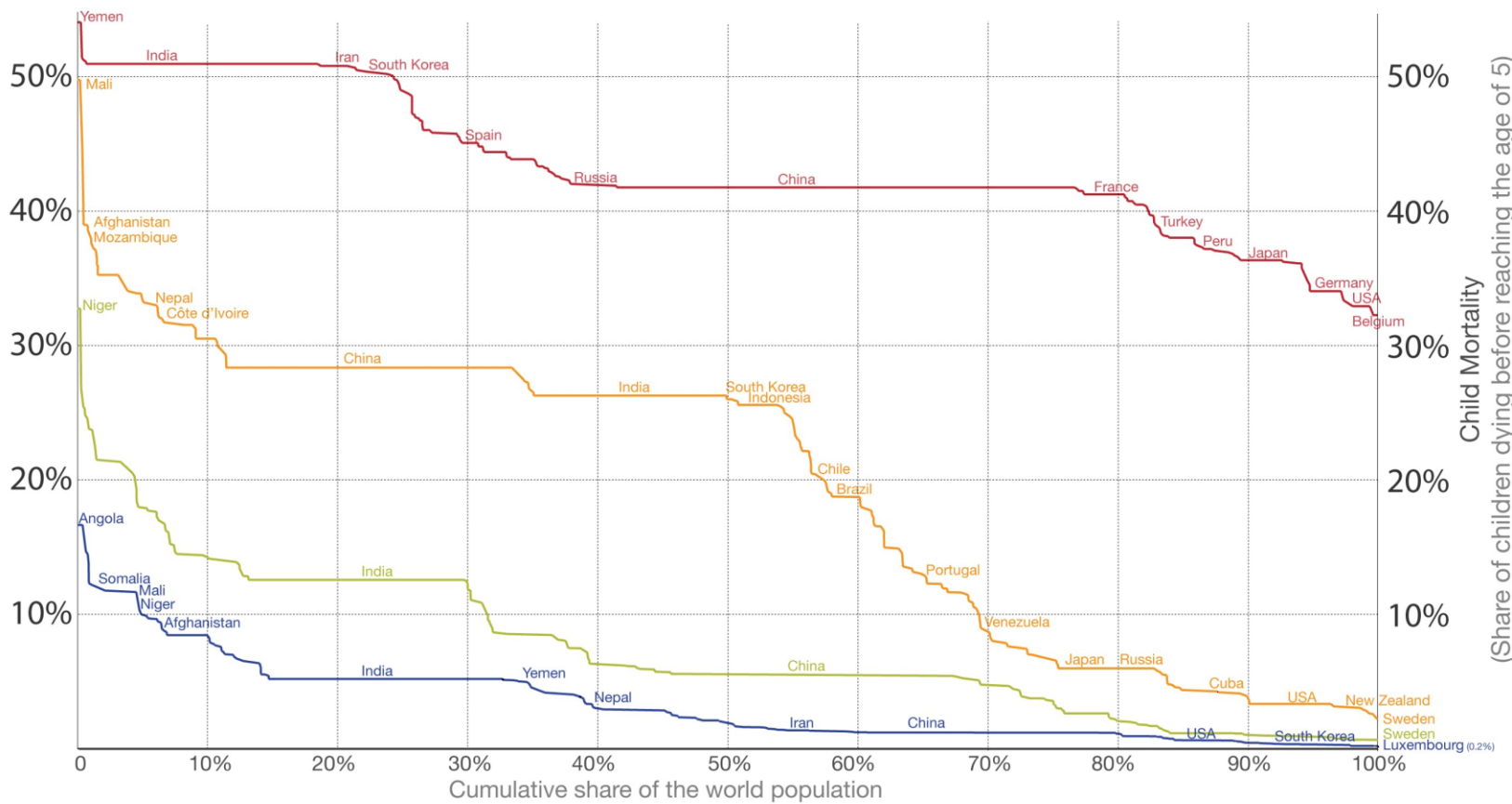
How to read this chart: On the x-axis you find the cumulative share of the world population. The countries are ordered along the x-axis descending by the child mortality rate of the country. You can see the child mortality for all countries in the world. Some – but not all – countries are labelled.

The 4 colored lines refer to the following 4 different points in time:

- 1800 (estimates)
- 1950-60
- 1990
- 2013

Global average child mortality rate:

- 1800: 43.3%
- 1950-60: 19.5%
- 1990: 7.4%
- 2013: 3.4%



Data source: [Gapminder.org](https://gapminder.org). Gapminder used childmortality.org, mortality.org, and other sources. The interactive data visualization is available at OurWorldinData.org. There you find the raw data and more visualizations on this topic.

Licensed under [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) by the author Max Roser.

MORTALITY

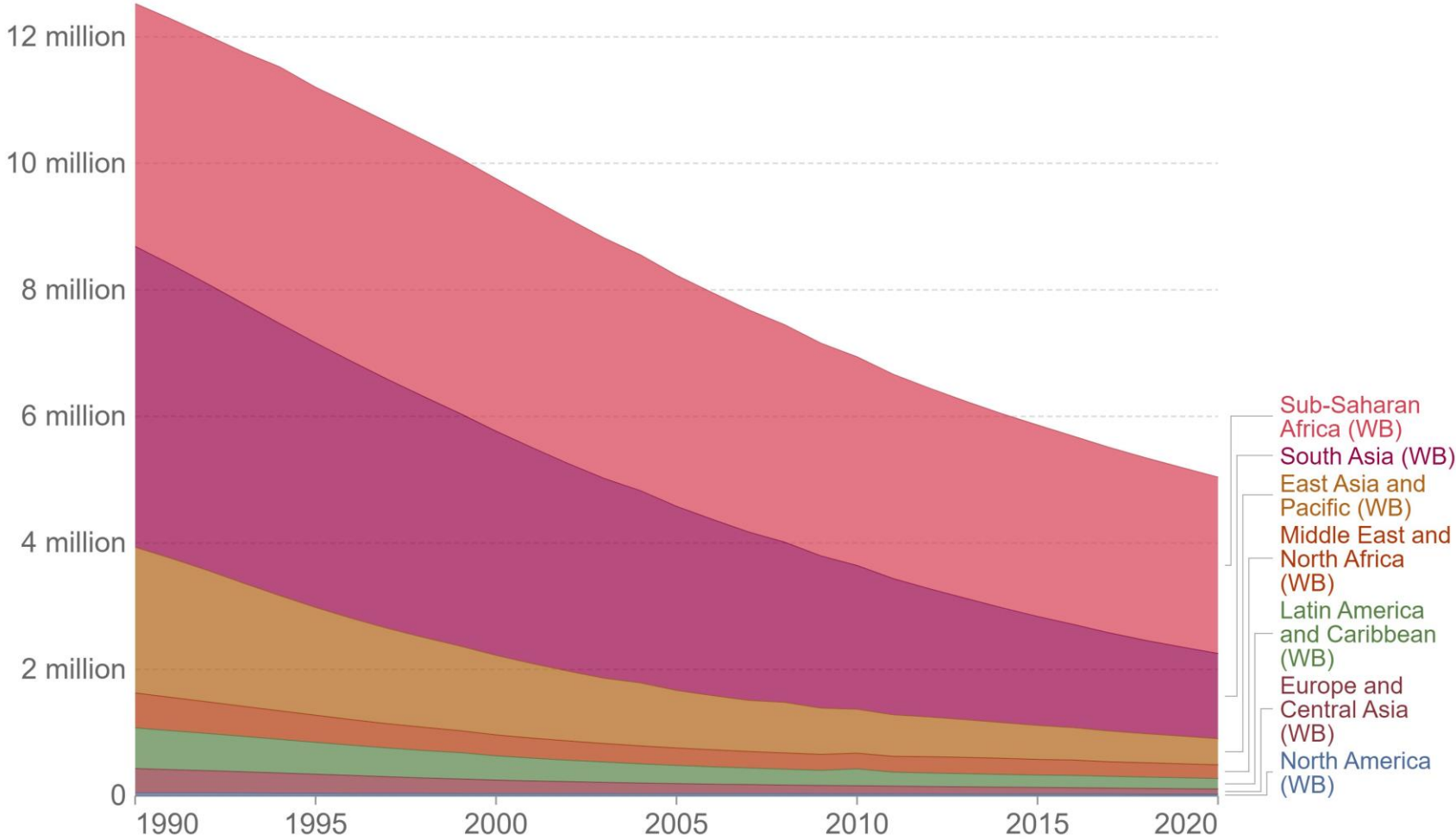
Figure 22. World population by level of child mortality rate, 1800-2013

Source: Our World in Data



Number of child deaths

The number of children dying before reaching the age of five.



Source: UN Inter-agency Group for Child Mortality Estimation (via World Bank)

OurWorldInData.org/child-mortality/ • CC BY

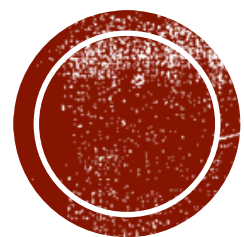
MORTALITY

Figure 23. Number of children dying before reaching the age of five, by region, 1990-2020

Source: Our World in Data

Did the child mortality rate also decline in Sub-Saharan Africa?





POPULATION AGING



POPULATION AGING

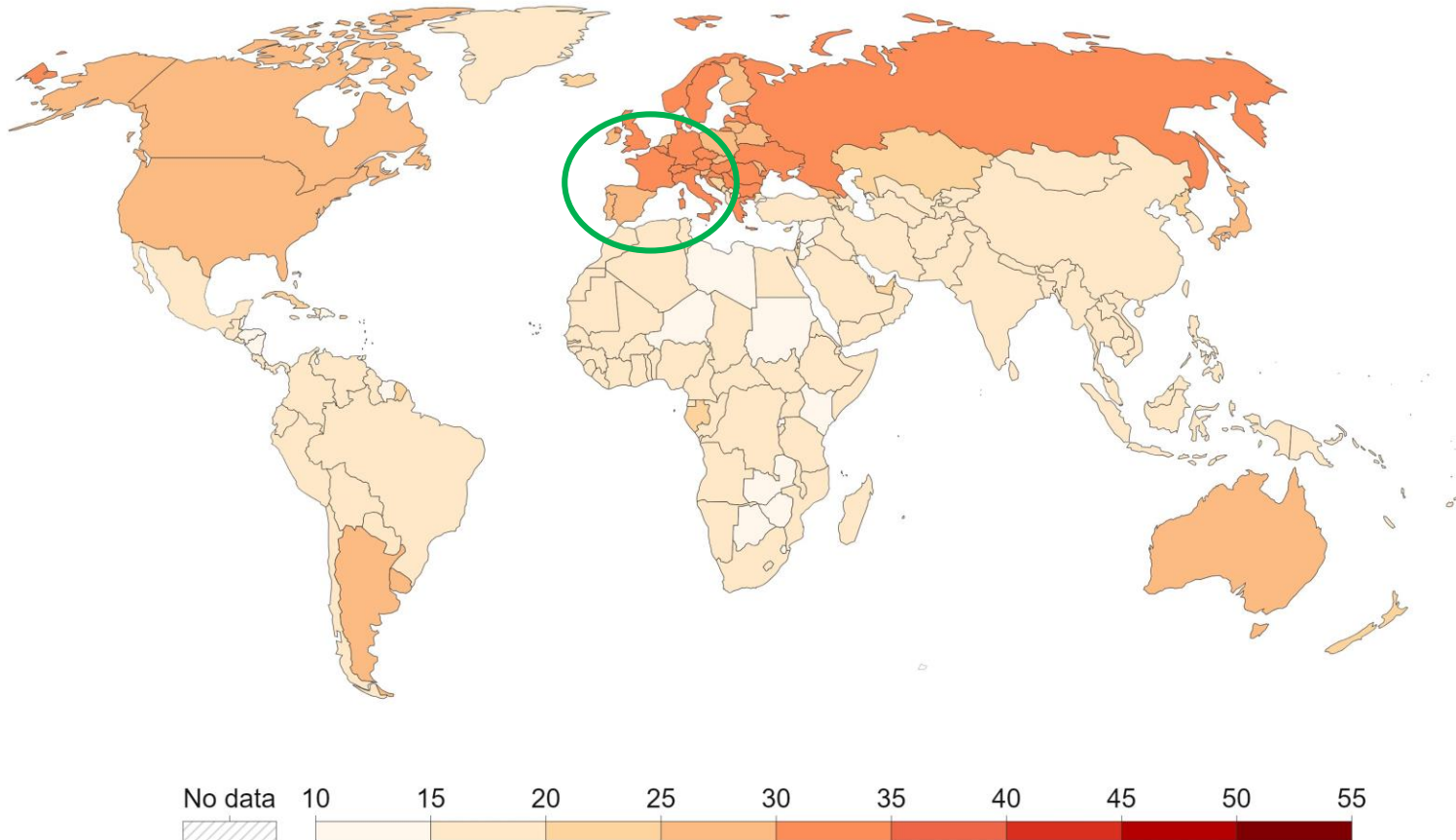
- A measure of population aging - **median age** – was increasing everywhere in the world from 1950-2015, except in Africa
- Differences between continents are sometimes huge:
 - Africa
 - More than **half** of its population are children and teenagers
 - Elderly are outnumbered by children 1:7
 - **Europe**
 - **Half** of its population is more than 40 years old
 - Elderly significantly outnumber children
- Differences between countries are even larger
 - Youngest countries are in Africa (median age below 17 years)
 - Oldest are in Europe (Germany, Italy, Austria, Finland, Slovenia) and in Asia (Japan), where the median age is more than 42 years (even 45 years)



Median age, 1971

The median age divides the population into two parts of equal size; that is, there are as many people with ages above the median age as there are with ages below.

Our World
in Data



POPULATION AGING

Figure 24. Median age,
1971

Source: Our World in Data

Source: United Nations, World Population Prospects (2022)

Note: 1950 to 2021 show historical estimates. From 2022 the UN projections (medium variant) are shown.

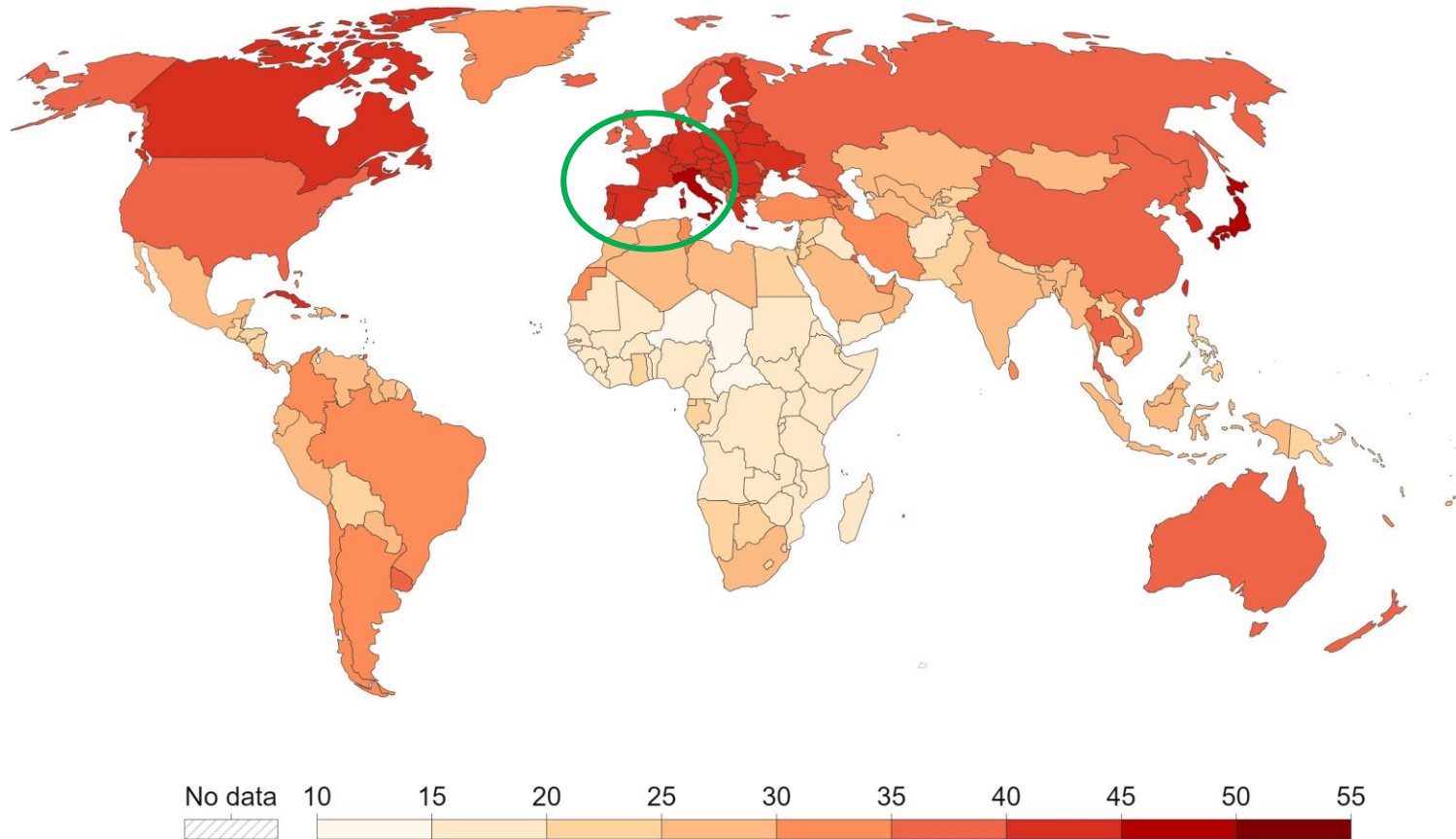
OurWorldInData.org/age-structure • CC BY



Median age, 2021

The median age divides the population into two parts of equal size; that is, there are as many people with ages above the median age as there are with ages below.

Our World
in Data



POPULATION AGING

Figure 25. Median age,
2021

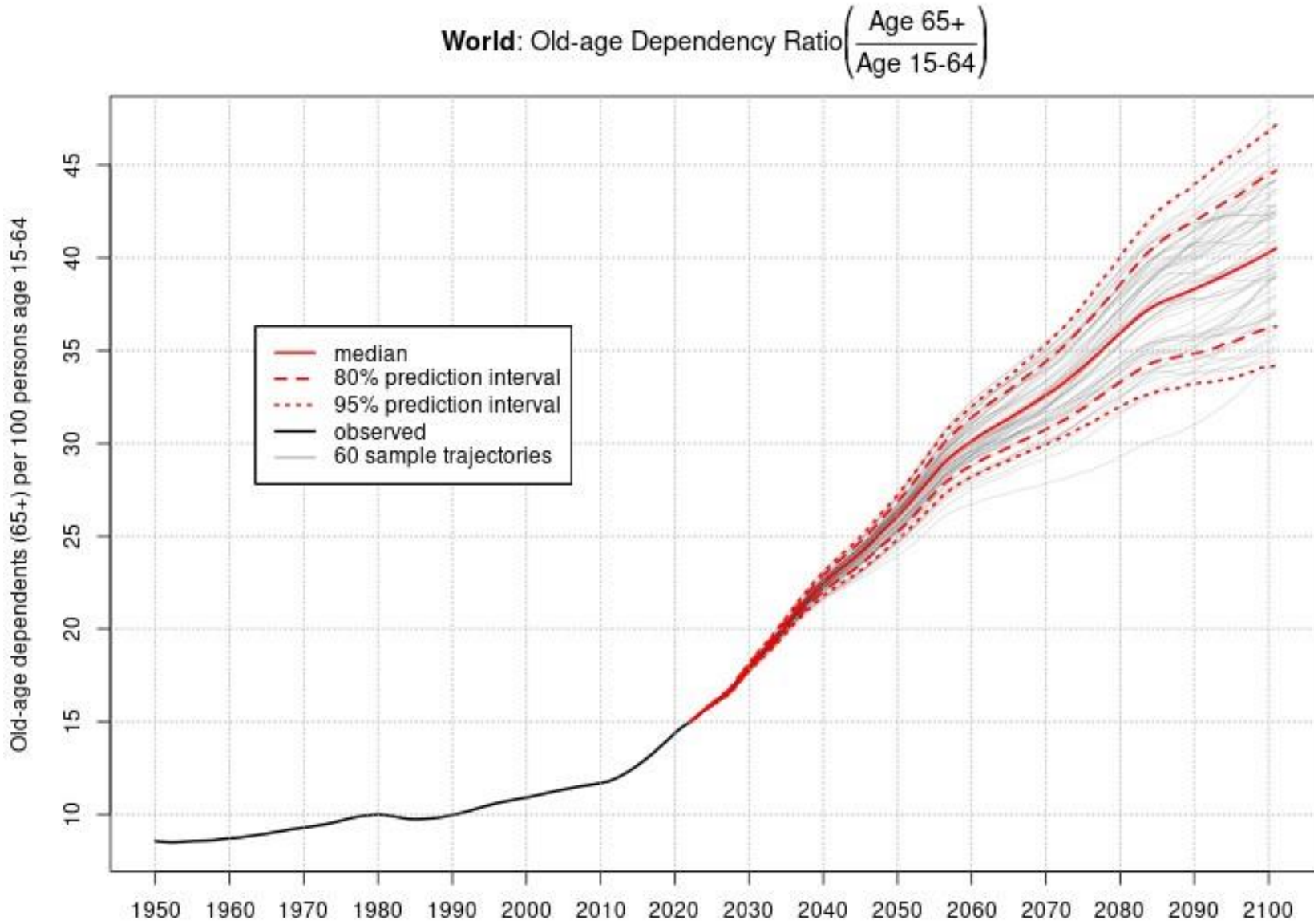
Source: Our World in Data

Source: United Nations, World Population Prospects (2022)

Note: 1950 to 2021 show historical estimates. From 2022 the UN projections (medium variant) are shown.

OurWorldInData.org/age-structure • CC BY





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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

POPULATION AGING

Figure 26. World old-age
Dependency Ratio

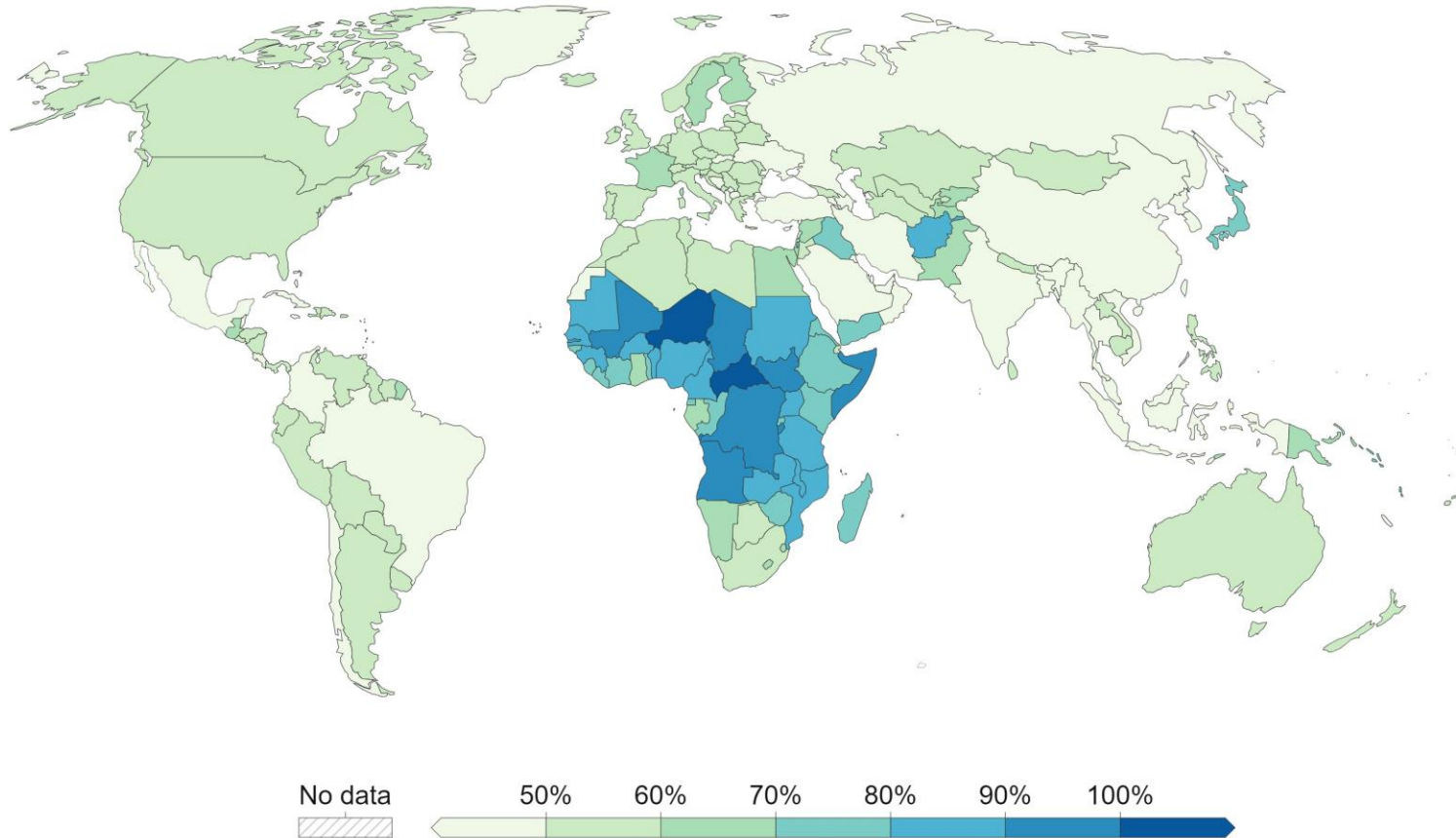
Source: UN (2022)



Age dependency ratio, 2021

The age dependency ratio is the sum of the young population (under age 15) and elderly population (age 65 and over) relative to the working-age population (ages 15 to 64). Data are shown as the number of dependents per 100 working-age population.

Our World
in Data



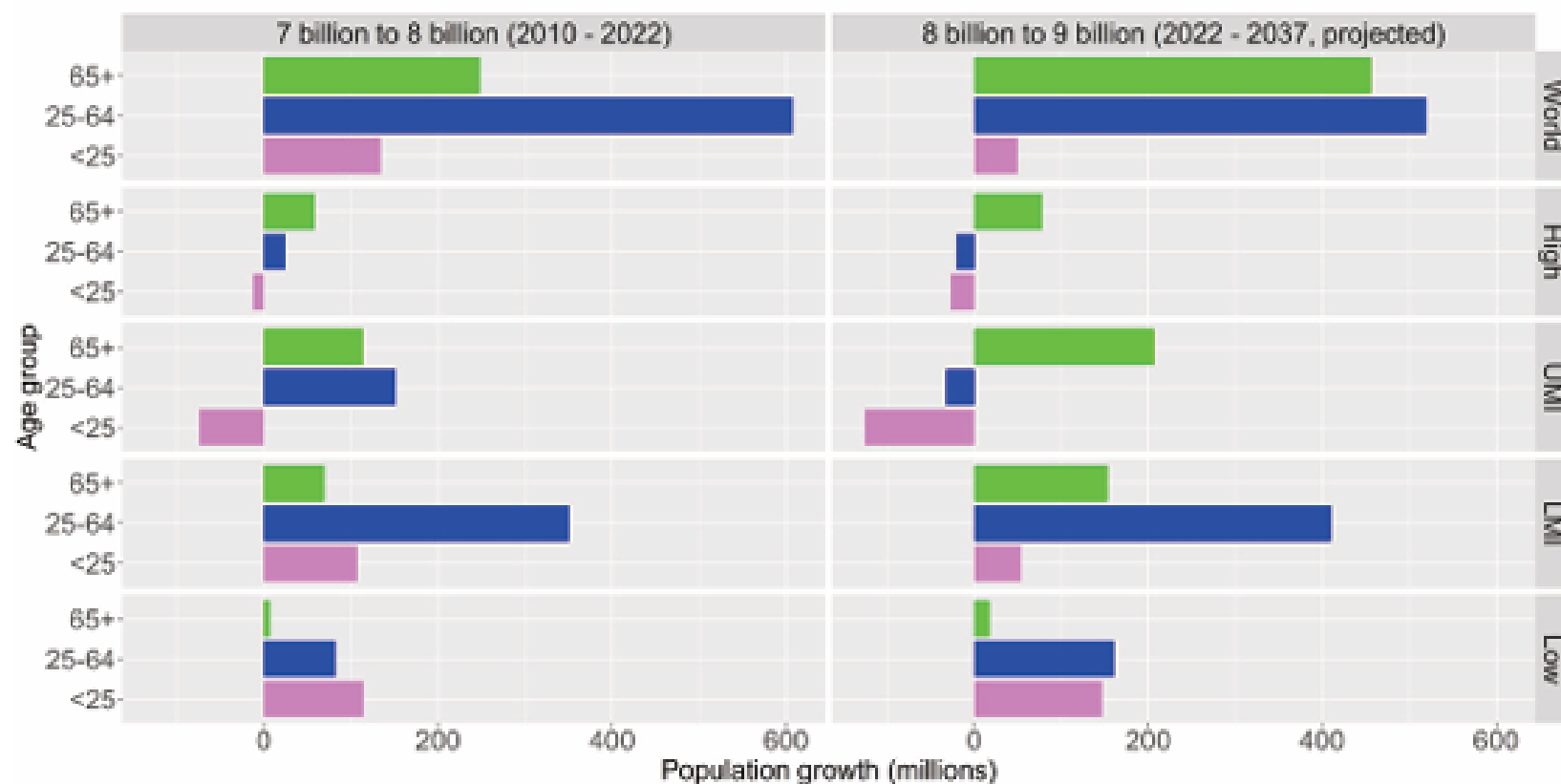
POPULATION AGING

Figure 27. World Age
Dependency Ratio, 2021

Source: Our World in Data



Population change by broad age group and World Bank income group, observed increase from 7 to 8 billion and projected increase from 8 to 9 billion



POPULATION AGING

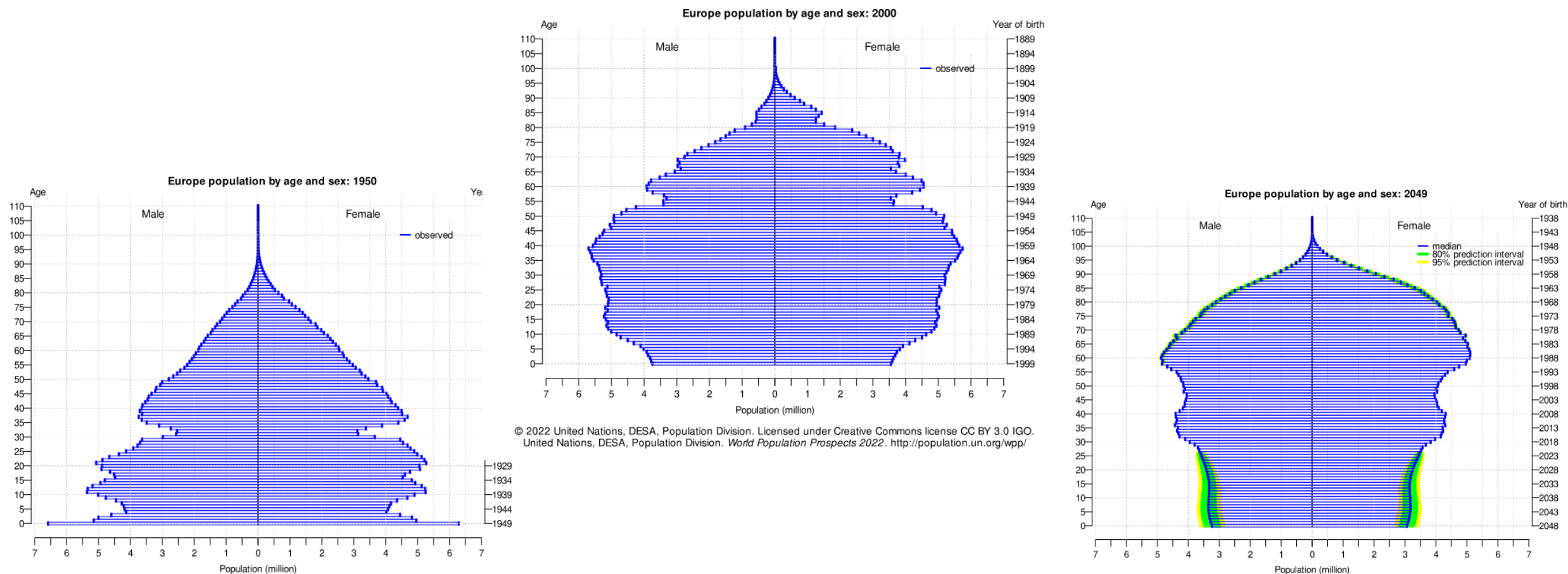
Figure 28. Population change by broad age group and World Bank income group, observed increase from 7 to 8 billion and projected increase from 8 to 9 billion

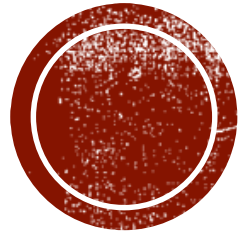
Source: UN (2022) *World population prospects*.



POPULATION AGING EUROPE

Figure 29. Age structure in Europe, 1950, 2000, and 2050





URBANIZATION



URBANIZATION

- World population living in cities:
 - 10% in 1900
 - 30% in 1950
 - 54% in 2014
 - 66% in 2050
- Most urbanized regions of the world
 - North America (82%)
 - Latin America and the Caribbean (80%)
 - Europe (73%)
- Least urbanized regions of the world are Africa (40%) and Asia (48%)



URBANIZATION

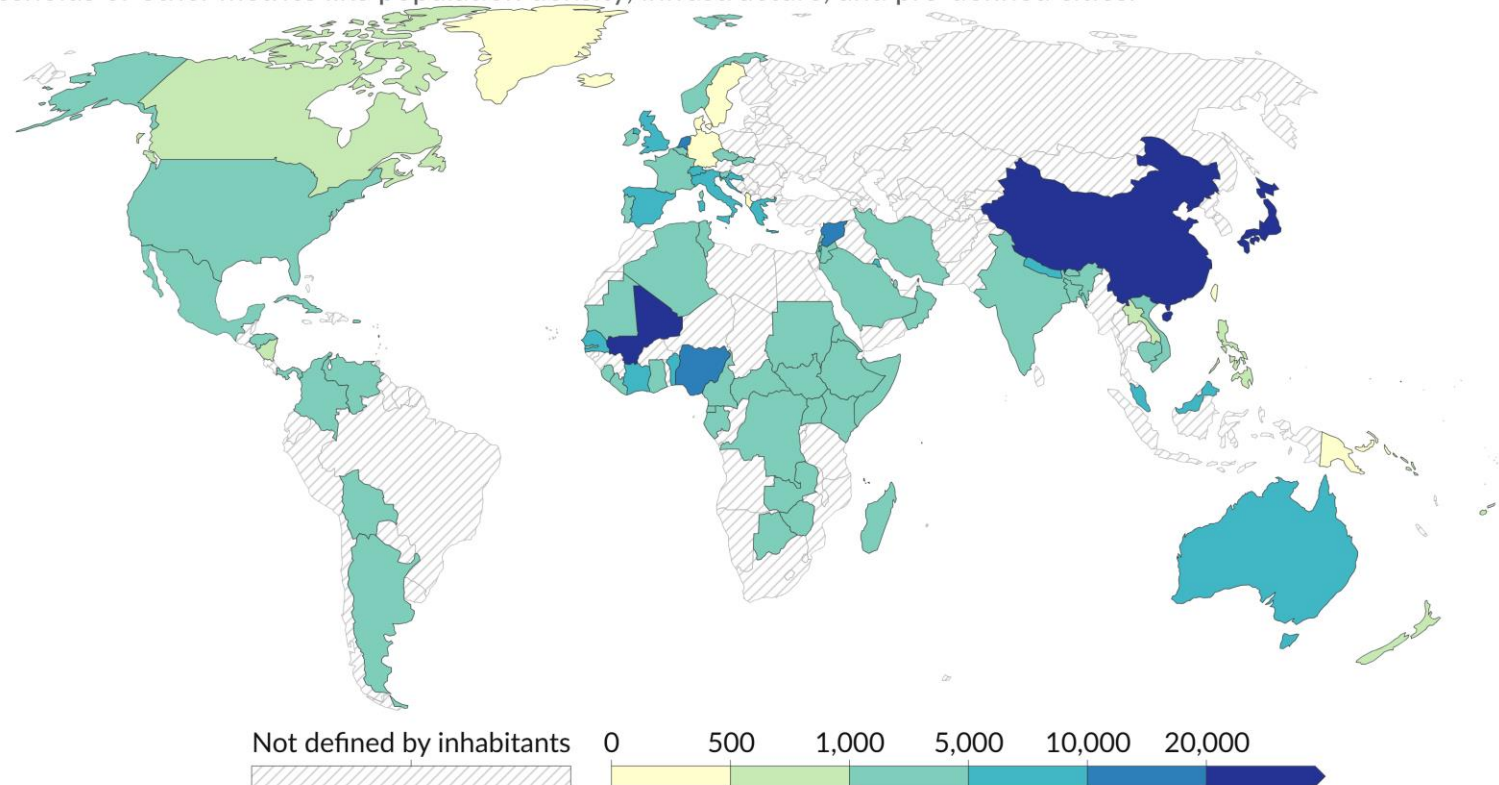
- Rural population
 - Slow increase since 1950
 - Is expected to peak in the next couple of years
 - Currently is 3.4 billion and is expected to fall to 3.2 billion by 2050
 - Almost 90% of the world's rural population lives in Africa and Asia
- Urban population
 - Sudden increase from 746 million in 1950 to 3.9 billion in 2014
 - 54% of the world's urban population lives in Asia, 14% in Europe, 13% in Latin America and the Caribbean
 - By 2050 the world's population living in cities is expected to increase by 2.5 billion
- Half of the world's population lives in rural areas or in cities up to 500 thousand inhabitants
- 1 per 8 people lives in one of 28 megacities (cities with more than 10 million inhabitants)



Minimum number of inhabitants for a settlement to qualify as an urban area, 2018



The concept of an 'urban area' lacks a universal definition, with national variations based on minimum population thresholds or other metrics like population density, infrastructure, and pre-defined cities.



URBANIZATION

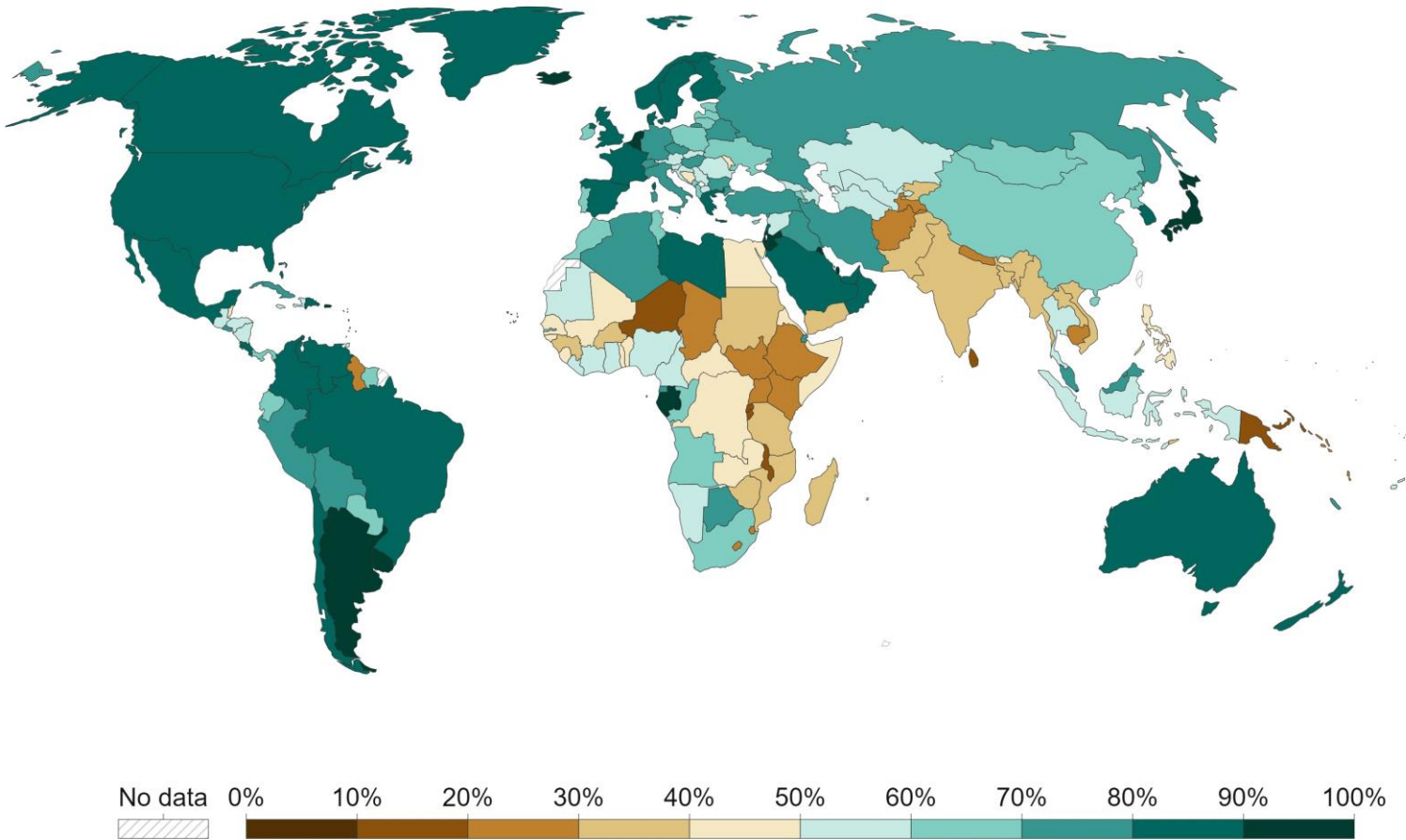
Figure 30. Definition of urban area, 2018

Source: Our World in Data

Data source: United Nations, Department of Economic and Social Affairs, Population Division (2018)
Note: Some countries with minimum inhabitant thresholds noted here also require additional qualities (such as population density) to be met.
OurWorldinData.org/urbanization | CC BY



Share of people living in urban areas, 2021



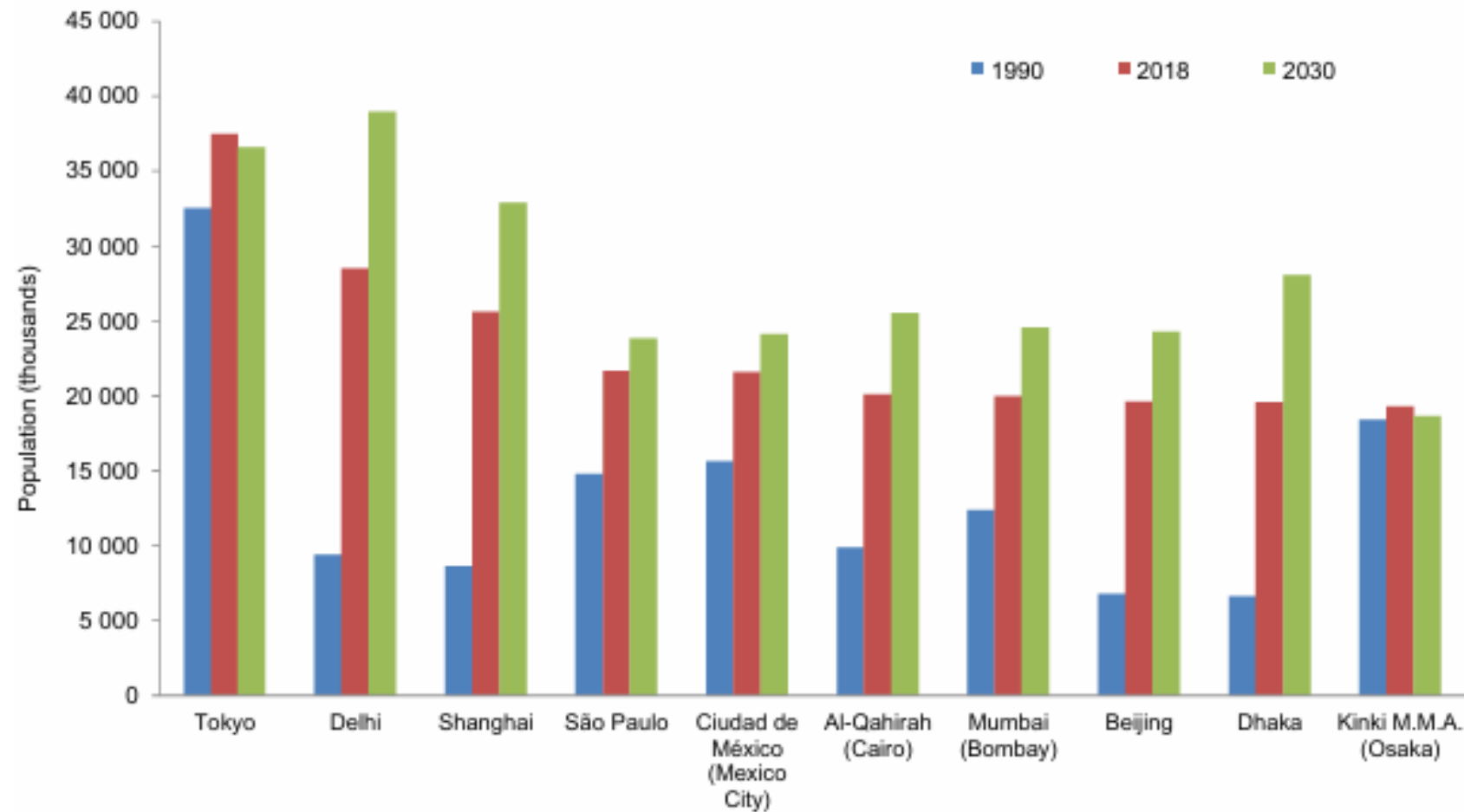
URBANIZATION

Figure 31. Share of people living in urban areas, 2021

Source: Our World in Data

Source: UN Population Division (via World Bank)
OurWorldInData.org/urbanization • CC BY
Note: Urban populations are defined based on the definition of urban areas by national statistical offices.





URBANIZATION

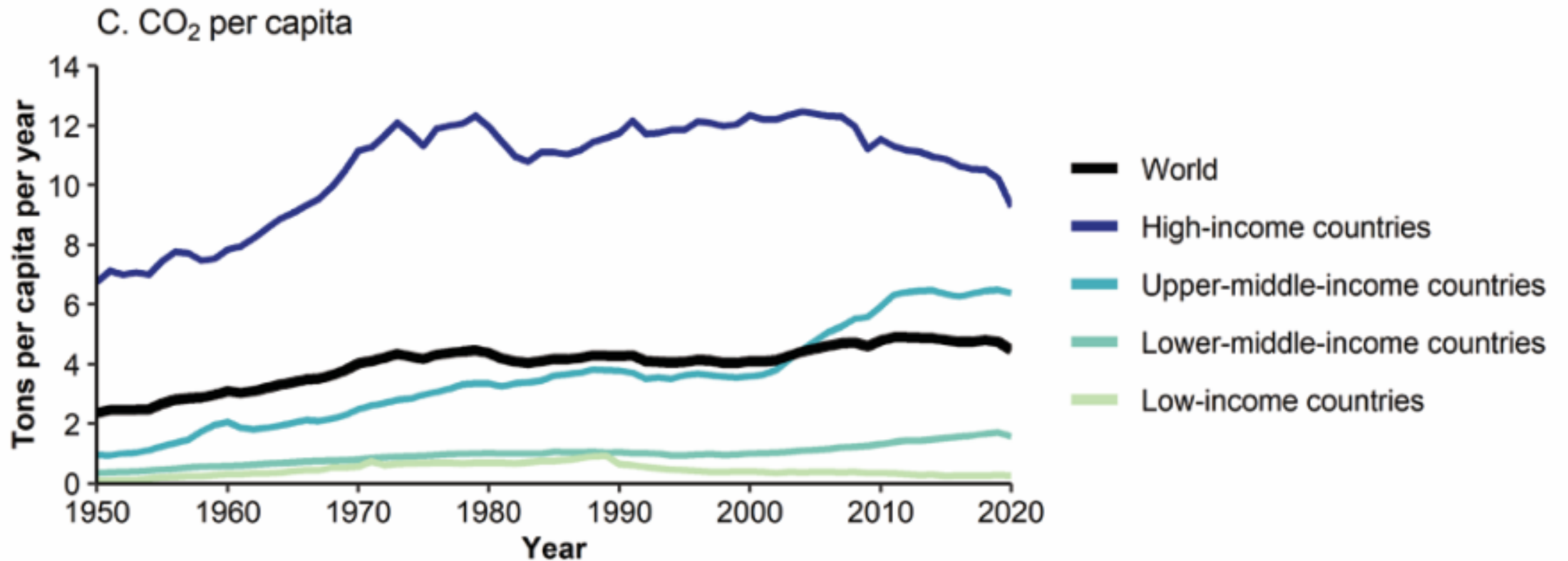
Figure 32. Population of the world's ten largest urban agglomerations in 2018, with estimates and projections for 1990 and 2030

Source: UN (2018), *World Urbanization Prospects*



URBANIZATION

Figure 33: Trends in CO₂ emissions per capita, 1950-2020, by World Bank income group



Source: UN (2022) *World population prospects*.

