United Nations

World Population Prospects 2022

Summary of Results

Department of Economic and Social Affairs
Population Division

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United Nations Department of Economic and Social Affairs, Population Division

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Acknowledgements

Contents

Notes on regions, development groups, countries or areas

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In this publication, data for countries and areas have been aggregated in six continental regions: Africa, Asia, Europe, Latin America and the Caribbean, Northern America, and Oceania. Further information on continental regions is available from https://unstats.un.org/unsd/methodology/m49/. Countries and areas have also been grouped into geographic regions based on the classification being used to track progress in achieving the Sustainable Development Goals of the United Nations (see: https://unstats.un.org/sdgs/indicators/regional-groups).

The designation of "more developed" and "less developed", or "developed" and "developing", is intended for statistical purposes and does not express a judgment about the stage in the development process reached by a particular country or area. More developed regions comprise all countries and areas of Europe and Northern America, plus Australia, New Zealand and Japan. Less developed regions comprise all countries and areas of Africa, Asia (excluding Japan), Latin America and the Caribbean, and Oceania (excluding Australia and New Zealand).

The group of least developed countries (LDCs) includes 46 countries, located in sub-Saharan Africa (32), Northern Africa and Western Asia (2), Central and Southern Asia (4), Eastern and South-Eastern Asia (4), Latin America and the Caribbean (1), and Oceania (3). Further information is available at http://unohrlls.org/about-ldcs/.

The group of landlocked developing countries (LLDCs) includes 32 countries or territories, located in sub-Saharan Africa (16), Northern Africa and Western Asia (2), Central and Southern Asia (8), Eastern and South-Eastern Asia (2), Latin America and the Caribbean (2), and Europe and Northern America (2). Further information is available at http://unohrlls.org/about-lldcs/.

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Definition of acronyms

AIDS	acquired immune deficiency syndrome
API	Application Programming Interface
ART	antiretroviral treatments
ASFR	age-specific fertility rate
COVID-19	coronavirus disease 2019
CRVS	civil registration and vital statistics
ECLAC	Economic Commission for Latin America and the Caribbean
GDP	gross domestic product
HIV	human immunodeficiency virus
ICPD	International Conference on Population and Development
IHME	Institute of Health Metrics and Evaluation
ISCED	International Standard Classification of Education
JRC	Joint Research Center
LDCs	least developed countries
LLDC	landlocked developing countries
OECD	Organization for Economic Co-operation and Development
PES	post-enumeration survey
PPP	purchasing power parity
SDGs	Sustainable Development Goals
SIDS	small island developing States
SSPs	shared socio-economic pathways
TFR	total fertility rate
UN DESA	United Nations Department of Economic and Social Affairs
UN IGME	United Nations Inter-Agency Group for Child Mortality Estimation
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Key messages

The world's population continues to grow, but the pace of growth is slowing down

- The world's population is projected to reach 8 billion on 15 November 2022.

- The latest projections by the United Nations suggest that the global population could grow to around 8.5 billion in 2030, 9.7 billion in 2050 and 10.4 billion in 2100.

- Population growth is caused in part by declining levels of mortality, as reflected in increased levels of life expectancy at birth. Globally, life expectancy reached 72.8 years in 2019, an increase of almost 9 years since 1990. Further reductions in mortality are projected to result in an average longevity of around 77.2 years globally in 2050.

- Life expectancy at birth for women in 2019 exceeded that for men by 5.4 years globally, with female and male life expectancies standing at 73.8 and 68.4, respectively. A female survival advantage is observed in all regions and countries, ranging from 7 years in Latin America and the Caribbean to 2.9 years in Australia and New Zealand.

- Following a drop in mortality, population growth continues so long as fertility remains at high levels. When fertility begins to fall, the annual rate of growth starts to drop.

- In 2021, the average fertility of the world's population stood at 2.3 births[2] per woman over a lifetime, having fallen from about 5 births per woman in 1950. Global fertility is projected to decline further to 2.1 births per woman by 2050.

- In 2020, the global population growth rate fell under 1 per cent per year for the first time since 1950. The world's population is projected to reach a peak of around 10.4 billion people during the 2080s and to remain at that level until 2100.

- Two-thirds of the projected increase in global population through 2050 will be driven by the momentum of past growth that is embedded in the youthful age structure of the current population. Such growth would occur even if childbearing in today's high-fertility countries were to fall immediately to around two births per woman.

- Given that most population increase until 2050 will be driven by the momentum of past growth, further actions by Governments aimed at reducing fertility would do little to slow the pace of growth between now and mid-century, beyond the gradual slowdown indicated by the projections presented here. Nevertheless, the cumulative impact of such changes could contribute to a more substantial reduction of global population growth in the second half of the century.

- Sustained high fertility and rapid population growth present challenges to the achievement of sustainable development. The necessity of educating growing numbers of children and young people, for example, draws resources away from efforts to improve the quality of education.

- For countries with continuing high levels of fertility, achieving the Sustainable Development Goals (SDGs), particularly those related to health, education and gender, is likely to hasten the transition towards lower fertility and slower population growth.

Rates of population growth vary significantly across countries and regions

- In 2022, the two most populous regions were both in Asia: Eastern and South-Eastern Asia with 2.3 billion people (29 per cent of the global population), and Central and Southern Asia with 2.1 billion (26 per cent). China and India, with more than 1.4 billion each, accounted for most of the population in these two regions.

- More than half of the projected increase in global population up to 2050 will be concentrated in just eight countries: the Democratic Republic of the Congo, Egypt, Ethiopia, India, Nigeria, Pakistan, the Philippines and the United Republic of Tanzania. Disparate growth rates among the world's largest countries will re-order their ranking by size.

- India is projected to surpass China as the world's most populous country during 2023.

- Countries of sub-Saharan Africa are expected to continue growing through 2100 and to contribute more than half of the global population increase anticipated through 2050.

- Whereas the populations of Australia and New Zealand, Northern Africa and Western Asia, and Oceania

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[1] In this report, births refer to live births.

(excluding Australia and New Zealand) are expected to experience slower, but still positive, growth through the end of the century, the populations of Eastern and South-Eastern Asia, Central and Southern Asia, Latin America and the Caribbean, and Europe and Northern America are projected to reach their peak size and to begin to decline before 2100.

- The 46 least developed countries (LDCs) are among the world's fastest-growing. Many are projected to double in population between 2022 and 2050, putting additional pressure on resources and posing challenges to the achievement of the Sustainable Development Goals (SDGs).

- For many countries and areas, including some small island developing States (SIDS), the challenges posed by rapid growth are compounded by their vulnerability to climate change and sea-level rise.

Levels and patterns of fertility and mortality vary widely around the world

- The gap in life expectancy at birth between certain groups of countries remains wide. In 2021, life expectancy in the least developed countries lagged 7.0 years behind the global average, due largely to persistently high levels of child and maternal mortality and, in some countries, to violence and conflict or to the continuing impact of the human immunodeficiency virus (HIV) epidemic.

- In 2021, fertility levels high enough to sustain positive population growth were found in sub-Saharan Africa (4.6 births per woman), Oceania excluding Australia and New Zealand (3.1), Northern Africa and Western Asia (2.8), and Central and Southern Asia (2.3).

- Some countries, including several in sub-Saharan Africa and in Latin America and the Caribbean, continue to experience high levels of adolescent fertility, with potential adverse consequences for the health and well-being of both the young mothers and their children. In 2021, 13.3 million babies, or about 10 per cent of the total worldwide, were born to mothers under 20 years old.

The population of older persons is increasing both in numbers and as a share of the total

- The share of the global population aged 65 years or above is projected to rise from 10 per cent in 2022 to 16 per cent in 2050.

- By 2050, the number of persons aged 65 years or over worldwide is projected to be more than twice the number of children under age 5 and about the same as the number of children under age 12.

- Whereas population growth at older ages is driven by lower mortality and increased survival, an upward shift in the population age distribution is caused by a sustained drop in the fertility level.

- Because of the female advantage in life expectancy, women outnumber men at older ages in almost all populations. Globally, women comprised 55.7 per cent of persons aged 65 or older in 2022, and their share is projected to decline slightly to 54.5 per cent by 2050.

- Countries with ageing populations should take steps to adapt public programmes to the growing proportion of older persons, including by improving the sustainability of social security and pension systems and by establishing universal health care and long-term care systems.

A sustained drop in fertility leads to an increased concentration of the population at working ages, creating an opportunity for accelerated economic growth per capita

- In most countries of sub-Saharan Africa, as well as in parts of Asia and Latin America and the Caribbean, the share of population at working ages (between 25 and 64 years) has been increasing in recent years thanks to reductions in fertility. This shift in the age distribution provides a time-bound opportunity for accelerated economic growth known as the "demographic dividend".

- To maximize the potential benefits of a favourable age distribution, countries need to invest in the further development of their human capital by ensuring access to health care and quality education at all ages and by promoting opportunities for productive employment and decent work.

More and more countries have begun to experience population decline

- The populations of 61 countries or areas are projected to decrease by 1 per cent or more between 2022 and 2050, owing to sustained low levels of fertility and, in some cases, elevated rates of emigration.

- Total fertility has fallen markedly in recent decades for many countries. Today, two-thirds of the global population

lives in a country or area where fertility is below 2.1 births per woman, roughly the level required for zero growth in the long run for a population with low mortality.

- Among countries with at least half a million people, the largest relative reductions in population size until 2050, with losses of 20 per cent or more, are expected to occur in Bulgaria, Latvia, Lithuania, Serbia and Ukraine.

International migration is having important impacts on population trends for some countries

- In some parts of the world, international migration has become a major component of population change.

- For high-income countries between 2000 and 2020, the contribution of international migration to population growth (net inflow of 80.5 million) exceeded the balance of births over deaths (66.2 million). Over the next few decades, migration will be the sole driver of population growth in high-income countries. By contrast, for the foreseeable future, population increase in low-income and lower-middle-income countries will continue to be driven by an excess of births over deaths.

- Between 2010 and 2021, 40 countries or areas experienced a net inflow of more than 200,000 migrants each; in each of 17 of them, the net inflow over this period exceeded 1 million people. For several of the top receiving countries, including Jordan, Lebanon and Türkiye, high levels of immigration in this period were driven mostly by refugee movements, in particular from Syrian Arab Republic.

- For 10 countries, the estimated net outflow of migrants exceeded 1 million over the period from 2010 through 2021. In many of these countries, the outflows were due to temporary labour movements, such as for Pakistan (net flow of -16.5 million), India (-3.5 million), Bangladesh (-2.9 million), Nepal (-1.6 million) and Sri Lanka (-1.0 million). In other countries, including Syrian Arab Republic (-4.6 million), Venezuela (Bolivarian Republic of) (-4.8 million) and Myanmar (-1.0 million), insecurity and conflict drove the outflow of migrants over this period.

- All countries, whether experiencing net inflows or outflows of migrants, should take steps to facilitate orderly, safe, regular and responsible migration, in accordance with SDG target 10.7.

The COVID-19 pandemic has affected all components of population change, including fertility, mortality and migration

- Global life expectancy at birth fell to 71.0 years in 2021, down from 72.8 in 2019, due mostly to the impact of the coronavirus disease (COVID-19) pandemic.

- The pandemic's impact on life expectancy has varied across regions and countries. In Central and Southern Asia and in Latin America and the Caribbean, life expectancy at birth fell by almost three years between 2019 and 2021. By contrast, the combined population of Australia and New Zealand gained 1.2 years due to lower mortality risks during the pandemic for some causes of death. In some countries, the pandemic has been responsible for a significant reduction in life expectancy at birth. For Bolivia (Plurinational State of), Botswana, Lebanon, Mexico, Oman and the Russian Federation, estimates of life expectancy at birth declined by more than 4 years between 2019 and 2021.

- Available evidence about the effect of the COVID-19 pandemic on fertility levels remains mixed. In low- and middle-income countries, the availability of and the demand for contraception, as well as reported numbers of unintended pregnancies and births, have remained relatively stable. In high-income countries, successive waves of the pandemic may have generated short-term fluctuations in numbers of pregnancies and births.

- The COVID-19 pandemic severely restricted all forms of human mobility, including international migration. The magnitude of the pandemic's impact on migration trends is difficult to ascertain due to data limitations.

Population data provide critical information for use in development planning

- The quality of population estimates and projections hinges on the collection of reliable and timely demographic data, including through civil registration and vital statistics systems, population censuses, population registers and household surveys.

- The COVID-19 pandemic has affected many data collection operations worldwide. Countries and development partners should give priority to the ongoing 2020 round of national population censuses, as such data provide critical information to inform development planning and to assess progress towards the achievement of the SDGs.

"Water for Peace" UN Photo/Harandane Dicko

Introduction

Understanding population trends and anticipating demographic change are crucial for national development planning and for implementing the 2030 Agenda for Sustainable Development.[2] The 2030 Agenda emphasizes that people are at the centre of sustainable development, echoing the ideals set forth in the Programme of Action of the International Conference on Population and Development (ICPD) adopted in Cairo in 1994.

Recent demographic trends are harbingers of future challenges to achieving the SDGs. For example, countries experiencing rapid population growth, most of which are in sub-Saharan Africa, must provide schooling and health care to growing numbers of children, and ensure quality education and employment opportunities to increasing numbers of youth. Countries, where population growth has slowed or stopped, must prepare for an increasing proportion of older persons and, in some cases, decreasing population size. These and other challenges can be addressed in part by responding to future demographic trends and incorporating that information into policies and planning.

World Population Prospects 2022 is the twenty-seventh edition of the official estimates and projections of the global population that have been published by the United Nations since 1951. They form a comprehensive set of demographic data to assess population trends at the global, regional and national levels. This report provides an overview of global population trends focusing on the period from 1950 to 2050 and presents a summary of key demographic prospects during the second half of the present century.

The United Nations population estimates and projections are used in the calculation of many development indicators used by the United Nations system, including about one-quarter of the indicators used to monitor global progress towards the achievement of the SDGs.

For the first time, the 2022 revision presents all demographic indicators and population estimates from 1950 and projections to 2100 by single age and sex for one-year intervals.

The report is released amidst a global crisis caused by the coronavirus disease (COVID-19) pandemic. The world is faced with its continuing and profound impacts on the health of populations and on economies and societies with no clear end in sight.

Empirical evidence of the impact of the pandemic on demographic phenomena remains incomplete due to gaps in the collection of demographic data and to time lags between data collection and dissemination. The full impact of the pandemic on national demographic trends may not be known for many years. The WHO-UN DESA Technical Advisory Group for COVID Mortality Assessment[3] was established to measure the excess deaths between 2020 and 2021. The report takes into account the estimates prepared by the advisory group as well as other robust information on the implications of the pandemic on mortality levels and trends through 2050, as well as on fertility and international migration.

The relationship between population and sustainable development should be considered within the context of climate change and other global environmental challenges that have a direct impact on sustainable development. The growth of the population itself may not be the direct cause of environmental damage; it may nevertheless exacerbate the problem or accelerate the timing of its emergence, depending on the problem in question, the timeframe considered, the available technology and the demographic, social and economic context.

Countries where fertility levels remain high should prepare to meet the needs of growing numbers of children and young people. Countries where a decline in fertility is creating an opportunity for a demographic dividend need to invest in human capital by ensuring access to health care and quality education at all ages and opportunities for productive employment. Countries with ageing populations should take steps to adapt public programmes to the growing proportion of older persons. All countries should take steps to facilitate migration in line with target 10.7 of the SDGs and the Global Compact for Safe, Orderly and

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[2] A/RES/70/1.
[3] https://who.int/data/technical-advisory-group/covid-19--mortality-assessment/membership.

Regular Migration.[4] Whereas all countries should take actions to tackle climate change and protect the environment, more developed countries—whose per capita consumption of material resources is generally the highest—bear the greatest responsibility for implementing strategies to decouple human economic activity from environmental degradation.

The report is organized into three parts. Part one describes the most likely trends in population size, growth and age structure from 1950 to 2050. Part two discusses the demographic drivers of population change—fertility, mortality and international migration and offers an assessment of the demographic impacts of the COVID-19 pandemic. Part three provides an overview of population trends until 2100 and their potential implications.

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[4]A/RES/73/195.

I.   A century of world population trends: 1950 to 2050

Today, the world's population is more than three times larger than it was in the mid-twentieth century. The global human population will reach 8.0 billion in mid-November 2022 from an estimated 2.5 billion people in 1950, adding 1 billion people since 2010 and 2 billion since 1998. It took around 37 years since 1950 for human numbers to double, surpassing 5 billion inhabitants in 1987. Thereafter, it is estimated that more than 70 years will be required for the global population to double again, rising to over 10 billion by 2059 (Part III).

Over the one hundred years from 1950 to 2050, the world population was growing the fastest in the period 1962-1965, when it was increasing on average by 2.1 per cent per year (figure I.1). Since then, the pace of population growth has slowed by more than half owing to reduced levels of fertility. In 2020, and for the first time since 1950, the rate of population growth fell below 1 per cent per year and it is projected to continue to slow in the next few decades and through the end of this century (Part III). The global population could grow to around 8.5 billion in 2030, and add 1.18 billion in the following two decades, reaching 9.7 billion in 2050.

Figure I.1

Global population size and annual growth rate: estimates, 1950-2022, and medium scenario with 95 per cent prediction intervals, 2022-2050
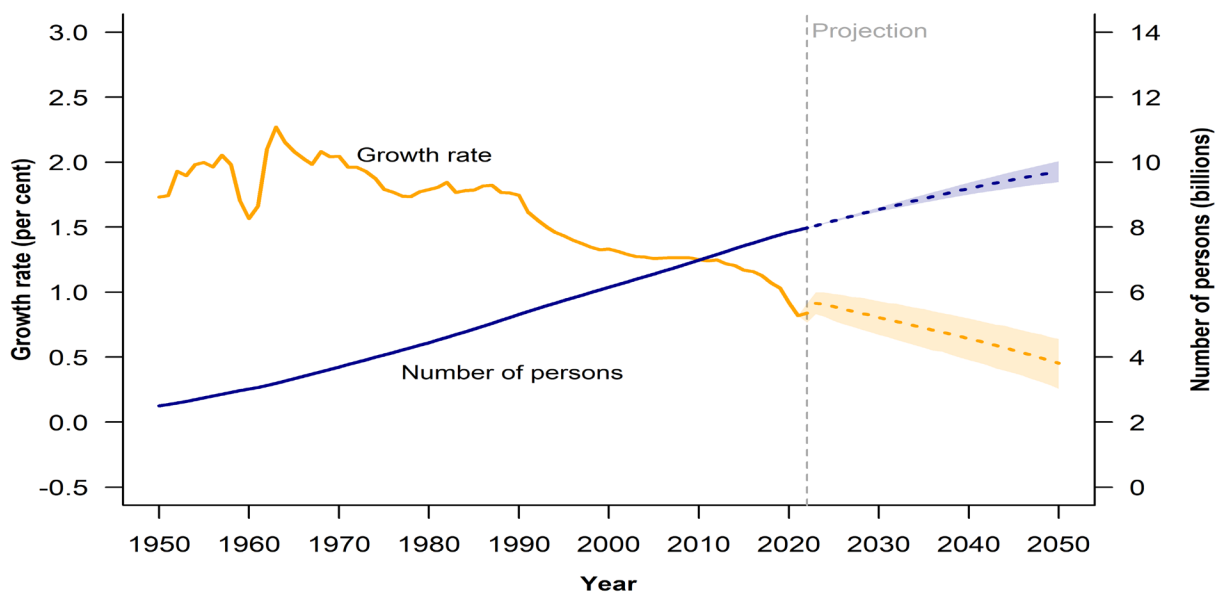
Given its reliance on assumptions at the country level about the two components of global population growth—fertility and mortality—the projection of the global population is inherently uncertain, and it typically becomes more uncertain over time (box III.1). However, the size of the world population in the near future is relatively certain because the size and age structure of the population over the next few decades are largely the result of demographic processes that have already taken place in the recent past. In particular, most of the women whose offspring will contribute to the population growth through 2050 are already alive. The prediction intervals shown in figure I.1 reflect the spread in the distribution of the simulated population trajectories and thus provide an assessment of the magnitude of the uncertainty inherent in the medium scenario.

The global population is still growing, albeit at a reduced rate. Some countries and regions continue to experience further population growth, while others have witnessed a stabilization or begun to decrease in population size.

The world's two most populous regions in 2022 were Eastern and South-Eastern Asia, with 2.3 billion people, representing 29 per cent of the global population, and Central and Southern Asia, with 2.1 billion (26 per cent) (figure I.2 and table I.1). China and India accounted for the largest populations in these regions, with more than 1.4 billion each in 2022.

Figure I.2

Population estimates, 1950-2022, and projections with 95 per cent prediction intervals, 2022-2050, by region
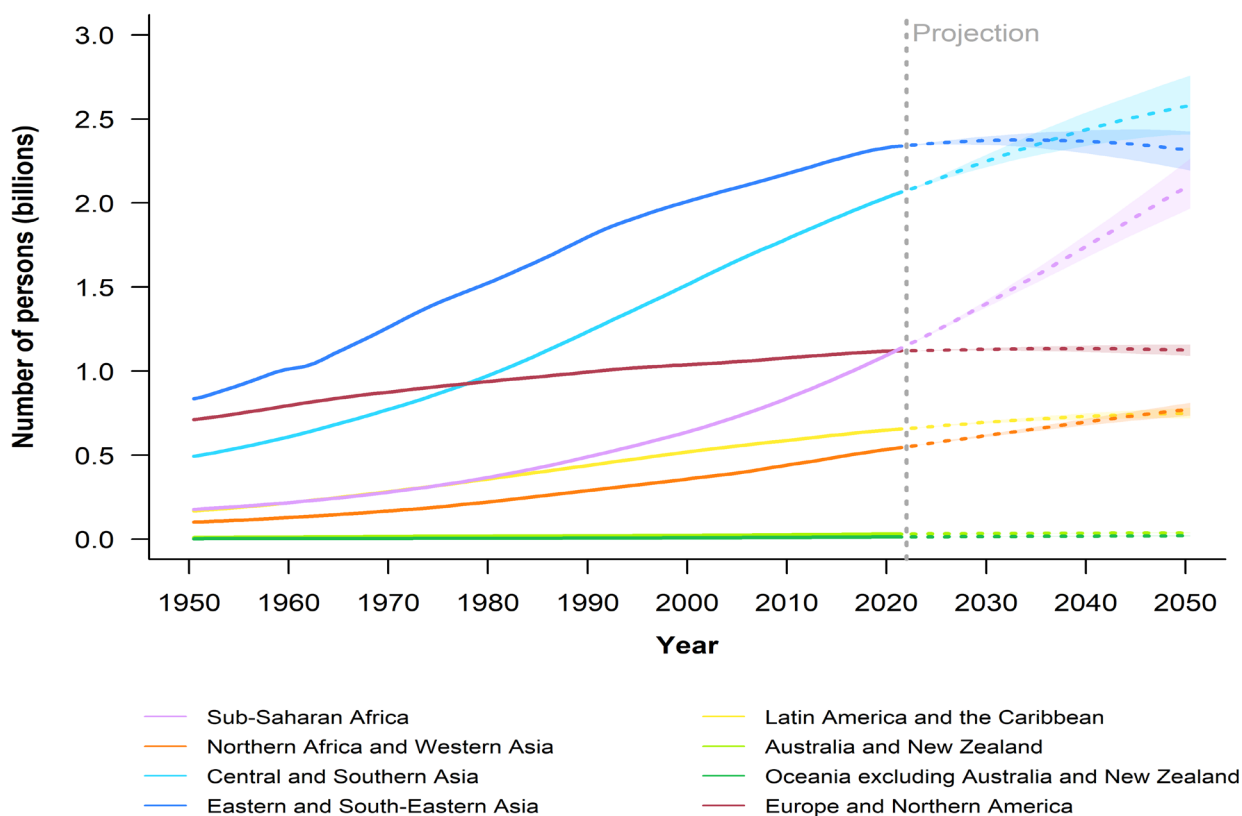
The population of Europe and Northern America combined and that of sub-Saharan Africa were comparable in size in 2022, with more than 1.1 and 1.2 billion people respectively. However, these two regions have reached such population size as a result of very different growth trajectories since the mid-20th century. Whereas Europe and Northern America have been growing at an annual rate of less than 1 per cent since the mid-1960s, reaching a growth rate close to zero in 2020 and 2021, the annual growth rate of the population of sub-Saharan Africa peaked at 3 per cent in 1978 and remained above 2.8 per cent during the 1980s. Since the 1980s, sub-Saharan Africa has been the region with the fastest growing population.

Almost 44.8 million people lived in the two regions of Oceania in 2022. With 2.5 million inhabitants in 1950, the population of Oceania (excluding Australia and New Zealand) reached close to 13.6 million in 2022, while the population of Australia and New Zealand combined grew from 9.9 to 31.2 million from 1950 to 2022 (table I.1).

Table I.1

Population of the world, SDG regions and selected groups of countries, 2022, 2030 and 2050 according to the medium scenario

	Population (in millions)		
Region	*2022*	*2030*	*2050*
World	**7,942**	**8,512**	**9,687**
Sub-Saharan Africa	1,152	1,401	2,094
Northern Africa and Western Asia	549	617	771
Central and Southern Asia	2,075	2,248	2,575
Eastern and South-Eastern Asia	2,342	2,372	2,317
Latin America and the Caribbean	658	695	749
Australia/New Zealand	31	34	38
Oceania*	14	15	20
Europe and Northern America	1,120	1,129	1,125
Least developed countries	1,112	1,328	1,914
Landlocked developing countries	557	664	947
Small island developing States	74	79	87

*excluding Australia and New Zealand

In the next three decades, the regions of the world will experience different growth rates of their populations. Consequently, the regional distribution of the population in 2050 will significantly differ from that of today.

Central and Southern Asia is expected to become the most populous region in the world by 2037 as the population of Eastern and South-Eastern Asia could start declining by the mid-2030s.

Between 2022 and 2050, the population of sub-Saharan Africa is expected to almost double, surpassing 2 billion inhabitants by the late 2040s. With average fertility levels remaining close to 3 births per woman in 2050, sub-Saharan Africa is projected to account for more than half of the growth of the world's population between 2022 and 2050. In 2022, the size of the population in this region was growing at an annual rate of 2.5 per cent, the highest among all eight regions or more than three times the global average of 0.8 per cent per year.

Europe and Northern America is projected to reach its peak population size and to begin experiencing population decline in the late 2030s due to sustained low levels of fertility, which has been below 2 births per woman since the mid-1970s and, in some countries, high emigration rates.

More than half of the projected increase in the global population between 2022 and 2050 is expected to be concentrated in just eight countries: the Democratic Republic of the Congo, Egypt, Ethiopia, India, Nigeria, Pakistan, the Philippines and the United Republic of Tanzania. The populations of the Democratic Republic of the Congo and the United Republic of Tanzania are expected to grow rapidly, between 2 and 3 per cent per year over the 2022-2050 period. Disparate population growth rates among the world's largest countries will change their ranking by size: for example, India is projected to surpass China as the world's most populous country in 2023 (figure I.3).

Figure I.3

Rankings of the world's ten most populous countries, 1990 and 2022, and medium scenario, 2050 (numbers in parentheses refer to total population in millions)

	1990	**2022**	**2050**
1	China (1,144)	China (1,426)	India (1,668)
2	India (861)	India (1,412)	China (1,317)
3	United States of America (246)	United States of America (337)	United States of America (375)
4	Indonesia (181)	Indonesia (275)	Nigeria (375)
5	Brazil (149)	Pakistan (234)	Pakistan (366)
6	Russian Federation (148)	Nigeria (216)	Indonesia (317)
7	Japan (123)	Brazil (215)	Brazil (231)
8	Pakistan (114)	Bangladesh (170)	Dem. Republic of the Congo (215)
9	Bangladesh (106)	Russian Federation (145)	Ethiopia (213)
10	Nigeria (94)	Mexico (127)	Bangladesh (204)
11	Mexico (81)	Japan (124)	
12		Ethiopia (122)	
13			Mexico (144)
14			Russian Federation (133)
15			
16		Dem. Republic of the Congo (97)	

Note: The figure depicts only those countries which are among the ten most populous countries in 1990, 2022 or 2050. A blue arrow indicates that a country maintains the same rank, a yellow arrow indicates that a country increases in rank and a green arrow indicates that a country's ranking is falling. The 10 highest ranking countries are shown in black. Other countries are shown in grey.

The population of 61 countries or areas are projected to decrease by 1 per cent or more between 2022 and 2050. In countries with at least half a million population, the largest relative reductions in population size over that period, with losses of 20 per cent or more, are expected to take place in Bulgaria, Latvia, Lithuania, Serbia and Ukraine. China is expected to experience an absolute decline in its population as early as 2023.

Globally, the world counts slightly more men (50.3 per cent) than women (49.7 per cent) in 2022. This figure is projected to slowly invert over the course of the century. By 2050, it is expected that the number of women will equal the number of men.

Historically, changes in a country's population size have been a direct consequence of a process known as the demographic transition in which gradually decreasing levels of mortality and fertility lead to longer lives and lower average number of births per woman. The transition often unfolds in a series of stages, during which population growth first accelerates and then slows down. This transition is accompanied by changes in the distribution of the population by age with a gradual increase in the share of older population. Due to the reduction of fertility in the intermediate stage of the transition, the relative size of successive birth cohorts begins to decline. Since the decline at younger ages is not immediately counterbalanced by increases at older ages, the share of the population in the working ages grows temporarily relative to the combined shares at younger and older ages (Lee and Mason, 2006). The growth of the share of the population at the

working ages can provide an opportunity for accelerated economic growth and social development known as the "demographic dividend". During this phase, overall dependency ratios fall, making more resources available to increase investments in education, health, employment, social protection, pension schemes, etc., thereby fostering short and medium-term economic growth and well-being. The population of working-age adults remains relatively large for several decades until eventually, population ageing generates a substantial increase in the percentage of persons at older ages.

In many countries in the advanced stages of the demographic transition, this demographic window of opportunity has already closed. Countries that are still at an early stage of the demographic transition, however, have an opportunity to maximize the benefits of the dividend by investing in human capital formation. While the demographic circumstances underlying the dividend are conducive to rapid economic growth on a per capita basis, reaping its potential benefits requires significant investments in education and health, progress towards gender equality and the availability of gainful employment.

Of the eight world regions, Eastern and South-Eastern Asia, Europe and Northern America, Australia and New Zealand, and Latin America and the Caribbean have the highest percentages of working-age population aged 25 to 64 years in 2022, accounting for 56, 54, 53 and 51 per cent of their total population, respectively. However, due to advanced population ageing, the percentage of persons of working age has stabilized or has started to decrease in these regions, except for Latin America and the Caribbean where the share of the working-age population is projected to start declining in the early 2040s.

In the other four world regions, the proportion of the working-age group will continue to increase for some time. In Central and Southern Asia and in Northern Africa and Western Asia, the population of working age is expected to start declining by 2045, whereas in Oceania (excluding Australia and New Zealand) and sub-Saharan Africa, the working-age population will continue to increase until 2050.

Worldwide, persons aged 65 years or over outnumbered children under age five for the first time in 2018. In 2022, there were 771 million people aged 65 years or over globally, 3 times more than the size in 1980 (258 million). The older population is projected to reach 994 million by 2030 and 1.6 billion by 2050. As a result, by 2050 there will be more than twice as many persons aged 65 or older than children under 5 globally, whereas the number of persons aged 65 years or over globally will be almost the same as the number of children under age 12.

While in some countries the rapid growth of the older population results mainly from sustained high levels of fertility in the past, the continued reduction of premature mortality of successive generations is the main driver in other countries.

The proportion of persons aged 65 or over is projected to increase globally between 2022 and 2050. At the world level in 2022, approximately 10 per cent of people are aged 65 or over (table I.2). The proportion of older persons in the world is projected to reach nearly 12 per cent in 2030 and 16 per cent in 2050. Europe and Northern America had the largest proportion of older population in 2022, with almost 19 per cent aged 65 or over, followed by Australia and New Zealand (16.6 per cent). Both regions are continuing to age further. Projections indicate that by 2050 one in every four persons in Europe and Northern America could be aged 65 years or over.

Populations in other regions are also projected to age significantly over the next several decades. For Latin America and the Caribbean, the share of the population aged 65 years or over could increase from 9 per cent in 2022 to 19 per cent in 2050. Similarly, the proportion aged 65 or over in Eastern and South-Eastern Asia is expected to double from around 13 per cent in 2022 to 26 per cent in 2050. Sub-Saharan Africa, which has the youngest age distribution of the eight SDG regions, is also projected to experience population ageing over the coming decades with the percentage of the population aged 65 or over rising from three per cent in 2022 to almost five per cent in 2050.

Table I.2

Percentage of population aged 65 years or over for the world, SDG regions, and selected groups of countries, 2022, 2030 and 2050, according to the medium scenario

Region	2022	2030	2050
World	**9.7**	**11.7**	**16.4**
Sub-Saharan Africa	3.0	3.3	4.7
Northern Africa and Western Asia	5.5	7.0	12.5
Central and Southern Asia	6.4	8.1	13.4
Eastern and South-Eastern Asia	12.7	16.3	25.7
Latin America and the Caribbean	9.1	11.5	18.8
Australia/New Zealand	16.6	19.4	23.7
Oceania*	3.9	5.1	8.2
Europe and Northern America	18.7	22.0	26.9
Least developed countries	3.6	4.1	6.1
Landlocked developing countries (LLDC)	3.6	4.1	5.8
Small island developing States (SIDS)	8.9	11.3	16.0

*excluding Australia and New Zealand

Between 2022 and 2050, the older population is projected to grow at rates above 3 per cent per year in Northern Africa and Western Asia, sub-Saharan Africa, Oceania (excluding Australia and New Zealand) and Central and Southern Asia. Despite this rapid growth, these regions are projected to have relatively small proportions of older people in 2050: 13 per cent in Northern Africa and Western Asia and Central and Southern Asia and 5 and 8 per cent in sub-Saharan Africa and Oceania (excluding Australia and New Zealand), respectively. Countries with ageing populations should take steps to adapt public programmes to the growing proportion of older persons, including sound social security and pension systems, the establishment of universal health care and long-term care systems.

Globally, women outnumber men at older ages. In 2022, women comprised 55.7 per cent of persons aged 65 or older. Among regions, the share of women in the population aged 65 or older is the lowest in Oceania (excluding Australia and New Zealand) (50.6 per cent) and the highest in Europe and Northern America (57.5 per cent) in 2022. With the ongoing progress in health and survival, allowing more men to reach older ages, the share of the women in the older population is projected to decrease to 54.5 per cent by 2050 at the global level. Similar patterns are expected to be observed across regions. In 2050, the share of women among the persons aged 65 or older is projected to range between 52 per cent in Northern Africa and Western Asia and 57 per cent in Oceania (excluding Australia and New Zealand).

The current age distribution of a population has a major impact on future population trends due to a phenomenon known as "population momentum". The relative youthfulness of today's global population ensures that the number of women of reproductive age will continue to increase for years and even decades. Nearly two-thirds of the anticipated increase in world population between 2022 and 2050 will be driven by the current age distribution of the global population (United Nations 2021a). Over a longer time period, however, the influence of today's age structure will fade, and population growth will depend increasingly on the future course of mortality and, especially, fertility.

Because of continued elevated levels of fertility in sub-Saharan Africa, the impact of momentum on the region's population growth between 2022 and 2050 is relatively less prominent (35 per cent) compared to the impact of fertility (43 per cent).

In populations where fertility levels have been relatively low for several decades and the age distribution has been shifting toward older ages, the number of women in the reproductive age range may be decreasing. In such situations, the population momentum contributes to slower growth or, in extreme cases, to population decline. Due to its advanced process of demographic ageing, Europe, where fertility has been below the replacement level since the late 1970s,[5] is the only region where momentum is expected to contribute to population decline between 2022 and 2050 (minus 7 per cent).

Linkages between population trends and selected Sustainable Development Goals (SDGs)

A path towards a more sustainable future requires demographic foresight, which involves anticipating the nature and consequences of major population shifts before and while they occur and adopting forward-looking and proactive planning guided by such analysis. The growing concentration of population growth in the less developed regions can pose challenges to the ability of countries to attain progress in development. Rapid growth of a country's population can exacerbate the challenge of eradicating poverty (SDG 1), potentially trapping communities in a vicious cycle: while economic growth may struggle to keep pace with population growth, poverty can deprive individuals of opportunities and choices, limiting their ability to control their fertility, perpetuating high levels of childbearing often starting early in life and ensuring the continued rapid growth of the population.

Reducing poverty in the context of rapid population growth remains a formidable challenge. In many cases, even though poverty reduction strategies may lift large numbers of people out of poverty, the proportion of the population living below the poverty line may be stagnant or even increase. The population in many countries in sub-Saharan Africa is projected to double between 2022 and 2050, putting additional pressure on already strained resources and challenging policies aimed to reduce poverty and inequalities.

For example, Angola has experienced population growth rates above 3 per cent per year since the early 1970s due to the combined effect of persistent high fertility levels and remarkable reductions in infant and child mortality, in particular during the past two decades. In 2018, around half of the population in that country was living in extreme poverty (figure I.4). From 2008 to 2018, the increase in the number of people living in extreme poverty (109 per cent) outpaced the growth of the total population (44 per cent).

During the first decade of the current millennium, Uganda made remarkable progress in reducing extreme poverty in a context of rapid population growth. Since 2010, however, the number of people living below the international poverty line has increased more rapidly than the entire population. In Madagascar, the population has been growing at a rate of about 3 per cent per year for several decades. The country remains one of the poorest countries in the world, with more than 70 per cent of its people living below the international poverty line.

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[5] Replacement-level fertility refers to the level of childbearing at which each generation exactly replaces the previous one in terms of size. If fertility remains below this level over the long run, the population will eventually decline in size (assuming that immigration levels will be insufficient to compensate for the decline). For populations at late stages of the demographic transition, the replacement level of fertility is approximated by a total fertility rate of 2.1 births per woman.

Figure I.4

Population growth rate, 2015-2020, by the proportion of the population living below the international poverty line, 2003-2021
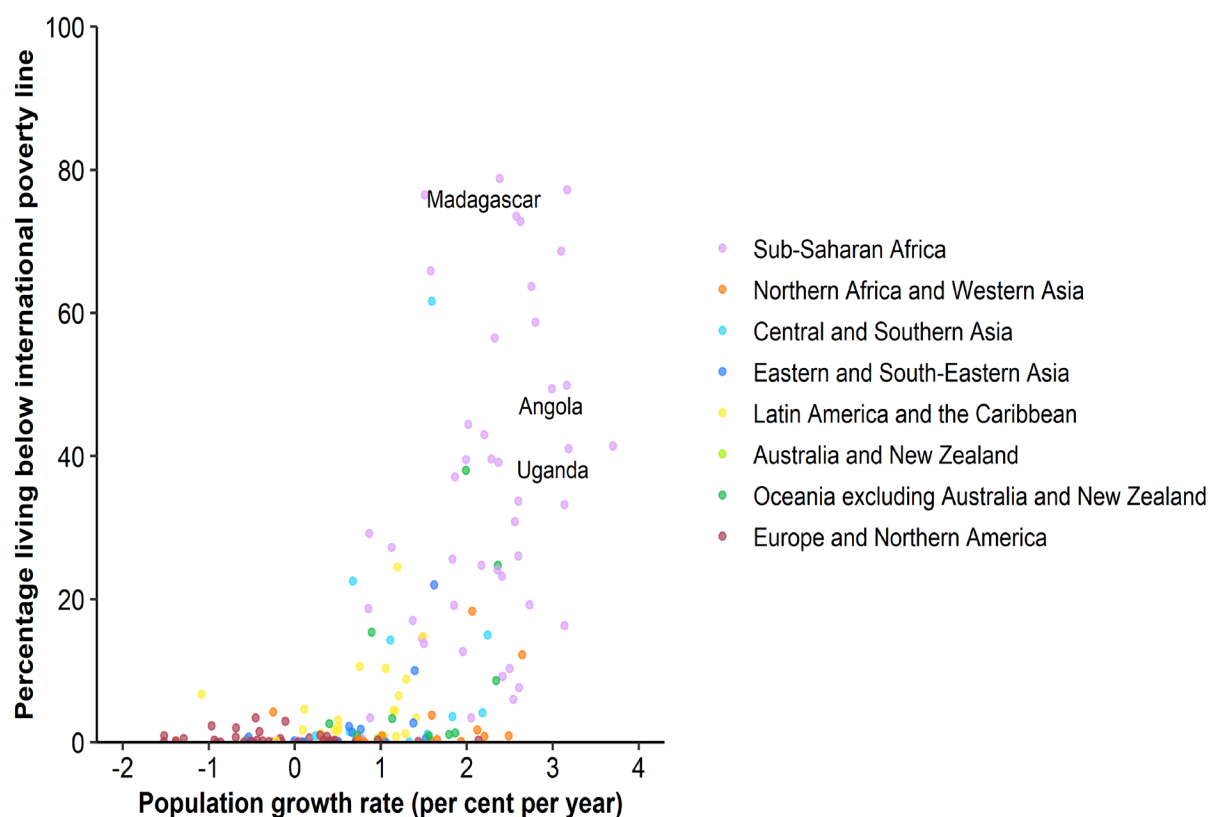
Source: Based on the most recent data available for the period 2003-2021, SDG Indicators Database, available at https://unstats.un.org/sdgs/dataportal/database/. Accessed on 2 June 2022.

Note: SDG indicator 1.1.1 is the proportion of the population living below the international poverty line, which the World Bank has defined as a per capita income of U.S. dollars 1.90 per day in terms of purchasing power parity (PPP).

Providing inclusive and equitable quality education at all levels is critical for achieving the Sustainable Development Goals as access to life-long learning opportunities will help people, especially those in vulnerable situations, to acquire the knowledge and skills needed to exploit opportunities and to participate fully in society.[6] Expanding educational opportunities and ensuring quality education for all can be particularly challenging for low- and lower-middle income countries with growing cohorts of children and youth. In sub-Saharan Africa, the completion rate of upper secondary education[7] increased only 3.4 percentage points, from 23.3 per cent to 26.7 per cent, during the past decade, leaving that region furthest behind.

Mali and Niger are among the countries with the highest percentages of youth of secondary school age and the lowest upper secondary education completion rates (figure I.5). The population in this age group has been growing rapidly in both countries, close to or above 2.5 per cent per year since the mid-2000s and is expected to continue growing relatively fast for the next two decades. According to the latest data available in 2020, in Mali, only about 1 in 8 young people of secondary school age completed upper secondary education, and only 33 per cent completed lower secondary education. In Niger, completion rates are even

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[6] A/RES/70/1, para 25.
[7] The completion rates for primary education, lower secondary education and upper secondary education (SDG indicator 4.1.2) measure the implementation of SDG target 4.1, which, seeks to ensure that, by 2030, all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.

lower: 10 per cent for lower secondary education and only 2.5 per cent for the upper secondary level in 2020. Among the lower-middle-income countries, Kenya had a completion rate for upper secondary education of about 42 per cent in 2020, significantly higher than in most countries in the region with similar proportions of youth aged 12 to 17. However, access to quality education in Kenya is still challenged by various factors, such as inadequate infrastructure, shortage of teachers and underfunding.

Figure I.5

Proportion of youth aged 12 to 17 years in 2021, by the upper secondary education completion rate, 2006-2020
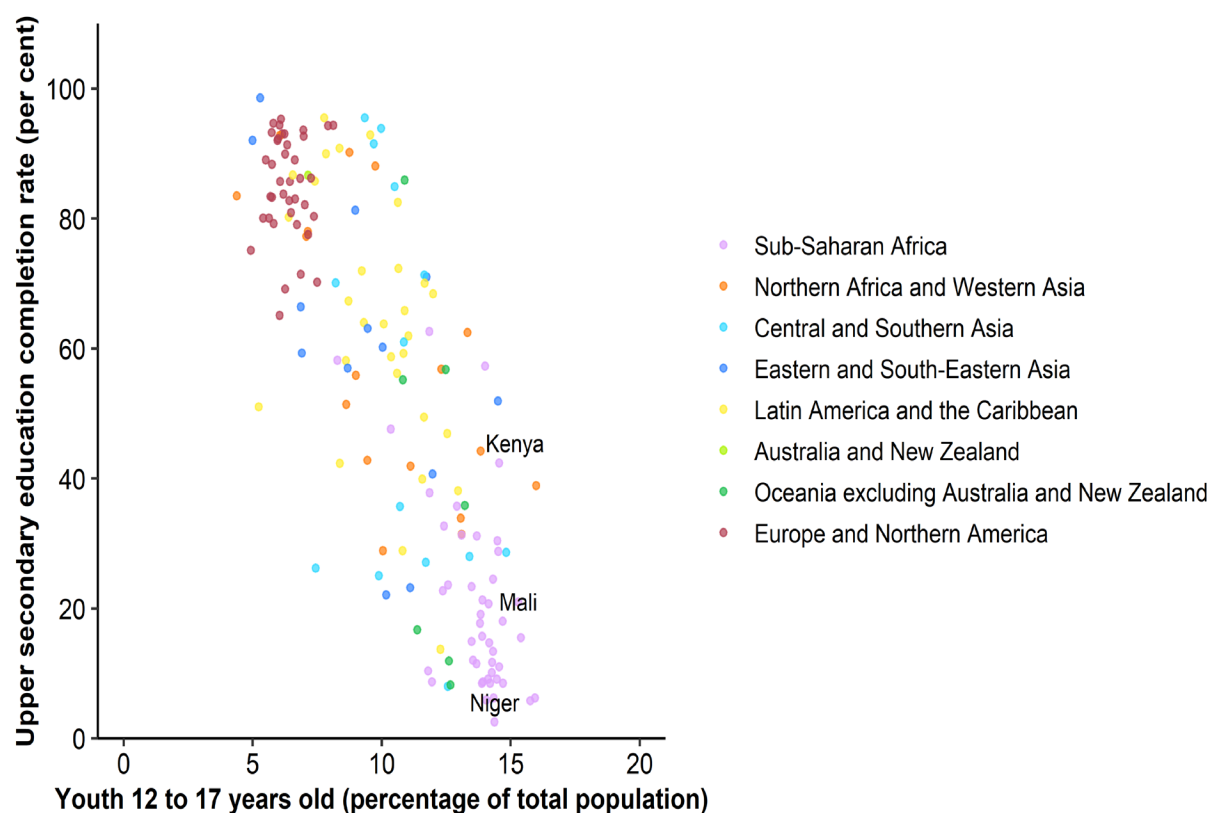
Source: Based on the most recent data available for the period 2006-2020, SDG Indicators Database; available at https://unstats.un.org/sdgs/dataportal/database/. Accessed on 2 June 2022.

Note: A completion rate at or near 100 per cent indicates that all or most children and adolescents have completed a level of education by the time they are 3 to 5 years older than the official age of entry into the last grade of that level of education. A low completion rate indicates low or delayed entry into a given level of education, high drop-out, high repetition, late completion or a combination of these factors. The population aged 12 to 17 years is a rough estimate of the population of typical secondary education ages, according to the International Standard Classification of Education (ISCED, 2011).

The slow progress in expanding education opportunities in low- and lower-middle-income countries has been further reduced by the COVID-19 pandemic. The COVID-19 pandemic has exacerbated longstanding inequalities in access to quality education, negatively affecting the learning and well-being of millions of children and youth worldwide (UNESCO 2021, 2022). As a result, past increases in school completion rates may slow or even reverse depending on the duration of full or partial school closures and other factors affecting the health and well-being of children, their families, and educators.

"A woman sits by the side of the road outside of Skopje, FYR Macedonia. Poverty and unemployment are high in the country" Photo: Tomislav Georgiev/World Bank

II. Trends in fertility, mortality and international migration

Trends in population size and age structure are shaped mostly by levels of fertility and mortality, which have declined almost universally around the globe. In some countries, international migration also has become an important determinant of population change.

The fertility level, or the average number of births per woman over a lifetime, has fallen markedly over recent decades in many countries. Two-thirds of all people globally live in a country or area where fertility is below 2.1 births per woman, which is roughly the level required for populations with low mortality to stabilize in the long run. In 2021, the average global fertility rate stood at 2.3 births per woman, falling from about 5 births per woman in the mid-twentieth century (figure II.1, Panel A). According to the assumptions about future fertility made in the United Nations projections (box III.1), by 2050, the average global fertility rate is expected to have declined to 2.1. To be more precise, with a probability of 95 per cent, global total fertility in 2050 is expected to lie between 1.88 and 2.42 births per woman (figure II. 1, shaded area around the projected trend).

Figure II.1

Global total fertility rate (Panel A) and number of births (Panel B): estimates, 1950-2021, and medium scenario with 95 per cent prediction intervals, 2022-2050
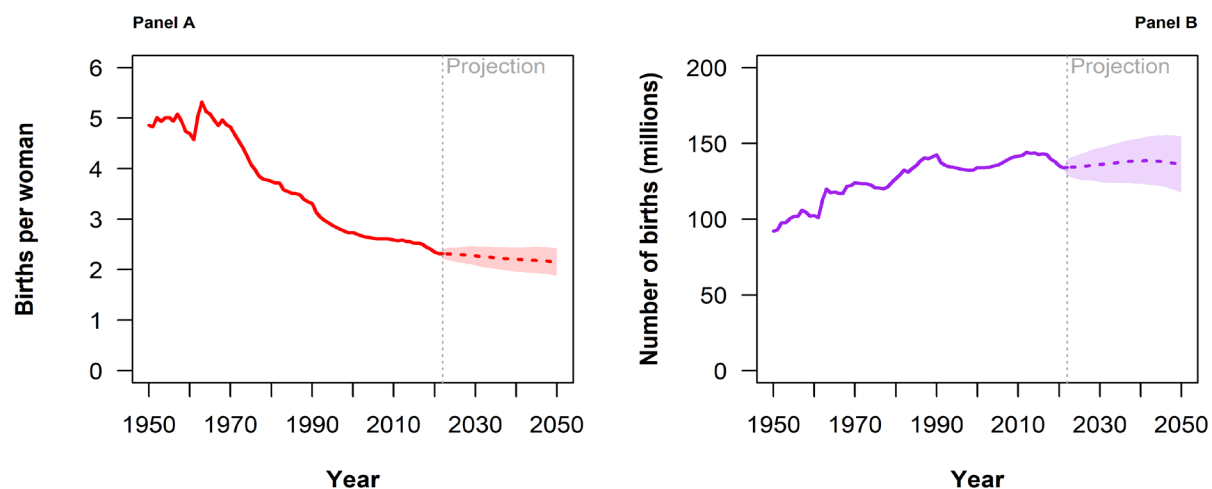

Despite the continuing decline in the average number of births per woman, the total annual number of births has remained stable at around 140 million since the late 1980s due to the youthful age distribution of the global population. The number of births has approached 140 million per year in the late 1980s, when the large cohorts of the earlier "baby boom" of the 1950s and 1960s were having their children (figure II.1, Panel B). In 2021, 134 million babies were born worldwide. In the future, the number of newborns is expected to slightly increase to reach 138 million annually between 2040 and 2045, despite the continuous decline in the average number of births per woman. Because uncertainty around the number of births is cumulative —i.e., each birth cohort will potentially become the parents of future generations—the plausible or likely range for future numbers of births is relatively wide: with a probability of 95 per cent, the size of the global birth cohort in 2050 will lie between 118 and 155 million.

In 2021, most births worldwide occurred in the two most populous regions—Central and Southern Asia (28 per cent of global births) and Eastern and South-Eastern Asia (18 per cent)—and in sub-Saharan Africa (29 per cent), the region with the highest fertility level. There is a wide variation in fertility levels across regions and countries (figure II.2, table II.1). In addition to sub-Saharan Africa (4.6 births per woman), fertility remained above the world's average in 2021 in Oceania excluding Australia and New Zealand (3.1), Northern Africa and Western Asia (2.8), and Central and Southern Asia (2.3).

Figure II.2

Total fertility rate: estimates, 1950-2021, and medium scenario, 2022-2050
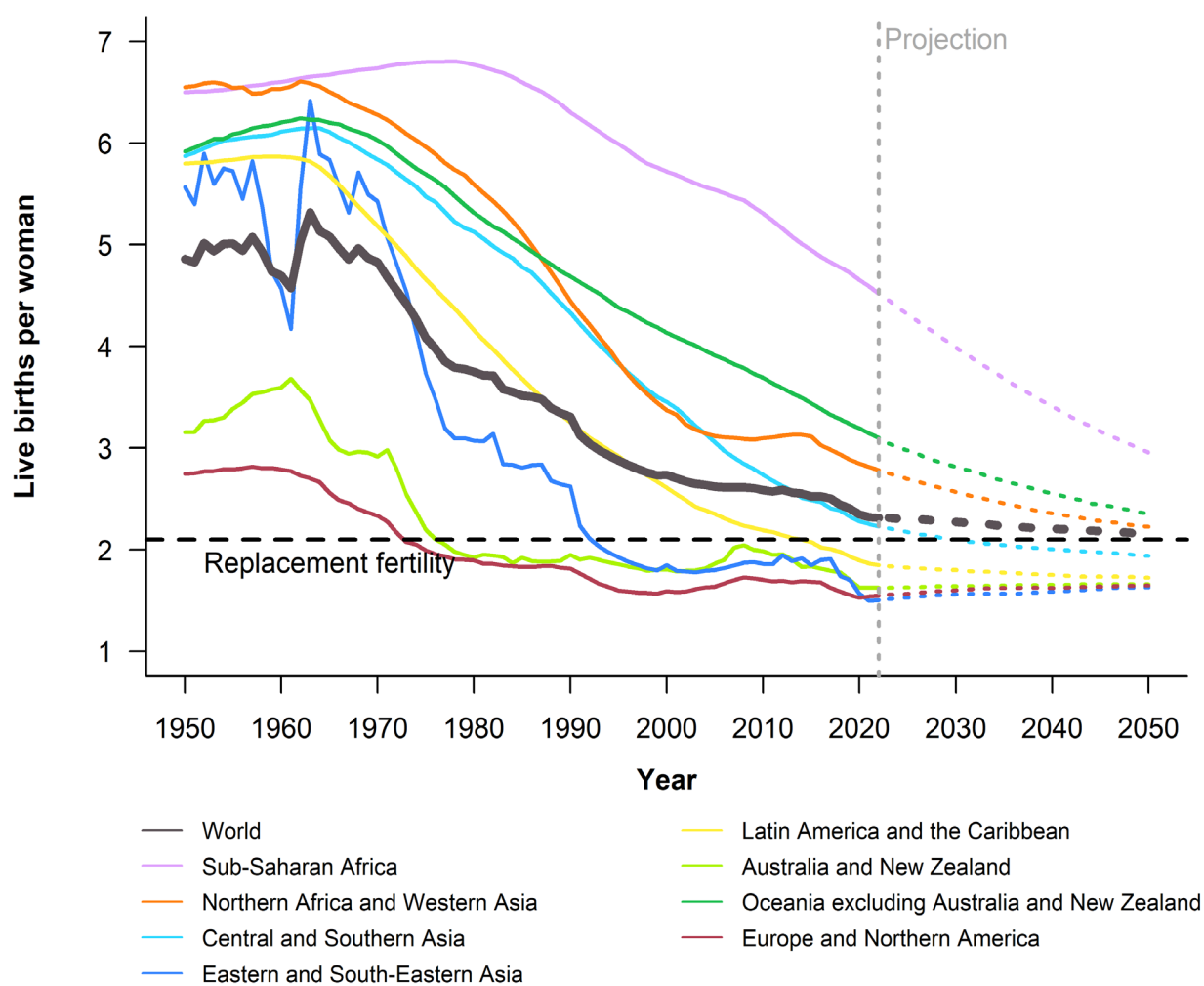
Elsewhere, the total fertility rate has fallen below 2 births per women and has been fluctuating in recent years, typically between 1.5 and 2 births per woman. Today, such countries are home to two thirds of the world's population. Most countries in Europe and Northern America, as well as Australia and New Zealand, have experienced persistent low levels of fertility since the late 1970s, with several countries falling at least temporarily below 1.4 births per woman. In some of these countries, fertility, after increasing in recent decades, has slightly declined in the most recent years.

Table II.1

Total fertility for the world, SDG regions and selected groups of countries, 1990, 2021 and 2050 according to the medium scenario

|	*Average number of births per woman*		
Region	*1990*	*2021*	*2050*
World	**3.3**	**2.3**	**2.1**
Sub-Saharan Africa	6.3	4.6	3.0
Northern Africa and Western Asia	4.4	2.8	2.2
Central and Southern Asia	4.3	2.3	1.9
Eastern and South-Eastern Asia	2.6	1.5	1.6
Latin America and the Caribbean	3.3	1.9	1.7
Australia/New Zealand	1.9	1.6	1.7
Oceania*	4.7	3.1	2.4
Europe and Northern America	1.8	1.5	1.6
Least developed countries	6.0	4.0	2.8
Landlocked developing countries	5.7	4.0	2.7
Small island developing States	3.3	2.3	2.0

*excluding Australia and New Zealand

Starting in the 1960s, fertility levels in Eastern and South-Eastern Asia declined more rapidly compared to Europe and other regions where the decline happened earlier, owing both to the rapid pace of socioeconomic development and to the effectiveness of state-sponsored family planning programmes in supporting changing patterns of childbearing. Since 2018, Latin America and the Caribbean joined the list of regions where fertility has fallen below 2 births per woman over a lifetime.

In 2021, about 13.3 million babies—or 10 per cent of the global number of births—were born to young mothers under the age of 20 worldwide, half of them in sub-Saharan Africa. Levels of adolescent childbearing have fallen most notably in Northern Africa and Western Asia since the late 1970s and in Central and Southern Asia since the late 1980s. In sub-Saharan Africa, the birth rate among adolescents was estimated to have fallen recently; however, it remains the highest among all regions, at 101 births per 1,000 women aged 15 to 19 in 2021 (figure II.3).

Latin America and the Caribbean was the region with the second highest level of adolescent fertility, at 53 births per 1,000 women aged 15 to 19. In 2021, the contribution of adolescent fertility to the total fertility was the highest in Latin America and the Caribbean with 14 per cent—a level about 30 per cent higher than in sub-Saharan Africa.

Early pregnancy and motherhood can have adverse health and social consequences both for the young mothers and for the children they bear. In Latin America and the Caribbean and sub-Saharan Africa, most governments considered adolescent fertility a major concern and have adopted policy measures to improve the sexual and reproductive health of adolescents (United Nations, 2021c).

Figure II.3

Adolescent birth rate, 2021

Births per 1,000 women aged 15-19
- ■ 100 or more
- ■ 60 to less than 100
- ■ 30 to less than 60
- ■ Less than 30
- ■ No Data
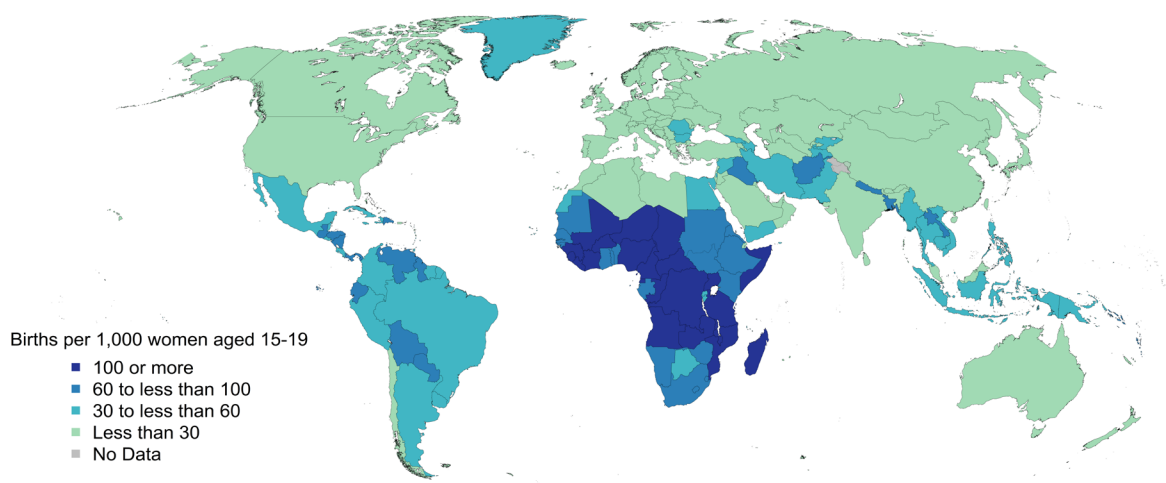
Source: *World Population Prospects 2022.*

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. The 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. The final boundary between the Republic of Sudan and 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).
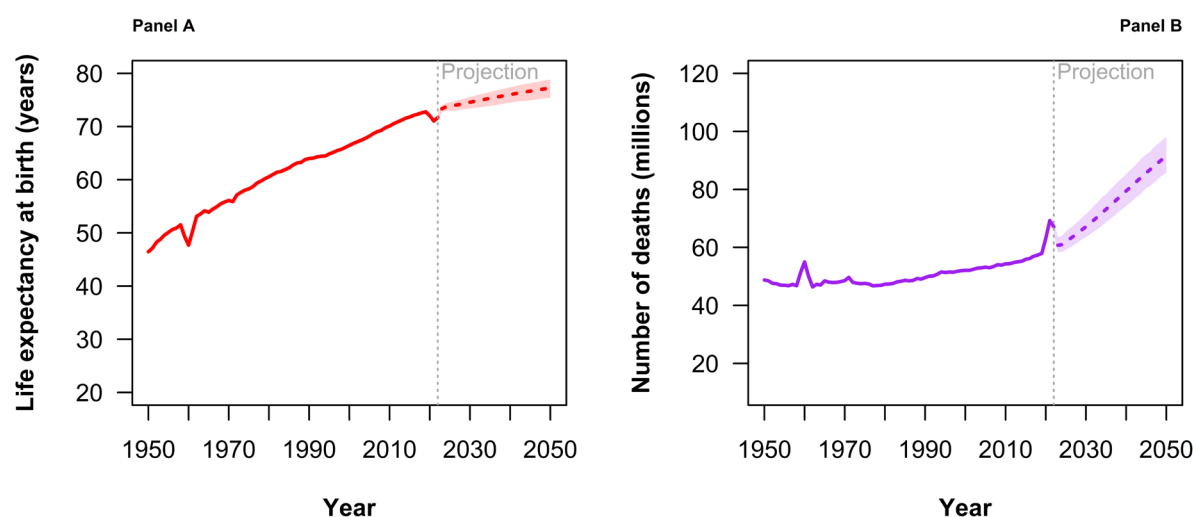
Global life expectancy at birth reached 72.8 years in 2019, an improvement of almost 9 years since 1990. According to current projections, further improvements in survival are expected to result in an average length of life globally of around 77.2 years in 2050. Because the global population is growing and also ageing rapidly (part I), the number of deaths worldwide is expected to increase over the next decades, from 67 million in 2022 to 92 million in 2050 (figure II.4, Panel B).

While considerable progress has been made in closing the difference in life expectancy at birth between countries, the gaps remain wide. In 2021, life expectancy in the least developed countries lagged 7.0 years behind the global average, due largely to persistently high levels of child and maternal mortality and, in some countries, to violence and conflicts or the continuing impact of the HIV epidemic. Progress in life expectancy at birth has slowed down in 2020 and 2021 due to the impact of the COVID-19 pandemic (box II.1 and figure II.4, Panel A).

Available evidence suggests that in some countries of Europe and Northern America, progress in life expectancy was already slowing or stalling even before the outbreak of the pandemic. In Canada, the United Kingdom and the United States, for example, vital statistics point to levels of life expectancy for recent years that are lower than what was previously projected based on the historical trajectory of improvement in survival in each country. The stalling life expectancy in the United States, for example, was mostly attributable to the stagnating decline in cardiovascular disease mortality (Mehta, Abrams and Myrskylä, 2020).

Figure II.4

Global life expectancy at birth (Panel A) and number of deaths (Panel B): estimates, 1950-2021, and medium scenario with 95 per cent prediction intervals, 2022-2050


In 2021, the disparity between the country with the highest and the country with lowest life expectancy at birth stood at 33.4. Among the countries with a population of at least half million in 2022, life expectancy at birth reached close to 85 years or above years in 2021 in Australia, the Hong Kong and Macao special administrative regions of China, and Japan. In contrast, life expectancy at birth is the lowest in Central African Republic, Chad, Lesotho and Nigeria with levels below 54 years in 2021.

In the coming decades, further increases in survival are expected to narrow but not to eliminate differences in life expectancy across countries and regions (table II.2). By 2050, life expectancy at birth is projected to reach 77.2 years worldwide, with a gap of 31.8 years remaining between the countries with the lowest and the highest values. As countries complete the demographic transition and reach historically low levels of mortality, further reductions in death rates become more difficult to achieve and the rise in life expectancy slows down, prompting a trend towards convergence between countries and regions over the long-term (Part III).

In some regions, life expectancy at birth actually declined during the late 1980s and 1990s due primarily to the HIV epidemic in sub-Saharan Africa and the health crisis in Eastern Europe following the dissolution of the Soviet Union. These setbacks have long-lasting effects on life expectancy at birth. Countries in sub-Saharan Africa experienced only limited progress in survival during the period 1980-2000. The slow recovery in life expectancy at birth in the countries of the former Soviet Union explains the large and continuing differences across European countries. In 2021, life expectancy at birth ranged from less than 70 years in the Republic of Moldova and the Russian Federation to 84 years in Switzerland.

Figure II.5

Life expectancy at birth: estimates, 1950-2021, and medium scenario, 2022-2050, by region
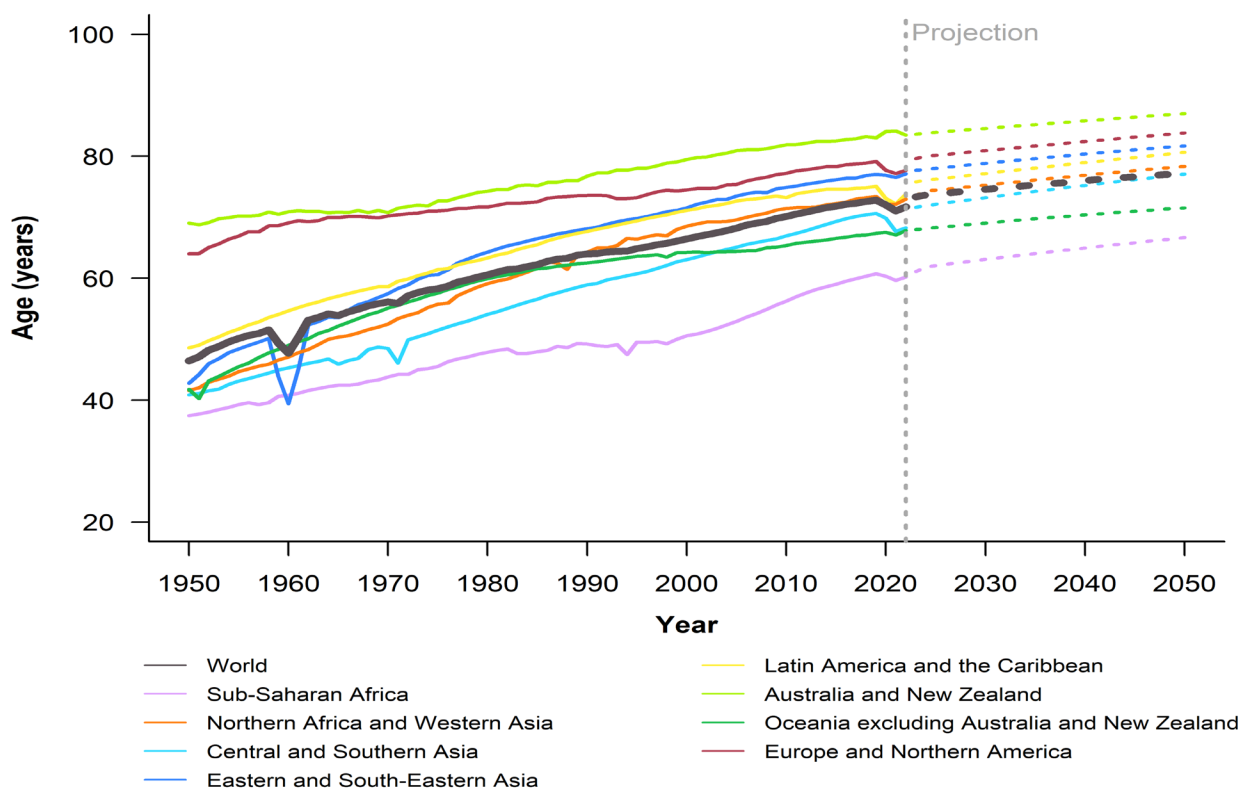
Note: The figure depicts values for the "period" life expectancy, which shows the average age a newborn would live to if current death rates continued for their whole life. These estimates do not predict actual lifespans. That is, a life expectancy in 2020 lower than in 2019, which may be due to the COVID-19 pandemic, does not mean that a newborn in 2020 is expected to have a shorter life than one born in 2019.

Gender inequalities across the world make women and girls more vulnerable to poor health, often putting them at higher risks of death, including from a maternal cause. At the global level, however, women live on average longer than men (table II.2). Higher male mortality has been associated with behavioural factors and genetic differences (Austad, 2006). In 2021, life expectancy at birth for women exceeded that for men by 5.4 years globally, with female and male life expectancies standing at 73.8 and 68.4, respectively. This female survival advantage is observed in virtually all regions and countries of the world. The female advantage in life expectancy at birth ranged from 7 years in Latin America and the Caribbean to 2.9 years in Australia and New Zealand. The COVID-19 pandemic contributed to widening the gap in life expectancy at birth between sexes. In 2019, this gap reached 5.2 years. In the last three decades, the sex gap in life expectancy at birth shrank in some regions (Australia and New Zealand, Europe and Northern America), but increased in others (Central and Southern Asia, and Eastern and South-Eastern Asia) (United Nations, 2020a). In sub-Saharan Africa, the rise in the sex differential of life expectancy at birth was interrupted in the late 1990s due to the disproportionate impact of the HIV/AIDS epidemic on female mortality in that region, which had its maximum effect on mortality rates in the mid-2000s. The COVID-19 pandemic contributed to a slight increase in the gap in life expectancy at birth between the sexes.

Table II.2

Life expectancy at birth by sex for the world, SDG regions, and selected groups of countries, 1990, 2021 and 2050

| | *Life expectancy at birth (years)* | | | | | | | | |
| | 1990 | | | 2021 | | | 2050 | | |
Region	*Males*	*Females*	*Both sexes*	*Males*	*Females*	*Both sexes*	*Males*	*Females*	*Both sexes*
World	**61.5**	**66.5**	**64.0**	**68.4**	**73.8**	**71.0**	**74.8**	**79.8**	**77.2**
Sub-Saharan Africa	47.3	51.2	49.2	57.8	61.6	59.7	64.3	69.1	66.7
Northern Africa and Western Asia	61.7	67.0	64.3	69.7	74.8	72.1	76.0	80.8	78.3
Central and Southern Asia	58.1	59.9	58.9	65.9	69.6	67.7	74.9	79.4	77.1
Eastern and South-Eastern Asia	65.6	70.7	68.1	73.6	79.6	76.5	79.4	84.1	81.7
Latin America and the Caribbean	64.6	70.9	67.7	68.8	75.8	72.2	78.1	83.1	80.6
Australia/New Zealand	73.7	79.8	76.8	82.7	85.6	84.2	85.4	88.6	87.0
Oceania*	60.3	65.5	62.5	64.6	70.1	67.1	68.4	74.9	71.6
Europe and Northern America	69.7	77.4	73.6	73.9	80.4	77.2	81.6	86.1	83.8
Least developed countries	48.7	51.6	50.1	61.7	66.5	64.1	67.8	73.5	70.6
Landlocked developing Countries	49.0	53.5	51.2	61.0	66.5	63.7	67.4	73.4	70.3
Small island developing States	63.4	67.9	65.6	68.0	73.9	70.8	74.1	80.0	77.0

*excluding Australia and New Zealand

A large portion of the gap between countries with the lowest and highest levels of life expectancy at birth is attributable to disparities in the under-five mortality rate, which represents the probability of dying between birth and age 5. Progress in reducing under-five mortality has been substantial and far-reaching in recent years, yet gaps remain. Globally, the under-five mortality rate fell from 92.8 deaths per 1,000 live births in 1990 to 37.1 in 2021. Still, a child born in sub-Saharan Africa in 2021 is 20 times as likely to die before his or her fifth birthday as a child born in Australia and New Zealand.

Although the HIV/AIDS epidemic continues to be a major public health concern, HIV-related mortality among adults appears to have reached a peak over the past decade in most countries that have been highly affected by the epidemic, thanks mostly to the increasing availability of antiretroviral treatments (ART). Nevertheless, in countries where HIV prevalence has been high, the impact of the epidemic in terms of morbidity, mortality and slower population growth continues to be evident. Thus, in Southern Africa, the sub-region with the highest prevalence of the disease, life expectancy at birth fell from 63.1 years in 1990 to 53.1 years in 2005 (before the introduction of ART). Life expectancy in Southern Africa had returned to its 1990 level by 2015 and increased further to 65.5 in 2019, representing a loss of two decades of potential improvements in survival rates. The COVID-19 pandemic contributed to removing the gains in life expectancy recorded in Southern Africa over the past decades with life expectancy at birth declining to 61.8 years in 2021.

Life expectancy at age 65 reflects the average number of additional years of life a 65-year-old person would live, according to the prevailing mortality conditions. Before the outbreak of the COVID-19 pandemic, in 2019, people who had already survived to age 65, could expect to live on average an additional 17.5 years worldwide, 6.2 years longer than a person of the same age in the early 1950s. In 2019, women aged 65 years could expect to live an additional 18.8 years and 65-year-old men an additional 15.9 years.

In 2021, Australia, Hong Kong SAR (China), Macao SAR (China), and Japan had the highest life expectancies at birth (about 85 years) and at age 65 (21.6 and over years) among the countries and areas with at least half a million population. A decrease in mortality from non-communicable diseases, such as cardiovascular disease, diabetes, cancer, and chronic respiratory disease and other age-related chronic conditions are expected to continue contributing to the extension of life. In 2050, a 65-year-old person is expected to live on average an additional 19.8 years in 2050 globally.

As is the case for many causes of death, COVID-19 is responsible for many more deaths among older persons than among younger persons (WHO, 2022). At the individual level, older people have a higher risk of serious illness and higher case fatality rates[8] than people in younger age groups. In addition, environmental and societal factors account for substantial variation across countries in old-age COVID-19 mortality; among these are the prevalence of co-morbidities in their national populations, the presence of robust old-age social protection systems, and the capacity of health systems to protect those at increased risk once the outbreak unfolded. The living arrangements of older persons in congregate settings has emerged as another factor of increased risk of contracting and dying from COVID-19, as it increases the efficiency of viral spread (Comas-Herrera and others, 2020).

Based on the latest available estimates of the effect of the COVID-19 pandemic on mortality (box II.1), the global life expectancy at age 65 lost 1.2 years between 2019 and 2021, or more than 71 per cent of the total decline in life expectancy at birth. With the exception of Australia and New Zealand, all regions of the world experienced a decline in the average number of years a 65-year-old person could expect to live. The decline was the strongest in Central and Southern Asia (-2.3 years) and Latin America and the Caribbean (-1.5 years).

In some parts of the world, international migration has become a major component of population change. During the period 1980-2000, population growth in high-income countries was mainly due to natural increase (104 million), that is, the difference between the total number of births and deaths, which was more than twice the contribution of net international migration to population growth (44 million), that is, the difference between immigration and emigration. For high-income countries between 2000 and 2020, the contribution of international migration to population growth (net inflow of 80.5 million) exceeded the balance of births over deaths (66.2 million). Over the next few decades, migration will be the sole driver of population growth in high-income countries, as the number of deaths will progressively exceed the number of births (figure II.6). By contrast, for the foreseeable future, population increase in low-income and lower-middle-income countries will continue to be driven by an excess of births over deaths. At the country level, large variations in the relative contribution of natural change and net migration to overall population change are observed.

Between 2010 and 2021, 40 countries or areas have experienced a net inflow of more than 200,000 migrants; in 17 of those, the total net inflow exceeded 1 million people.

In 2020, Türkiye hosted the largest number of refugees and asylum seekers worldwide (nearly 4 million), followed by Jordan (3 million), the State of Palestine (2 million) and Colombia (1.8 million). Other major destination countries of refugees, asylum seekers or other persons displaced abroad were Germany, Lebanon, Pakistan, Sudan, Uganda and the United States of America (United Nations, 2020b).

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[8] The case fatality rate refers to the proportion of people who died from COVID-19 among all persons infected with COVID-19 during a certain period of time.

Box II.1

The impact of the COVID-19 pandemic on fertility, mortality and international migration

The evidence of the full demographic impact of the pandemic remains incomplete, owing both to gaps in the collection of demographic data and to time lags between data collection and dissemination. Despite these challenges, World Population Prospects 2022 accounts for the impact of the COVID-19 pandemic on population and demographic estimates, using the latest available evidence.

The available evidence of the effect of the COVID-19 pandemic on fertility remains mixed. The pandemic could potentially influence the number of births per woman through various channels, such as postponement of childbearing in the face of the uncertainty regarding the disease and its economic impacts, disruptions in marriage patterns and family formation, and disruptions in the availability and access to sexual and reproductive health-care services, including family planning. The available evidence on the impact of the pandemic on fertility also suggests differences by level of income. The latest studies in low- and middle-income countries have shown little evidence of a change in the number of unintended pregnancies and births. In these countries, contraceptive availability and demand have remained relatively stable (United Nations, 2021d). In high-income countries, the COVID-19 pandemic acted as a temporary interruption rather than a permanent change in long-term trends. The successive waves of the pandemic may have produced temporary reductions in the numbers of pregnancies and births, without affecting long-term trends in countries with low fertility. Given this evidence, no additional impact of the COVID-19 pandemic was included in the fertility estimates of World Population Prospects 2022 other than those already reflected in available national data.

The Population Division of the United Nations Department of Economic and Social Affairs (UN DESA) collaborated with the World Health Organization (WHO) to develop estimates of numbers of deaths attributable to the direct and indirect impacts of the pandemic. The excess mortality associated with the pandemic is estimated to have reached 14.9 million for the period between 1 January 2020 and 31 December 2021—a figure almost 3 times the officially reported numbers of deaths.[9] The excess mortality was calculated as the difference between the number of deaths that have occurred and the number of deaths that would be expected to occur in the absence of the pandemic based on estimates from previous years. Deaths directly associated with COVID-19 are deaths due to the disease. Indirect deaths attributed to the pandemic are those that occurred due to the impact of the pandemic on health systems and on the society at large and include deaths attributable to health conditions for which people were unable to access prevention or treatment due to overburdened health systems. The excess mortality estimates are also accounting for deaths that may have been averted during the pandemic due to lower mortality risks, such as deaths due to seasonal influenza, traffic accidents or occupational injuries. The estimates of mortality due to COVID-19 indicate that the global death toll was higher for men than for women and higher among older adults than for younger persons. It is estimated that life expectancy at birth fell to 71.0 years in 2021 due to the impact of the COVID-19 pandemic. Globally, the COVID-19 pandemic contributed to a loss of 1.7 years of life expectancy at birth between 2019 and 2021. These estimates are derived through an innovative methodology which produces comparable mortality estimates even in a context where data are incomplete or unavailable (Knutson and others, 2022; WHO, 2022). The excess mortality estimates are available only for 2020. After 2021, World Population Prospects 2022 takes different approaches in terms of recovery from the effects of the pandemic. Depending on the availability of recent mortality data by country and the prevalence of COVID-19 vaccination (i.e., at least one injection), life expectancy at birth was assumed to return to pre-pandemic levels and trends in 2022 for countries with high vaccination prevalence or with data supporting such patterns. For all other countries with low vaccination prevalence or without additional data, World Population Prospects 2022 assumes a return to pre-pandemic mortality levels and trends with a time lag of 1 to 3 years.

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[9] https://who.int/news/item/05-05-2022-14.9-million-excess-deaths-were-associated-with-the-covid-19-pandemic-in-2020-and-2021.

Box continued

Available data indicate that there was no convincing evidence of a reversal in child mortality gains, as it had been feared early during the COVID-19 pandemic. However, it is worth noting that indirect impacts of the pandemic on child mortality could take time to unfold. The impact of factors such as interruptions in routine childhood immunization and nutritional programmes and other pandemic conditions such as increased food insecurity and loss in household income may be observed in the coming years, as they may take some time to be realized (UNICEF and others, 2021).

The COVID-19 pandemic severely restricted all forms of human mobility. The closing of national borders and disruptions of international travel affected or canceled plans of people to move to another country. Hundreds of thousands of migrants were stranded, unable to return to their country, while reduced job opportunities and school closures forced many others to return to their home countries earlier than planned. While it remains difficult to assess the full extent of the pandemic's impact on migration trends, World Population Prospects 2022 assumed a halving of net migration during 2020 and 2021.

It is estimated that ten countries experienced a net outflow of more than 1 million migrants between 2010 and 2021. In many of these countries, these outflows were due to temporary labour movements, such as for Pakistan (net outflow of -16.5 million during 2010-2021), India (-3.5 million), Bangladesh (-2.9 million), Nepal (-1.6 million) and Sri Lanka (-1 million). In other countries, including Syrian Arab Republic (-4.6 million), Venezuela (Bolivarian Republic of) (-4.8 million), and Myanmar (-1 million), insecurity and conflicts have driven the net outflow of migrants over the decade.

The conflict in Ukraine has forced people to flee their homes seeking safety, protection and assistance. By the end of May 2022, the conflict had displaced some 13 million persons, including 6.8 million refugees who have fled Ukraine, mostly crossing into Poland and other neighbouring countries (Office of the United Nations High Commissioner for Refugees, 2022).

Figure II.6

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
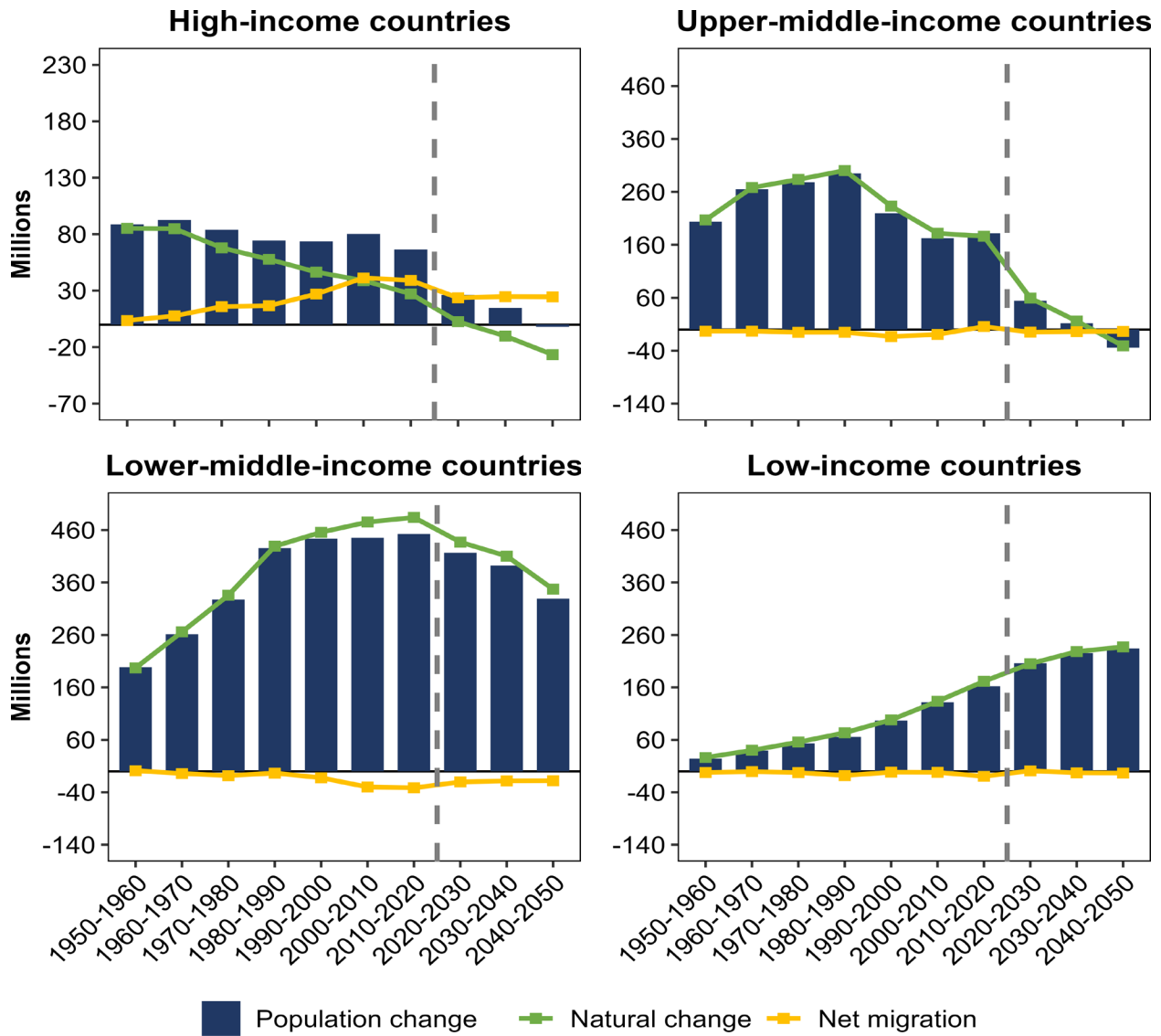
Box II.2

Data sources used in World Population Prospects 2022

The United Nations publishes population estimates and projections for 237 countries or areas, comprising the entire population of the world. For the 236 countries or areas that had at least 1,000 inhabitants in 2021, the data set contains complete time series of population size by age and sex and of the components of population change—fertility, mortality and international migration—from 1950 until 2100.

The quality of population estimates and projections hinges on the availability of reliable and timely demographic data, including data collected through civil registration and vital statistics (CRVS) systems, population censuses, population registers and household surveys. Recent and historical data on the size of the population and its composition by age and sex, as well as information on levels and patterns of the components of population change, are used for the preparation of population estimates for each country or area.

Recent population counts are critical for obtaining accurate estimates of population size and its composition by age and sex (Spoorenberg, 2020). The principal data source for this purpose is the population census. Most countries conduct a census approximately once per decade. The COVID-19 pandemic disrupted the planning and conduct of population censuses from 2020 onwards and has impaired the functioning of registration and reporting systems in many countries. A recent survey indicated that the pandemic had a negative impact on the preparation, fieldwork or collection phases of the census in some 75 per cent of the 111 countries that responded (United Nations Statistics Division 2021). Some countries had used administrative registers as sources of census data. It is important to assess the impacts of the pandemic on the timely production of complete and reliable population data and to learn from these experiences how to build more efficient and resilient data systems.

For the estimation period between 1950 and 2022, data from 1,758 censuses were considered in the present evaluation. In some countries, population registers based on administrative data systems provide the necessary information. Population data from censuses or registers referring to 2015 or later were available for 152 countries or areas, representing 64 per cent of the 237 countries or areas included in this analysis. For 74 countries or areas, the most recent available population count was from the period 2005-2014. For the remaining 11 countries or areas, the most recent available census data were from before 2005. In addition, information on births and deaths from civil registration and vital statistics systems for 169 countries, and demographic indicators from 2,890 surveys, were considered in the present evaluation.

A key task in preparing estimates and projections of the world population is to ensure that, for each country, past, current and future trends in fertility, mortality and international migration are consistent with changes in the size of the population and its distribution by age and sex. Various techniques are used to identify the most likely trends in fertility, mortality and international migration. For countries where no or only minimal data are available, demographic and statistical models are used to estimate levels of fertility, mortality and migration. Times series of population estimates, and of the components of population change, are critical inputs for the creation of population projections, as they provide a starting point for the projected future trends.

Civil registration and vital statistics systems are the preferred source of information for computing statistics on levels and trends in the fertility and mortality of a population, and for tracking changes in the size of a population and in its distribution by age and sex between censuses. In addition to being a source of essential population statistics, the universal registration of births and deaths also helps

to ensure access to legal identity for all persons, as called for in SDG target 16.9 on "legal identity for all, including birth registration". Although complete vital statistics are essential for demographic accounting, many countries lack such statistics. Among 233 countries or areas,[10] only 73 per cent of the countries, territories and areas register at least 90 per cent of births. Furthermore, for death registration, only 68 per cent of the countries, territories and areas register at least 90 per cent of deaths.

Demographic data are essential for development planning and for assessing progress towards the achievement of the Goals and targets of the 2030 Agenda for Sustainable Development. The United Nations population estimates and projections are used for the global monitoring of around one quarter of the 231 SDG indicators. Data from the World Population Prospects are used to compute national-level estimates for a subset of these indicators and, more broadly, to derive regional aggregates using a consistent set of population weights. Assessing statistical capacity gaps between countries to collect, generate, analyse and disseminate demographic data, and strengthening national capacities where most needed, are crucial factors both for the implementation of national planning and for SDG reporting.

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[10] https://unstats.un.org/unsd/demographic-social/crvs/.

"Children in primary school on the first day of classes in the new school year"
Photo: Genti Shkullaku / World Bank

# III. Long-range population projections to 2100

Long-range population projections are highly uncertain, especially for high-fertility countries still in the early stages of the demographic transition. As mentioned in Part I, there is a probability of 95 per cent that the size of the global population will lie between 9.4 and 10.0 billion in 2050 and between 8.9 and 12.4 billion in 2100 (box III.1). Thus, the size of the world's population is almost certain to rise over the next several decades, as is the degree of uncertainty associated with these projections. Later in the century, there is about 50 per cent chance that the world's population will peak—that its size will stabilize or begin to decrease—before 2100.

As fertility will be the most important determinant of global population trends in the coming decades, uncertainty around the number of children to be born in populous, high-fertility countries is a major source of the uncertainty in global population projections. Because of the momentum of growth embedded in current age structures, reductions in fertility over the next several years will have only a limited effect on the growth of the world population between now and 2050. However, a fertility decline in the near term can have important consequences for growth in the last decades of the century as the impact of fertility decline on population size cumulates from one generation to the next.

Increasing uncertainty at dates farther into the future is reflected in a widening band of prediction intervals for projections of the number of births and of the total population size (figure III.1). It is projected that 136 million babies will be born worldwide in 2050, with upper and lower bounds of the prediction interval indicating that the observed number of births in that year could plausibly deviate from the median trajectory by up to ±19 million—thus, an uncertainty range of more than one fourth of the median value (27 per cent). Over the following five decades, the number of births is projected to decrease by 24 million globally, reaching 111 million in 2100. At that point, the uncertainty range widens to nine tenths of the median value (90 per cent) as the prediction interval extends from 77 to 178 million.

Figure III.1

Global population size and total number of births and deaths, estimates (1950-2022) and medium scenario with 95 per cent prediction intervals, 2022-2100
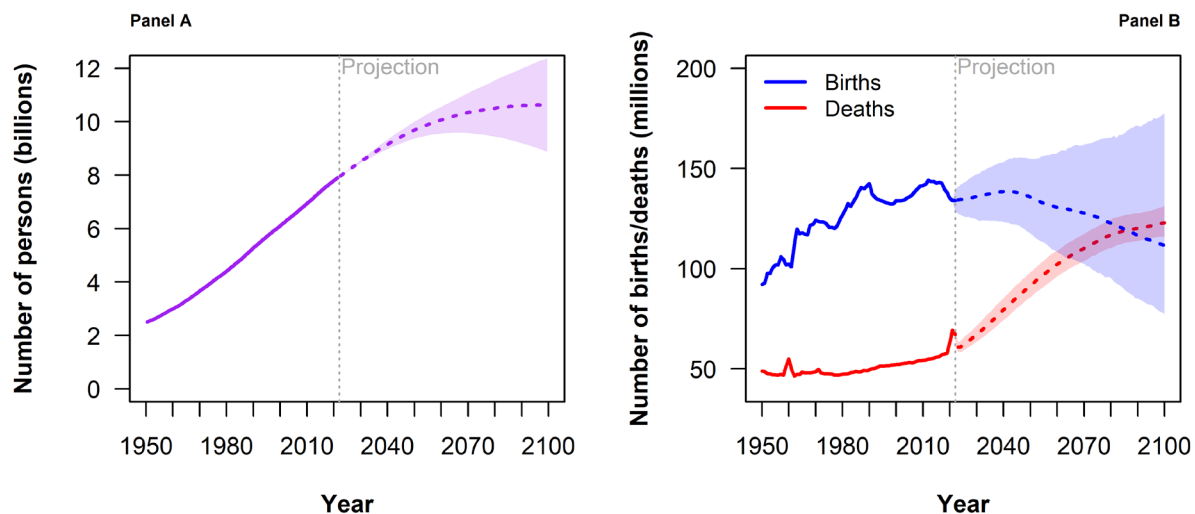
For both fertility and mortality, the uncertainty of projected levels and trends was assessed using a predictive model derived from a probabilistic analysis of the observed variability of changes over time in the past. In each case, the most likely future course of fertility based on several thousand statistical simulations was taken as the most likely future trend. International migration is the component of population change that is the most difficult to project. Given the sparsity and/or incompleteness of data on past trends as well as the potentially rapid and significant changes in migration flows in response to economic, social, political and environmental factors, international migration can change significantly in volume and direction within a short timeframe. Because of these challenges, international migration was projected on the basis of past international migration estimates, assuming a continuation of recent migration trends in countries with stable migration levels as well as taking into account the policy stance of each country with regard to future international migration flows.

The global population is expected to reach 9.7 billion in 2050 and 10.4 billion in 2100, according to the medium scenario, which assumes a decline of fertility for countries where large families are still prevalent, a slight increase of fertility in several countries where women have fewer than two births on average over a lifetime, and continued reductions in mortality at all ages. There is inherent uncertainty in population projections. At the global level that uncertainty depends on the range of plausible future trends in fertility, mortality, and international migration, which have been assessed for each country or area using demographic and statistical methods. This analysis concludes that, with a probability of 95 per cent, the size of the global population will stand between 9.4 and 10.0 billion in 2050, and between 8.9 and 12.4 billion in 2100.

Sub-Saharan Africa will account for most of the growth of the world's population over the coming decades, while several other regions will begin to experience decreasing population numbers. Sub-Saharan Africa is projected to become the most populous of the eight geographic regions in the late 2060s, surpassing both Eastern and South-Eastern Asia and Central and Southern Asia in size (figure III.2), and it could see its population reach 3.44 billion by the end of the century.

While population growth in Northern Africa and Western Asia has been slower than in sub-Saharan Africa in recent decades, the region is also projected to continue to grow through the end of this century, adding 221 million people between 2022 and 2050 and another 174 million people between 2050 and 2100. The world's two most populous regions in 2022 are Eastern and South-Eastern Asia, with 2.3 billion people, representing 29 per cent of the global population, and Central and Southern Asia, with 2.1 billion (26 per cent). Both regions, which experienced rapid population growth since the mid-twentieth century, are expected to reach their peak population size in the coming decades. Eastern and South-Eastern Asia is projected to reach a maximum population size of 2.4 billion around 2034 and the population of Central and Southern Asia is projected to peak some 38 years later at 2.7 billion around 2072. The combined population of Europe and Northern America is stabilizing, having reached 1.12 billion in 2022 and, according to the medium scenario, projected to grow slowly to just under 1.13 billion around 2038 and decline thereafter to about 1.0 billion at the end of the century. The population of Latin America and the Caribbean, which quadrupled in size between 1950 and 2022, is projected to peak at just below 752 million around 2056 and decline thereafter to about 646 million in 2100. The population of Oceania is projected to continue to grow through the end of the century. The total population of the region, excluding Australia and New Zealand, is expected to increase from 13.6 million in 2022 to 19.6 million in 2050 and 24.6 million in 2100. Australia and New Zealand, which are home to 31.2 million people in 2022, could see their population grow to 38.1 million in 2050 and 44.2 million in 2100, according to the medium scenario.

Figure III.2

Population by SDG region: estimates, 1950-2022, and medium scenario with 95 per cent prediction intervals, 2022-2100
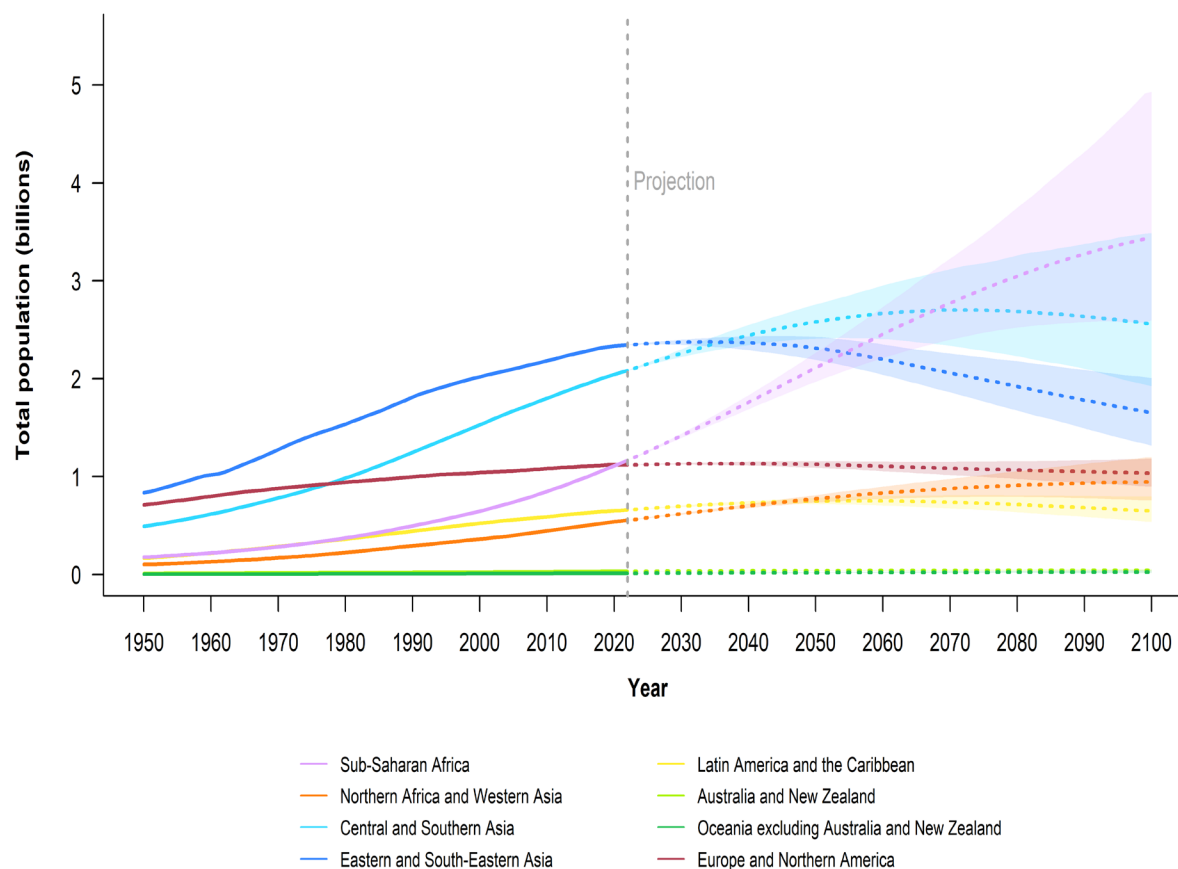

Another means of exploring the potential variability of future population trends involves making specific, stylized changes in the assumptions about future levels and trends of fertility, mortality and migration. This (deterministic) exercise resulted in nine scenarios that illustrate the impact on projected population trends of hypothetical changes in the underlying assumptions (box III.1).

In the high- and low-fertility scenarios, the future fertility level for each country or area is assumed to be consistently higher or lower than in the medium scenario by exactly one half (0.5) of a birth per woman, on average, while retaining the same assumptions with respect to mortality and international migration. As illustrated in **figure III.3**, the trends in global population size associated with the high- and low-fertility scenarios diverge considerably from the trajectory of the medium scenario and imply a range of future outcomes that is much broader than the prediction intervals of the probabilistic analysis.

The probabilistic assessment of projection uncertainty suggests that the range between the high- and low-fertility scenarios may be implausibly large, especially in the latter decades of the current century. The medium scenario of global trends is derived by aggregating the "best guess" projections for individual countries and areas. Although a deviation of half (0.5) of birth between actual and projected fertility levels is entirely plausible for a given country or area in a given year, it is unlikely that this would be the case for all countries and areas and for all future years as implied by the traditional high- and low-fertility scenarios of the United Nations population projections (Gerland and others, 2014).

Figure III.3

Global population size: estimates, 1950-2022, and medium scenario with 95 per cent prediction intervals and high- and low-fertility scenarios, 2022-2100
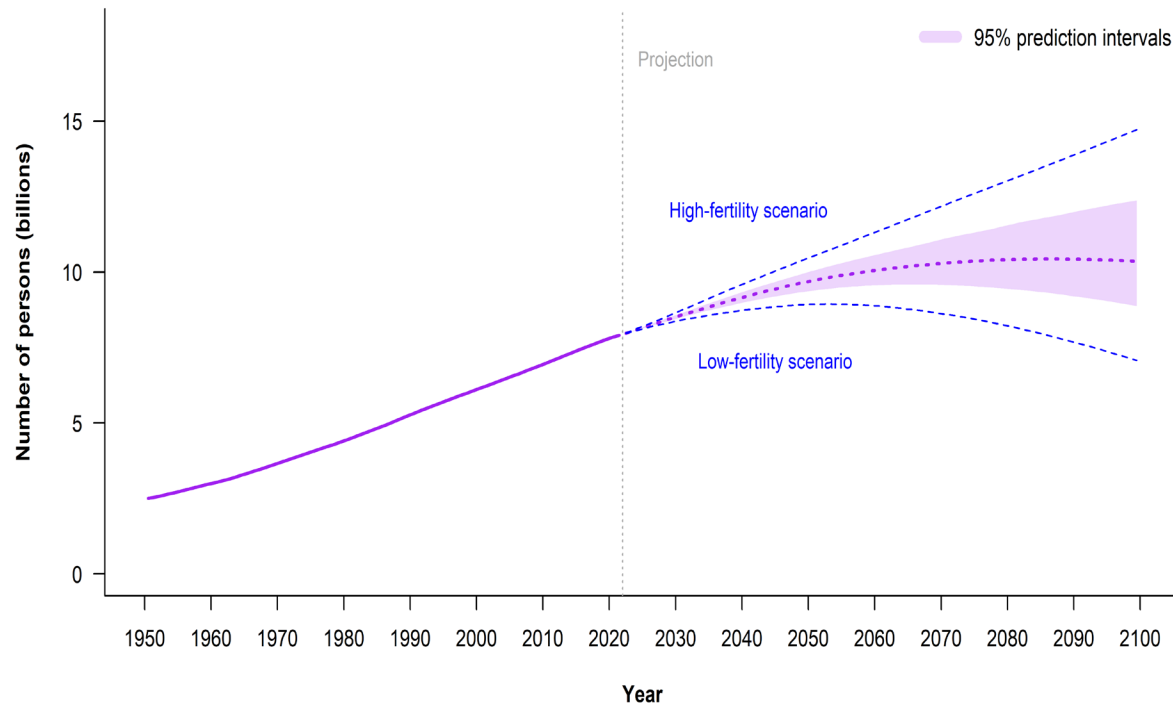

Besides the probabilistic and deterministic population projections released by the United Nations, other institutions produce long term population projections. The latest sets of three shared socio-economic pathways (SSPs) published by the Joint Research Center of the European Commission (JRC) outline alternative scenarios illustrating a broad range of possible futures (European Commission, Joint Research Center, 2018). The first of these scenarios, SSP1, labelled 'Sustainability/Rapid Social Development', assumes an acceleration of the demographic transition through sustained investments in education and health that would contribute to future low levels of mortality and fertility. The second scenario, SSP2, labelled 'Continuation/Medium Population Scenario', is considered as the most likely future based on trends of recent decades and assumes a medium pathway in future fertility, mortality and education. The last scenario, SPP3, labelled 'Fragmentation/Stalled Social Development', is characterized by rapid population growth accompanied by low education, and high mortality and fertility.

Global population levels are lowest in SSP1, peaking at 8.7 billion between 2050 and 2060, and declining to 7.3 billion by 2100 (figure III.4). This is broadly consistent with the United Nations low-fertility scenario. Under SSP2, the middle-of-the-road scenario, the future population would peak around 9.7 billion in 2070. This figure is still lower than the United Nations medium scenario of around 10.4 billion in 2100. Finally, SSP3 shows continued global population growth through to the end of the century, reaching 13.6 billion by 2100. SSP3 is higher than the United Nations medium scenario, but still below the high-fertility scenario (figure III.4). In sum, at the global level, the lowest SSP trajectory lies close to the United Nations low-fertility scenario. However, while the traditional "low- and high-fertility" scenarios of the United Nations may be plausible for high-fertility countries *individually*, they depict rather unlikely outcomes for regional and global aggregates (Gerland and others, 2014).

Alternative long-term population projections have also been undertaken by the Institute of Health Metrics and Evaluation (IHME). In its recent projections, IHME projected that the global population will reach 8.8 billion in 2100 with a range of 6.8 billion to 11.8 billion (figure III.4). The main difference between the projections released by IHME and the United Nations lies in the assumptions on the future level of fertility. IHME projects that the global level of fertility will decline faster than under the United Nations medium scenario. According to IHME, the average number of children per woman will decline to 1.66 children at the end of the century while the United Nations projects fertility to be around 1.84 at the same date.

Figure III.4

Comparisons of long-term global population projections under various scenarios, United Nations, IHME and JRC, 2022-2100
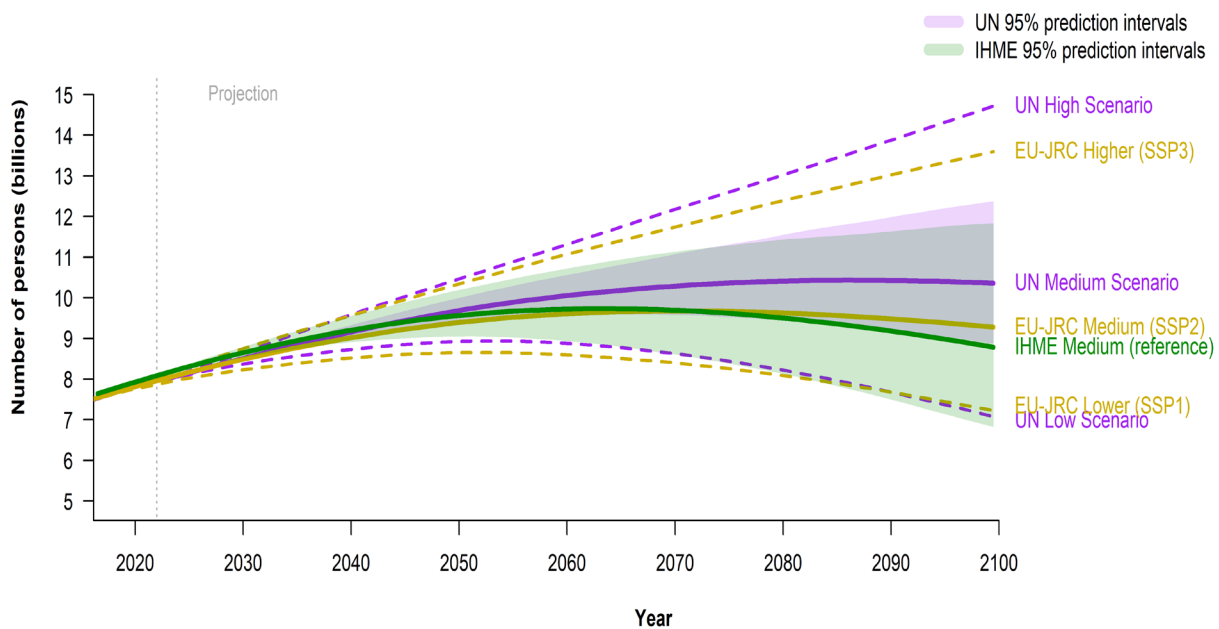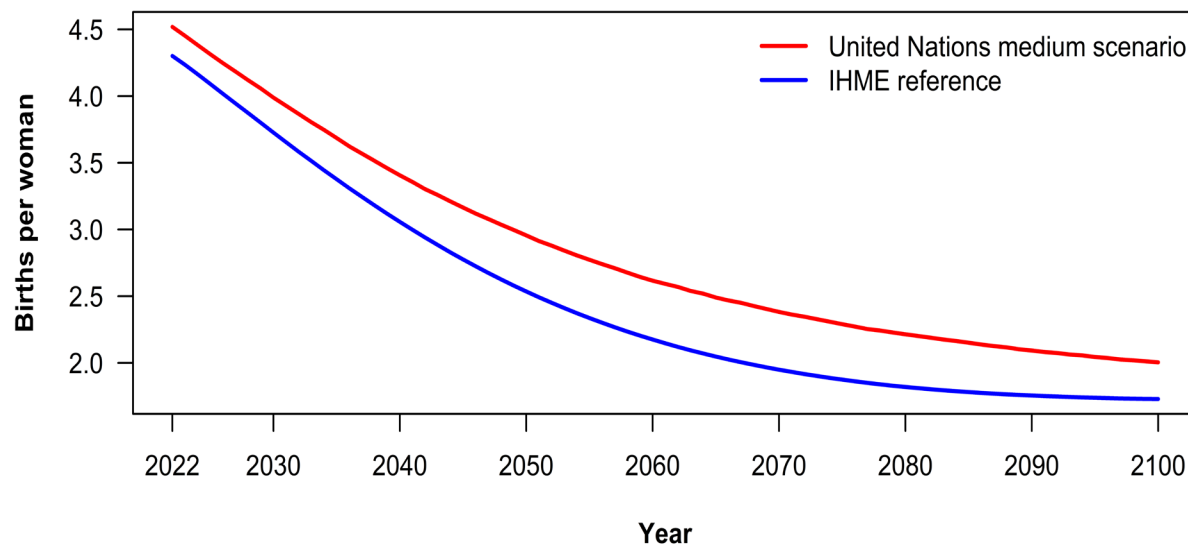

Sources: - IHME series: Institute for Health Metrics and Evaluation (IHME) (2020). *Global Fertility, Mortality, Migration, and Population Forecasts 2017-2100*. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME). https://doi.org/10.6069/MJND-3671.

JRC series: Wittgenstein Centre for Demography and Global Human Capital (2018). Wittgenstein Centre Data Explorer Version 2.0. Available at: http://wittgensteincentre.org/dataexplorer.

For example, with a total fertility rate of 1.7 births per woman in 2100, IHME projects a faster decline of fertility in sub-Saharan Africa than the United Nations medium scenario, which projects a total fertility rate of 2.0 at the end of the century (figure III.5). This difference of 0.27 births per woman in 2100 results in a population that is 378 million lower than projected by the United Nations medium scenario. At the national level, the differences in the fertility rate between the two sets of projections by 2100 can be more substantial, with 1.79 births per woman instead of 2.22 in Niger or 1.33 births per woman instead of 1.87 in Ethiopia, for example. In India, IHME projects a total fertility rate of 1.29 births per woman in 2100 instead of 1.69 in the United Nations medium scenario, resulting in a population that is 433 million smaller than according to the United Nations projections at the end of the century.

Figure III.5

Comparison of long-term fertility projections, sub-Saharan Africa, 2022-2100, United Nations medium scenario and IHME reference scenario

Data source: - IHME series: Institute for Health Metrics and Evaluation (IHME) (2020). *Global Fertility, Mortality, Migration, and Population Forecasts 2017-2100*. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME). https://doi.org/10.6069/MJND-3671.

In addition, the fertility trajectories projected by IHME for sub-Saharan Africa start at a lower level of fertility and assume a faster decline than the United Nations medium scenario. By 2067, the IHME projects a total fertility rate (TFR) of 2 births per woman in the Reference scenario compared to 2.63 in the United Nations medium scenario. Independent reviews have suggested that the IHME projections may overstate the likely pace of fertility decline and assume too low levels of future total fertility rate during this century (see also Alkema, 2020; Ezeh, Kissling and Singer, 2020; Gietel-Basten and Sobotka, 2020).

The available sets of long-term population projections rest on different methodologies to project future trends in fertility. The approach taken by the United Nations consists in projecting future fertility trends based on historical and present fertility levels and trends. These projected fertility trajectories implicitly take into account past progress made in development, education, contraceptive use, etc. By contrast, the models of fertility projections developed by IHME and JRC are based on assumptions made on women's future educational attainment and, in the case of IHME, on the satisfied demand for contraception. Moreover, IHME did not project the total fertility rate—a period indicator—but projected cohort fertility.

The medium scenario of the United Nations embodies an *optimistic* vision of development. In particular, it assumes that continued progress towards gender equality and women's empowerment will mean that as time progresses, individuals will be better able to realize their childbearing intentions. Assuming that such progress continues into the future, women will have even more social and economic opportunities and a better ability to realize their family goals.

Box III.1

World Population Prospects 2022 population projections: scenarios and underlying assumptions

The medium scenario can be interpreted as the most likely future trend among the various projections published by the United Nations in the World Population Prospects. It corresponds to the most likely population projection based on several thousand simulated future trends, each one based on distinct trajectories of fertility and mortality for individual countries and areas. Prediction intervals reflect the spread in the distribution of outcomes across the projected trajectories and thus provide an assessment of the uncertainty inherent in the medium scenario.

The predictive model was derived from a probabilistic analysis of the variability of observed changes over time in levels of fertility and mortality. Since these models have been calibrated using historical data on trends in fertility and mortality, an implicit assumption that underlies the medium scenario is that the pace and patterns of change in these variables will be similar in the future to what they have been in the past seventy years.

A continuing decline in the level of fertility is assumed for countries where women are having, on average, more than two births over a lifetime. This is in line with the expectations based on the fertility transition theory and on the trends observed globally. Smaller families have gradually become the norm for contemporary societies in almost all regions, reflecting changes in the economic and social costs and benefits of childbearing, as well as in cultural values around families and children. The transition to historically low levels of fertility has been closely related to several key aspects of human development, such as reductions in child mortality, increased levels of education, expanded access to family planning services, increased female labour force participation, and the changing conditions and motivations for raising children as life becomes more urban. Moreover, education at the secondary and higher levels helps to motivate a delay in marriage and family formation, especially for girls and young women.

A slight increase in the level of fertility is assumed for countries where women are having, on average, fewer than two births over a lifetime. Such future changes were informed by data from 48 countries that have experienced declines of total fertility below two children per woman followed by a subsequent rebound over at least two consecutive periods of five years.

The 'rebound' in future fertility that is assumed for low-fertility countries is consistent with an expectation of continued progress towards gender equality and women's empowerment. In several low-fertility countries, recent surveys have indicated that many women are having fewer children than they would like. Women face multiple obstacles to achieving their desired family size – demands of higher education, high costs of childcare, challenges to work-family balance, unequal division of household tasks between partners, care responsibilities for ageing parents and biological limits to the reproductive life span. Addressing these constraints will help to ensure that all individuals will have the opportunity and means to achieve family sizes that they desire.

As regards long-term mortality trends, a continued improvement in survival in all countries is assumed, informed by historical trends in average and extreme longevity. Past mortality crises are in general expected to only have short term impacts. In the 2022 revision, all countries are assumed to catch up with their pre-COVID-19 pandemic levels and trends between 2022 and 2025 depending on their mortality experience in 2020 and 2021, and their adult COVID-19 vaccination coverage in early 2022. Such recovery can be considered a reasonable assumption in a context of uncertainty about the implications of the pandemic over the short and medium term in the different regions.

Box continued

In addition to the medium scenario, and probabilistic 80 per cent and 95 per cent prediction intervals, the United Nations publishes detailed results for nine other projection scenarios. Four scenarios differ from the medium scenario only with respect to the level of fertility — they share the same assumptions with respect to mortality and international migration. These four sets of fertility assumptions are as follows: low-fertility, high-fertility, constant-fertility and instant-replacement-fertility. In the high-fertility scenario, levels of total fertility for each population are consistently 0.5 births higher than what is assumed for the medium scenario. Similarly, in the low-fertility scenario, total fertility is projected to remain 0.5 births below the level assumed for the medium scenario. In the constant-fertility scenario, total fertility remains constant at the level estimated for 2022. In the instant-replacement scenario, fertility for each country is set to the level necessary to ensure a net reproduction rate of 1.0 starting in 2022. In this scenario, fertility varies slightly over the projection period in such a way that the net reproduction rate always remains equal to one, thus ensuring the replacement of the population over the long run. In addition to the five fertility scenarios, a momentum scenario, a constant-mortality scenario, a zero-migration scenario and a "no change" scenario, in which both fertility and mortality are kept constant, are also computed. Further details are included in a forthcoming methodology report.

Annex: What's new in the 2022 revision?

In order to better respond to the needs of Member States, the United Nations system and other users, and to ensure greater compliance with existing international standards for the production of population estimates and projections, *World Population Prospects 2022* was produced following a major upgrade of the entire production process. A key feature of the upgraded dataset is that it includes, for the first time, estimates and projections by *single* year of age and by *one-year* time interval—the so-called "1x1" data configuration, instead of the "5x5" layout employed previously.

All relationships of the demographic balancing equation hold true within each 1x1 cell, as a result of using the cohort-component framework to account for changes in fertility, mortality and international migration over age and time. Population figures now refer to 1 January (0h) of a given year, and all counts and rates of vital events refer to calendar years (from 1 January until 31 December).

The upgrade responds to the growing demand for annual population data to assess progress in implementing the Sustainable Development Goals (SDGs). The upgrade also provides greater transparency about the input data used, the procedures and methods employed, and the assumptions made. These changes should provide users with a better understanding of the use of national data in preparing the current edition of the *World Population Prospects* (Stevens and others, 2016).

The process of upgrading the *World Population Prospects* was incremental and built on a data information system, including (a) an inventory of available data (DataCatalog), (b) a repository (DataArchive) of input data sources, (c) a database (DemoData) to store and update the information used in preparing estimates of population estimates and of the components of population change (fertility, mortality, migration), (d) a structured set of metadata used for data analysis, statistical modelling and public documentation (ShortNotes), and (e) a dissemination platform (DataPortal) to give access to all output and input data in tabular form and tools for creating interactive visualizations.

For *World Population Prospects 2022*, a new protocol was developed for evaluating and adjusting census data, consisting of the following steps. First, the results of post-enumeration surveys (PES) were used to adjust population counts for under-enumeration. Results from national PES were used for countries with available data. In other cases, a statistical model was developed based on 310 PES covering 130 countries between 1946 and 2019, with the average number of years of education by sex, GDP and the under-five mortality level as time-dependent covariates. Second, the population under age 10 was adjusted for possible under-enumeration of children, based on a systematic reconstruction of population counts under age 10 using recent estimates of fertility and mortality levels. Finally, population counts by age were evaluated for systematic digit preferences, then smoothed depending on the degree of age heaping. Where necessary, available population counts were graduated into single ages and extended up to ages 100 and over. These steps will be described in greater detail in a forthcoming technical paper.

For each country or area, all relevant empirical data on fertility and mortality were consolidated into a database (DemoData) with relevant metadata describing the data sources and estimation methods used. Several new statistical approaches were used to estimate robust annual time series for past and current levels and trends in fertility and mortality from 1950 to 2021. Time series of the average number of live births per woman (TFR) were modelled by extending the theoretical model used by the United Nations for fertility projections, and by incorporating the uncertainty in measuring past fertility based on different types of data sources, direct and indirect estimation methods, and other factors contributing to systematic biases and non-sampling errors (Liu and Raftery 2020). This new unified approach takes into account both the uncertainty from the past estimates of fertility rates and the uncertainty from the theoretical model of fertility change. This approach has been upgraded to work with annual times series for both estimates and projections. Out-of-sample validation showed improved performance of the overall projection model, while providing users with information about the uncertainty of estimates of past fertility rates. Furthermore, time series

of age-specific fertility rates (ASFR) by five-year age groups were modelled using a Bayesian hierarchical model taking into account the underlying characteristics of the data and adjusting for various types of non-sampling errors and biases (Chao 2022). The age range was extended to cover early and late fertility from age 10 to 54. When available, data by single age were used. Estimates for five-year age groups were graduated into single age using a spline model which was recalibrated using over 4,500 age-specific patterns from high quality vital registration, fertility surveys and health and demographic surveillance systems from low- and middle-income countries (Schmertmann 2014).

For mortality, in countries lacking civil registration data, a similar approach was taken whereby available sex-specific estimates of adult mortality (45q15) were modelled in a similar statistical framework as was used for age-specific fertility. The adult mortality estimates were then combined with estimates of child mortality—under-five mortality—to obtain full life tables using an existing model life table system, or an augmented one taking into account adult HIV prevalence and ART coverage for countries experiencing the impact of the HIV/AIDS pandemic. For countries with complete or partially deficient death registration, time series of life tables were computed either using single ages or abridged age groups graduated into single ages. Years with missing data were filled in using interpolation and extrapolation methods. Additional evaluation, adjustments and smoothing over age, periods and cohorts were applied, as required, to the mortality rates for infants and children, as well as for adults and at older ages to address issues of completeness of death registration or age reporting and to ensure consistency by age (monotonic increase at older ages), over time expected monotonic decline under normal mortality conditions, and between sexes at older ages (i.e., higher male mortality).

Moreover, additional efforts were made to incorporate the effect of crises on mortality as well as on other demographic variables, including fertility, migration and age structure. A review of the annual breakdown of total deaths by major types of crises since 1950 was undertaken and a literature review was conducted to develop a set of age-sex patterns of crisis deaths by type of event which were used to distribute the different excess mortality by age, sex and year. The effects of almost 7,000 crises, including conflicts and battles, mass killings, flooding, cyclones, epidemics, earthquakes, the COVID-19 pandemic, famines, droughts and tsunamis were included.

For international net migration, new annual time series were estimated using the refugee statistics from the Office of the United Nations High Commissioner for Refugees (UNHCR) for 1950-2021, estimates of international migration flows and stocks of foreign-born persons from the United Nations, new intercensal estimates derived from the adjusted population census protocol developed for the 2022 revision, and from prior estimates and datasets from various international organizations and research institutions, including Eurostat, OECD, the U.S. Census Bureau and the University of Washington.

In collaboration with various academic researchers and contributors, a full suite of new R libraries was developed to perform various demographic computations and analyses in a more transparent way, dynamically query the DemoData open Application Programming Interface,[11] standardize and harmonize empirical counts of population, deaths and births, to streamline the analysis and modeling of time series of fertility and mortality, to evaluate and adjust population censuses, to estimate intercensal net migration and to compute age and sex distributions of net migration, and to apply the cohort-component method by single year of age to compute all relevant demographic indicators, and to ensure internal consistency by age and sex and over time, and between the three demographic components of change (fertility, mortality and migration) and the enumerated population. For about 30 countries with available high quality population data, a fully integrated probabilistic population reconstruction was conducted from 1950 to 2021 (Wheldon and others, 2015).

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[11] https://population.un.org/DemoData/web/.

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World Population Prospects 2022 is the twenty-seventh edition of the official United Nations population estimates and projections. It presents population estimates from 1950 to the present for 237 countries or areas, underpinned by analyses of historical demographic trends. This latest assessment considers the results of 1,758 national population censuses conducted between 1950 and 2022, as well as information from vital registration systems and from 2,890 nationally representative sample surveys.

The 2022 revision also presents population projections to the year 2100 that reflect a range of plausible outcomes at the global, regional and national levels. For the first time, the estimates and projections are presented in one-year intervals of age and time instead of the five-year intervals used previously.