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Global population growth

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With the rapid rise of the global human population, long term consequences materialize. These concern the welfare of future generations and the safety of eco-systems on the planet. Forecasts tell with fair certainty that the number of inhabitants on Earth will increase in the near term. There is a need to investigate the question of how many people could sustainably live on Earth, given a certain level of human well-being and the resources available. If there is a global necessity to pursue a stable or decreasing change in population size, the other question remaining is how this can be achieved in an ethically acceptable way.

What is at stake?

The total human population has increased dramatically from around 1.6 billion in 1900 to nearly 8 billion today, and it is forecast to continue growing over the course of the 21st century. A larger human population will—all else equal—place greater stress on most ecological systems and may have adverse consequences for human welfare.

A rapidly growing human population may constitute a global catastrophic risk in that it could threaten human welfare and in particular may reduce the welfare of future generations. A large population may contribute and interact with other global catastrophic risks, e.g., those related to ecological collapse. As such, it may contribute to the "destruction of humanity's long-term potential" (Ord, 2020), making it an existential risk in a weak sense. It is not, however, an existential risk in its strict sense: A risk "…that threatens the premature extinction of Earth-originating intelligent life…" (Boström, 2013).

While population growth will not, in itself, threaten our ability to feed a global population or put at risk current civilization, if the global population grows more quickly than societies can adapt, we and future generations may be confronted with very difficult trade-offs, and irreparable harm to the biosphere.

Global population growth is likely to be regionally imbalanced, concentrated in poorer countries. This means that negative side-effects of population growth will also be concentrated in poorer countries. A growing share of the world population in the least well-off countries may contribute to future political challenges such as conflicts and global inequality, which in turn may lead to migration from poorer countries.

How much do we know?

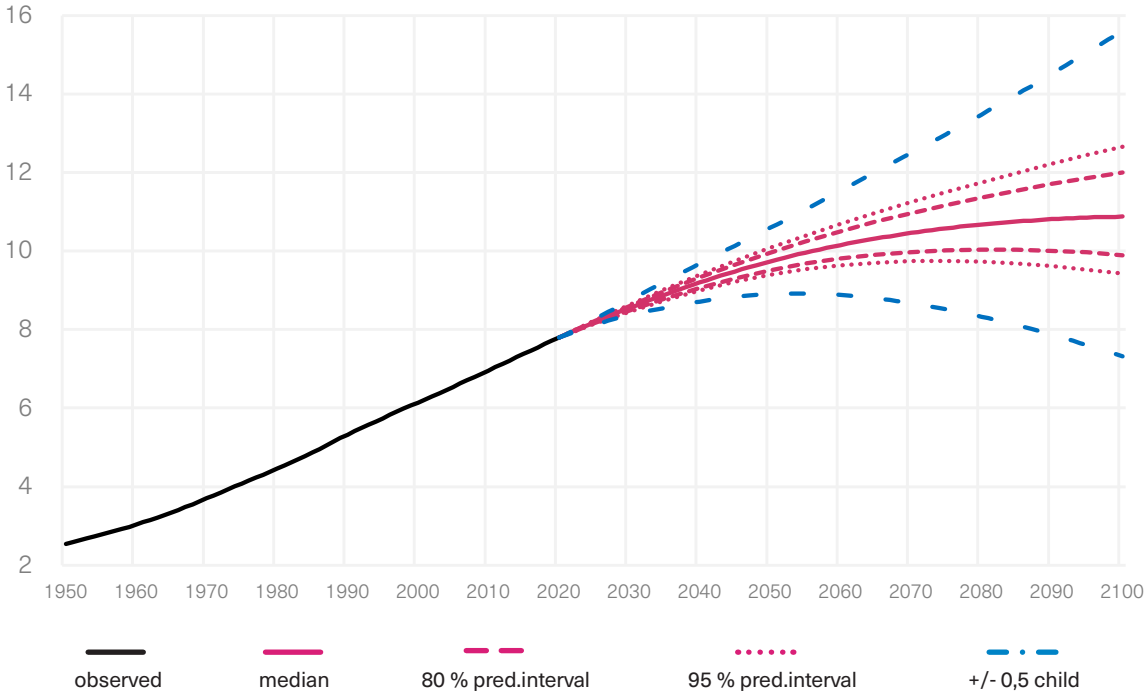
Demographers and government agencies have reliable information on population statistics and can make high-quality forecasts for the near future. We can be nearly certain that the human population will grow substantially over this century. The UN 2019 Population Prospects have a median forecast of 9.7 billion people for 2050 and around 10.9 billion for 2100. As much current population growth is due to the young age structure of the global population, these forecasts are rather certain and the UN gives

Global Population Size

High-income countries have high-quality vital statistics to estimate and measure population size, and most countries have some systems to estimate the population in their countries with varying degrees of certainty. The UN Population Division maintain a high-quality database of the current and historical human population and make high-quality regional and global population forecasts.

The global population has grown from around 1.7 billion in the 1950s, to nearly 8 billion today, and is forecasted to reach around 11 billion in 2100. The growth rate for the total human population peaked at around 2 percent per year in the 1960s and is around 1 percent today. The rate is forecasted to decline to the point where is no growth in around 2100. Most of the future population growth will take place in Sub-Saharan Africa, while most of the growth since the 1950s took place in Asia.

UN Probabilistic Population Projections until 2100
Billions



This figure shows estimates and probabilistic projections of the total world population, based on projections of total fertility and life expectancy at birth. The lines represent the probabilistic median, and 80 and 95 percent prediction intervals, as well as the (deterministic) high and low variants.

SOURCE: FN, DESA, Population Division World Population Prospects 2019, population.un.org/wpp

an 80 percent confidence interval of 9.5–10 billion for 2050 and 9.9–12 billion for 2100.

Most of our uncertainty about future population growth is related to childbearing. There are two major factors whose impact is not yet known:

1. the speed of fertility decline in Sub-Saharan Africa, and
2. future fertility trajectories in middle-income countries in Asia (particularly India and China).

Fertility decline in Sub-Saharan Africa has previously been slower than in historic forecasts, though on the other hand the world has several recent historical examples of very rapid fertility decline (e.g. in East and South East Asia). China currently has very low fertility of around 1.3 children per woman, and fertility is rapidly falling in India. Whether the large Asian countries will have childbearing levels comparable to current southern European countries, or more comparable to the higher fertility levels in Anglo-Saxon countries, will be very important for global population trajectories in the 21st century.

There is much less certainty and more scientific debate on the consequences of population growth. The majority of researchers, though not all, foresee negative consequen-

ces of very large population sizes, while there is more debate about the positive and negative consequences of population growth in the nearer term.

Some researchers worry about potentially negative impacts of population decline at a national level, though these worries are usually linked to effects on the age structure (the ratio of older individuals to younger individuals) rather than the absolute population size. Insofar as the elderly are an increasing share of the population, that could place a variety of burdens on younger generations.

Most population growth will take place in low-income countries (with incomes per capita below about US$1000/year). But for the next several decades, most externalities of unsustainable consumption are linked to the current (and future) population size in high-income and upper-middle income countries. Thus, a focus on current individuals (contemporary population size and consumption, and their children) puts the focus on high-income countries, while a focus only on changes in population size (e.g. a focus on countries that will see large-scale population growth) puts more of a focus on low-income countries.

In the very long term, it is reasonable to assume that it is the global population size that will determine what a desirable or sustainable population is. However, for this century, most negative externalities of population growth will be concentrated in high-income and upper middle-income countries.

The consequences of global population growth will be context dependent and depend on current and future policy choices. Where societies make sustainable choices, the environmental consequences of population growth will be relatively smaller. Nevertheless, and especially given humanity's failure to make sufficiently sustainable choices, it is likely that a large global population will mean that future generations will have to make trade-offs between, for example, material welfare, a sustainable eco-sphere, and the well-being of future generations. Such trade-offs will be harder if we greatly value aspects such as untouched wildness and global biodiversity, where a large human population will likely imply negative externalities for the foreseeable future, and a too large population may be associated with irreversible harm. The level of a sustainable global population will eventually be determined by what we as a society value, and what trade-offs we think are reasonable.

What are the key factors affecting population growth?

There are three main factors that affect population growth:

Global population trends are primarily shaped by childbearing.
Fertility levels are highest in low-income countries, but fertility levels in middle-income countries (such as India and China) will be at least as influential for Earth's future population.

Most population growth in the 21st century will take place in low-income countries.
But, each (living and soon to be born) person in high-income countries contributes more to current negative externalities of a large population size.

A growing population may make it harder to balance different needs of future human populations.
The needs being things such as affluence, equity and the maintenance of the biosphe-

"How many people the Earth can support depends in part on how many will wear cotton and how many polyester; on how many will eat beef and how many bean sprouts; on how many will want parks and how many will want parking lots; on how many will want Jaguars with a capital J and how many will want jaguars with a small j."

Cohen, 2017

re. Sustainable policy choice may reduce the need to make such trade-offs.

Governance of global population size

Population size is seen as a strictly national concern, and there exists no super-national organization or global treaty with a mandate to regulate either national or global population size. There exists no global consensus on, or governance of, what a desirable level of childbearing is; instead there is considerable diversity in the policies and goals of different countries.

At the national level, different countries pursue very different population trajectories, where some countries spend considerable resources on reducing childbearing levels, while other countries implement polices to increase it. Since the 1970s, member countries of the UN report their population policies to the UN population division. They are asked if they had policies to support higher or lower fertility.

In 2016, of the 192 countries in the world 28 percent reported that they wanted to increase fertility, 15 percent that they wanted to maintain it, 42 percent that they wanted to lower it, and 15 percent reported that they had no official policy. In Europe, 66 percent reported that they wanted to increase fertility, while no countries reported that they wanted to lower it. In Africa 83 percent of countries wanted to reduce fertility, while 4 percent wanted to increase it. All countries that wanted to reduce fertility had childbearing above 2 children per women, and nearly all countries that wanted to increase it had fertility below 2. However, some Asian countries had fertility above 2, and still reported they wanted to increase it. Nearly all countries report policies both to support family planning, for example by making contraceptives available (which has the potential to lower population growth), and most countries—including nearly all high-income countries—report having child and/or family allowances (which has the potential to support growth).

During the 20th century, many developing countries sought to reduce population growth, and this was in many contexts encouraged and supported by western NGOs and aid agencies. Where they took place in countries with weaker human rights and checks, such programs were associated with substantial human-rights abuses, for example in India and China. Today, several international organizations and some parts

of the UN system continue to promote family planning programs in low-income countries, though there is a strong focus on female empowerment and meeting unmet needs/desires for contraceptives. Conversely, some states and inter-governmental organizations in rich countries—such as the European Union—instead fund programs with the aim of increasing population growth. In conclusion, there exist no unified governance for either population growth or a sustainable global population size.

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The project *Sustainable Population in the Time of Climate Change* investigates two major research questions about population size in relation to climate change: The first question examines how many people could sustainably be on Earth, given the resources available and a certain level of human well-being. Drawing both on previous research and new environmental economic models we will estimate a sustainable population size. We will also advance our understanding of how population change is related to economic and technological development, as well as ecological sustainability. Given that there is a global necessity to pursue a stable or decreasing change in population size, the project's second question addresses how this can be achieved in an ethically acceptable way.

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