

# Aspenia

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Joel E. Cohen

# How many people can the planet hold?

*Everyone born in 1965 or earlier and still alive today has seen human numbers more than double. This never happened before and is unlikely to happen again. In the coming half century, demographic growth promises to continue, but more slowly, leading to an older, more urban global population. How well Earth supports its human population remains up to us: sheer numbers matter, but so do the conditions in which the planet's billions survive.*

The current decade spans three unique, important transitions in the history of humankind.<sup>1</sup> Before 2000, young people always outnumbered old people. From 2000

forward, old people will outnumber young people.

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Until approximately 2007, rural people always outnumbered urban people. From 2008 forward, urban people will outnumber rural people. From 2003 on, the median woman worldwide has had, and will continue to have, too few or just enough children during her lifetime to replace herself and the father of her children in the following generation.<sup>2</sup>

1950-2050. The century with 2000 as its midpoint marks three additional unique, important transitions in human history. First, no person who died before 1930 had lived through a doubling of the human population. No person born in 2050 or later is likely to live through a doubling of the human population. In contrast, everyone born in 1965 or earlier and still alive has seen human numbers more

than double from 3.3 billion in 1965 to 6.8 billion in 2009. The peak population growth rate ever reached – about 2.1% a year – occurred between 1965 and 1970.<sup>3</sup> Human population never grew with such speed before the twentieth century and is likely never again to grow at such a rate. Our descendants will look back on the peak in the rate of growth during the late 1960s as the most significant demographic event in the history of the human population, even though those of us who lived through it did not recognize it at the time.

Second, the dramatic fall since 1970 of the global population growth rate to 1.1 or 1.2% a year at present<sup>4</sup> resulted primarily from choices by billions of couples around the world to limit the number of children born. Never before the twentieth century was a fall in the global population growth rate voluntary.

Third, the last half century saw, and the next half century will see, an enormous shift in the demographic balance between the more developed regions of the world and the less developed ones. In 1950 the less developed regions had roughly twice the population of the more developed ones. By 2050 the ratio will exceed six to one.<sup>5</sup> These colossal changes in the composition and dynamics of the human population by and large escape public notice.

Four major trends are expected to dominate changes in the human population in the coming half century. The population will be bigger, growing more slowly, more urban, and older than in the twentieth century. These projections remain uncertain because, for example, no one knows how closely future rates of birth, death and urbanization will resemble their assumed future trends. Despite their uncertainty, the projections do suggest some challenges humanity will face over the next fifty years.

**WHY, WHEN AND WHERE.** Although the rate of population growth has fallen since the 1970s, current rates (as a percentage) and absolute numbers of global population growth are still greater than any experienced prior to World War II. Rapid global population growth has not ended. Human numbers currently increase by 75 million to 80 million people annually, the equivalent of adding another US population every four years or so.<sup>6</sup> Whereas the first absolute increase in population by one billion people took from the beginning of time until the early nineteenth century, one billion people will be added to today's population in only 13 to 14 years. By 2050 the world's population is projected to reach 9.2 billion, depending on future birth and death rates. This anticipated increase from 2009 to 2050 exceeds the total population of the world in 1930, which was around two billion.

Childbearing choices made today and tomorrow will help determine the future size of the human population. In the unlikely event that fertility does not change at all from today's levels, population would grow to 11.9 billion by 2050, nearly doubling the six billion people alive in 1999. The 9.2 billion projection above assumes that family planning will be more widely practiced and the trend towards smaller families will continue. If, compared to this assumption, women have on average one more child for every two women, world population could reach 10.8 billion by 2050. If women have on average one fewer child for every two women, world population could be 7.8 billion by 2050. A difference in fertility of a single child per woman's lifetime between now and 2050 alters the projection for 2050 by three billion, a difference equal to the entire world population in 1960.

**42** Virtually all population growth in the next 45 years is expected to happen in today's economically less developed regions. Between 2005 and 2050 population will at least triple in Afghanistan, Burkina Faso, Burundi, Chad, Congo, the Democratic Republic of the Congo (DRC), East Timor, Guinea-Bissau, Liberia, Mali, Niger and Uganda. These countries are among the poorest on earth. Despite higher death rates at every age, poor countries' populations grow faster than rich countries' populations because birth rates in poor countries are much higher. At present, the average woman bears nearly twice as many children (2.8) in the poor countries as in the rich countries (1.6 children per woman).

Half the global increase will be accounted for by just nine nations. Listed in order of their anticipated contribution, they are India, Pakistan, Nigeria, DRC, Bangladesh, Uganda, the United States, Ethiopia and China.

In contrast, 51 countries or areas, most of them economically more developed, are projected to lose population between now and 2050. Germany is expected to drop from 83 million to 79 million people, Italy from 58 million to 51 million, Japan from 128 million to 112 million and, most dramatically, the Russian Federation from 143 million to 112 million. Thereafter Russia will be slightly smaller in population than Japan.<sup>7</sup> International migration could falsify these projections with unexpected speed; for example, Italy's population appears to be millions larger now than it was projected to be by European and Italian statistical agencies only a few years ago because of unanticipated high immigration – both authorized and undocumented.

Nevertheless, migration has little immediate effect on global population size, though it may accelerate the slowing of global population growth. Migrants who move from high-fertility to low-fertility regions or their descendants often adopt the reduced-

fertility patterns of their new home, with some time delay. From 2005 to 2050, the more developed regions are projected to have about 2.2 million more immigrants than emigrants a year, and the US is expected to receive about half of these.<sup>8</sup> If recent levels of migration continue, the 98 million net migrants expected to move to the developed regions during 2005–2050 will more than offset the projected loss of 73 million



people in those countries from an excess of deaths over births.<sup>9</sup> These projections have even greater uncertainty than the projections of births and deaths, because, more than most demographic variables, future international migration is subject to intentional policy choices by national governments, making it difficult to predict.

WHO. Slowing population growth everywhere means that the twentieth century was probably the last in human history in which younger people outnumbered older ones. The proportion of all people who were children aged four years and younger peaked in 1955 at 14.5% and gradually declined to 9.5% by 2005, whereas the fraction of people aged 60 and older increased from a low of 8.1% in 1960 to 10.4% in 2005. Around the year 2000, each group constituted approximately 10% of humanity. Now and henceforth, the elderly have the numerical upper hand.

This crossover in the proportions of young and old reflects both improved survival and reduced fertility. The average life span grew from perhaps 30 years at the beginning of the twentieth century to more than 65 years at the beginning of the twenty-first. The more powerful influence, however, is reduced fertility, adding smaller numbers to the younger age groups.

The graying of the population is not proceeding uniformly around the globe. In 2050, nearly one person in three will be 60 years or older in the more developed regions and one person in five in the less developed zones. But in 11 of the least developed countries – Afghanistan, Angola, Burundi, Chad, DRC, Equatorial Guinea, Guinea-Bissau, Liberia, Mali, Niger and Uganda – half the population will be aged 23 years or younger.<sup>10</sup> If recent trends continue as projected to 2050, virtually all of the world's population growth will be in urban areas. In effect, the poor countries will have to build the equivalent of a city to accommodate one million people every five days for the next 40 to 45 years.<sup>11</sup>

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CAN THE PLANET COPE? IT IS UP TO US. Projections of billions more people in the cities of the developing countries and more elderly people everywhere, coupled with hopes of economic growth – especially for the world's poor – raise concerns in some quarters about the sustainability of present and future populations.

The number of undernourished people rose by 75 million in 2007, bringing the estimated world total to 923 million undernourished people – roughly one person in seven.<sup>12</sup> This prodigious stain of human hunger results from collective human choices, not biophysical necessities. While hundreds of millions suffered hunger, enough food was grown to satisfy 50% more people than are alive now, at least at a subsistence level. The estimated cereal production in the 2007-2008 crop year exceeded 2.1 billion metric tons of cereal grains,<sup>13</sup> sufficient to feed more than 10 billion people an adequate vegetarian diet. But as demographer-sociologist Kingsley Davis observed in 1991: “There is no country in the world in which people are satisfied with having barely enough to eat.”<sup>14</sup> While too many people eat too much, nearly a billion eat less than barely enough.

The question of sustainability, or of human carrying capacity, is not a question about mere survival. It is about whether billions of people can live with freedom of choice and material prosperity – however freedom and prosperity may be defined – and whether their children and their children's offspring will be able to continue to live with freedom and prosperity, however they may define them in the future.

This worry is as old as recorded history. Cuneiform tablets from 1600 BC showed that the Babylonians feared the world was already too full of people. In 1798, Thomas Malthus renewed these concerns,<sup>15</sup> as did Donella Meadows and her co-authors in their 1972 book *The Limits to Growth*.<sup>16</sup> While some people have fretted about too many people, optimists have offered reassurance that deities or technology will provide for humankind's well-being.

Attempts to quantify earth's human carrying capacity or to define a sustainable human population size face the challenge of understanding nature's constraints, human choices and the interactions between them.<sup>17</sup> For example, what will humans desire and accept as the average level and distribution of material well-being in 2050 and beyond? What technologies will be used? What domestic and international political institutions will be used to resolve conflicts? What economic arrangements will provide credit, regulate trade, set standards and fund investments? What social and demographic arrangements will influence birth, health, education, marriage, migration and death? What physical, chemical and biological environments will people want to live in?

What level of variability will people accept? (If people do not mind seeing human population size drop by billions when the climate becomes unfavorable, they may regard a much larger population as sustainable when the climate is favorable.) What level of risk are people willing to live with? (Are mud slides, hurricanes or floods acceptable risks or not? The answer will influence the area of land viewed as habitable.) What time horizon is assumed? What will people's values and tastes be in the future? As anthropologist Donald L. Hardesty noted in 1977, "A plot of land may have a low carrying capacity, not because of low soil fertility but because it is sacred or inhabited by ghosts."<sup>18</sup>

Most published estimates of earth's human carrying capacity uncritically assumed answers to one or more of these questions. My book *How Many People Can the Earth Support?* analyzed more than five dozen of these estimates published from 1679 onward. Estimates made in the past half century ranged from less than one billion to more than 1,000 billion. These estimates are political numbers, intended to persuade people either that there are too many of us already or that there is no problem with continuing rapid population growth. By contrast, scientific numbers are intended to describe reality. Because no estimates of human carrying capacity have explicitly addressed the questions raised above, taking into account the diversity of views about their answers in different societies and cultures at different times, no scientific estimates of sustainable human population size can be said to exist.

WHERE WE ARE HEADED. No one knows the path to sustainability because no one knows the destination, if there is one. Too often, attention to long-term sustainability is a diversion from the immediate problems of making tomorrow better than today – a task that offers much room for science and constructive action. The three main strategies are: create a bigger pie (amplify human productive capacity through investment in education, health and technology), use fewer forks (increase access to reproductive health care and contraception to slow population growth voluntarily, reduce extravagant consumption), and practice better manners (improve the terms of people's interactions by reforming economic, political, civil and social institutions, policies and practices to achieve greater social and legal equity). As economist Robert Cassen remarked, "Virtually everything that needs doing from a population point of view needs doing anyway."

<sup>1</sup> Joel E. Cohen, "Human population grows up", *Scientific American*, September 2005.

<sup>2</sup> Chris Wilson and Gilles Pison, «La majorité de l'humanité vit dans un pays où la fécondité est basse», *Population et Sociétés*, no. 405, October 2004.

<sup>3</sup> United Nations, Department of Economic and Social Affairs, Population Division, *World population prospects: the 2006 revision and world urbanization prospects*.

<sup>4</sup> UN Population Division.

<sup>5</sup> UN Population Division.

<sup>6</sup> United Nations, Department of Economic and Social Affairs, Population Division, *World population prospects: the 2006 revision, Highlights*, Working Paper no. 202, 2007.

<sup>7</sup> All the figures cited can be consulted at [www.esa.un.org/unpp](http://www.esa.un.org/unpp) (UN Population Division).

<sup>8</sup> United Nations, Department of Economic and Social Affairs, Population Division, *International Migration 2006*.

<sup>9</sup> *Ibid.*

<sup>10</sup> Data available at [www.esa.un.org/unpp](http://www.esa.un.org/unpp) (UN Population Division).

<sup>11</sup> Joel E. Cohen, "Sustainable cities", *Bulletin of the American Academy of Arts and Sciences*, summer 2008.

<sup>12</sup> Food and Agricultural Organization, *Food Outlook & Global Market Analysis*, November 2008, p. 1.

<sup>13</sup> *Ibid.*, p. 2.

<sup>14</sup> Kingsley Davis and Mikhail S. Bernstam, eds., *Resources, environment and population: Present knowledge and future options*, supplement to vol. 16 of *Population and Development Review*, Population Council, 1990.

<sup>15</sup> T.R. Malthus, *An essay on the principle of population*, complete first edition (1798) and partial seventh edition (1872), reprinted in Gertrude Himmelfarb, ed., *On Population*, Modern Library, 1960.

<sup>16</sup> Donella H. and Dennis L. Meadows, Jørgen Randers, and William W. Behrens III, *The limits to growth: a report for the Club of Rome's project on the predicament of mankind*, Signet, New American Library, 1972.

<sup>17</sup> Joel E. Cohen, *How Many People Can the Earth Support?* W. W. Norton, 1995.

<sup>18</sup> Donald L. Hardesty, *Ecological Anthropology*, John Wiley, 1977.

<sup>19</sup> Robert Cassen et al., *Population and development: old debates, new conclusions*