WORLD DEMOGRAPHY AND FOOD SUPPLY

Graeme Hugo
Professor of Geography, Adelaide University, Adelaide, Australia

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Summary

The world's population was 6 billion at the turn of the twenty-first century. It is projected to reach 9.4 billion in 2050 and will stabilize at slightly less than 11 billion about 2200. Global rates of population growth peaked at 2.04% per annum in the late 1960s but subsequently declined to 1.33% in the late 1990s and are projected to continue to decline. The cause of the decline has been a reduction in global fertility from about five children per woman in the early 1960s to less than three children per woman. The transition to low fertility in the developing world occurred earliest and has been strongest in Asia and Latin America but is now well under way in Africa, although fertility rates remain high in Sub-Saharan Africa. About 97% of current population growth is occurring in developing parts of the world, and the proportion of the global population living in developing areas has increased from 67.8% in 1950 to 80% in 1998 and is projected to be 87% by 2050.

One-sixth of the world population is farmers, and they produce the equivalent of 3800 calories of food per person per day—well above the minimum daily requirements needed for each of the 6 billion inhabitants of the world. Nevertheless, 10% of the global population remains hungry or malnourished, 200 million of them children. This is due to the fact that distribution of the food produced remains ineffective because of poverty, political interventions, and environmental disasters. In 1970, more than one-third of the developing world's population was classified as food deficient. In 2000, the proportion is one-fifth.

Food deprivation is greatest in parts of Africa. Cereals account for the bulk of food consumed in the world, and yields per hectare of all main cereals are continuing to increase. There have been significant achievements in expanding food production in

decades and these are likely to continue. Nevertheless, increased production has come at a cost of environmental degradation, and it is crucial that food production involve sustainable agriculture. It is projected that demand for cereals will increase from 1921.3 million tons in the late 1990s to 3046.5 million tons in 2025. Meeting this demand will require continuation of improved seed varieties, better agricultural practices, adoption of sustainable agriculture, overcoming pollution, and taking action on climatic change. Moreover, continued sustained effort to achieve a stabilization of global population as quickly as possible retains a high priority.

1. Introduction

On October 12, 1999, the UN estimated that the world's population had reached 6 billion. At the beginning of the twentieth century the global population was less than a third as big as it was 100 years later. Table 1 shows that the century saw an escalating momentum of population growth. However, global population growth was most rapid between 1965 and 1970 (2.04% per annum) and subsequently declined to 1.33% per annum at the turn of the last century. The annual increment of people to the world population declined from a peak of 86 million in 1985–1990 to 78 million in 1998. It is anticipated that this slowdown will continue.

World Population Reached	Expected to Reach
1 billion in 1804	
2 billion in 1927 (123 years later)	6 billion in 1999 (12 years later)
3 billion in 1960 (33 years later)	7 billion in 2013 (14 years later)
4 billion in 1974 (14 years later)	8 billion in 2028 (15 years later)
5 billion in 1987 (13 years later)	

Table 1. World population growth (*Populi* December 1998, p. 3)

This section seeks to summarize recent and impending trends in global population and relates this to contemporary and likely future patterns in the availability of food. This issue has been a subject of debate since Malthus published his controversial *Essay on Population* in 1797 which argued that population increases geometrically, while the means of subsistence only increases in an arithmetic progression, and the resulting gap results in checks which increase mortality and bring the two rates into balance.

The UN Population Division biannually produces global population projections and these will be analyzed here. These projections are not intended as forecasts but indicate the population outcomes of a number of well-defined and plausible (but hypothetical) scenarios of demographic change. The projections are prepared for five main fertility assumptions (medium, high, high/medium, low/medium, and low) in addition to two illustrative (but unrealistic) scenarios of achieving instant achievement of replacement fertility (and hence showing the momentum of population growth and of keeping current levels of fertility constant). All seven sets of projections have the same mortality assumptions, although these are different for each of the eight major regions of the world. For each area life expectancy is assumed to improve, and the eight values tend to converge toward a nearly identical value over time. In the 1992 long-range projections,

this value was 85 years, and in the 1998 projections it was increased to age 90 (87.5 years for men and 92.5 years for women). For the projections of major areas of the world, international migration assumptions are included. These were the same as the revised assumptions developed for the 1996 revision of the projections. The projections assume no net migration after 2025.

2. A Decline in the Momentum of Population Growth

The most striking demographic feature of the 1990s was a decline in the momentum of global population growth. Table 2 indicates that if the year 2025 is taken, the 1990 UN projections, based on trends at that time, projected a population of 8.504 billion, 5.8% higher than the medium figure for the 1998 series (8.039 billion). This projection points to the massive and sustained falls in world fertility which have occurred. The effect of this in reducing population growth rates has been counterbalanced to a degree by improved life expectancy but is still strikingly evident in the new projections.

Region	1990	1996	1998
World	8504	8309	8039
Developed countries	1354	1319	--
Developing countries	7150	6721	--
Europe	515	502	701*
North America	332	369	369
Former USSR	352	297	--
Oceania	38	41	41
Africa	1597	1454	1454
Latin America/Caribbean	757	690	690
Asia	4912	4686	4784*

* Includes part of former USSR

Table 2. Changes in the projections of population in 2025, 1990, 1996
(*UN Population Division* 1998a)

The change in global fertility levels has been striking. Until the early 1960s women on average around the world had five children (a Total Fertility Rate of 5). (The Total Fertility Rate can be defined as the sum of age-specific fertility rates—live births at each age of mother per female population of that age. It represents the number of children a woman would bear during her lifetime if she experienced age-specific fertility rates at each age of her reproductive life. However, Table 3 shows that the TFR declined to three in the first half of the 1990s. The decline has been greatest in the developing countries but was also significant in the developed and undeveloped regions. A TFR of 2.1 is known as replacement level fertility whereby couples have an average of two children and hence replace themselves in the population. A population with this level of fertility will eventually stop growing. It will be noted in Table 3 that the developed regions of the world have undergone a transition to below replacement level fertility, but this is also true of a large number of developing countries, especially in

Asia, Latin America, and the Caribbean. About 44% of the world's population now live in countries with below replacement fertility. Table 3 shows that the difference in fertility between developed and developing areas more than halved in 30 years. In one generation there has been a fundamental change in reproductive behavior.

(Births per woman)				
Period	World	Developed regions	Developing regions	Undeveloped countries
1960–1965	5.0	2.7	6.0	6.6
1965–1970	4.9	2.4	6.0	6.7
1970–1975	4.5	2.1	5.4	6.7
1975–1980	3.9	1.9	4.7	6.6
1980–1985	3.6	1.8	4.1	6.4
1985–1990	3.4	1.8	3.8	6.0
1990–1995	3.0	1.7	3.3	5.5

Table 3. Total fertility rate, 1960–1995 (UN 1998, p. 22)

There have been significant variations between countries in the extent of fertility decline, although most nations have experienced some decline. Table 4 gives an indication of the degree of variation with regard to TFRs ranging from 1.4 births per woman in Southern Europe to 6.4 in East Africa, Central Africa, and West Africa. The fertility transition has clearly begun later in the latter regions. It will be noted that only in the developed areas of Northern Europe and North America have there not been substantial falls in fertility in the 1990s.

Major areas and regions	Total fertility rates			Percentage change		
	1980–1985	1985–1990	1990–1995	1980–1985 to 1985–1990	1985–1990 to 1990–1995	1980–1985 to 1990–-1995
Africa	6.3	6.0	5.7	–4.8	–5.0	–9.5
East Africa	6.9	6.7	6.4	–2.9	–4.5	–7.2
Middle Africa	6.5	6.5	6.4	0.0	–1.5	–1.5
North Africa	5.6	4.8	4.1	–14.3	–14.6	–26.8
South Africa	4.9	4.5	4.2	–8.2	–6.7	–14.3
West Africa	6.7	6.6	6.4	–1.5	–3.0	–4.5
Asia	3.7	3.4	2.8	–8.1	–17.6	–24.3
East Asia	2.5	2.4	1.9	–4.0	–20.8	–24.0
South Central Asia	4.9	4.4	3.7	–10.2	–15.9	–24.5
Southeast Asia	4.2	3.6	3.2	–14.3	–11.1	–23.8
Western Asia	5.0	4.7	4.1	–6.0	–12.8	–18.0

Europe	1.9	1.8	1.6	–5.3	–11.1	–15.8
Eastern Europe	2.1	2.1	1.6	0.0	–23.8	–23.8
Northern Europe	1.8	1.8	1.8	0.0	0.0	0.0
Southern Europe	1.8	1.6	1.4	–11.1	–12.5	–22.2
Western Europe	1.6	1.6	1.5	0.0	–6.3	–6.3
Latin America and the Caribbean	3.8	3.3	2.9	–13.2	–12.1	–23.7
Caribbean	3.1	2.9	2.7	–6.5	–6.9	–12.9
Central America	4.5	3.9	3.4	–13.3	–12.8	–24.4
South America	3.7	3.2	2.8	–13.5	–12.5	–24.3
North America	1.8	1.9	2.0	5.6	5.3	11.1
Oceania	2.6	2.5	2.5	–3.8	0.0	–3.8

Table 4. Estimated fertility rates and percentage change, 1980–85, 1985–90, and 1990–95 (UN 1997, p. 23)

The trajectory of future global population growth is largely dependent upon future fertility trends. UN projections of future population have a number of fertility assumptions that all assume a continuing decline of fertility, and it is difficult to see a situation where the strong trend of decline will be reversed or even stopped in the short term and medium term. The high assumption is that the global TFR will decline to 2.5 in 2050, the medium assumption sees it fall to 2.0, and the low assumption to 1.6. The medium fertility assumption is seen as most indicative of likely future patterns and this would see the global TFR ultimately stabilizing by the year 2055 at replacement levels.

The decline in fertility in the developing world is of enormous significance to the world's future. It is important to note that this decline has occurred in some contexts in which broad-based economic development has not occurred. Purely economically driven explanations of fertility decline have accordingly been generally rejected. There are four types of circumstances under which fertility has declined.

1. Strong commitment by government to family planning together with active, efficient, well-organized family planning programs.
2. Broad-based economic development is not always necessary for major fertility declines—limited, specific impacts such as improved health, education (especially of women), and policies to improve the status of women can be influential.
3. Ideas are a potential agent of change. Hence mass media and education have an important impact.
4. Culture makes a difference in whether or not groups are receptive to family planning.

Clearly there are multiple pathways to lower fertility. It is estimated that more than 40% of couples in sexual union in the developing world now practice contraception.

Nevertheless, it is also true that in these areas women report that one in four births is unwanted.

Hence it would seem that the world is definitely on the path to lower fertility. However, the fact of past high fertility has meant that there are an unprecedented number of women in the childbearing ages and entering those ages. Hence even though their fertility is lower, the number of children being born is still high. The demographic momentum of this age structure added about 830 million people to the world in the 1990s and will do so in the first two decades of the twenty-first century. Analysts have warned about complacency relating to future population growth because of the decline in fertility. The continuation and identification of this decline must remain an important global priority. To achieve maximum demographic impact, governments in developing countries need to pursue three broad policy options:

1. Reduce unwanted pregnancies by strengthening family planning and addressing the unmet need for contraception.
2. Reduce the demand for large families by investing in human development such as education, improvement of women's status, and infant and child survival.
3. Slow down the momentum of population growth by raising the average age at which childbearing occurs and by lowering family size.

Global population growth is also influenced by patterns of mortality and this also has undergone significant change. Table 5 shows that during the second half of the twentieth century almost two decades have been added to the average life expectancy of world citizens. (Life expectancy is defined as the average number of years a person of a given age can expect to live if the present mortality rates at all ages for a given period are maintained over their lifetime.) The greatest increase in longevity has been in developing regions, but most countries have recorded massive mortality declines. Nevertheless, there are still differences of almost 25 years in life expectancy between the world's developed and developing regions. Overall in 1990–1995 male life expectancy (62.2 years) was lower than that of females (66.5). There are wide differences between countries in mortality, and Table 6 reflects this with life expectancies of less than 50 years in East and West Africa and of 77.4 in Australia and New Zealand.

Period	Developed regions	Developing regions	Undeveloped countries	World
1950–1955	66.5	40.9	35.5	46.5
1955–1960	68.5	44.4	37.7	49.6
1960–1965	69.8	47.7	39.6	52.3
1965–1970	70.5	52.2	41.8	56.0
1970–1975	71.2	54.7	43.6	57.9
1975–1980	72.2	56.7	45.2	59.7
1980–1985	73.0	58.6	47.1	61.3
1985–1990	74.0	60.6	49.3	63.1
1990–1995	74.2	62.1	49.7	64.3

Table 5. Life expectancy at birth (in years) for both sexes combined, 1950–1995 (UN 1998, p. 39)

Major area or region	Both sexes	Males	Females
Africa	51.8	50.4	53.3
East Africa	46.7	45.4	48.0
Middle Africa	51.0	49.3	52.7
North Africa	62.1	59.3	64.9
West Africa	49.5	48.0	51.1
Asia	64.5	63.2	66.0
East Asia	69.7	67.6	71.9
South Central Asia	60.4	59.9	60.8
Southeast Asia	63.7	61.7	65.6
West Asia	66.3	64.4	68.4
Europe	72.7	68.5	76.9
Eastern Europe	68.2	63.0	73.6
Northern Europe	75.8	72.8	78.8
Southern Europe	76.0	72.7	79.3
Western Europe	76.7	73.2	80.2
Latin America and Caribbean	68.5	65.3	71.8
Caribbean	68.5	66.4	70.8
Central America	70.5	67.6	73.4
South America	67.8	64.4	71.4
North America	76.2	72.8	79.5
Oceania	72.9	70.3	75.6
Australia/New Zealand	77.4	74.5	80.3
Melanesia	59.1	58.1	60.3
Micronesia	67.3	65.7	69.1
Polynesia	69.3	67.2	71.6

Table 6. Life expectancy at birth (in years), by major area and region, 1990–1995 (UN 1998, p. 40)

It is anticipated that mortality will continue to decline in all countries, and the UN projections assume this to be the case. While countries vary greatly in their current mortality levels, they are all expected to converge toward an average life expectancy of the sexes of about 90 years, although they are anticipated to reach this level at different times.

The recent gains in life expectancy are reflected in the fact that in the 1992-based projections, life expectancy trajectories converged toward 85 years.

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Biographical Sketch

Graeme Hugo, Ph.D., is professor of the Department of Geographical and Environmental Studies and Director of the Key Centre in Research and Teaching in the Social Science Application of GIS at the University of Adelaide. He completed his Ph.D. in demography at the Australian National University in 1975 and subsequently took up an appointment at Flinders University in South Australia. He has since held visiting positions at the University of Iowa, University of Hawaii, Hasanuddin University (Indonesia), and the Australian National University and has worked with a number of international organizations and many Australian government departments and instrumentalities. He is the author of more than one hundred books, articles in scholarly journals, and chapters in books, in addition to a large number of conference papers and reports.