

World Population Growth

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The population of the world was two billion (2,000,000,000) around 1920, three billion in 1960, four billion in 1975, and five billion in 1987. A further billion was then added in only 13 years, with six billion reached in 2000. The estimated population of the world, or of individual countries such as Australia, can be found at any time by accessing the World Population Clock on the United States Census Bureau's home page (<http://www.census.gov>).

The United Nations Population Division web site also includes sets of population projections with different fertility assumptions. Estimates of the rural, urban, and total populations of the world, its regions, and individual countries since 1950 can also be accessed at: <http://www.un.org/esa/population/unpop.htm> or at: <http://esa.un.org/unpp/>

Another useful source is the there *International Migration Report* (United Nations 2002), which can be accessed at: <http://www.un.org/esa/population/publications/ittmig2002/ittmigrep2002.htm>

The UN figures in this Chapter are generally those from the 2000 Revision (United Nations 2001:23,38-39). These estimates show that if fertility remains constant or declines slowly, the world population would reach seven billion in 2010. If fertility declines relatively quickly then the rise to seven billion would be postponed until 2015 and eight billion would be attained around 2050. However, more recently, in its 2002 Revision, the UN has made new assumptions about the future of fertility and the impact of the HIV/AIDS epidemic.

Although estimates of the world's population before the 20th century are less reliable, growth has been rapid since about 1650 (Table 3.1). Caldwell and Schindlmayr (2002) have described the emergence of a consensus about world population growth after 1650, initially as a result of inter-related work by Carr-Saunders (1936) and Willcox (1940) whose estimates were legitimised by the United Nations in 1951. In the 1970s additional estimates by Durand were incorporated (United Nations 1973) but Caldwell and Schindlmayr (2002:185-186) imply that the United Nations glossed over the reservations made by the three pioneers on the quality of their estimates.

Omran (1971,1982) has identified three models of the shift from high to low mortality and these are described below. For each model there are three stages, the first being the era of pestilence and famine when mortality rates were extremely high. Up to the 17th century, population growth was slow and unsteady. In some years the population actually decreased because of wars, epidemics, malnutrition, and famine. The *plague*, a fever affecting rats but which can spread to humans, was an example of a major killer. In a series of *pandemics* (epidemics spreading over a wide area) called the Black Death, the plague killed perhaps one-third of Europe's population between 1347 and 1349. By the 18th century, apart from local outbreaks, the plague had mysteriously disappeared from Europe (Gale 1959:Chapter 2).

Europe then entered second stage (Omran's 1977:4), the era of receding pandemics, as epidemics (of plague, typhoid, cholera, etc.) became less severe. In the United States, the age of receding pandemics began somewhat later, in the 19th century. Using data from New York City, Omran (1982:176) showed that from the 1850s onwards, peaks of mortality became lower as deaths from cholera and smallpox diminished.

The Black Death killed perhaps 35 million persons in Europe alone and had a substantial impact on total population size. However by the 20th century the world's population was so much larger (see Table 3.1), that even the 20 million deaths throughout the world during the 1918 influenza pandemic, and the nine million European military deaths between 1914 and 1918, were comparatively insignificant (United Nations 1973:144–5).

After the middle of the 17th century, the rate of world population growth accelerated, largely because of falling death rates (on average people were living longer). Growth rates reached a peak of 2% in the late 1960s. By the late 1970s, the rate declined to 1.7% (United Nations 1974:5; 2001:38).

One simple and useful rule used by demographers is that if 70 is divided into the annual rate of growth, the result is the number of years a population takes to double itself (Haupt and Kane 1991:46). If the world's population growth rate is 2%, the population will double in 35 years. Compare this with the growth before 1850 in Table 3.1, when the rates implied doubling times of over 100 years. The world's population has been estimated at 250 million in the year AD 1, but it took over 1500 years to reach 500 million.

Today the world can roughly be divided, according to the level of per capita income or economic development, into *more developed* or *less developed* regions. The developed countries mostly lie in Europe; others include the United States, Canada, Japan, Australia, and New Zealand. In 1950, about 33% of the world's population lived in the developed region, but by 2000 this proportion had fallen to 20%. A further decline to 13% is estimated for 2050 (United Nations 2001:Table 1).

TABLE 3.1 Estimates of population and growth rates by continent, 1650–2000

(a) Estimated population (millions)									
	1650	1750	1850	1950	1950	1970	1980	1990	2000
Africa	100	95	95	221	277	356	467	619	794
Asia	330	479	749	1399	1700	2142	2631	3164	3672
Latin America	12	11	33	167	218	285	361	440	519
North America	1	1	26	172	204	232	255	283	314
Europe	100	140	266	548	605	657	693	722	727
Oceania	2	2	2	13	16	19	23	26	31
The World	545	728	1171	2519	3020	3691	4430	5255	6057

(b) Approximate annual growth rate (%)								
	1650-1750	1750-1850	1850-1950	1950-1960	1960-1970	1970-1980	1980-1990	1990-2000
Africa	-0.1	-	0.8	2.2	2.5	2.7	2.8	2.5
Asia	0.4	0.5	0.6	1.9	2.3	2.1	1.9	1.5
Latin America	-0.1	1.1	1.6	2.7	2.7	2.4	2.1	1.6
North America	0.3	3.0	1.9	1.7	1.3	0.9	1.1	1.0
Europe	0.3	0.6	0.8	1.0	0.8	0.5	0.4	0.2
Oceania	-	-	1.8	2.2	2.0	1.6	1.6	1.5
The World	0.3	0.5	0.8	1.8	2.0	1.8	1.7	1.4

Note: Growth rates take account of births, deaths, and international migration. Due to rounding, world figures may not agree with the column totals.

Sources: (1650–1850) Carr-Sanders 1936:42, Figure 8; (1950–2000) United Nations 2001:38,52,64,74,84,92,94

Table 3.1 shows that Europe and North America have relatively low growth rates. In the developed countries, fertility began to decline around the end of the 19th century, while in developing countries it remained high. Some developed countries have achieved *zero population growth (ZPG)* or negative growth rates, and around 2025 the more developed region as a whole may be experiencing negative growth (United Nations 2001:Figure 3).

Negative growth is generally associated with *below replacement fertility*. The level necessary to ensure that the population replaces itself in the long run is mostly considered to be 2.1 children per woman (United Nations 2001:3).

In Asia and Latin America, growth was getting faster in the 1970s but has since slowed. During the period 1965–75, in the developing countries 'there was substantial fertility decline in Asia, some in North Africa, and almost none in black

Africa' (Mauldin and Berelson 1978:89). Until recently, Africa was the only region where growth rates had not fallen.

DECLINING MORTALITY

The early reductions in mortality came about in Europe and North America as a result of a combination of the factors shown in Box 3.1, but their relative importance is the subject of much debate. Razzell (1974) stresses the importance of inoculation against smallpox in the 18th century and improved hygiene, including the greater use of soap and washable cotton clothes in the first 40 years of the 19th century.

McKeown (1976) and McKeown et al. (1972) emphasise improvements in nutrition resulting from increased food production, and reject the argument that advances in medical science accounted for much of the decline in mortality. Beaver (1973) suggests that in the second half of the 18th century infant mortality fell in England and Wales when supplies of cheap cow's milk became generally available throughout the year.

Preston and van de Walle (1978) found that mortality in 19th century France was relatively high in the three largest urban areas. However, at some point after 1850 the mortality for these areas was reduced, apparently because of improvements in water supply and sewerage. Medical improvements did not become important until diphtheria immunisation in the 1890s.

Australia provides an interesting contrast with Europe. Declines in mortality have been well documented since 1856, when death registration became compulsory throughout the country. Australia's geographical isolation and low population density served to prevent the introduction and spread of some diseases. Immunology (the study of the body's resistance to disease) has played little part in the decline of mortality in Australia because diseases such as cholera were almost unknown. Also, the standard of nutrition has been high since the late 19th century (Lancaster 1967). Improved drainage and sewerage, and more effective health legislation seem to have contributed to declining mortality in the late 19th century (Young 1976:30).

BOX 3.1 Causes of mortality decline in the 18th and 19th centuries

Improved agriculture led to increased food production and better nutrition (eg the Agricultural Revolution in England included better fertilisers, crop rotation, and winter crops).

Industrialisation. The development of the factory system meant a greater variety of manufactured goods. Factory production of machinery (eg the iron plough, steam engine etc.) also contributed to improved agriculture and transport.

Improved transport made the distribution of food and other goods easier (eg in Europe, railways enabled food supplies to be sent rapidly from rural to urban areas).

Social reforms eg laws regulating child labour in factories.

Greater control of temperature and humidity in the home and at work may have contributed to the decline of some diseases.

Public sanitation including improved water supplies and sewage disposal, and water purification (eg filters eliminate cholera and typhoid from the water).

Improved personal hygiene was possible because of 2 and 6 above (eg cheap easy to wash cotton clothing and soap became generally available).

Asepsis and antisepsis (the exclusion and killing of disease-causing organisms) was developed by Joseph Lister in the later 19th century (eg the sterilisation of surgical instruments).

Immunology (the study, of the body's resistance to disease), eg Jenner's paper of 1798 on inoculation against smallpox, and the discoveries by Koch in 1876 and Pasteur 1877 that inoculation with a mild case of the disease will prevent a serious case.

Biological factors. People become more resistant to some diseases, and some diseases such as scarlet fever become more *benign* (ie less dangerous).

Note: The causes listed here refer to declines in Europe, North America, Australia, and New Zealand.

Source: Thomlinson 1976:97–102.

Omran (1971, 1977:10) has defined three models of *epidemiological transition* from high to low mortality.

- The *Classic* or *Western Model* involves the gradual fall in Western mortality over the past 200 years, from high death rates of about 30 per thousand to low rates of less than 10. In the early stages this decline was a response to the process of modernisation and owed little to medical measures.
- The *Accelerated Model* describes Japan and Eastern Europe. The mortality decline took place much faster than in the Classic Model, and benefited from the medical revolution as well as from social, economic, and environmental improvements.
- The *Delayed Model* applies to developing countries where death rates have fallen rapidly since World War II but have not yet reached the low levels of the developed countries. In the developing countries modern medical technology and mass medical intervention have had an important effect. New drugs, such as antibiotics, became available and mass campaigns were organised to eradicate malaria, smallpox, and other diseases. Smallpox has now virtually disappeared from the world.

A summary of the extensions or refinements to the notion of the epidemiological transition can be found in Salomon and Murray (2002:205–207). In 1986 Olshansky and Ault suggested a fourth stage, the 'age of delayed degenerative death' where mortality from degenerative diseases shifts to the older age groups. The term *counter transition* refers to rising mortality, with the HIV/AIDS epidemic in Africa as a notable example.

URBAN GROWTH

The growth of the world's population has been accompanied by urban growth. Around 1800, the world urban population numbered 25 million (Kelley and Williamson 1984:419). Kelley and Williamson have referred to the *urban transition*, with city growth speeding up in the early stages of development, and slowing down in the later stages.

For the year 2000, the United Nations estimated that 47% of the world's population lived in urban areas, and that this proportion would rise to 60% by the year 2000. In 2000 75% of the population of Europe lived in urban areas, in the majority of countries with more than 75% of the population living in urban areas are in Europe, headed by Belgium with 97%. In 1950, the largest urban area (or *agglomeration*) was New York with 12 million people. By 1990 the largest was Mexico City with 20 million, reflecting the importance of urbanisation in the developing regions (United Nations 1991:Table 8). By 2015, there are expected to be 23 cities with populations of more than 10 million, including five, Tokyo, Mumbai, Lagos Dhaka and Sao Paulo, going over 20 million.

CONTINENTAL GROWTH

Europe

Since the 18th century Europe has had the lowest population growth rate of all the continents. Emigration and relatively low fertility have contributed to this. Borrie (1970:85) estimated that since the 16th century over 60 million Europeans have moved overseas, especially during the 50 years after 1875.

Fertility rates began to decline in France before 1800, and in many other countries in the late 19th and early 20th century (Knodel and van de Walle 1982). The European Fertility Project studied the decline using 19th and 20th century census and vital registration data for approximately 600 European provinces (see Coale and Watkins 1986). Initial declines in fertility generally occurred after a fall in infant mortality, and continued until reaching low levels. In 1870, the provinces of a country could have different levels of fertility. By 1960 they were all similar, so that the nation became the unit of comparison (Watkins 1991:263).

The highest fertility ever recorded for a population was for the Hutterites (an American religious group) between 1920 and 1931 (Coale and Treadway 1986:33-4). The European Fertility Project used Hutterite women as a benchmark and showed that 19th century European women had lower fertility than the Hutterites. This was partly because in many European provinces more than half the women were unmarried, and the fertility of unmarried women was low. (Watkins 1986:429). Within marriage there was little attempt to stop childbearing. After 1870, marital fertility, (based on births to married women) began to fall, as wives terminated childbearing at earlier ages and family limitation spread rapidly (Watkins 1986:447-8).

In 1950, Europe comprised 22% of the world's population but by 2050 this could have fallen to as low as 7% (United Nations 2001:Table 1). Almost all European countries now have annual population growth rates of less than 1%, and Eastern Europe has experienced a numerical decline in the 1990s (United Nations 2001:76). The former USSR was a special case because it spanned both Europe and Asia, with the population approximately equally divided between Russians and non-Russians. Writers such as Besemeres (1980:Chapter 6) and Anderson and Silver (1989) have commented on the more rapid growth rates of non-Russians contributing to demands for social, cultural, and political independence. The ethnic divisions of the former USSR culminated in that country's division into 15 independent states in 1991.

Africa

The most suspect element in the consensus on world population growth mentioned above are the pre-20th century estimates for Africa (Caldwell and Schindlmayr 2002). Two 17th century writers, Riccioli and King, had both made guesses of 100 million for Africa's population and Willcox assumed that this population was maintained for the next two centuries. Carr Saunders reduced his estimate to 95 million for 1750 and 1850 (Table 3.1) to take account of the slave trade.

African population growth up to the 20th century was limited primarily by high mortality rates as well as by the American and Indian Ocean slave trade. Between 1500 and 1867, when the last slave ship crossed the Atlantic, about 12 million slaves were shipped from Africa to the Americas, with about half sailing in the 18th century (Eltis 1998:372; Richardson 1998:389). In addition over two million slaves were exported from sub-Saharan Africa to the Middle East and other destinations via the Sahara desert, Red Sea or Indian Ocean (Richardson 1998:386–7).

Africa has 22% of the world's land area, but only 13% of the world's population. However, with high fertility and falling mortality, Africa's population is growing faster than that of any other continent and its share of the world's population is expected to rise. According to van de Walle and Foster (1990), there was little evidence of a sustained fertility decline in sub-Saharan Africa. Exceptions were countries such as Botswana, Zimbabwe, and South Africa where family planning programs are having some impact (Lucas 1992). More recently parts of some African countries have been shown to have below replacement level (see for example Kinfu, 1999).

European and Asian immigration to Southern and East Africa in the 19th and 20th centuries was important for the continent's economic development but made only a minor contribution to population growth. More recently, Africa has become a continent of emigration. Today there are noticeable movements of Africans to developed countries because of political instability and economic decline in the home countries. As African countries achieved independence, many Europeans and Asians moved out. For instance, many Portuguese settlers left Mozambique and Angola around 1975. Van Rooyen (2000:34) wonders if South Africa will follow the examples of Namibia, Zimbabwe, and Algeria where the majority of Europeans have left.

The Americas

In the year 1500 the Amerindian population of South and North America was estimated to be around 14 million. After contact with Europeans, the local populations declined because of armed conflicts and the introduction of new diseases such as smallpox and measles. When Columbus reached the Caribbean in 1492, around 300,000 Amerindians inhabited the islands but by the middle of the 17th century they had virtually been eliminated. On the American mainland during the 16th century, Amerindian numbers declined by 2.5 million, but the numbers of Africans increased as the Portuguese brought African slaves to Brazil. Slavery then spread to the settlements established by the French, British, and Dutch in North America and the Caribbean. Immigration from Europe accelerated during the 19th century, with 35 million Europeans settling in the United States between 1845 and 1914. This immigration, combined with a high rate of natural increase, made the United States one of the world's largest nations (McEvedy and Jones 1978:270-81).

Growth rates in North America started to decline earlier than in Latin America. In the 1980s, Canada and the United States had crude birth rates of around 15 per thousand, compared with 25 for the Caribbean, and just below 30 for South America. In Central America two countries, Guatemala and Nicaragua, had birth rates above 40 (United Nations 1989:120).

Asia

Table 3.1 shows that 59% of the world's population lives in Asia. Asia contains the world's two largest countries: China, with about one-fifth of the world's population, and India, with about one-sixth. Because of its higher fertility, India's population is expected to pass China's in the 21st century. Four other countries in Asia have populations over 100 million, in descending order: Indonesia, Pakistan, Japan, and Bangladesh.

The first Chinese population count took place about 2,000 years ago, in 2AD, and showed a population of 50 million. Sustained growth began in the 14th century, and population pressure on arable land became apparent in the 18th and 19th centuries. Between 1749 and 1851 the annual growth rate was 0.9% and the population more than doubled (Banister 1992:51). The period 1851–1949 began with enormous loss of life in the Tai-Ping rebellion, followed by other political upheavals and disasters (Durand 1977:263) and population growth fell to 0.3% with the 1953 census recording 583 million or less (Banister 1992:54). The 1970s estimates of China's population by Frejka (1976:3) ranged from 839 to 930 million. In fact the 1982 census gave a total of just over one billion and another 126 million had been added by the next census, in 1990 (Poston 1992:699).

Dyson (1989:6–9) considers that population growth in India was near zero, or even negative, from 1760 to 1820 because of wars and social and economic

disruption. Positive growth occurred from 1830 to 1891 but then slackened to an average of only 0.2% per annum between 1891 and 1920 because of famine and epidemics. By 1960 the growth rate had reached 2%.

In 1992, United Nations estimates showed India's population growth at around 2% per annum compared with China's 1.5%. A major reason is that fertility in China fell more quickly than in India in the 1970s and 1980s. Birth rates in China halved from 42 to 21 between 1964 and 1981 (Cho 1992:70). In contrast India's birth rate in 1992 was still above 30.

Because of their massive size, emigration from China and India had little effect on their growth rates, but sometimes had a substantial impact on the destination countries. For example, Indians came to outnumber Melanesians in Fiji. Poston and Yu (1992:123–4) estimate that there were around 27 million overseas Chinese spread around the world in the early 1980s. Overseas Chinese dominate the populations of Hong Kong, Macao, and Singapore, and comprise about one-fourth of the population of Malaysia.

Around 1950, Asia had a crude birth rate of approximately 40, and a crude death rate of 24. In the 1980s the crude birth rate was about 28, and the crude death rate nine per thousand (United Nations 1989:120, 136). Within Asia, falls in growth rates between 1950 and 1990 were marked in East Asian nations such as China and Japan. Growth rates in western Asia were 2.7%, and some countries, such as Jordan and Saudi Arabia, had rates around 4% (United Nations 1989:90).

Oceania

The 17th century writers Riccioli and King had both guessed a population of 100 million for Oceania in 1650 but with the advantage of 19th and 20th century data, Carr Saunders and Willcox were able to reduce these estimates to two million (Caldwell and Schindlmayr 2002:192).

Oceania, like the Americas, gained population through immigration from Europe. Today the populations of Australia (around 19 million in 2000) and New Zealand (around 3.8 million) are largely of European descent. The number of Australian Aboriginal people was estimated at around 300,000 in 1788, but as the result of armed conflict and introduced diseases, fell to about 75,000 at the beginning of the 20th century before rising again (National Population Inquiry 1975: Chapter 12). Similarly, for the Maori population of New Zealand, Pool (1991) estimated that deaths exceeded births from the arrival of the Europeans in 1769 until the mid-19th century.

The remainder of this region consists of the island nations in Melanesia, Polynesia, and Micronesia. In Melanesia, scientists writing in the 1920s anticipated a bleak demographic future, with prospects of depopulation related to the adverse effects of European contact (Bedford 1980:10:14–16). Only two of the five Melanesian countries, Fiji and New Caledonia, had censuses before the 1960s, and in these countries in the forty years 1881–1921 the indigenous populations of Fijians and New Caledonian Kanakas had fallen by 25% and 37% respectively (Bedford 1980:17). The populations then entered into a period of sustained population growth.

Bedford (1980:50) gives a 1976 population for Melanesia of 3.9 million. The South Pacific Community's estimate for 2000 is 6.5 million, of which 4.8 million are in Papua New Guinea. Papua New Guinea is growing at around 2.3%, while Vanuatu and Solomon Islands are growing at 3.0 and 3.4% respectively. In Polynesia, some countries such as Niue and the Cook Islands have experienced low or even negative growth because of emigration to developed countries, especially New Zealand, Australia, and the United States.

Australia's population numbers are shown in Table 3.2 and exclude the Aboriginal population before 1970. European settlement began in 1788 and only in the 1860s did the Australian-born outnumber the overseas-born from the United Kingdom (Lucas 1987:94). Jackson (1988:26–7, 60) has shown the very high population growth (of up to 11% annually) before 1860, with the 1850s as the last decade in which immigration accounted for the bulk of Australia's population increase. Net migration has been negative in two periods, 1901–5 and 1931–5, and in the 20th century the highest rates were between 1946 and 1970 (Jackson 1988:27).

TABLE 3.2. Australia's Population 1851–2001

Place/Date	Males (^{'000})	Females (^{'000})	Total (^{'000})	Sex Ratio Males per 100 Females
1851	257	181	438	142
1861	669	483	1152	139
1881	1215	1035	2250	117
1891	1704	1470	3174	116
1901	1978	1796	3774	110
1911	2313	2142	4455	108
1921	2763	2673	5436	103
1933	3367	3263	6630	103
1947	3797	3782	7580	100
1954	4546	4440	8987	102

BEGINNING AUSTRALIAN POPULATION STUDIES

Place/Date	Males ('000)	Females ('000)	Total ('000)	Sex Ratio Males per 100 Females
1961	5312	5196	10508	102
1966	5816	5734	11550	101
1971	6413	6343	12756	101
1976	6775	6773	13549	100
1981	7,267	7309	14576	99
1986	8000	8018	16018	100
1991	8615	8,669	17284	99
1996	9108	9,203	18311	99
2001 Census	9655	9731	19387	99

Sources: Australian Bureau of Statistics, 1997,2000, 2002: Jackson 1988:35.

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