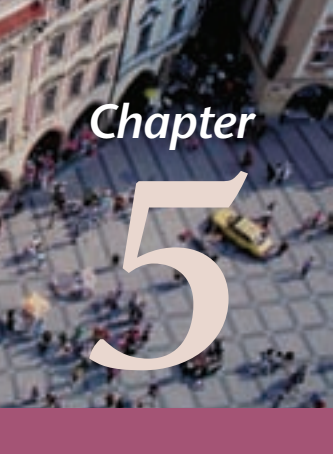


Chapter 5

Population change

The population of an area alters as a consequence of both natural change and migration. The annual population change of an area is the cumulative change in the size of a population after both natural change and migration have been taken into account.

Table 5.1 Global population data

Region	Birth rate (per 1,000)	Fertility (per woman)	Death rate (per 1,000)	Infant mortality rate (per 1,000)	Life expectancy at birth (years)	Population density (per km^2)
World	21	2.7	9	52	67	329
MEDCs	11	1.6	10	6	77	158
LEDCs	23	2.9	8	57	65	433
Africa	38	5.1	15	84	52	205
North America	14	2.0	8	7	78	111
Latin America	21	2.5	6	26	72	184
Asia	20	2.4	7	49	68	839
Europe	10	1.4	12	7	75	212
Oceania	17	2.1	7	27	75	26

Source: World Population Data Sheet (2006)

Key terms

Birth rate A measure of an area's fertility. It is expressed as the number of live births per 1,000 people in 1 year.

Death rate The number of deaths per 1,000 people in 1 year.

Life expectancy The average number of years from birth that a person can expect to live.

Longevity The increase in life expectancy over a period of time. It is a direct result of improved medical provision and increased levels of economic development. People live longer and this creates an older population.

Natural change The change in size of a population caused by the interrelationship between birth and death rates. If birth rate exceeds death rate, a population will increase. If death rate exceeds birth rate, a population will decline.

The growth of world population

In 1999, the world's population reached 6 billion. It has grown rapidly in the last 200 years, particularly since 1950 (Table 5.2). Natural increase peaked at 2.2% globally in the 1960s. Since then, falling birth rates have reduced this increase to 1.2%. However, the global population is still expanding by 80 million every year. Estimates suggest that by 2050 the global population will be 9 billion, with zero growth occurring only towards the end of the century.

Year	Population (billions)
1800	1.1
1850	1.4
1900	1.8
1950	2.6
2000	6.1

Table 5.2 World population growth, 1800–2000

The growth in world population has not taken place evenly. The populations of some continents have grown

and continue to grow at faster rates than others. Europe, North America and Australasia have very low growth rates. In 1995, their share of the world's population was 20%. This is expected to fall to 12% by 2050. It is estimated that Europe's population will shrink by 90 million during this period.

Asia has a rapid, but declining, rate of population growth. Between 1995 and 2050, China, India and Pakistan will contribute most to world population growth. Indeed, it is estimated that by 2050 India will overtake China as the world's most populous country. Another potential area of rapid population growth is sub-Saharan Africa, particularly Nigeria and the Democratic Republic of Congo.

Causes of population growth

Several different factors interrelate to cause growth in the world's population (Figure 5.1):

- **health** — the control of disease, birth control measures, infant mortality rates, diet and malnutrition, the numbers of doctors and nurses, sexual health, sanitation
- **education** — health education, the age at which compulsory schooling finishes, females in education, levels of tertiary education, literacy levels (Photograph 5.1)
- **social provision** — levels of care for the elderly, availability of radio and other forms of media, clean water supply
- **cultural factors** — religious attitudes to birth control, status gain from having children, the role of women in society, sexual morality

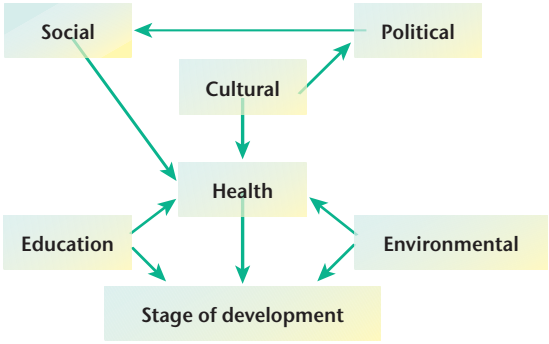


Figure 5.1 Causes of world population growth

Jenny Reynolds

Photograph 5.1 A primary school in Malawi. Some of the children are late starters because the government only recently introduced primary education for all

- **political factors** — taxation to support services, strength of the economy, impact of war and conflicts, access to healthcare and contraception
- **environmental factors** — frequency of hazards, environmental conditions that breed disease

All countries and regions of the world are dynamic and changing. They develop both economically and socially and this affects population change over time.

The measurement of population characteristics

Most of the countries in the world collect data about their populations, usually in the form of a census. This is a detailed collection of information on a regular basis — for example, every 10 years. The data collected include employment characteristics, ethnicity, educational attainment, patterns of social activity, and housing type and ownership.

In the UK, the data are collated by areas of local government and by postcode. The smallest area is that covered by one census collector — an area known as an **enumeration district**.

The information collected is of use to:

- governments — to provide a basis for the allocation of resources to services such as health, education and employment
- non-governmental bodies — retailers, advertisers, financial services, property developers and utilities

Censuses are not without problems. Some people object to them on the grounds that they infringe privacy. Some people do not return their census forms. Political conditions in some countries make censuses difficult to organise.

At a national government level, a census:

- records trends over the previous 10 years which can be projected forward to enable planning in a range of social services
- helps with prediction of natural population change and migration patterns
- enables the estimation of national housing demands
- enables the planning of national transport demands
- is a snapshot of the diversity of the country

For businesses and commerce, a census:

- can be linked to other data sources, such as credit card data, to provide information on regional lifestyles
- enables targeted marketing, based on postcode areas
- enables the insurance industry to assess risk more effectively
- enables retailers to invest in optimum locations where spending power is highest
- allows firms to target goods to stores according to the profile of the population. For example, supermarkets stock more prepared foods in areas where there are greater numbers of young single adults

Indicator	Niger	Guatemala	Yemen	Haiti	Kenya	Pakistan	Botswana	USA	UK
Birth rate (per 1,000)	55	34	41	36	40	33	26	14	12
Death rate (per 1,000)	21	6	9	13	15	9	27	8	10
Natural increase (%)	3.4	2.8	3.2	2.3	2.5	2.4	–0.1	0.6	0.2
Infant mortality rate (per 1,000)	149	35	75	73	77	79	56	6.7	5.1
Fertility rate (per woman)	7.9	4.4	6.2	4.7	4.9	4.6	3.1	2.0	1.8
Contraceptive usage (% of married women)	14	43	23	28	39	28	40	73	84
% population urban	21	39	26	36	36	34	54	79	89
% population under 15 years	49	43	46	42	43	41	38	20	18
Life expectancy (years)	44	67	60	52	48	62	34	78	78
GNP per capita (US$, 2005)	800	4,410	920	1,840	1,170	2,350	10,250	41,950	32,690
% population living below US$2 per day	86	32	45	78	58	74	50	0	0

Source: World Population Data Sheet (2006)

Table 5.3 Demographic and economic indicators for selected countries

It is easy to see, therefore, that censuses are a useful source of information for geographers and demographers. Table 5.3 shows examples of the demographic and economic indicators that are collected by censuses and other agencies.

Changes in population characteristics

Fertility

In most parts of the world, fertility exceeds both mortality and migration. It is, therefore, the main determinant of population growth. Its importance has increased over time with the worldwide fall in mortality. Several African countries (e.g. Niger, Liberia, Mali) have very high birth rates of 50 and over per 1,000 per year. At the other end of the scale, Austria, Germany, Belarus (Photograph 5.2), Bulgaria, Slovenia and Ukraine have birth rates of 9 and under per 1,000 per year. Why does fertility vary?

- The relationship with **death rate** can be important. Countries in sub-Saharan Africa have high birth rates that counter the high rates of infant mortality (often over 100 per 1,000 live births). One study of sub-Saharan Africa concluded that a woman must have, on average, eight or nine children to be 95% certain of a surviving adult son. In contrast, in Europe, the average falls short of two children. Improvements in healthcare, sanitation and diet have led to a drop in rates of child mortality and reduce the need for large numbers of children as forms of security for the future. The USA has one of the highest birth rates among

Key terms

Fertility The number of live births per 1,000 women aged 15–49 in 1 year. It is also defined as the average number of children each woman in a population will bear. If this number is 2.1 or higher, a population will replace itself.

Infant mortality rate The number of deaths of children under the age of 1 year expressed per 1,000 live births per year.

developed countries, with a total fertility rate of 2.0. Other developed countries have fertility rates lower than 2.0.

- In many parts of the world, **tradition** demands high rates of reproduction. Intense cultural expectations may override the wishes of women. One useful indicator of women's ability to limit the number of children they have, and of the prospect for future fertility decline, is their desire to cease child-bearing. In Vietnam, 92% of women who had two children said they did not wish to have any more children. In Nigeria, by contrast, the figure was only 4%. Fertility among women aged 15 to 19 presents a special concern, as these young women may lack the physical development and social support needed, and child-bearing may curtail a young woman's education. In some countries, such as Chad, Bangladesh and Mozambique, more than one in four adolescent girls has given birth.
- **Education** for women, particularly female literacy, is a key to lower fertility. With education comes knowledge of birth control, more opportunities for employment and wider choices. Contraceptive use is becoming more widespread in developing countries to help women avoid unwanted pregnancies and to lower birth rates. A clear prerequisite is the availability of modern contraception for couples with both the knowledge and desire to use it. This objective has been generally achieved in much of Latin America and the Caribbean, but often falls short in sub-Saharan Africa and parts of Asia and Oceania. For example, in Rwanda, only 10% of women practise a modern method of family

Jane Buekett

Photograph 5.2 Belarus has a very low fertility rate

planning, while at least 70% do in Brazil. Obstacles such as the lack of funds and supplies, and the lack of comprehensive programmes to educate couples with their choices, are significant barriers.

- Young **age structures** lead to developing countries far outpacing developed countries in population growth. Large proportions of young people, as there are in Mali (48%) and Bolivia (39%), ensure future population growth even when births per woman decline. This is because the 'youth bulge' is about to move through the child-bearing years. Conversely, countries with smaller proportions of youth, such as Poland (17%) and Japan (14%), face population decline even if births per woman increase.
- **Social class** is important. Fertility decreases from lower to higher classes or castes.
- **Religion** is of major significance because both Islam and the Roman Catholic Church oppose the use of artificial birth control. However, adherence to religious doctrine tends to lessen with economic development. This is particularly well illustrated in Italy. Although it is the location of the Vatican — the home of the pope — the fertility rate in Italy is very low (1.3). This suggests that some form of artificial birth control is taking place.
- **Economic factors** are important, particularly in less developed countires, where children are an economic asset. They are viewed as producers rather than consumers. In more developed countries, this is reversed. The length of time children spend in education makes them expensive, as does the cost of childcare if both parents work. In eastern Europe, economic uncertainty is a major factor in causing low fertility rates.
- There have been several cases in recent years of countries seeking to influence the rate of population growth. Such **political influences** have been either to increase the population (as in 1930s Germany and Japan, and more recently in Russia and Romania) or to decrease it (as in China, with its one-child policy).

Explosion or implosion?

There are over 6.5 billion people in the world. In the late twentieth century, the population was doubling every 30 years — this was described as the 'population explosion'. Various predictions have been made about future population growth. In 1996, one study by Earthscan estimated that the world's population would peak at around 10.6 billion in 2080 and then decline. The main reason for the slow down in population growth is that fertility rates are falling faster than had been expected.

Population growth in the less developed world

The fastest rates of population growth have been in the less economically developed world. Consequently, the greatest falls in fertility rates are expected to take place there. The average growth rate in the less developed world (excluding China) is 1.8%. Except in Africa and the middle east, where in almost 50 countries families of at least six children are the norm and the annual population growth is still over 2.3%, birth rates are now declining in less developed countries.

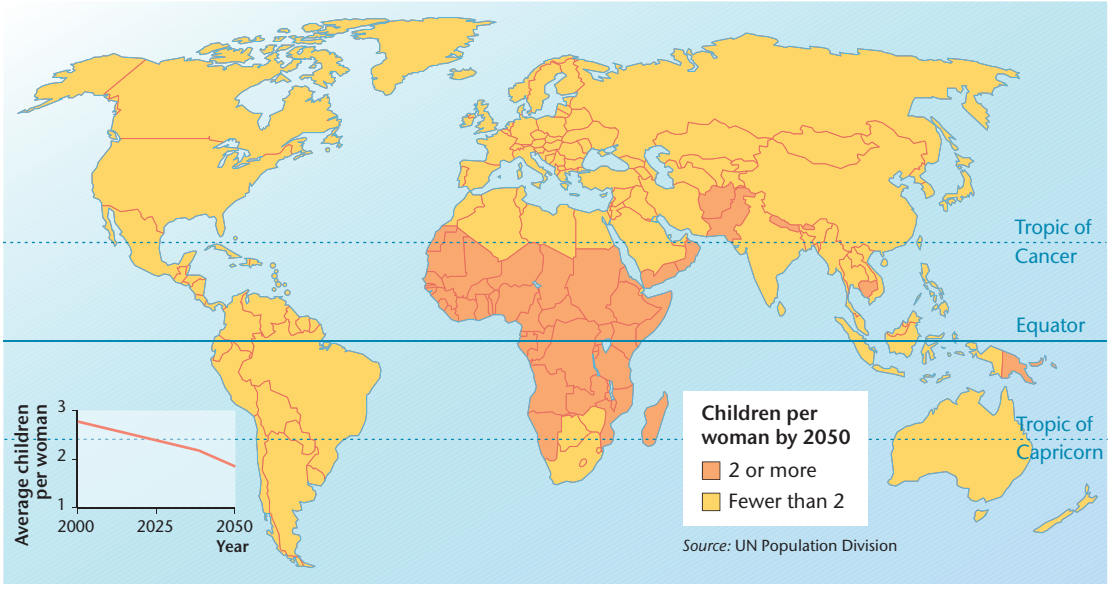


Figure 5.2 Global fertility decline

India is approaching China as the most populous country on Earth. Its population is over 1 billion and is expected to overtake that of China by 2050. This assumes an annual population growth of around 0.9% per year for India compared with 0.4% a year for China. In the southern states of India, such as Tamil Nadu and Kerala, where literacy rates are high, fertility rates have fallen sharply. However, in the impoverished Hindi belt in the north, traditional attitudes prevail, ensuring large numbers of children. Nevertheless, in India as a whole, fertility has dropped more than 50% in the last 30 years.

Fertility rates are declining in a range of less developed countries from east Asia to the Caribbean, and throughout most of South America (Figure 5.2). Although traditional religious attitudes are usually seen as a barrier to low fertility, in the Islamic world fertility is now below replacement level, at fewer than 2.12 children per woman. Tunisia, Iran and Turkey are all now in this category.

Population growth in the more developed world

In the more economically developed world, population growth has been slow for several decades. In some countries, for example Italy, Russia and Portugal, there has even been a small fall in the population — in Italy a population decrease of 4 million by 2020 is forecast. In the next 40 years, Germany could see its population drop by almost 20% and Japan by 25%. In Russia, President Putin has described the country's natural decrease as a 'national crisis'.

The fertility required to maintain the population level is 2.12 children per woman. There are already over 50 nations with fertility rates at or below this level. The United Nations (UN) predicts that by 2016 there will be 88 nations in this category — the 'Under 2.1 Club'. China is already a member of this 'club', although its population will not begin to decline until 2040 at the earliest. This is due to the time lag between reaching replacement-level fertility and actual

population decline. Population growth in China will continue well into the twenty-first century.

There are very low fertility rates in many east European countries, for example Ukraine, Romania, Bulgaria, Belarus, Hungary, the Czech Republic and Latvia. Here economic collapse and uncertainty following the end of communist rule has made many women postpone or abandon having children.

Conversely, at 2.0, fertility in the USA is relatively high. Some writers suggest that this is because the American people are more religious and optimistic than those in most other rich nations, leading to a desire for more children. It is also thought that immigration will continue to be high in the USA. This gives a younger structure to the population, thereby increasing fertility.

As concern spreads about low fertility in the more developed world, governments are beginning to act. For example:

- the Japanese government has set aside £50 million to try to stop the fall in fertility. The money is being spent on encouraging people to have more children and on projects to assist this objective
- several European countries have put in place incentives to increase birth rates, with considerable financial benefits being offered for a third child (Table 5.4)

Mortality

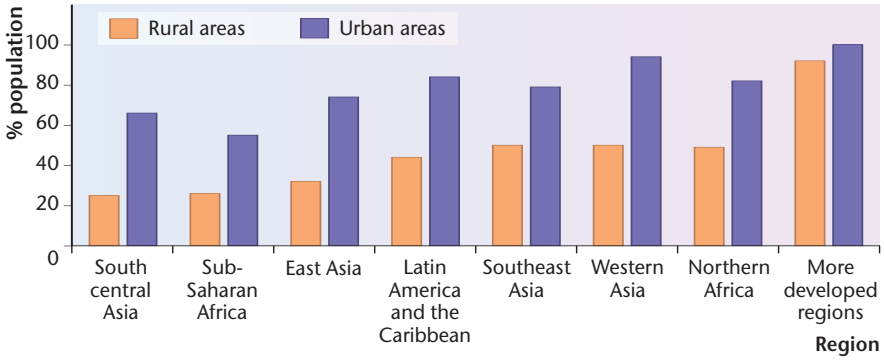
Some of the highest death rates are found in less developed countries, particularly in sub-Saharan Africa. Liberia, Niger, Sierra Leone, Zambia and Zimbabwe all have death rates of 20 per 1,000 or more. However, some of the lowest mortality rates are also found in countries at the lower end of the development range, for example Kuwait (2 per 1,000), Bahrain (3 per 1,000) and Mexico (5 per 1,000). Why does mortality vary?

- **Infant mortality** is a prime indicator of socioeconomic development. It is the most sensitive of the age-specific rates. Sierra Leone has an infant mortality rate of 163 per 1,000 live births. Infant mortality is falling across the world, but there are still wide variations between nations — 142 infant deaths per 1,000 births in Liberia, but only 3 per 1,000 in Finland. Areas with high rates of infant mortality have high rates of mortality overall.
- Areas with high levels of **medical infrastructure** have low levels of mortality. A lack of prenatal and postnatal care, a shortage of medical facilities and trained

Country	Germany	France	Sweden	Ireland	UK
Child benefit for mother with three children (£ per month)	290	263	226	189	170
Maternity and parental leave (weeks)	170	170	78	40	52
Percentage of working women aged 25–54 with no children	7.7	7.3	8.2	6.6	8.0
Percentage of working women aged 25–54 with two children	56	59	82	41	62
Fertility rate	1.3	1.9	1.8	1.9	1.8

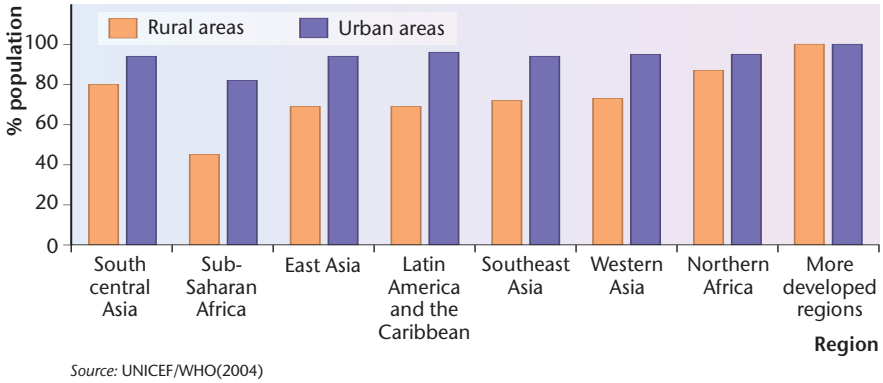
Table 5.4 Incentives to increase fertility

Figure 5.3
Access to improved sanitation, 2002



Source: UNICEF/WHO(2004)

Figure 5.4
Access to improved water sources, 2002



Source: UNICEF/WHO(2004)

professionals, and ignorance of the need for professional care are major contributors to high rates of mortality.

- Life expectancy is higher in countries with higher levels of **economic development**. Poverty, poor nutrition, and a lack of clean water and sanitation (all associated with low levels of economic development) increase mortality rates. Worldwide, only 58% of the population has access to one of life's fundamental needs: adequate or improved sanitation facilities (Figure 5.3). There are, however, wide regional and rural/urban disparities. In developing countries, only one-quarter to one-half of all rural residents have access to improved sanitation. In many parts of the world, rural populations also lack access to safe drinking water (Figure 5.4).

Table 5.5
Major causes of death in more developed and less developed countries

More developed countries	Less developed countries
Heart disease and strokes	Respiratory diseases: influenza, pneumonia, tuberculosis (collectively 25% of all deaths)
Cancer	Parasitic diseases: malaria, sleeping sickness (15%)
Wars: international (e.g. two World Wars)	Wars: civil wars (e.g. Ethiopia, Sudan)
Transport-related accidents	Natural disasters (e.g. earthquakes) AIDS (greater impact than in more developed countries)

- The incidence of **AIDS** is having a major effect on mortality, especially in sub-Saharan Africa (Table 5.5). The number of people in the world now living with HIV/AIDS is over 40 million, with over 25 million in sub-Saharan Africa (Photograph 5.3). In some countries in southern Africa (Swaziland, Botswana, Lesotho and Zimbabwe), over 20% of the total population is affected. Out of the 7 million HIV/AIDS sufferers in south and southeast Asia, over 5 million live in India. It is estimated, however, that infection rates have begun to decline in some countries.

Around the world, mortality has fallen steadily because of medical advances. People are more willing to control mortality than they are to control fertility.

Sean Sprague/Still Pictures

Photograph 5.3 A feeding centre for children in Namibia. Most are AIDS orphans and many are HIV positive

The demographic transition model

The **demographic transition model (DTM)** describes how the population of a country changes over time (Figure 5.5). It gives changes in birth and death rates, and shows that countries pass through five stages of population change.

Stage 1 (high fluctuating) A period of high birth rate and high death rate, both of which fluctuate. Population growth is small. Reasons for the high birth rate include:

- limited birth control/family planning
- high infant mortality rate, which encourages the birth of more children

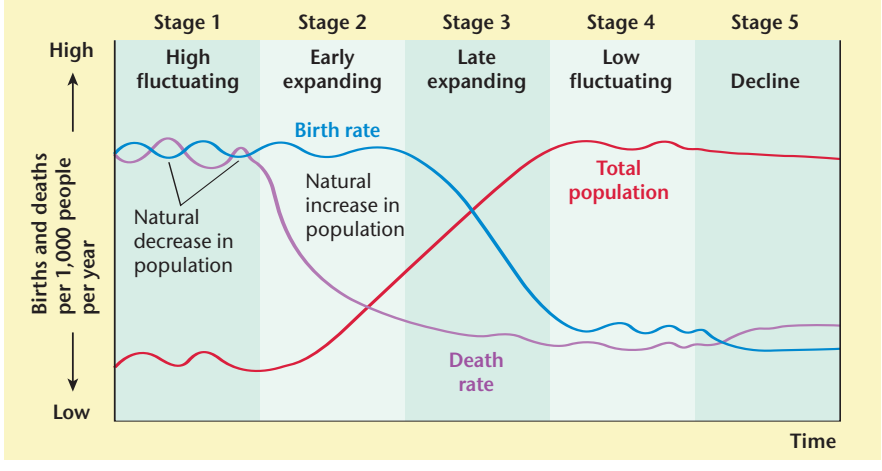


Figure 5.5 The demographic transition model

- children are a future source of income
- in many cultures, children are a sign of fertility
- some religions encourage large families

Reasons for the high death rate include:
- high incidence of disease
- poor nutrition and famine
- poor levels of hygiene
- underdeveloped and inadequate health facilities

Stage 2 (early expanding) A period of high birth rate but falling death rate. The population begins to expand rapidly. Reasons for the falling death rate include:
- improved public health
- better nutrition
- lower child mortality
- improved medical provision

Stage 3 (late expanding) A period of falling birth rate and continuing fall in death rate. Population growth slows down. Reasons for the falling birth rate include:
- changing socioeconomic conditions
- greater access to education for women
- preferences for smaller families
- changing social trends and fashions, and a rise in materialism
- increased personal wealth
- compulsory schooling, making the rearing of children more expensive
- lower infant mortality rate
- the availability of family-planning systems, which are often supported by governments

Stage 4 (low fluctuating) A period of low birth rate and low death rate, both of which fluctuate. Population growth is small and fertility continues to fall. There are significant changes in personal lifestyles. There are more women in the workforce, with many people having high personal incomes and more leisure interests.

Stage 5 (decline) A later period, during which the death rate slightly exceeds the birth rate. This causes population decline. This stage has only been recognised in recent years and only in some western European countries. Reasons for the low birth rate in this stage include:
- a rise in individualism, linked to the emancipation of women in the labour market
- greater financial independence of women
- concern about the impact of increased population numbers on the resources for future generations
- an increase in non-traditional lifestyles, such as same-sex relationships
- a rise in the concept of childlessness
- the death rate may slightly increase because the population is ageing

Case study

Demographic change in the UK

During medieval times, both birth and death rates in the UK were high, at around 35 per 1,000. Generally, the birth rate was a little higher than the death rate, resulting in a slow rate of natural increase.

The birth rate tended to remain at a relatively stable level, but the death rate varied considerably. In 1348–49, the epidemic of bubonic plague, called the Black Death, killed one-third of the population. Other plagues followed in the seventeenth century, including the Great Plague of 1665. There was an increase in mortality between 1720 and 1740, which is attributed to the availability of cheap gin. This was ended by the introduction of a 'gin tax' in 1751.

Falling death rate

The period from the mid-eighteenth century to about 1875 was a time of rapid urbanisation, which alerted public officials and enlightened industrialists to the urgent need for improvements in public health. Factory owners soon recognised that an unhealthy workforce had a huge impact on productivity. The provision of clean, piped water and the installation of sewage systems, together with improved personal and domestic cleanliness, saw the incidence of diarrhoeal diseases and typhoid fall rapidly. Greater disposable income from factory wages led to more food being consumed by the working class and to a wider range of food products being demanded. At the same time improvements in farming practices and transport systems allowed this demand to be met. Better nutrition played a significant role in the decline in infant mortality.

The combination of better nutrition and the general improvements in health brought about by legislation such as the Public Health Acts of 1848 and 1869 caused the incidence of common infectious diseases such as scarlet fever and tuberculosis to diminish markedly. Public perception of cleanliness was also a major factor. Soap was a well-advertised product and the availability of cheaper cotton clothing (which is easier to wash than woollen clothing) was important.

Falling birth rate

After 1875, the continued decrease in the death rate was accompanied by a reduction in the birth rate. Medical science began to play an important role in the control of mortality, with doctors being able to

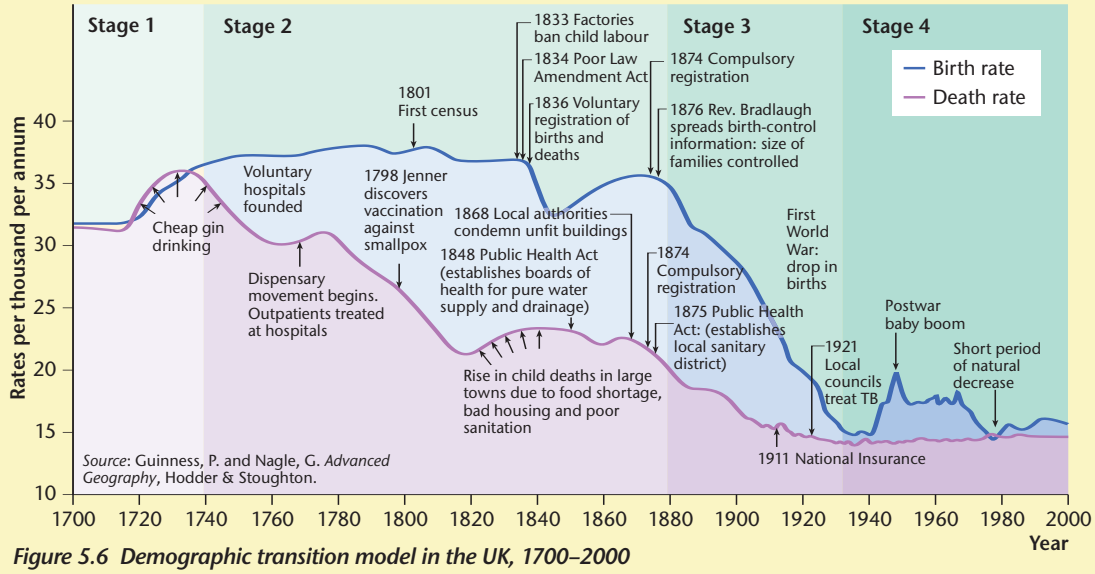


Figure 5.6 Demographic transition model in the UK, 1700–2000

administer more effective drug treatments. Surgery grew more advanced and anaesthesia became available. From the early part of the twentieth century, increasing attention was paid to maternity and child welfare, and to the health of school-children. There were further advances in nutrition — for example cheap American wheat, and refrigerated meat and fruit from Australia and New Zealand, began to be imported.

The decline in fertility began with the celebrated trial of two social reformers, Charles Bradlaugh and Annie Besant. They were prosecuted, and later acquitted, for publishing a book that gave contraceptive advice. The desire for smaller families at this time was due to the financial costs of looking after children, especially when education to the age of 13 became compulsory. Between 1890 and 1930, the birth rate fell from 32 per 1,000 to 17 per 1,000.

By 1940, the birth rate had fallen again to 14 per 1,000, partly due to the uncertainties of war. Immediately following the war, birth rates rose for a short while — the postwar baby boom. However, by 1980 birth rates had again fallen to 14 per 1,000 and have remained at this level. The introduction of the oral contraceptive pill and the wider use of condoms have meant that the relationship between desired family size and achieved family size has remained strong. The rise in the importance of women in the employment structure of the UK in the last few decades, particularly in service industries, has further impacted on birth rates, particularly in the professional classes.

The validity and application of the DTM

The DTM is useful because:

- it is universal in concept — it can be applied to all countries in the world
- it provides a starting point for the study of demographic change over time
- the timescales are flexible
- it is easy to understand
- it enables comparisons to be made demographically between countries

Limitations of the DTM are that:

- the original model did not include the fifth stage
- it is eurocentric and assumes that all countries in the world will follow the European sequence of socioeconomic changes
- it does not include the role of governments
- it does not include the impact of migration

In the 1960s, it was noted that many countries of the more developed world had gone through the first four stages of the model. Countries of the less developed world seemed to be in a situation similar to stage 2 — their death rates had fallen but their birth rates were still very high, leading to rapid population growth.

In the UK, as noted in the case study, stage 2 took over 100 years to complete (Figure 5.6). This was because social, economic and technological changes were introduced gradually and the death rate fell slowly. In many parts of the less developed world, the death rate has fallen much more rapidly because these changes, particularly the introduction of Western medical practices, have taken place more quickly. The birth rate, however, has stayed high and so the population has increased rapidly.

It was hoped that such countries would move into stage 3, as failure to do so could result in the population exceeding available resources. This was one of the