Geo Factsheet

Number 26

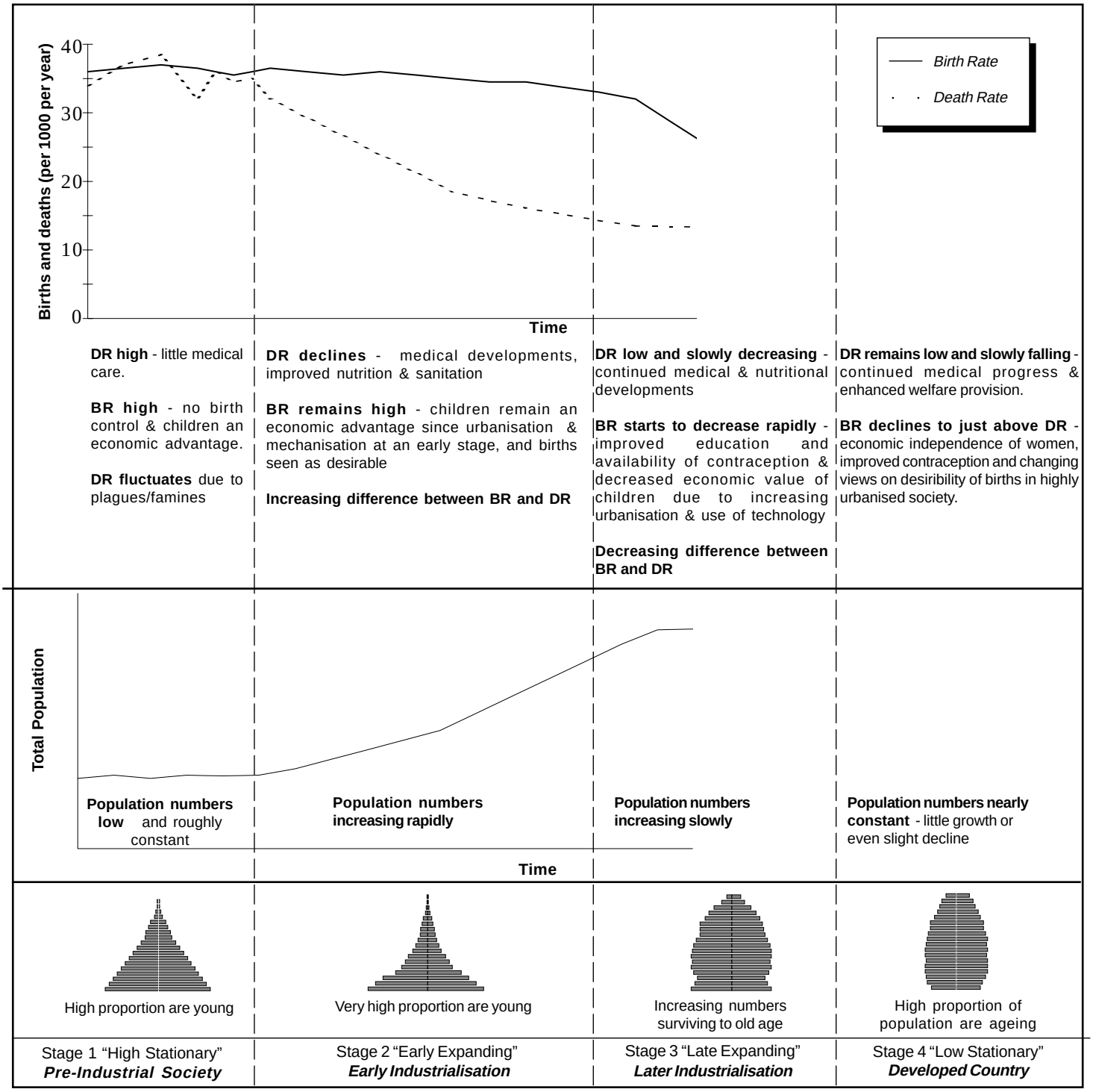
The Demographic Transition Model

The Demographic Transition Model was first developed to describe the transition through which European countries had passed in their progression from an agrarian to a modern society. Since then, it has been applied to the transitions of the less-developed countries and used to predict future population sizes and patterns. This Factsheet will describe the model and consider its uses and limitations.

1. The Basic Model

The demographic transition model (DTM) suggests that populations go through four stages, with the first corresponding to a hunter-gatherer society and the fourth an industrialised developed society (Figure 1).

Fig. 1 The four stages of the Demographic Transition Model



Does It Work?

The DTM has been widely used to predict future population patterns and numbers. A key question must therefore be asked: "Is it a valid model?"

Applying the DTM to Europe

1. Historically

The DTM suggests that the fertility decline is closely linked to socio-economic modernisation - i.e. indices such as literacy, infant mortality or degree of urbanisation should be good predictors of the onset of fertility decline.

Studies have suggested that fertility decline occurred more or less simultaneously within a cultural region rather than being linked everywhere directly to socio-economic indices. A study of **Walloon** and **Flemish** communities in **Belgium** found numerous striking examples of "twin communities" - one Flemish and one Walloon - with similar characteristics and locations but with widely varying fertility rates, which showed that **culture** was the dominant factor. Evidence from the **European Fertility Project** shows that the fertility transition occurs under a great diversity of socio-economic conditions. This suggests, then, that **diffusion** within a specific cultural or linguistic region is a dominant factor in the onset of the fertility transition.

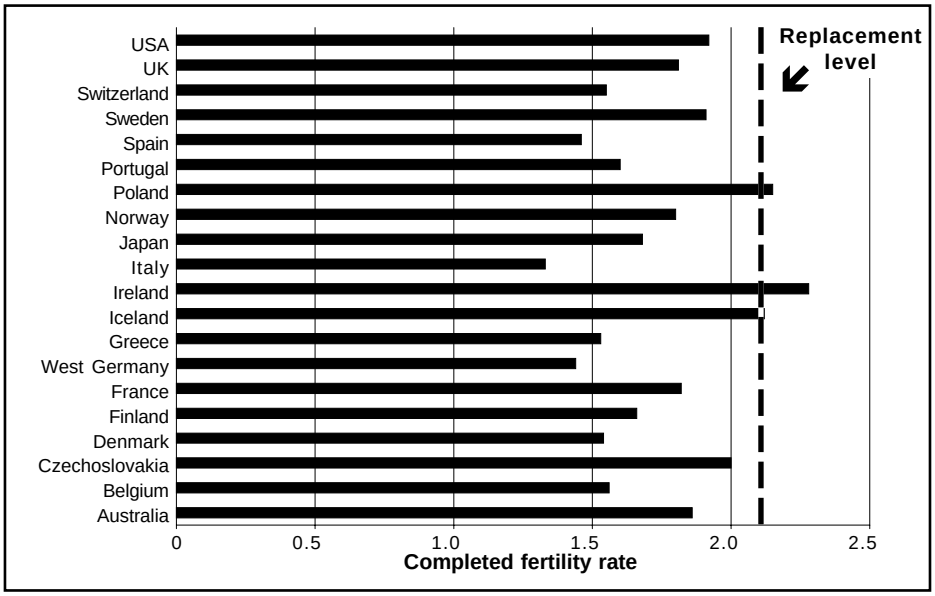
The model also ignores differences in pre-industrial fertility; this seems dubious in the face of total fertility (*average total number of children per fertile woman)* as low as 5 in early nineteenth century Sweden (compared with 8 in parts of Africa at present). There is also some evidence that the upper classes and bourgeoisie practised birth control. This calls into question the applicability of stage 1 of the DTM, which presupposes one "natural" fertility level in pre-industrial society.

2. The Future

Many developed countries currently have birth-rates below the replacement level (Figure 2). This trend, if continued, will give rise to a declining population. Indeed, some governments are already introducing **pronatalist policies** to counteract population decline. Some geographers therefore argue that the DTM should have a fifth stage.

One view is that the present low level is just the bottom of a cycle and that an upward trend will follow. One explanation for this is that the current apparent trend just reflects a delay in child-bearing; women will soon "catch-up" and produce the missing births. Sweden, for example, is now experiencing an up-swing in fertility which may reflect this phenomenon. However, until the "catch-up" period has ended, this hypothesis cannot be accurately evaluated.

Fig. 2 Total fertility for selected developed countries (1985-1990)

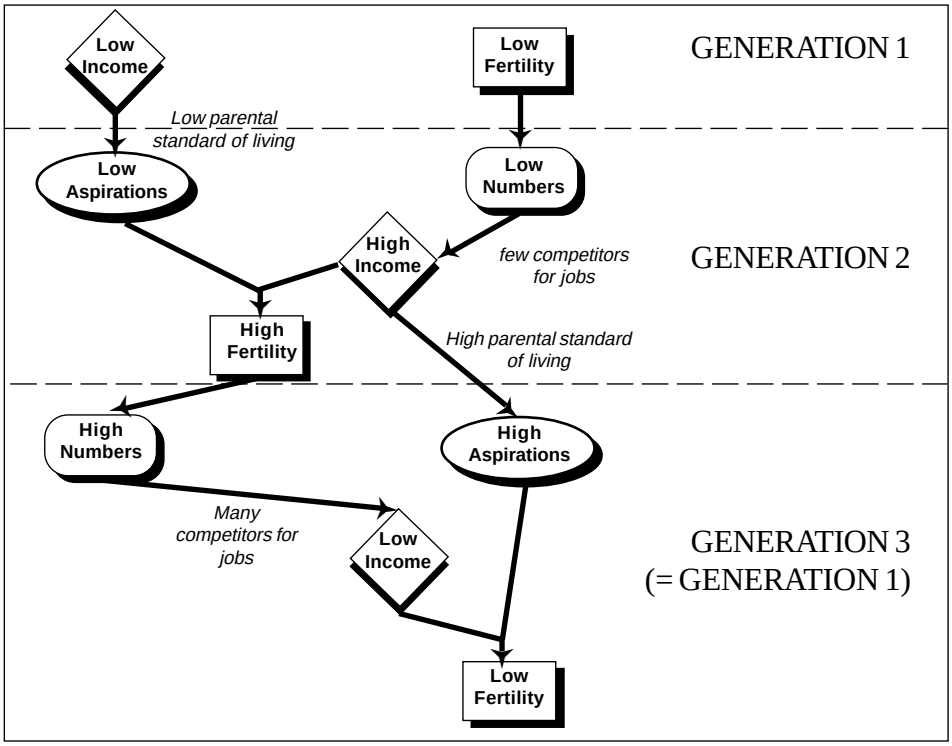


Another approach focuses upon longer-term cycles, and is based upon the idea that the fertility level of one generation determines the fertility level of the next (Figure 3). **Easterlin's** relative income hypothesis assumes that fertility **in developed countries** is determined by income relative to aspirations - a generation with low aspirations but high income will increase their fertility and vice versa. This model assumes that high numbers of one generation produce a low per-capita income, and that the economic aspirations of the offspring are dictated by the environment in which they grew up. This model fits well with the post-war baby boom - but as yet, the latest baby boom has not materialised.

It is, then, too early to pass judgement on if and how a fifth stage is to be added to the model, since we have yet to see whether fertility rates will recover.

Exam Hint: *Examination questions on the DTM often ask the candidate to assess its applicability to a particular country (eg the UK) or a particular category of countries (eg developing countries). High marks on such questions require an in-depth knowledge of the trends for particular countries and an ability to compare them with the DTM; non-specific answers will gain little credit.*

Fig. 3 An explanation for fertility cycles



Case Study: The UK and the DTM

Figure 4 shows the births and deaths in the UK from 1700 to 1970.

- *1700-1760: birth and death rate are both high and oscillating.* ***This is broadly consistent with stage 1 of the DTM.***
- *1760-1880: death rates are generally falling but birth rates are remaining high and even increasing.* ***This is broadly consistent with stage 2 of the DTM.***
- *1880-1940: death rates continue to fall and birth rates decline.* ***This is broadly consistent with stage 3 of the DTM.***
- *1940-1980: birth & death rates are low.* ***This is broadly consistent with stage 4 of the DTM***

The model is, then, a reasonable fit. However, there are some anomalies:

1. *Birth rate trend is rising 1700-1840, (whereas it would be expected to be approximately constant).*
2. *Death rate rises slightly 1820-1840*
3. *Death rate rises around 1916 and 1940*
4. *Rise in birth rate in the fifties and sixties*

The increase in births in the 18th and 19th centuries could be due to improvements in recording births and deaths; before the national census came into being in 1811, statistics had to be gleaned from parish registers. It is by no means certain that all births and deaths would be so recorded, thus both birth and death rates could be artificially depressed. Furthermore, in the early stages of industrialisation, there were still strong economic advantages to having children - many children contributed to the family by working in factories and mines - so there would be an incentive to produce more children.

Fluctuating death rates in the 19th century reflect the fact that many diseases were still incurable and epidemics occurred periodically. The rising death rate in the early 19th century could be due to increased contagion from people living in greater proximity in towns and cities than previously.

The death rate peaks coincide with the two World Wars; the birth-rate peak corresponds to the post-war "baby boom" - considered to be due to returning servicemen and women. In fact, the boom at least partially compensated for a war-time birth-rate depression due to many partnerships being split up.

Figure 5 shows the birth and death rates from 1971 to 1996. This is clearly into stage 4; births and deaths are both low. However, from 1976, the gap between births and deaths widens once more - there is renewed natural increase. The gap continues to widen until 1991 when the birth rate heads downwards once more.

Again, this is not exactly what would be expected from stage 4 of the DTM; the "standard" pattern would be for birth rates to stay around the 12 per 1000 mark. It can perhaps be explained by reference to the increasing number of working women in the seventies; the birth rate may have been elevated by such women making a late decision to have a family. In addition, the increased availability of crêche facilities at work made it a more viable proposition for women to combine a career with child-bearing. The mid- and late-eighties consumer boom may also have encouraged higher fertility.

Figure 6 shows a population pyramid for the UK in 1995. It can be seen to correspond reasonably closely to stage 4; the relatively high numbers in the 25-34 cohort correspond to the baby boom. Note the high proportion (around 18%) post-retirement age. The increased survivorship of women can also be clearly seen for age 50+.

Figure 7 shows the projected future population of the UK. If the projections are at all accurate, then there would seem a demand for a fifth stage in the DTM since the population is predicted to decline from early in the next century. Note also that the population is predicted to rise significantly from now - another inconsistency with stage 4 of the DTM.

Fig. 4 Birth and Death Rates for the UK 1700-1970

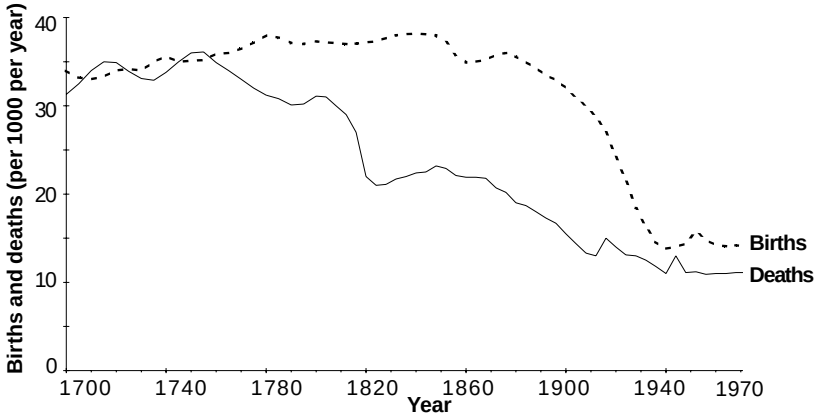


Fig. 5 Birth and Death Rates for the UK 1971-96

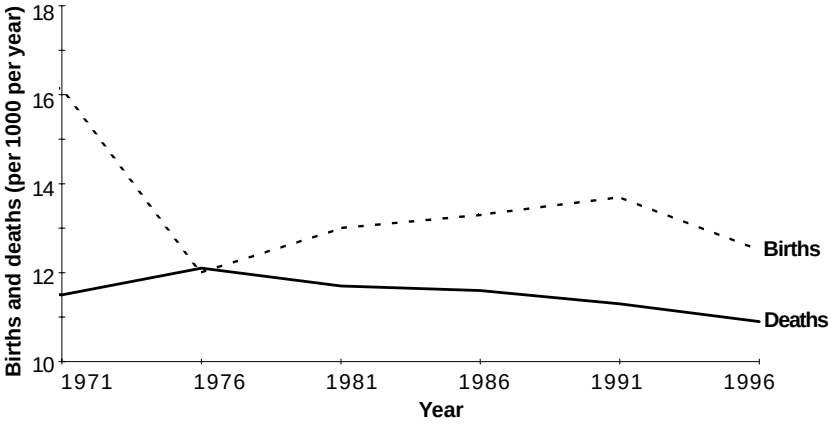


Fig. 6 Population Pyramid for the UK (1995)

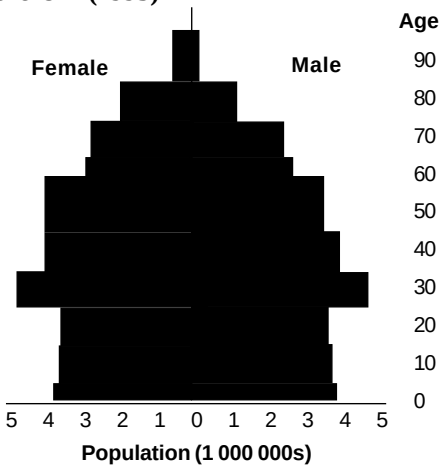
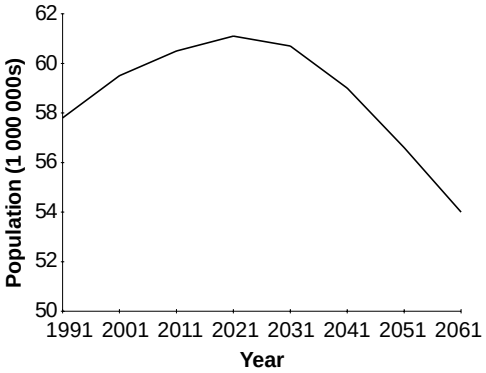


Fig. 7 Projected Population of the UK



Applying the DTM to developing countries
Despite its foundation on European data, the DTM has proved a good fit for data for developing countries. When applying the model to developing countries today, a pattern emerges:

- The transitions of mortality and fertility occur in a much shorter time (typically 3 or 4 times as fast)
- The total percentage increase in population over the transition period is comparable to the European model, but because the base figure is larger, the actual growth is much greater.
- As in Europe, the cultural setting - rather than the degree of modernisation - determines the onset of fertility decline - which have taken place over a wide variety of social, economic and demographic conditions. For example, the introduction of a family planning programme can contribute to fertility decline even at very low levels of industrialisation.

Why should the transition be faster?
A number of factors contribute to this:

- The decline in mortality is due to "imported" medical knowledge and technology, rather than being dependent on internal advances
- Effective contraception has been introduced
- The role of governments - eg China and Singapore - in promoting decreased fertility
- Educational programmes aimed at women have resulted in delayed marriage and first birth as well as increased availability of contraception

Why Does the Fertility Decline Start?
Here, it is important to distinguish between "modernisation" - a change in economic organisation and "Westernisation" - which includes secularisation (i.e. the decline of religious influence on society), mass education and increased environmental control. Westernisation appears to be the primary force for change, and can in fact precede economic development; this is backed up by the fertility decline in Bangladesh (until recently total fertility was between 6 and 7 children per woman; by 1991 it had declined to 4.3 and in 1994 it was 3.4) at very low levels of modernisation.

It has also been suggested that diffusion now plays the dominant role in promoting reduced fertility - the reproductive behaviour of couples is likely to be affected by the perceptions of their community and, increasingly, by the transmission of ideas internationally via radio and television.

Transition in Islamic countries
Cultural factors overwhelmingly determine fertility in Islamic countries. As a religion, Islam has developed very specific ideas on family life, the positions of men and women in society and on child-bearing; Islamic countries have continued to favour early marriage and large families. Although there is no actual religious ban on family planning, 90% of countries world-wide with Total Fertility Rates over 7.0 are Islamic.

Despite several government initiatives, fertility in Pakistan has only started to decline within the last decade. In contrast, the oil-rich Gulf states, (which have already attained a very low death rate) have been pursuing a strong pro-natalist policy due to a shortage of labour.

Exam Hint: *When an exam question asks candidates to consider how well the DTM describes data that has been given, it is important to explain which stages do* ***not*** *fit, and why, as well as to diagnose the correct stage.*

Marks will be awarded to candidates who make it clear to the examiner that they know the characteristics of each stage. High scoring answers will examine anomalies between the model and the given data.

Case Study: India
Figure 8 shows birth and death rates in India.

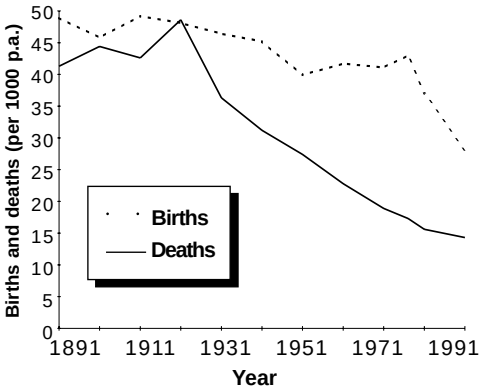
Until 1921, birth and death rates were high and oscillating - suggesting stage 1. However, note that there still appears to be a net natural increase during this period, which is not what would be expected.

From 1921 until 1981 there is a rapid decline in the death rate, continuing at a slower pace after 1981 - which in itself is consistent with stage 2 (and possibly the start of 3) of the DTM. However, births started to decline almost simultaneously and continued to decrease until 1951. Births then rose gradually for two decade before declining. This pattern is not in line with what would be expected for stage 2, although the pattern 1981-1991 seems consistent with stage 3.

It is possible that the anomalously low figure occurring in 1951 is due to inaccuracies in collecting census data so soon after the India/ Pakistan partition.

The sharp variations in death rates observed in the early twentieth century are attributable to famines and epidemics - in particular the influenza epidemic of 1918/19. Epidemics, droughts and famines combine to exacerbate each other's effects; malnourished people are more susceptible to even minor illnesses.

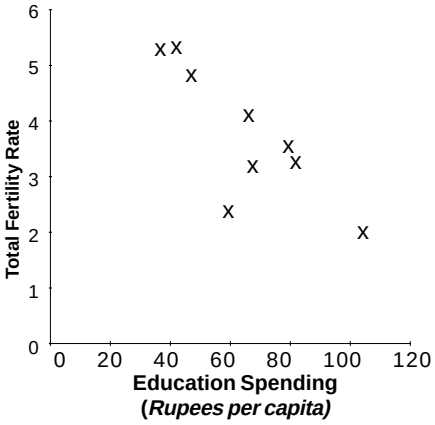
Fig. 8 Birth and Death Rates in India 1891-1991



Indira Ghandi instigated a birth-control program in the 1960s; as can be seen, its effect was not dramatic. It became increasingly coersive - and hence unpopular - and with her fall from power in 1977, the birth-rate temporarily ceased its downward trend in reaction, before resuming in the eighties.

It is important to bear in mind that the great economic and cultural diversity of India indicates that demographic trends will not be uniform throughout; the Southern states - notably Kerala and Tamil Nadu have low fertility rates (Total Fertility Rates 2.2 and 2.6) whereas the Northern states have TFRs betwen 4.8 and 5.5; here, a much lower percentage of women are literate and infant mortality remains high. Figure 9 illustrates how fertility rates vary with education spending in selected states.

Fig. 9 TFR and Education Spending (Selected Indian Regions)



Evaluating and Improving the Model

Although no two countries have followed an identical transition path, there are more similarities than differences; the model's universality is the key to its utility. Attempts to intervene have accelerated or delayed the process, but not succeeded in averting it. Table 1 gives an account of the uses and limitations of the DTM. Demographers now tend to concentrate on the mortality transition and the fertility transition independently. Establishing causes - and hence perhaps being able to predict **when** transitions occur - is the key focus for development.

Table 1. Uses and Limitations of the Demographic Transition Model

Uses

1. Offers a good description of general trends.
2. Provides a basis for comparison between countries.
3. Predictive - predicts that ultimate decline in fertility will occur.
4. Attempts to offer explanation of transition.
5. Has provided a starting point for more sophisticated models.

Limitations

1. Derived from a limited database - European countries only.
2. Does not predict total population numbers for a country since migration not included.
3. Cause of decline in birth rate not wholly understood.
4. Impact of external influences from other countries not explained.
5. Does not predict when transitions will occur.
6. Does not predict length of transitional period.
7. Does not go beyond stage 4.

Case Study: Latin America

The fertility transition in Latin America is of particular interest because of its simultaneous onset in many countries; all except four countries started their declines in the sixties (Table 2). This offers further evidence of the importance of cultural rather than economic factors in bringing about a reduction in birth rate.

Table 2: Year of onset of Fertility Decline and % decline in following decade

	Year	% Decline
Brazil	1960	8.3
Guatemala	1960	9.6
Venezuela	1960	15.6
Costa Rica	1961	37.5
Colombia	1962	34.3
Chile	1962	28.7
El Salvador	1962	10.8
Nicaragua	1962	8.5
Panama	1962	20.0
Paraguay	1963	19.7
Ecuador	1965	20.0
Peru	1965	16.8
Honduras	1966	11.5
Bolivia	1972	13.8
Mexico	1972	36.4

Despite this synchronicity, the actual speed of change varied widely between countries (Figure 11). In terms of their current situation, the countries may be divided into four groups:

Group 1: Argentina, Chile, Uruguay. *In these countries fertility is low and stable. Argentina and Uruguay completed their fertility transition by 1950.*

Group 2: Colombia, Panama, Brazil, Costa Rica, Venezuela, Mexico*. In these countries total fertility is in the range of three to four births per woman and in some, shows signs of stabilising.*

Group 3: Peru, Ecuador, El Salvador, Paraguay*. These countries are mid-transition; fertility rates are between four and five births per woman.*

Group 4: Honduras, Nicaragua, Bolivia. *These countries still have high fertility rates of above five births per woman.*

Figure 10: Latin America

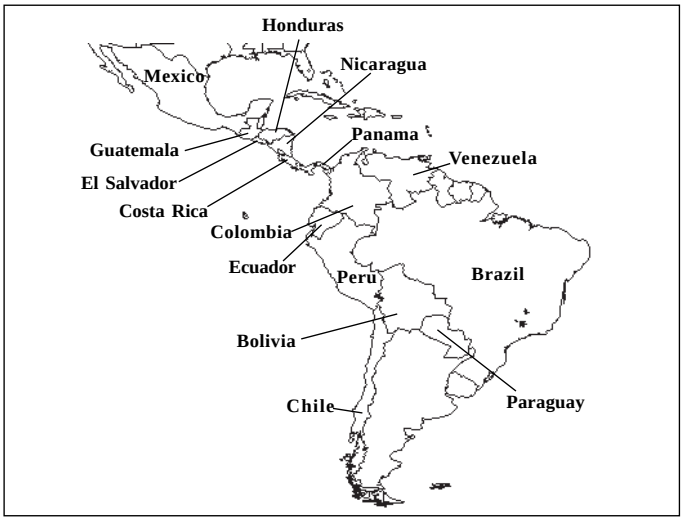
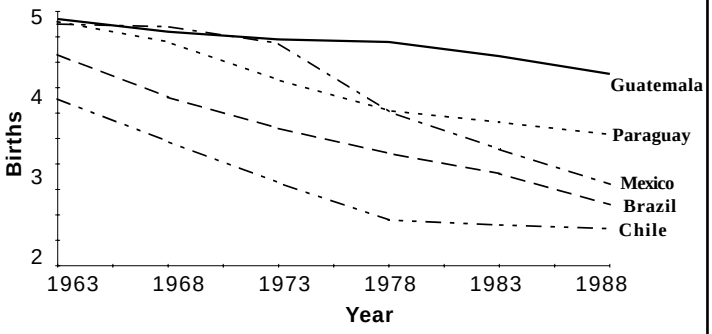


Figure 11: Total Fertility for selected Latin American countries



It is interesting to note that even for those countries that have stabilised, fertility rates are still well above replacment level - 2.96, 2.73 and 2.43 respectively for Argentina, Chile and Uruguay. The relatively low status and education of of women in Latin American society is likely to account for this.

This hypothesis is supported by the evidence gathered in a study on Colombia. The beginnings of decline were identified in the 1960s for women with complete primary education, in the late 1960s for women with incomplete education and in the late 1970s for those with no formal schooling. This suggests that fertility decline within each stratum was a result of social diffusion of birth control.

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