# UNIT 3 DETERMINANTS OF POPULATION CHANGE

**Structure**

## 3.0 INTRODUCTION

In Unit-2, we have highlighted the important concepts related to the aspects of population size, distribution, composition or structure used in the study of demography. Now it is easy for you to understand the determinants of population change, namely births, deaths and migration. Technically, i.e. in demographic terminology, birth rate is called 'fertility rate' while death rate is called 'mortality rate'. Since the changes in population basically take place due to births, deaths and migration, these are called determinants of population change. Of course, there are some other factors such as natural calamities which also affect the populations occasionally.

We need to know about all these determinants. Therefore, in the present Unit (i.e. Unit-3), our discussion will centre around fertility, mortality and migration with emphasis on types, measurements/indices as well as factors influencing them, among other things.

## 3.1 OBJECTIVES

After going through this unit, we expect you to be able to:

- Explain different determinants of population change;
- Describe the types, measures/indices fertility, mortality and migration and factors influencing them;
- Identify the sources of data on the determinants of population change; and
- Analyse and interpret the concepts of differential fertility, mortality and migration and related trends.

## 3.2 FERTILITY

In this section, we will deal with the concept of fertility, its measures/indices and factors influencing it.

### 3.2.1 Concept of Fertility

'Fertility' in demography refers to the actual birth performance of a group of women or to the relative frequency with which the births occur in total population or in the population exposed to it. The growth of the population of the world largely depends on human fertility. Any society replenishes itself through the process of human fertility. Thus, in population dynamics, fertility is a positive force through which the population expands, counteracting the force of attrition caused by mortality. If this replacement of human numbers is not adequate, that is, if the number of deaths in a particulars society continues to be more than that of births, that society would face the danger of becoming extinct. On the other hand, excessive replacement of human number can also create several social and political problems for a country.

Fertility is, in fact, a result of 'fecundity'. Fecundity is the physiological capacity to reproduce. Obviously, it is not possible to measure exactly the real capacity of women to produce off-springs; it can only be guessed/observed with the help of the maximum levels of fertility ever observed in a non-contraceptive population.

It is important to differentiate between fecundity and fertility. 'Fecundity' refers to "the capacity of a man, a woman or a couple to participate in reproduction, i.e. the capacity to produce a live child or children" (UN, 1958, p.38). Fertility, on the other hand, "refers to the actual reproductive performance whether of an individual or a couple or a group". While there is no direct measurement for fecundity, fertility can be studied from the statistics of births.

Let us look at some useful terms that have relevance in the context of study of fertility.

- ***Sterility:*** While a man or woman or a couple who has given birth to at least one live child, is considered fertile, one who has not had a single child is considered sterile. While fertility promotes continuation of human race, sterility hinders population growth and gradually leads to its extinction.

- ***Birth order:*** The sequence of live births of a women are classified according to their order or rank; e.g. first order birth (i.e. first in order), second order birth, (i.e. second in order), etc.

- ***Parity:*** Women may be classified according to the number of children born alive to them. For instance, the first parity women are those who have given birth to one child; the second parity women are those who have given birth to two children; and so on. Thus, while the birth order refers to the child, parity refers to the mother.

- ***Natural fertility:*** As defined by Henry (1953 in Asha and Tara, 2006, p.253), the French demographer, natural fertility is "fertility of a human population that makes no deliberate effort to limit births." Fertility may be considered to be natural if no contraception or induced abortion is used. Practice such as prolonged breastfeeding and/or abstinence after childbirth do tend to lower fertility, but when such practices are adopted without any intention of controlling fertility, the results of fertility is considered as natural.

- ***Contraception:*** Contraception refers to measures which are taken in order to prevent sexual intercourse or coitus from resulting in conception. A contraceptive method is sometimes termed as a birth control method, though "birth control" is used in a broader sense to include intentional abortions, sterilization and complete abstinence from coitus (Asha and Tara, 2006, p.17).

As we have discussed in Unit-2, the sources of data on fertility include: i) Vital registration system, ii) Population census, iii) Sample surveys, iv) National family household surveys, and v) Research reports.

### 3.2.2 Measures / Indices of Fertility

Bhaskar D. Misra (1980, pp.161-171) provides following measures of fertility which, in fact, are different fertility rates ranging from crude to accurate measures.

### 3.2.2.1 Crude Birth Rate

The most commonly used measure of fertility is crude birth rate (CBR), which is also the easiest to calculate and understand. It requires minimum information to calculate it. CBR is the ratio of the total number of births during a given year to the average or mid-year population in that year. Symbolically,

$$CBR = \frac{B}{P} \times K$$

Where:

- B and P respectively denote the total number of births occurring in a given year and the total average or mid-year population in that year, and
- K is a constant, usually 1,000.

Crude birth rate is affected by the age and sex structure of the population, because persons of all ages are not involved in the process of reproduction, Therefore, it can lead to erroneous conclusions in comparing the populations with varying age-sex structures. However, for short periods of time it can meaningfully be used to depict the changes in fertility in a population.

### 3.2.2.2 General Fertility Rate

General fertility rate (GFR) is an improvement over crude birth rate with regard to the population exposed to the chance of conception. It differs from CBR in defining the denominator population, which in the case of GFR is the number of women in fertile age group (in the age range 15-49 or sometimes 15-44) and not the total female population. GFR is expressed as:

$$GFR = \frac{B}{W_{15-49}} \times K$$

Where:

- W15-49 represents the average number of women in the reproductive ages in the period concerned, and
- B and K are same as already defined above.

We can say that the GFR is a type of standardized rate, standardized for the proportion of women in reproductive ages. However, it is affected by the distribution of women by age in the whole reproductive span. Among the various populations with similar pattern of fertility, a population with higher proportion of fertile-age women in the age of fertility-peak will produce a higher value of GFR than other groups. Further, where the tradition and customs do not permit unmarried women, widows and divorced women the right of becoming mother, it is preferable to consider only the currently married women in reproductive ages and not all women.

*General marital fertility rate* (GMFR) is based on the logic mentioned above, and it is expressed as:

$$GMFR = \frac{B}{W^{m}_{15-49}} \times K$$

Where:

$W^{m}_{15-49}$ denotes the average number of married women in reproductive ages (15-49).

GMFR is certainly a better or more refined measure than GFR. But, again, as the chance of giving birth by a married women is not uniform over all the ages, it is also affected by the distribution of women in the age range 15-49.

### 3.2.2.3 Age-Specific Fertility Rates

A detailed and more meaningful analysis of the pattern of fertility in a population is provided by the fertility rates calculated for various ages. ASFR can be calculated separately for each age or for any convenient age-group(s).

ASFR is calculated by the formula:

$$ASFR = \frac{B_x}{W_x} \times K$$

Where:

$B_x$ and $W_x$ are the births to women aged 'x' and the average number of women aged 'x' respectively.

Age-specific marital fertility rate (ASMFR) is an improvement over age-specific fertility rate, in the same sense as general marital fertility rate is over general fertility rate. ASMFRs describe the fertility experience of married women by age. The formula for calculation of ASMFRs is:

$$ASMFRx = \frac{B_x}{W^{m}_{x}} \times K$$
$$= ASFR_x \, M_x \, K$$

Where:

- $W^{m}_{x}$ is the average number of married women at age 'x', and
- $M_x$ is the reciprocal of proportion of married women at age x.

When TFR per woman is multiplied by the proportion of births that are female out of the total births, we get gross reproduction rate. The proportion of female births in India is around 0.4878, and it varies slightly from country to country.

### 3.2.2.4 Total Fertility Rate

Total fertility rate (TFR) summarizes the patterns of fertility exhibited by the age-specific fertility rates and represents a single index of total fertility. It is just a summation of ASFRs over all ages, i.e.

$$TFR = \left( \sum_{x=15}^{49} ASFR_x \right)$$

If the ASFRs are given in five-year age intervals, their sum should be multiplied by 5. The physical meaning of total fertility rate is that it is the expected number of children that a cohort of 1,000 women will bear in their life time, if none of them dies before crossing the age of reproduction. It is sometimes also expressed

as per woman in place of per 1,000 women. It can also be said that the total fertility rate is a type of the standardized rate with equal weights given to all ages and therefore, is independent of the age-composition of the population.

### 3.2.2.5 Gross Reproduction Rate

The gross reproduction rate (GRR) is a measure of population replacement which describes the rate of increase of population over a generation. It is defined as the average number of daughters among a birth cohort of women, which they will bear in their life time, passing through the reproductive ages and bearing children according to a fixed schedule of fertility, if they all survive to the end of child bearing period. In other words, it states how many female children a cohort of women passing through the child-bearing period would have, if they were as fertile at each age as a current schedule of age-specific fertility rates indicates, and none of them died before reaching the end of the child-bearing period. Clearly, it has a close resemblance with the total fertility rate. The difference between the GRR and TFR is that while the latter considers all the births, the former includes the births of daughters only. Thus, the GRR indicates how effectively mothers are replacing themselves with daughters who will bear the next generation. GRR can be expressed as:

$$GRR = \sum_{x=15}^{49} \frac{B_x}{W_x} \times \frac{B_{fx}}{B_x}$$

Where:

- $B_x / W_x$ is the ag-specific fertility rate of age 'x', and
- $B_{fx} / B_x$ is the proportion of female births among the total births at age 'x' of mothers.

Since the sex ratio at birth does not appreciably change with the age of mother, usual practice is to ignore such variations in the calculation of GRR, which is given by

$$GRR = \left( \sum_{x=15}^{49} ASFR_x \right) \times \textit{proportion of all births that are female}$$

$$= TFR \times \frac{100}{205} \text{ (or 0.4878)}$$

It is assumed that in India for every 100 females 105 males are born. If the data be given in five-year age-groups, GRR is calculated as :

$$GRR = 5 \times \left( \sum_{x=1}^{7} ASFR_x \right) \times \frac{100}{205}$$

The gross reproduction rate can also be defined as the ratio between the size of birth cohorts in two successive generations, in a one sex population model, if the mortality force does not operate before the end of child-bearing period. In strict sense, the GRR is a generational measure. However, it can be calculated for both the synthetic and real cohort. The GRR, when calculated from the period-fertility rates, show what would happen in terms of birth performance (considering only female births) in a real birth cohort of females if they pass through child-bearing

ages experiencing the fertility rates described by the period-fertility schedule and without experiencing any mortality before the end of reproductive ages.

### 3.2.2.6 Net Reproduction Rate

The assumption of no mortality before the end of child-bearing ages in the definition of gross reproduction rate is a serious limitation of GRR. This limitation is overcome in the calculation of net reproduction rate (NRR) which indicates the rate of replacement over a generation; had the cohort of women had the experience of mortality over all the ages represented by a mortality schedule. It is a measure of the number of daughters which a cohort of girl-infants will bear as they grow to adulthood and pass through the child-bearing period, provided that as they pass through each age they bear children at the rate indicated by a current schedule of age-specific fertility rate and from birth till the end of the child-bearing period they are subjected to mortality as per the life table. Thus, it is a measure of replacement that considers both the schedule of fertility and the schedule of mortality. In symbols it is defined as

$$NRR = \sum_{x=15}^{49} \frac{B_x}{W_x}\left(\frac{B_{fx}}{B_x}\right)\frac{L_x}{l_0}$$

Where:

- Lx/1o is the life table survival rate, and
- (Bx/Wx) and (Bfx/Bx) are the age-specific fertility rate at age 'x' and proportion of females among the total births at age 'x' respectively.

Assuming that in India for every 100 females, 105 males are born, we have

$$NRR = \frac{100}{205}\sum_{x=15}^{49} \frac{B_x}{W_x}\frac{L_x}{l_0}$$

If the data are given in five-year age-groups, then

$$NRR = \frac{100}{205}\sum_{x=1}^{7} \frac{B_x}{W_x}\frac{{}_5L_x}{l_0}$$

The NRR indicates that on an average how many daughters would be born to a group of women starting life together and experiencing throughout their life a given schedule of fertility and mortality. It is an estimate of the extent to which a newly born girl-infant will live to replace herself with a daughter, taking care of her livelihood or health before she accomplishes replacement. Like GRR, it is also a generational measure but can be meaningfully calculated for both the synthetic and real cohort. The NRR describes the long-term growth potential of a population experiencing given sets of fertility and mortality rates by age. If NRR is one, the population will in the long run become stationary which indicates exact replacement. If the NRR is less than 1, in the long term, the population will not be replacing itself and if NRR is greater than 1, in the long run the population will be more than replacement.

### 3.2.3 Factors Influencing Fertility

In this sub-section, we will discuss the factors that influence fertility, with an emphasis on those that have brought about a change from high fertility to low fertility in developed countries.

Fertility, in general, is influenced by the following factors.

- *Social and religious customs:* Most often these customs favour high fertility in many societies of the developing countries.
- *Mean duration of married life due to early marriage*: The higher the mean duration of married life the higher will be the fertility.
- *Environmental causes such as hot or cold climate:* The countries or regions with hot climate generally have high fertility compared to the areas with cold climate.
- *Economic factor:* The poverty breeds high fertility.
- *Level of literacy / education:* The higher the level of education the lower the fertility.
- *Age and sex structure of population*: Young population with more females in reproductive age-group is likely to have higher fertility than the older populations.
- *Mortality rate:* The higher the mortality the higher the fertility.

Now, let us look at the following factors which have played an important role in bringing down the high fertility rates to lower level in developed countries.

***Attitudinal/Motivational Factors:*** Demographers (Asha and Tara, 2006. p.311) are of the opinion that, over the years, tremendous changes have occurred in the attitudes of couples towards reproduction. It appears that they have moved away from a strong positive desire to have more children to a strong motivation for a limited family. Such attitudinal change operated at the level of individuals and couples, who translated it into action to have a small family. Such actions of individual families acted as a motivational force for change in the social atmosphere in favour of birth control and use of diverse and effective means of contraception and in the wake of social and economic conditions arising out of the Industrial Revolution. Thus, motivational factors have played an important role in bringing about a change from high fertility to low fertility. It has, in fact, also a relationship with their literacy and educational level.

***Economic and Social Factors:*** The phenomenon of decline in fertility that happened in the developed countries is very complex. There are several interacting and overlapping economic and social factors responsible for the transition from high fertility to low fertility. These factors include: i) Industrialization; ii) Urbanization; iii) Rising levels of living and increased cost of bringing up children; iv) Family functions and structure; v) Relationship between mortality and fertility; and vi) Social mobility (Asha and Tara, 2006. pp.11-12).

The process of *industrialization* initiated the process of modern economic growth; the per capita productivity increased and real income rose. Advancements in science and technology further improved the productivity of labour, for they

created conditions in which workers received better education and training, worked shorter hours as a result of social reforms, and had better nutrition because of increased availability of food supplies. Several structural changes also took place about the same time. The share of agriculture to total product and that in the labour force decreased; there was a corresponding rise in the share of industry and other non-agricultural sectors.

Industrialisation was accompanied by *urbanization.* Declines in mortality were registered because of agricultural, economic and social developments that came in the wake of industrialization. Several changes accompanied the growing industrialization and urbanization, which had implications for fertility decline. Of particular interest are the changes which took place in the structure and functions of the family – the basic unit of society. The family lost its function as an economic unit, in the sense that it ceased to be a producing unit and became only a consumer unit. With the introduction of laws which prohibited child labour and making of education compulsory, the economic usefulness of children to their parents was drastically reduced. In fact, they became a liability because of the increasing costs and lengthening duration of education. At the same time, there were declines in mortality, specially infant and child mortality; more children survived and the burden of binging them up fell entirely on the nuclear family (Asha and Tara, 2006. pp.311-312).

Parents soon realized that, because of declining mortality, there was no need to have a large number of children in the hope that a few at least would survive. They, therefore, started haing fewer children. The advantages of rising real incomes flowing from industrialization were in danger of being nullified by large families, specially because of the *rising costs of bringing up children.* A large family was, therefore, seen as a threat to maintenance of a certain standard of life, and couples responded to this threat by having smaller number of children. Rising costs of child-rearing was, thus, an important factor in fertility decline in developed and developing countries. Certain measures initiated by the Governments of various countries also contributed to changes in the attitudes of parents towards their children. Financial responsibility for medicines and medical treatment, provision of old-age security, etc., which were orgininally shouldered by the family, were taken over by the State in many countries; children, therefore, were no longer the only source of old-age security.

With the spread of education among women, social attitudes to women as well as the attitudes of women to themselves underwent profound changes. It was realized that a woman need not be restricted to her age-old role of homemaker and bearer of children. Women began to participate in gainful employment which provided an alternative to childbearing and childrearing. Education was also responsible for bringing about a rational outlook, free from religious dogma; and this rational outlook facilitated the acceptance of the idea of fertility control. Moreover, flowing from educational opportunities rising prosperity was the aspiration of the individual so as to rise in the social scale. Too many children were perceived to be an obstacle in the attainment of this objective — to climb up the social ladder; and the natural result was the limiting of the size of the family.

According to Notestein (1953, pp.15-18), the growth of a huge and mobile city population largely changed the corporate family life of traditional society; instead

came individualism which was characterized by increasing personal aspirations to move upward. Large family became "a progressively difficult undertaking; expensive and difficult for a population ever increasingly freed from old taboos and increasingly willing to solve its problems rather than accept them. Notestein (1953) pointed out that the decline in fertility in the West occurred as a result of the growth of an urban industrial society. He concluded that the development of technology was the underlying factor for fertility transition. He also pointed out that industrialization and urbanization resulted in the development of rational and secular point of view; the growing awareness of the world and modern techniques through proper education, improved health and the acceptance of alternatives to early marriage and childbearing as a means of livelihood and prestige of women.

Asha and Tara (2006, pp.311-313) summarise the reasons for the recent decline in fertility and current low levels of fertility in most of the developed countries as follows: i) Development of improved methods of fertility control – increasing use of the most-effective methods; ii) Liberalised abortion laws – extensive grounds and facilities for abortion; iii) Decreasing desire for large families; iv) Rising costs of rearing child; v) The increasing trend of women's employment in paid jobs outside the home; and vi) Instability and changes in the values attached to the rewards and penalties of parenthood in the context of other needs and aspirations.

### 3.2.4 Differential Fertility

It has been observed that the levels and patterns of fertility vary considerably in various sub-groups of the same population. These sub-groups may be based on residence (urban or rural), social and economic status, educational attainment, occupation, income, size of land-holding, religion, caste, race, etc. A study of differential fertility is useful in identifying the factors determining fertility (Asha and Tara, 2006, pp.316-323).

Different factors are responsible for fertility differentials among different groups within a particular country or society. These differentials can be studied under two broad categories.

i) *Regional differences in fertility*. These include: a) Rural-urban differences in fertility, and b) Fertility differential due to ecological or geographical factor.

ii) *Fertility differentials based on socio-economic factors.* These include: a) educational attainment and fertility; b) economic status and fertility; c) occupation of the husband and fertility; d) employment of women and fertility; e) religion, caste, race and fertility; f) demographic factors such as the age and sex structure of the population and fertility, and so on.

#### 3.2.4.1 Regional Differences in Fertility

Regional differences in fertility are presented as follows.

- ***Rural-urban Residence and Fertility:*** Numerous studies have been conducted on fertility differential according to rural-urban residence. It has been found that the fertility of those residing in cities was lower than that of

rural residents; and these differentials were more or less stable. However, when national birth rates declined the fertility differentials widened in a more pronounced manner among urban upper classes than among other classes.

In India, the rural-urban fertility differentials in 1951 were relatively smaller as a result of the gradual narrowing down of these differentials which had begun since 1931. After 1951, urban fertility was more or less consistently lower than rural fertility in most of the States in India. These differentials, however, have become more pronounced in recent times.

The national sample survey and the sample registration schemes in India have consistently shown the rural crude birth rates to be higher than the urban crude birth rates (See Table 3.1).

**Table 3.1: Crude Birth Rates in India for Rural and Urban Areas: 1968-1997**

| Year | Fertility | | Year | Fertility | |
|---|---|---|---|---|---|
| | Rural | Urban | | Rural | Urban |
| 1968 | 39.0 | - | 1979 | 34.3 | 28.3 |
| 1969 | 38.8 | 32.8 | 1980 | 34.6 | 28.1 |
| 1970 | 38.9 | 29.7 | 1981 | 35.6 | 27.0 |
| 1971 | 38.9 | 30.1 | 1982 | 35.5 | 27.6 |
| 1972 | 38.4 | 30.5 | 1983 | 35.3 | 28.3 |
| 1973 | 35.9 | 28.9 | 1984 | 35.1 | 29.2 |
| 1974 | 35.9 | 28.4 | 1988 | 33.1 | 26.3 |
| 1975 | 36.7 | 28.5 | 1995 | 30.0 | 22.7 |
| 1976 | 35.8 | 28.4 | 1996 | 29.5 | 21.6 |
| 1977 | 34.3 | 27.8 | 1997 | 28.9 | 21.5 |
| 1978 | 34.7 | 27.8 | | | |

**Sources:**

1) Office of the Registrar General, India. 1981. *Sample Registration System.* Appendices 1-4. New Delhi: Vital Statistics Division, Ministry of Home Affairs.
2) Office of the Registrar General, India. 1983. *Sample Registration System 1976-78*, New Delhi: Vital Statistics Division, Ministry of Home Affairs, p.9.
3) Office of the Registrar General, India. *Sample Registration Bulletin,* Vol.X, No.2, April 1976, p.2, Vol.XIX, No.2, December, 1985, p.5, and Vol.XXIV, No.2, Dec.1990, p.6.

Further, the total fertility rates for rural and urban areas were 5.8 and 4.3 respectively in 1972. The total marital fertility rate was also higher for rural areas (6.8) than for urban areas (6.0). In fact, each fertility index shows that, in 1972, rural fertility was unambiguously higher than urban fertility.

These rural-urban differences also vary from State to State even at a point of time depending upon geographical and ecological factors.

### 3.2.4.2 Fertility Differentials based on Socio-economic Factors

Socio-economic factors that cause differential fertility include the following.

- ***Educational Attainment and Fertility:*** The educational attainment of couples have very strong bearing on the number of children born. Educational attainment, especially of women, is one of the indicators of modernization and the status of women in society. In low fertility countries, historically the relationship between fertility and the educational attainment of the wife has been negative, in the sense that the higher the educational level the lower was the family size (Asha and Tara, 2006, p.320).

  In the high fertility countries, such as Egypt, Taiwan and Chile (Greater Santiago) a distinct negative relationship has been observed between the educational attainment of the woman and the number of children born to her. In a high fertility country like India also, in Bangalore City, women with high school or college education were found to have a smaller family than those with a lower educational attainment.

  The sixteenth round of the National Sample Survey (1960-61 urban areas) also brought out a clear-cut relationship between the educational attainment of the married urban woman and her completed family size. It was observed that the complete average family size was 6.10, 6.32 and 6.25 respectively for the illiterate, for those whose education did not go beyond the primary school level, and for those who had completed their primary school education. For those who had the secondary school education or higher education (above secondary school) the average family size was 4.25 and 2.62 respectively.

  Two Indian studies have established a distinct relationship between the education of the woman and fertility. The first study was conducted in the metropolitan city of Greater Bombay in 1966 (J. R. Rele, 1972) and the second in Panaji, Goa, in 1969 (Asha and Rama Rao, Unpublished). A negative association between the educational attainment of currently married women and fertility was observed in Grater Bombay; and this association was sharp and consistent for each age-group.

**Table 3.2: Mean Number of Children Born Alive per Currently Married Woman by her Present Age and Educational Level**

| Present age of woman (years) | Illiterate & below primary | Secondary | Matriculation & above | Total |
|---|---|---|---|---|
| **Total 15 and over** | **3.57** | **3.43** | **2.26** | **3.35** |
| 15-19 | 0.47 | 0.38 | * | 0.42 |
| 20-24 | 1.43 | 1.39 | 0.96 | 1.35 |
| 25-29 | 2.58 | 2.62 | 1.66 | 2.41 |
| 30-34 | 3.82 | 3.33 | 2.22 | 3.41 |
| 35-39 | 4.58 | 4.17 | 3.06 | 4.26 |
| 40-44 | 4.78 | 4.86 | 3.54 | 4.65 |
| 45 and over | 4.59 | 4.93 | 4.17 | 4.66 |
| Average standardized for present age | 3.51 | 3.45 | 2.57 | |

**Source:** Asha A. Bhende and G. Rama Rao. *Fertility and Family Planning in Panaji, Goa.* (unpublished).

The age distribution of all currently married women of Panaji and suburbs was taken as the standard.

**Table 3.3: Differential Fertility by Background Characteristics of Mothers in India–1992-93**

| Background characteristics | Total Fertility Rate | Mean Number of Children Ever Born to Women (Age 40-49 years) |
|---|---|---|
| **I. Residence** | | |
| Urban | 2.70 | 4.16 |
| Rural | 3.67 | 5.13 |
| **II. Education** | | |
| Illiterate | 4.03 | 5.26 |
| Literate < middle complete | 3.01 | 4.50 |
| Middle school complete | 2.49 | 3.71 |
| High school and above | 2.15 | 2.80 |
| **III. Religion** | | |
| Hindu | 3.30 | 4.78 |
| Muslim | 4.41 | 5.83 |
| Christian | 2.87 | 4.01 |
| Sikh | 2.43 | 3.99 |
| Other | 2.77 | 4.24 |
| **IV. Caste / Tribe** | | |
| Scheduled caste | 3.92 | 5.40 |
| Scheduled tribe | 3.55 | 4.81 |
| Other | 3.30 | 4.76 |
| **Total** | **3.39** | **4.84** |

**Source:** International Institute for Population Sciences (IIPS). 1995. *National Family Health Survey (MCH and Family Planning) India — 1992-93.* Bombay.

The above findings underline the progressive emergence of fertility differentials in India, beginning with metropolitan cities and other urban areas. It may be emphasized here that the cutting point in women's educational attainment for exhibiting a negative relationship with fertility was the level of matriculation and above. Women who had either passed the matriculation examination or had studied beyond that level generally have on an average 1.0 to 1.5 children less than that of illiterate or semi-literate women. This finding has important implications for development planning and points to the need for emphasizing, to a greater extent, the value of the education of women.

**Check Your Progress**

**Notes:** a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under "Answers to 'Check Your Progress' Questions".

1) What is fecundity? Explain how it is different from fertility.

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2) What is natural fertility? How is it affected by contraception'?

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3) What are various sources of data on fertility?

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## 3.3 MORTALITY

Mortality is one of the three basic determinants of population change, the other two being fertility and migration. Historically, the factor of mortality has played a dominant role in determining the change in population, the size of which fluctuated in the past mainly in response to variations in mortality. The increase in the population of European countries following the Industrial Revolution in the seventeenth century was mainly due to decline in the death rates. The developing countries, which are undergoing a typical demographic transition, have also been affected initially by the fall in the death rates. In fact, the single most important contribution of demography has been the revelation of the fact that sharp declines in mortality rates rather than any rise in the fertility rates has been responsible for bringing about a rapid growth of population.

The study of mortality is useful for analyzing current demographic conditions as well as for determining the prospects of potential changes in mortality conditions of the future. The public health administration depends heavily on the study of mortality, for statistics on death in the population cross-classified by age, sex, and the cause of death are of great value for the formulation, implementation and evaluation of public health programmes. Statistics on deaths also form the basis of the policies of insurance companies.

### 3.3.1 Concept of Mortality

*Mortality* is nothing but occurrence of death of a live being after its birth. According to United Nations (1953), mortality or death is defined as follows: "Death is the permanent disappearance of all evidence of life at any time after birth has taken place i.e. post-natal cessation of vital functions without capacity of resuscitation". A death can, thus, occur only after a live birth, and the span between birth and death is life.

You may like to know the difference between still birth, abortion and miscarriage. *Still birth* is the delivery of dead foetus (naturally dead, not killed) not by the pregnant mother. *Abortion* is nothing but expulsion of foetus from the uterus before it attains extra-uterine life; foetal mortality. It is again categorized into two types as *induced abortion* and *spontaneous abortion. Induced abortion* is forced expulsion of foetus. The *spontaneous abortion is* also called *miscarriages.* Often, miscarriages occur due to morbidity. *Morbidity* is nothing but falling sick or ill; state of sickness / illness due to various reasons.

From demographic point of view, child mortality infant mortality and maternal mortality are very crucial.

- *Child Mortality Rate (CMR):* It is defined as the number of deaths at age 1-4 years in a given year per 1000 children in that age-group at the mid-point of year concerned. It excludes infant mortality.
- *Infant Mortality Rate (IMR):* A live born child up to the completion of 365 days of life is called an infant. The infant mortality rate is the number of deaths of infants under one year of age per 1000 live births in a given year (Haupt and Kane, 1980).
- *Maternal Mortality Rate (MMR):* It is the number of deaths among women of reproductive age due to puerperal (pregnancy and the related) causes per 1,00,000 live births in a given year.

The ***sources of data*** on mortality in India include the following.

i) The Demographic Year Book of the United Nations – provides statistics on the number of deaths.

ii) A special issue of the Demographic Year Book – gives data on deaths in greater detail.

iii) Census Surveys of India.

iv) National Sample Surveys in India.

v) National Family Health Surveys conducted in 1992-93, 1998-99, 2005-06 – provide some information on mortality in India and States.

vi) Other Research Reports.

## 3.3.2 Measures / Indices of Mortality

Various measures are employed in the measurement and analysis of mortality. These measures are discussed below.

### 3.3.2.1 Crude Death Rate

The crude death rate is the most simple and the commonly used measure of mortality, which can be quickly calculated and, at the same time, easily understood. It is a ratio of the total registered deaths in a specified year to the total mid-year population multiplied by 1,000. It is computed as follows:

$$CDR = \frac{D}{P} \times K$$

Where:

- D is the total number of deaths registered during a calendar year (January 1 to December 31);
- P is the total population at the middle of the year (July 1);
- K is 1,000 constant.

For example, the crude death rate for Greater Bombay for 1973 for the given data may be computed as follows:

Total number of deaths during 1973 (January 1 to December 31) = 61,931

Total population at the middle of the year, i.e. mid-year population

(July 1, 1973) = 6,551,000

Therefore, crude death rate for Greater Bombay for 1973 $= \frac{61,931}{6,551,000} \times 1,000$

$= 9.45$

The crude death rate of 9.45 indicates that, in 1973 in Greater Bombay 9.45 deaths occurred per 1,000 population. The crude death rate, thus, expresses the frequency of deaths in the entire population taken as a single number.

***Uses of CDR:*** These include the following.

- CDR provides one of the bases for computing the rate of natural increase in population.
- It is the most widely available index of the level of mortality.
- It gives us a general idea about the trend in mortality in a particular area over a period of time.

***Limitations of CDR:*** Though it is summary measure and very useful indicator of the level of mortality in any population, it is not a refined measure, as is evident from its very name itself, and suffers from limitations such as the following.

- Inadequate coverage of death statistics, though this is not inherent in its very nature.
- It is silent about age and sex-wise details of deaths.

Table 3.4 provides estimates of average annual death rates of what we call CDRs in India from 1881-1981.

**Table 3.4: Estimates of Average Annual Death Rate in India — 1881-1981**

| Decade | Average Annual Death Rate (Deaths per 1000 population) | Decade | Average Annual Death Rate (Deaths per 1000 population) |
|---|---|---|---|
| 1881-1891 | 41.3 | 1931-1941 | 31.2 |
| 1891-1901 | 44.4 | 1941-1951 | 27.4 |
| 1901-1911 | 42.6 | 1951-1961 | 22.8 |
| 1911-1921 | 48.6 | 1961-1971 | 18.9 |
| 1921-1931 | 36.3 | 1971-1981 | 14.9 |

**Source:** Asha and Tara. 2006. *Principles of Population Studies.* Mumbai: Himalaya Publishing House, p.225.

1) Up to 1941: Kingsley Davis. 1968. *The Population of India and Pakistan.* New York: Russell and Russell, p.36.
2) 1941-1971: C.I.R.E.D. 1971. *The Population of India: World Population Year.* 1971 Series, p.35.
3) 1971-1981: *Census of India, 1981. Population Projections for India 1981-2001,* p.19.

In fact, each measure of mortality is usually computed separately for males and female.

### 3.3.2.2 Age-Specific Death Rate

Age-Specific Death Rate (ASDR) is an improved measure over CDR, as the relative frequency of deaths varies with age. Using this measure, a better comparison can be made in terms of the death rates calculated separately for each age. It can separate the component of mortality from the inherent effect of age composition on the number of deaths and its ratio to the population. Death rates specific for age are generally calculated separately for the two sexes so as to exhibit the variations by sex also.

$$ASDR = \frac{\text{Number of deaths at age 'a' of sex 'S' (or of both sexes)}}{\text{Mid-year population of a given year at age 'a' of sex 'S' (or of both sexes)}} \times K$$

K is usually taken as 1,000.

### 3.3.2.3 Maternal Mortality Rate

The maternal mortality rate is the number of women who die as a result of childbearing in a given year per 100,000 births in that year. Maternal deaths are those caused by complications of pregnancy and childbirth.

### 3.3.2.4 Infant Mortality Rate

Infants are defined in demography as an exact age-group, namely, age 'zero', or those children in the first year of life, who have not yet reached age one. Infant

mortality rate (IMR) is a measure of mortality among infants. It is customarily defined or computed as the ratio of the infant deaths (deaths of children in the first year of life or under one year of age) registered in a calendar year to the number of live births registered in the same year, usually multiplied by 1000.

This rate is computed as follows:

$$\frac{d_0}{B} \times K$$

Where:

- $d_0$ is the number of deaths below age one, registered during a calendar year.
- B is the number of live births, registered during the same year.
- K is 1,000 constant.

This rate is only an approximate measure of the true risk of death between the birth of the baby and its first birthday, for no adjustment is made for the fact that some of the infants, who died in the year considered, were born in the proceeding year.

*Neo-natal mortality rate* is the infant deaths that occur before the completion of one month of age.

*Post-neo-natal mortality rate* is the infant deaths that occur between first and eleven completed months.

*Peri-natal mortality rate:* The exact definition of perinatal mortality varies from country to country. The following two formulae are commonly used to estimate the perinatal mortality ratio:

$$(a)\ \frac{Deaths\ under\ one\ week + Fetal\ deaths}{Births} \times 1{,}000$$

$$(b)\ \frac{Neonatal\ death + Fetal\ deaths}{Births} \times 1{,}000$$

The perinatal death rate differs from the perinatal death ratio as the former also includes the fetal deaths in the denominator, besides the births in a year. Therefore,

$$Perinatala\ death\ rate = \frac{Perinatal\ death\ ratio \times Births}{Births + Fetal\ deaths} \times 1{,}000$$

Fetal death ratios and fetal death rates, as defined below are used for measuring the reproductive loss due to fetal deaths. The fetal deaths include either all the fetal deaths or late fetal deaths only (usually after 28 weeks of gestation).

$$Fetal\ death\ ratio = \frac{Fetal\ deaths}{Births} \times 1{,}000$$

$$\text{Fetal death ratio} = \frac{\text{Fetal deaths}}{\text{Births} + \text{Fetal deaths}} \times 1{,}000$$

$$= \frac{\text{Fetal death ratio} \times \text{Briths}}{\text{Births} + \text{Fetal deaths}} \times 1{,}000$$

The importance of studying IMR is obvious because of several reasons. *First,* the IMR is one of the most sensitive indicators of availability of the medical and health facilities to a population. *Second,* it measures the mortality in that segment of the population where it is extremely high and to which the expectation of life at birth is very sensitive. *Third,* any reduction in mortality, in general, affects the IMR to a greater extent, and influences the age-distribution of the population. Further, a number of empirical studies have shown some sort of statistical relationship between IMR and the birth rate. Thus, IMR becomes one of the important parameters to understand the mechanism of fertility change in a population.

### 3.3.2.5 Cause-Specific Death Rate

Cause-specific death ratios and rates (CSDRs) are used to make analysis of the death statistics classified by cause. The two devices (CSD ratios and rates) are of great help in comparing the distribution of deaths by cause between two populations or to trace the time-trend for a particular population. These are also used to make multiple decrement life tables by cause of death and to describe how much sensitive the expectation of life at a specified age is for the changes in mortality due to one or more causes. The study of mortality by cause provides a detailed picture to the researcher, planners and the policy makers of the general state of health and mortality situation prevailing in a community or a country.

The cause-specific death ratio is simply a ratio of deaths due to a specific cause to total deaths occurring during a period of time. The cause-specific death rate is expressed as the ratio of deaths in a year due to a specific cause to the total mid-year (average) population. It is calculated as:

$$\frac{D_i}{D} \times K, \quad D = \sum_{i=1}^{n} D_i$$

Where:

- $D_i$ represents the deaths due to cause 'i', and
- D is the total number of deaths; value of K is usually 1,000.

Cause-specific death rates can also be calculated for specific age. An age- and cause- specific death rate is given as:

$$\frac{D_{ia}}{P} \times K$$

Where:

- $D_{ia}$ represents deaths at age 'a' due to cause 'i',
- P is the mid-year population, and
- K is a constant, usually 10,000 or 100,000.

### 3.3.2.6 Comparative Mortality Index

The comparative mortality index (CMI) measures the relative level of mortality in an area, as compared with the level of mortality in that area in some past specified (standard) years. It takes into consideration both, the changing schedule of mortality as well as the changes in age-distribution of population over time.

The CMI is defined as the ratio of the weighted sum of the ASDRs in current year to that in a standard year, at par with the price index number. The weights are the averages of the proportion of population in various age-groups in the standard and current (later) year.

The formula for calculating the CMI is:

$$CMI^c = \frac{\sum_a w_a \ ASDR_a^c}{\sum_a w_a \ ASDR_a^s}$$

Where:

- $ASDR_a^c$ is the age-specific death rate at age 'a' in current year 'c',
- $ASDR_a^s$ also 'a' is the same as above, and 's' is the standard year, and
- $w_a$ represents the weight at age 'a'.

$$w_a = \frac{1}{2}\left(\frac{P_a^c}{P^c} + \frac{P_a^s}{P^s}\right)$$

Where:

$P^c_a / P^c$ and $P^s_a / P^s$ are the proportions of population at age 'a' in current year 'c' and standard year 's' respectively.

Though the basic purpose for which the CMI is employed is to compare the level of mortality at two dates due to its typical weight pattern, it can also be used to trace a time-trend of mortality over a short period of time.

### 3.3.2.7 Standard Mortality Ratio

Standard mortality ratio (SMR) is a type of indirectly standardized death rate. It is used to compare the general level of mortality (or the mortality due to particular cause) in an occupation or industry with the general level of mortality (or the mortality due to a particular cause) in the total population. It is defined as the ratio of observed deaths to the expected number of deaths in an occupation or industry had the age-specific death rate for the total population prevailed in that. It is calculated by the formula.

$$SMR^o = \frac{Observed\ deaths}{Expected\ deaths} \times 100$$

$$= \frac{d^o}{\sum P_a^o \ ASDR_a^t} x\ 100$$

Where:

- $d^o$ and $P^o_a$ are the total deaths and the population at age 'a' in occupation 'o', and
- $ASDR^t_a$ is the age-specific death rate at age 'a' in total population 't'.

For a particular cause, in an occupation, SMR is expressed as:

$$SMR^{oc} = \frac{d^{oc}}{\sum P_a^o \, ASDR_a^{tc}} x\ 100$$

Where:

- $d^{oc}$ denotes the deaths in occupation '*o*' due to cause 'c', and
- $ASDR_a^{tc}$ is the age- and cause-specific death rate at age 'a' in total population 't'.

### 3.3.2.8 Average Expectation of Life at Birth or Average Life Expectancy

The average expectation of life at birth is a good measure of the level of mortality because it is not affected by the age-structure of the population. This measure is derived from the life-table which is constructed to summarise the mortality experience of a single hypothetical generation or a cohort of people subject to a set of constant age-specific death rates throughout its lifetime.

The term "average expectation of life" represents the average number of years of life which a cohort of new-born babies (that is, those born in the same year) may be expected to live if they are subjected to the risks of death at each age according to the age-specific mortality rates prevailing in a given country at the time to which the measure refers. Though the average expectation of life at birth is a measure which is rather complicated to calculate it is most easily understood by the common man. It is, therefore, widely used to compare mortality levels and analyse mortality trends in different countries.

The expectation of life at birth is denoted as ($e_x^0$). The average number of years to which a survivor of age x is expected to live is given by:

$$e_x^0 = T_x / l_x$$

Where:

- $e_x^0$ = expectation of life at age 'x',
- $T_x$ = total number of person-years lived by survivors,
- $l_x$ = survivors of initial cohort to age 'x'.

**Table 3.5: Estimated Average Expectation of Life at Birth in India — 1901-1910 to 1991-2000**

| | Year Average Expectation of Life at Birth | | |
|---|---|---|---|
| | **Males** | **Females** | **Both Sexes** |
| 1901-1910 | 22.6 | 23.3 | 22.6 |
| 1911-1920 | 19.4 | 20.9 | 20.1 |
| 1921-1930 | 26.9 | 26.6 | 26.8 |
| 1931-1940 | 32.1 | 31.4 | 31.8 |
| 1941-1950 | 32.5 | 31.7 | 32.1 |
| 1951-1960 | 41.9 | 40.6 | 41.3 |
| 1961-1970 | 47.1 | 45.6 | 46.4 |
| 1971-1980 | 52.5 | 52.1 | 52.3 |
| 1981-1990 | 55.6 | 56.4 | 56.0 |
| 1991-2000 | 58.1 | 59.1 | 58.6 |

**Source:** Asha and Tara, 2006, op cit, p.227.

1) C.I.R.E.D. 1974. *The Population of India, World Population Year Series,* p.36.
2) Registrar-General of India. 1985. *Sample Registration Bulletin*, Vol.19, No.1, June, p.20.
3) *Family Welfare Year Book 1989-90*, p.113.

***Recent Global Mortality Levels:*** Though around 1980 data on mortality were available only for a little over one-third of the world population, it is possible to estimate approximate levels of mortality for various countries of the world on the basis of data collected in Sample Surveys.

Table 3.4 presents estimates of the crude death rate and the average expectation of life at birth for 1950-55, 1970-75 and 1990-95.

**Table 3.6: Estimates of Crude Death Rates and Average Expectation of Life for the World and Various Regions of the World**

| Regions | Crude Death Rate (Death per 1000 population | | | Average Expectation of Life at Birth | | |
|---|---|---|---|---|---|---|
| | 1950-55 | 1970-75 | 1990-95 | 1950-55 | 1970-75 | 1990-95 |
| *World Total* | *18.8* | *12.8* | *9.3* | *46.0* | *55.2* | *64.4* |
| *More Developed Regions* | *10.1* | *9.2* | *10.1* | *65.0* | *71.1* | *74.4* |
| *Less Developed Regions* | *23.3* | *14.3* | *9.1* | *41.6* | *52.2* | *62.3* |
| Africa | 26.7 | 19.8 | 13.7 | 36.1 | 45.0 | 53.0 |
| Latin America | 14.4 | 9.2 | 6.8 | 52.3 | 61.4 | 68.9 |
| South America | 10.3 | 8.9 | 7.1 | 66.5 | 69.7 | 67.9 |
| North America | 9.4 | 9.3 | 8.7 | 69.0 | 71.4 | 76.1 |
| East Asia | 20.1 | 9.8 | 7.2 | 62.5 | 68.4 | 69.7 |
| South Asia | 25.2 | 16.7 | 8.1 | 48.5 | 54.9 | 63.6 |
| Europe | 10.9 | 10.4 | 11.2 | 65.4 | 71.2 | 72.9 |
| Oceania | 12.4 | 9.3 | 7.8 | 72.3 | 74.8 | 76.5 |
| Australia and New Zealand | 9.4 | 8.1 | 7.5 | 72.3 | 74.8 | 76.3 |
| Russian Federation | 9.2 | 7.9 | 13.3 | 61.7 | 70.4 | 67.6 |

**Source:** United Nations. *World Population Prospects, Assessed in 1973, 1984 and 1990.*

*Developing Countries:* The crude deaths rates for selected developing countries with comparatively reliable data indicated that these countries had very high crude death rates in 1920-24. For instance, CDR was 31 in Singapore, 30 in Chile and 29 in Sri Lanka. In the past 50 to 54 years, these countries have made a tremendous progress in reducing their crude death rates. In 1982, not much variation was observed in the crude death rates of these countries which were very similar to those of the developed countries, and occasionally even lower. Thus, some developing countries have made very rapid progress in the reduction of their mortality rates.

### 3.3.2.9 Standardized Death Rates

Standardization of CDR aims at the estimation of the levels of mortality, comparable with various populations, irrespective of their varying age- and sex-structures. Standardized rates, however, do not carry any meaning in themselves

and can only be used for comparison with such rates calculated in a similar fashion for other/different populations. The advantage of standardized rates over age- and sex-specific rates is that while the latter are too detailed and clumsy to allow a convenient comparison, the former give a single index easy for comparison.

There are two different ways of standardization — one is called the direct standardization and the other is the indirect standardization. *Direct standardization* is a simple and straight-forward method of adjusting death rate for age-structure. It requires the set of ASDRs of the population under study and the age-distribution of a standard population. Any population can be selected as standard; from the set of those to be compared or any other population not in the set. However, a population that approximately makes the average age composition of the populations under study may be preferred. The meaning of a *directly standardized death rate* (DSDR) of a population is that it is a crude death rate that would result if the ASDRs of the population under study apply to a population with the age distribution as that of standard population. It can be expressed as:

$$DSDR^p = \sum_a ASDR_a^p \times \left(\frac{P_a^s}{P^s}\right)$$

Where:

- DSDR is directly standardized death rate of population 'p',
- is the ASDR at age 'a' in population 'p', and
- $P^s_a / P^s$ is the proportion of population at age 'a' in standard population 's'.

Non-availability of the ASDRs of a population, many times, present difficulty in the use of the above mentioned procedure. The problem in such cases can be dealt with the technique of indirect standardization. It requires knowledge of the age-distribution and the crude death rate of the population to be compared and the ASDR and crude death rate of standard population. The formula for the indirectly standardized death rate (ISDR) is (Bhaskar D. Misra, 1980, pp.138-146):

$$IDSR^p = \frac{CDR^p}{\sum_a \left(\frac{P_a^p}{P^p}\right) \times ASDR_a^s} \times CDR^s$$

Where:

- $CDR^p$ = CDR of population 'p',
- $CDR^s$ = CDR of standard population 's'
- $\frac{P_a^p}{P^p}$ = Proportion of population at age 'a' in population 'p',
- $ASDR_a^s$ = Age-specific death rate at age 'a' in standard population 's'.

### 3.3.3 Differential Mortality

In this section, we present you sex and age-patterns of mortality.

### 3.3.3.1 Average Expectation of Life at Birth: Sex Differences in Mortality

It has been observed that in most countries of the world, mortality conditions differ for males and females. The general experience is that females have an overall advantage over males with respect to mortality. The exceptions to this rule are India and Bangladesh. As is evident in Table 3.7 for most countries, the average expectation of life at birth is higher for females than males. The gap between the average expectation of life for females and males is wider in the developed countries than in the developing countries.

**Table 3.7: Sex Differentials in Average Expectation of Life at Birth for Selected Developing and Developed Countries**

| | | Expectation of Life at birth | | |
|---|---|---|---|---|
| **Country** | **Year/Period** | **Male** | **Female** | **Difference** |
| Bangladesh | 1988 | 56.91 | 55.97 | -0.94 |
| Egypt | 1991 | 62.86 | 66.39 | 3.53 |
| Kenya | 1990-1995 | 54.18 | 57.29 | 3.11 |
| Mauritius | 1989-1991 | 65.57 | 73.39 | 7.82 |
| Mexico | 1990-1995 | 67.84 | 73.94 | 6.10 |
| Chile | 1990-1995 | 68.54 | 75.59 | 7.05 |
| India | 1981-1985 | 55.40 | 55.67 | 0.27 |
| Kuwait | 1990-1995 | 73.31 | 77.22 | 3.91 |
| Korea | 1989 | 66.92 | 74.96 | 8.04 |
| Malaysia | 1990-1995 | 68.68 | 73.04 | 4.36 |
| Pakistan | 1990-1995 | 60.60 | 62.60 | 2.00 |
| Sri Lanka | 1981 | 67.70 | 71.66 | 3.88 |
| Singapore | 1992 | 73.70 | 78.27 | 4.57 |
| United States | 1991 | 72.00 | 78.90 | 6.90 |
| Japan | 1992 | 76.09 | 82.22 | 6.13 |
| France | 1991 | 72.91 | 81.13 | 8.22 |
| Denmark | 1990-1991 | 72.18 | 77.74 | 5.56 |
| Romania | 1992-1994 | 66.56 | 73.17 | 6.61 |
| Spain | 1990-1991 | 73.40 | 81.49 | 7.09 |
| Sweden | 1992 | 73.35 | 80.79 | 5.44 |
| United Kingdom | 1992 | 73.52 | 79.05 | 5.53 |
| Australia | 1992 | 74.47 | 80.41 | 5.94 |
| Russian Federation | 1992-1994 | 62.02 | 73.75 | 11.73 |

**Source:** United Nations. 1995. *Demographic Year Book 1993.* New York. pp.506-536.

In India, though the female expectation of life at birth has always been lower than that of males, it is now only slightly better (Asha and Tara, 2006, p.195).

### 3.3.3.2 Age-Pattern of Mortality

Age is an important variables in the analysis of mortality, for death rates vary with age and sex (Asha and Tara, 2006, pp.198-210).

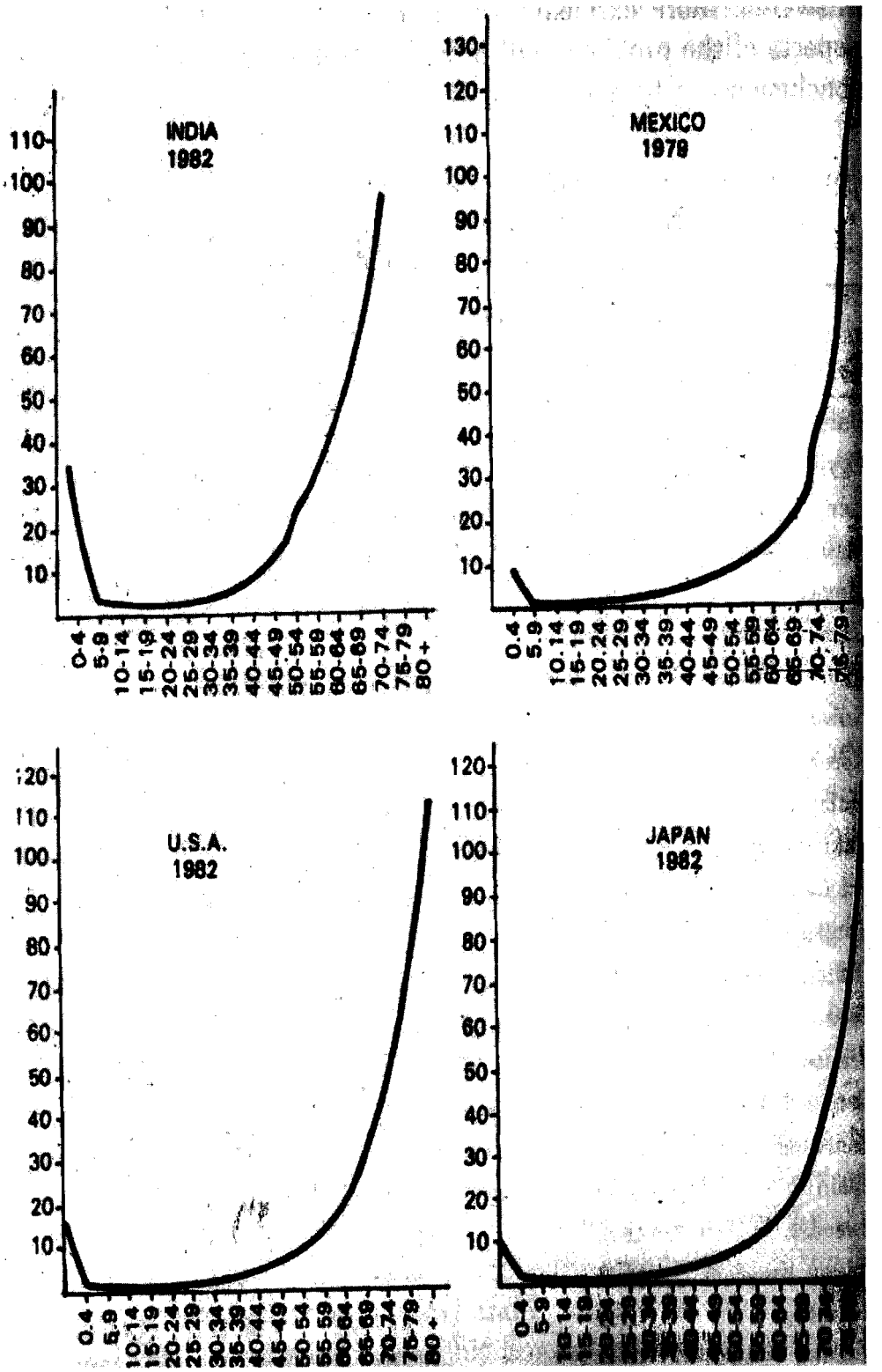


**Fig.3.1: Age-Specific Death Rates for Males for some Selected Developing Countries and Developed Countries (around 1980)**

## Table 3.8: Age-Specific Death Rates for Some Selected Developing and Developed Countries (Age-group-wise deaths per 1000 in specific age-groups)

| Country and Year | Sex | Age | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | All ages | Below 1 | 1-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85+ |
| Mauritius(1991) | Male | 7.6 | - 5.3 | - | *0.3 | 0.6 | *0.6 | 1.3 | 1.6 | 2.9 | 3.6 | 6.3 | 9.7 | 15.6 | 19.2 | 31.1 | 45.5 | 65.2 | 98.1 | 150.1 | 206.9 |
| | Female | 5.6 | -4.0 | - | *0.3 | *0.3 | 0.6 | 0.9 | 0.7 | 0.9 | 1.6 | 2.2 | 3.7 | 5.8 | 9.7 | 15.9 | 25.5 | 39.0 | 68.1 | 130.2 | 172.6 |
| Mexico (1990) | Male | 6.0 | 37.7 | 2.5 | 0.7 | 0.6 | 1.4 | 2.3 | 2.9 | 3.3 | 4.1 | 5.1 | 7.0 | 9.2 | 13.8 | 18.0 | 27.2 | 37.5 | 60.6 | 85.6 | 142.8 |
| | Female | 4.4 | 29.8 | 2.3 | 0.5 | 0.4 | 0.6 | 0.8 | 0.9 | 1.2 | 1.8 | 2.5 | 3.6 | 5.4 | 8.9 | 12.5 | 20.1 | 29.3 | 48.9 | 72.7 | 138.5 |
| Trinidad & Tobago (1989) | Male | 7.0 | 10.1 | 1.0 | *0.4 | *0.4 | 1.2 | 1.8 | 2.4 | 2.4 | 2.4 | 3.8 | 5.6 | 9.6 | 16.2 | 23.3 | 36.7 | 61.1 | 87.6 | -171.8 | - |
| | Female | 6.5 | 6.8 | 0.7 | *0.3 | *0.4 | *0.6 | 1.0 | 1.1 | 1.2 | 1.5 | 2.7 | 6.3 | 9.1 | 15.0 | 20.9 | 33.3 | 46.9 | 70.3 | -162.4 | - |
| United States of America (1991) | Male | 9.1 | 10.2 | 0.5 | 0.2 | 0.3 | 1.3 | 1.7 | 1.8 | 2.2 | 2.8 | 3.5 | 5.0 | 7.4 | 11.9 | 18.6 | 28.1 | 42.3 | 63.8 | 100.1 | 178.0 |
| | Female | 8.1 | 8.0 | 0.4 | 0.2 | 0.2 | 0.5 | 0.5 | 0.6 | 0.8 | 1.2 | 1.6 | 2.7 | 4.2 | 6.8 | 10.5 | 15.9 | 24.3 | 37.8 | 62.8 | 140.7 |
| Japan (1992) | Male | 7.6 | 4.9 | 0.5 | 0.2 | 0.2 | 0.6 | 0.7 | 0.7 | 0.8 | 1.2 | 1.9 | 3.1 | 4.9 | 8.4 | 13.4 | 19.7 | 32.2 | 56.1 | 97.2 | 183.9 |
| | Female | 6.2 | 4.0 | 0.4 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.7 | 1.1 | 1.6 | 2.4 | 3.7 | 5.6 | 9.0 | 15.8 | 30.3 | 58.7 | 135.6 |
| United Kingdom (1992) | Male | 10.9 | 7.3 | 0.3 | 0.2 | 0.2 | 0.6 | 0.9 | 0.9 | 1.0 | 1.4 | 2.1 | 3.3 | 5.8 | 10.0 | 17.7 | 30.2 | 47.5 | 75.7 | 116.7 | 195.8 |
| | Female | 11.0 | 5.7 | 0.3 | 0.1 | 0.1 | 0.3 | 0.3 | 0.4 | 0.5 | 0.8 | 1.3 | 2.2 | 3.6 | 6.0 | 10.3 | 17.2 | 27.2 | 45.0 | 74.4 | 150.4 |
| Sweden (1992) | Male | 11.3 | 6.0 | 0.3 | 0.1 | 0.2 | 0.5 | 0.8 | 0.8 | 1.0 | 1.4 | 2.0 | 3.0 | 4.7 | 8.2 | 14.3 | 23.4 | 38.0 | 63.8 | 106.2 | 199.0 |
| | Female | 10.5 | 4.7 | 0.2 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.5 | 0.7 | 1.2 | 2.0 | 3.0 | 4.6 | 7.6 | 12.4 | 20.2 | 36.7 | 67.5 | 154.2 |
| India ** (1992) | Male | 9.5 | -22.7 | - | 2.0 | 1.2 | 1.6 | 2.1 | 2.3 | 2.9 | 4.0 | 5.1 | 8.0 | 13.2 | 20.6 | 30.7 | 46.2 | | | -94.5 | - |
| | Female | 9.1 | -24.8 | - | 2.5 | 1.6 | 2.2 | 3.0 | 2.7 | 2.8 | 3.9 | 5.3 | 9.0 | 14.4 | 24.2 | 34.6 | | | | -81.1 | - |

* Rates based on 30 or fewer deaths.

** Estimated.

**Source:** 1) United Nations. 1995. *Demographic Year Book, 1993.* New York, pp.454-469.

2) Registrar General. India. 1993. *Sample Registration System: Fertility and Mortality Indicators.* New Delhi, p.148.

Table 3.8 presents age-specific death rates for males and females for selected developing and developed countries and Fig. 3.1 presents age-specific death rates for males for two developing and developed countries each. It may be observed that the age-specific death rates are higher at age 0 than at other ages for all countries, irrespective of whether the country is developed or developing. The death rate suddenly drops for the age-group 1-4 and then gradually decreases up to the age group 10-14. For almost all the countries, the lowest values of the age-specific death rates are observed for the age group 10-14. After age 14, the values of the age specific death rates slowly increase up to age 50 or 55, and then rise steeply at the higher ages. It may be observed from Fig. 3.1 that the typical age-specific mortality curve in countries of high mortality is roughly U-shaped, which indicates that mortality is very high at both the extremes of the life span, that is, in infancy and in old age. The shape of the age-specific mortality curve of countries with low mortality is roughly J-shaped, the difference in the shape of the two curves being due to the difference in the infant mortality rate of these two countries. In countries with low mortality rates the curve extends over a large number of age-groups. A similar pattern of the age-specific mortality curve is observed for females, the only difference being that the values of the age-specific death rates are lower for most of the age-groups because of lower female mortality.

### 3.3.3.3 Other Differentials of Mortality

Important variations in the levels of morality are evident for different sub-groups of the population even in the same country. For instance, the rural areas and urban areas of the same country have widely different death rates. In addition to morality differentials by geographical residence, differentials due to other demographic and socio-economic factors may also be observed within the boundaries of a particular country. Such factors include occupation, income level, educational attainment, sex, age, marital status, etc. These differentials, among others, vary widely from country to country, and across different regions/States within a country including India.

## 3.3.4 Causes of Death

The World Health Organisation has prepared a Manual on the International Statistical Classification of Diseases, Injuries and Causes of Death. According to this Manual (WHO, 1955), one thousand groups of diseases have been identified, and these are re-grouped into an intermediate list of 150 causes numbered A1, A2, A3, etc. These, in turn, are regrouped into an abbreviated list of 50 causes numbered as B1, B2, B3, etc. This last list of 50 groups of causes is used for computing deaths and death rates on the basis of the causes of death.

Again, from this list of 50 groups of causes, various diseases have been grouped according to their response to various health measures, resulting in five groups. These are:

1) Infectious and parasitic diseases of the respiratory system,
2) Cancer,
3) Diseases of the circulatory system,
4) Deaths by violence, and
5) All other causes.

The pattern of mortality on the basis of causes of death in the developing regions is quite different from that in the developed regions, though this pattern too has

undergone changes over the years as mentioned above. For those countries for which data on causes of death are available, it is possible to study the changes in the causes of death along with the changes in mortality.

i) ***Reasons for high mortality in the past:*** It has already been pointed out that, up to the nineteenth century, death rates all over the world were very high and fluctuating. The main reasons for such high mortality rates were:

- Acute and chronic food-shortages causing famines and conditions of malnutrition;
- Epidemics;
- Recurrent wars; and
- Poor sanitary conditions.

The study of infant mortality gains importance, specially because mortality during the first year of life is invariably high for all countries, irrespective of whether the overall levels of mortality are high or low. Further, level of infant mortality acts as an indicator of the medical and health facilities, expectation of life at birth, age structure of population and fertility change in a population.

ii) ***Factors affecting infant mortality:*** A variety of factors affecting infant mortality are customarily classified as *biological/endogenous* and *exogenous (socio-economic* and *environmental) factors.* These categories should not be treated as watertight compartments for there is a great deal of interaction between them. At times, it is even possible to modify biological factors by introducing changes in socio-economic factors or environmental factors.

- *Endogenous/Biological factors:* Most of the endogenous factors related to the formation of the foetus in the womb are biological in nature. Among the biological factors affecting foetal and neo-natal infant mortality rates, the important ones are the age of the mother, the birth order, the period of spacing between births, prematurity birth, weight at birth and the fact of multiple births. Based on in-depth studies done on the age of the mother, the parity of the mother or the order of pregnancy and/or of birth it has been generally observed that foetal and neo-natal mortality rates are higher at the younger ages of the mother (that is, below the age of 19), at first parity and for the first birth order. These mortality rates start declining up to the age of 29 of the mother, and at the second and third parity and then again increases with higher age of the mother, higher parities, and high birth orders. It is now an established fact the causes of foetal and neo-natal deaths arise mainly out of genetic factors, and may be traced back to the intrauterine life of the feotus and to the damage occurring during the process of birth.

- *Exogenous Causes:* Social, cultural, economic and environmental factors are also found to affect infant mortality, specially during the post-neo-natal period. However, post-neo-natal deaths are mainly due to various epidemics caused by communicable diseases, both of the digestive system such as diarrhoea and enteritis, and of the respiratory system such as bronchitis and pneumonia as well as by faulty feeding patterns and poor hygiene. The important environmental factors include crowding and congestion, insanitary surroundings, lack of proper sunshine and fresh air, etc. Changing patterns of lifestyle impacting on culture producing illegitimate births and consequent effects leading to infant mortality is also contributing to a high infant mortality rate.

One interesting feature of the role of endogenous and exogenous factors in determining infant mortality rates is worth noting. In developed countries where infant mortality rates are very low, a higher proportion (that is, more than two-thirds) of infant deaths occur during the neo-natal stage only, because, being developed they have been successful in almost completely eliminating the environmental factors responsible for such deaths. The main causes of infant mortality in these countries are, therefore, mainly genetic or biological in nature. On the other hand, in countries where infant mortality rates are high, the majority of infant deaths occur after the neo-natal stage and are mainly due to environmental factors (United Nations, 1973).

International comparisons of the causes of death by regions, continents or countries is made difficult because of differences in terminology, method certification, diagnostic techniques and the interpretation of death certificates by the coders.

iii) ***Causes of mortality decline in developed countries:*** In Europe, North America and Oceania continuous economic progress resulting from Agricultural and Industrial Revolutions have been the main reasons for the reduction in mortality rates, which first began to decline rather weakly in the seventeenth century and then with an increasing tempo throughout the eighteenth and nineteenth centuries.

Important developments that affected morality in European countries since the eighteenth century have been the increase in the supply of food, advances in technology, extension of the benefits of medical research, development of immunology, advances in chemotherapy (use of drugs to cure or inhibit the progress of diseases) and other improved health services, improvements in sanitary conditions and public health measures, and heavy and better clothing to combat severe winters, social reforms, etc. All these have collectively led to improvements in the standards of living and fall in morality in many ways.

Similar developments over a period in other countries also have gradually contributed to the decline of their mortality rates.

**Check Your Progress**

**Notes:** a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under "Answers to 'Check Your Progress' Questions".

4) List out different measures of mortality.

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## 3.4 MIGRATION

In this section, we will touch upon migration, which is the third determinant of population change, the other two being fertility and mortality which we have already discussed above. Unlike fertility and mortality, migration is purely a social phenomenon which is the result of a complex mechanism involving social, psychological, economic, political, institutional and other determinants (Bhaskar D. Misra, 1980, p.224).

The process of migration not only affects the size and growth of population of an area but also produces remarkable alterations in the structure and distribution of population. The study of migration, thus, occupies an important place in population studies. In addition, the study of migration is a matter of interest and importance not only to demographers but also to economists, sociologists, human geographers, political scientists, legal departments, policy-makers and planners, public administrators, social pathologists and social psychologists.

Some of the reasons why different persons working in a variety of fields are interested in the study of migration are as follows:

- Migration may be considered as a symptom of basic social change.
- Industrialization and economic development have been accompanied by large-scale movements of people from farm areas to towns, from one town to another, from one city to another, and from one country to another.
- Technological and other changes in certain areas causing migration of people from rural to urban areas has given rise to towns, cities and metropolitan cities.
- Increased market and business operations requiring supply of skilled and unskilled workers.
- Growth of industries leading to the occupational and employment status of the migrants.
- The emergence of such a massive population phenomenon, especially that of rural-urban migration, and new problems arising out of such migration.

In preceding sections, the terms used such as "death," "diseases," "births," "abortion," etc., are easily understood by the public, for scientific and commonly understood meanings of these terms do not differ much from each other. On the other hand, terms such as "change of place," "migration," "communication," "mobility," "emigration," "immigration," "out-migration," etc that we will be using in this section connote different meanings to different persons, for their meanings in scientific language and common parlance may differ widely.

So, we will cover these terms under the concept of migration and types of migration.

### 3.4.1 Concept and Types of Migration

The United Nations' Multilingual Demographic Dictionary (1958) defined migration as follows: "Migration is a form of geographical mobility or spatial mobility of people between one geographical unit to another, generally involving

a change in residence from the place of origin or place of departure to the place of destination or place of arrival. Such migration is called permanent migration and should be distinguished from other forms of movement which do not involve a permanent change of residence."

*Migrant* and *migration:* A *migration* is defined as a move from one defining area to another (or a move involving some minimum specified distance) made during a given migration interval and involving a change of residence. A *migrant* is a person who has changed his/her usual place of residence from one defining area to another (or one who has moved some specified minimum distance) at least once during the migration interval.

i) **Typology of migration:** Migration can be classified into different types based on different criteria.

   a) *Spatial migration:* Based on space it is divided into internal migration (within a country) or international migration (across political borders). The internal migration can again be divided into intra-local and inter-local, and intra-regional and inter-regional.

   b) *Temporal migration* (based on time-length): The temporal migration is divided into four categories – daily, periodic, seasonal and long-term migrations.

   c) *Causal migration:* Based on the cause, the migration is voluntary or forced.

   d) *Consequential:* Based on the consequences, migration is of two types: innovative (to introduce or to adapt to innovations) or conservative (to conserve one's own values, traditions, etc).

However, it is customary to study migration with respect to: i) Internal migration, and ii) International migration. Internal migration is the migration of persons within a country, while international migration refers to the movement of people from one country to another.

In order to have better understanding of the concept and types of migration, we may have a look at the following concepts / terms.

- ***Immigration*** and ***Emigration*****:** The terms immigration and emigration refer respectively to movement into or out of a particular territory, and are used only in connection with international migration. Thus, migrants leaving India to settle down in the Unite States are immigrants to the United States and emigrants from India.

- ***In-migration*** and ***Out-migration****:* In-migration refers to movement into a particular area, while out-migration refers to movement of people out of a particular area, both referring to movements *within a country*, that is, *internal migration*. Thus, migrants from Tamil Nadu to Maharashtra are considered to be immigrants for Maharashtra and out-migrants for Tamil Nadu. Each move is either an immigration or in-migration with respect to the place of destination and emigration or out-migration with respect the place of origin and departure.

- ***Place of origin*** *or* ***Place of departure*** and ***Place of destination*** *or* ***Place of arrival:*** The place from which a move is made by the migrants is the place of origin or departure. The place of arrival or the place of destination refers to the place at which a move of the migrants terminates.

- ***Gross migration*** and ***Net migration*****:** The total of the arrivals of immigrants and in-migrants and departures of emigrants and out-migrants is known as gross migration or the volume of migration. Net migration is the difference between the total number of persons who arrive and the total number of persons who leave. This is also referred to as the balance of migration. i.e. difference between the number of immigrants and emigrants is net migration with reference to a country in the context of international migration, and the difference between in-migrants and out-migrants is also net-migration with reference to a place within a country in the context of internal migration.

- ***Migration stream****:* It refers to the total number of moves made during a given migration interval which have a common area of origin and common area of destination. In practice, it refers to a body of migrants having a common area of origin and a common area of destination.

- ***Migration interval****:* Though migration occurs more or less continuously over a period of time, it is necessary to specify the interval over which it is observed. This interval may be *definite,* i.e. when data refers to a definite interval such data measure a fixed-term or fixed-period of migration, be it one year, two years, five years, or an inter-censual period, etc. Or, it may be *indefinite* — the life-time migration of a population based on the place of last residence which does not have a definite time-reference or at only a given point of time.

- ***Sources of data*****:** A periodic national census surveys, population registers and sample surveys are the three principal sources of information on internal migration (Asha and Tara, 2006, pp.363-369).

### 3.4.2 Measures / Indices of Migration

It is customary to classify the measures of migration into two categories: *1) direct measures,* and *2) indirect measures.* The direct measures are based on data obtained from direct questions asked during a census on the movements of persons. Questions on the following items provide information for direct estimation of migration movements: i) the place of birth of the person, ii) the last or previous place of residence of the person, or iii) the duration of stay of a person at the present place of residence. The indirect measures of estimating migration do not require special questions; the extent of migration can be estimated from the total counts in a census and the available age-sex distribution of the population.

#### 3.4.2.1 Direct Measures of Migration

In this type of measure data elicited directly from the migrants is used for measuring migration. It is done in the following ways.

1) ***Based on the Place of Birth:*** In almost every census, a question is asked on a person's place of birth. On the basis of the information obtained through this question, all enumerated persons in the population can be classified in either of the following two groups:

a) Migrants or life-time migrants, defined as persons who are enumerated in a place which is different from the place where they were born; and

b) Non-migrants defined as persons who were enumerated in the place where they were born.

The category of migrants is then further sub-divided into various migration streams on the basis of specific places of birth and places of residence.

2) ***Based on Duration of Residence:*** Sometimes a question on the duration of residence at the place of enumeration is included in the census questionnaire. An analysis of information obtained through this question forms another approach to the study of migration. Persons who have lived in the place of enumeration all their lives are treated as non-migrants. The following categories are included as migrants on the basis of their duration of residence at the place of enumeration:

a) those born outside the area of enumeration, and

b) those born in the area of enumeration who had at some time lived outside of it (return migrants).

Thus, while measuring migration with the help of the question on the duration of residence, we take into account the number of return migrants; but in the place-of-birth approach we exclude the number of return migrants from the category of migrants.

3) ***Based on Place of Last Residence:*** In order to obtain information on the last move, information is obtained about the place of last residence. This information may then be classified into the following two categories:

i) Migrants whose place of last residence and place of present residence differ, and

ii) Non-migrants who have never moved outside the area of their place of birth.

The data on the place of last residence identifies all migrants and covers all persons who had migrated at any time during their life-time.

4) ***Place of Residence at a Fixed Prior Date:*** In some countries, a question about the residence on a specified date is included in the census questionnaire or in the sample survey questionnaire. The replies obtained to those questions are useful in any study of migration, for migration interval is clear-cut, migration status is determined by a comparison of residence at two definite points in time; and a migrant is defined as a person whose residence at the census date differs from his residence at the specified prior date. Such information is very useful in analyzing current migration and for computing the "period migration rate."

Any measurement of migration on the basis of residence at a fixed prior date is simple and specific. It is, therefore, considered by many demographers to be a more satisfactory and useful measure for migration analysis than the measures based on place of birth data or last residence data. Certain limitations of this approach, however, need to be noted. The possibility of inaccuracy in the data due to recall-lapse cannot be ruled out. When the

reference period for the question on the place of residence at a fixed prior date is not the same as that of the inter-censual period, such data cannot be used for determining the components of inter-censual population growth.

### 3.4.2.2 Indirect Measures of Migration

In addition to the measurement of migration based on information obtained through direct questions on migratory movements asked in a census surveys, it is possible to estimate net inter-censual migration by using the population counts in two successive census operations.

The growth in the population of any area/region is due to a natural increase (excess of births over deaths) plus migratory movements. If the population counts of an area at two points of time are available and if the number of births and deaths which had occurred in that area is also known, it is possible to compute the expected population count at the end of the interval in the absence of any migration data. The difference between the observed (actual population count at the end of the period) and the expected population gives the estimate of the net change due to migration. Such estimates can be arrived at by adopting: i) the use of vital statistics, and ii) the use of estimates of the probability of survival.

1) ***The Vital Statistics Method:*** In a country or a place where reliable information on the births and deaths in its population is available, the estimate of a natural increase between two successive census operations can be obtained. The estimates of net migration can be arrived at by subtracting the natural increase from the total population change. It should be remembered that the estimates of net migration obtained by the vital statistics method also include international migration figures. This simple equation to estimate net migration is a form of the "balancing equation."

   Net $M = (P_1-P_0) - (B-D)$

   Where, for any give area:

   - Net M is the Net Migration,
   - $P_0$ is the population at the earlier census,
   - $P_1$ is the population at the later census,
   - B is the number of births in that area during the inter-censual period, and
   - D is the number of deaths which occurred in that area during the same period.

   In developing countries, however, the data on births and deaths obtained from vital registration systems are not accurate and adequate, and hence are of poor quality. The errors in the reporting of births and deaths, therefore, affect the estimation of net migration based on this approach.

2) ***The Survival Ratio Method:*** This approach for estimating the net internal migration for the period between two census operations is based on the survivorship probabilities obtained from existing life-tables. The basic information needed is the age-distribution by sex, as enumerated in each area in two successive census operations and a set of survivorship ratios which may be applied to the population of the first census in order to derive

an estimate of the number of persons expected to survive to the second census. The differences between the enumerated population at the end of the second census and the expected population is the estimation of net-internal migration.

In case appropriate life-tables are not available or where the use of the available life-tables is forbidden for some reason or the other, the estimates of net-migration may be obtained by computing the survival ratios of two consecutive census operations. Both the *life-table survival ratio method* and the *census survival ratio method* cannot, however, provide estimates of net-migration for persons born during the inter-censual period. Other appropriate methods may have to be used for this purpose. It should be noted that the migration estimates obtained by the census survival ratio method are better than those arrived at by computing life-table survivorship probabilities as the former has built-in corrections for the age-errors, inherent in census data.

3) ***Migration Rate:*** A migration rate is the number of migrants related to the population that may have migrated during given migration interval. The migration rate is computed as follows (Asha and Tara, 2006, pp.370-380):

$$m = \frac{M}{P} \times k$$

Where:

- $m$ is the rate of migration for the specified migration interval;
- M is the number of migrations or the number of persons migrating during the interval;
- P is the population exposed to the likelihood of migration during the interval ( or mid-year population);
- k is 100 or 1000 (constant).

Similar rates can be calculated for in- and out-migration and gross- and net-migration.

***For In-migration (in-m):***

$$In\text{-}m = \frac{Mi}{P} \times k$$

Where:

- *In-m* is immigration, and
- *Mi* is the number of in-migrants in a given population

***For out-migration (out-m):***

$$Out\text{-}m = \frac{Mo}{P} \times k$$

Where:

- *Out-m* is out-migration, and
- *Mo* is the number of out-migrants in a given population.

***For gross-migration (gross-m):***

$$Gross - m = \frac{Mi + Mo}{P} \times k$$

Where, *Gross-m* is gross-migration.

***For net-migration (net-m):***

$$Net - m = \frac{Mi - Mo}{P} \times k$$

Where, *Net-m* is net-migration.

### 3.4.3 Differential Migration

Distinct group differentials in migration are studied by comparing the characteristics of migrants with those who do not migrate but continue to stay in the place of origin and / or with those who live in the place of destination. Some of these differentials are as follows.

- Differential migration by age.
- Differential migration by sex.
- Differential migration by marital status.
- Differential migration by educational attainment.
- Differential migration by employment status.

Given below is some information on differential migration in India.

#### 3.4.3.1 Internal Migration in India: Some Differentials

The main source for the study of internal-migration in India is provided by the decennial population census. In the 1961 census, about 68.6 percent of the population was enumerated at the place of birth, indicating that only 31.4 percent had moved from their place of birth. The percentage of life-time migrants was found to have slightly decreased to 29.5 in the 1971 census. A large number migrants moved only short distances, that is, they move from one place to another within their own district.

Majority of the Indian population has been immobile or non-migrating. Generally, the following factors have been mainly responsible for their immobility: i) predominance of agriculture, ii) the caste system, iii) early marriage, iv) joint family system, v) diversity of languages and culture, and vi) lack of education, etc.

***Inter-State Migration in the Indian States During 1951-61 and 1961-71 Based on Place of Birth Data:*** The study of inter-state migration in India is fraught with problems because of the boundary changes which have taken place during the inter-censual periods. Some demographers have overcome these difficulties by adjustment of various types of migration and have tried to estimate the inter-State migration in India (Asha and Tara, 2006, pp.386-387).

Based on the estimates of net-migration in the States of India during 1951-1961, following is the order of gaining and loosing states.

| Rank Order of Gaining States | | Rank Order of Losing States | |
|---|---|---|---|
| **Rank** | **State** | **Rank** | **State** |
| 1 | West Bengal | 1 | Uttar Pradesh |
| 2 | Maharashtra | 2 | Bihar |
| 3 | Delhi | 3 | Kerala |
| 4 | Madhya Pradesh | 4 | Rajasthan |
| 5 | Assam | 5 | Madras (Tamil Nadu) |
| 6 | Punjab | 6 | Orissa |
| 7 | Mysore (Karnataka) | 7 | Jammu and Kashmir |
| 8 | Gujarat | | |
| 9 | Andhra Pradesh | | |

During 1951-1961, heavy net-migration was observed to Bengal, Maharashtra, Delhi, and Madhya Pradesh. West Bengal net gain was of nearly 2.8 million population and that of Maharashtra 1.0 million.

The estimates of net-migration in the Indian States during 1961-1971 yielded the following results:

| Rank Order of Gaining States | | Rank Order of Losing States | |
|---|---|---|---|
| **Rank** | **State** | **Rank** | **State** |
| 1 | Maharaslitra | 1 | Uttar Pradesh |
| 2 | Delhi | 2 | Kerala |
| 3 | Orissa | 3 | West Bengal |
| 4 | Assam and Meghalaya | 4 | Andhra Pradesh |
| 5 | Madhya Pradesh | 5 | Karnataka (Mysore) |
| 6 | Rajasthan | 6 | Punjab Group |
| 7 | Tamil Nadu (Madras) | | |
| 8 | Nagaland and Union Territories | | |
| 9 | Gujarat | | |
| 10 | Jammu and Kashmir | | |
| 11 | Bihar | | |

On comparison of the two periods i.e. 1951-1961 and 1961-1971 for inter-State net- migration, the change in the pattern of gaining and losing population has been observed as follows: Maharashtra, Delhi, Madhya Pradesh, Assam, and Gujarat continued as gaining States, though their rank order had changed, with Maharashtra gaining the first rank. Some States like Jammu and Kashmir, Rajasthan, Bihar and Tamil Nadu which were losing population due to migration during 1951-1961, became gaining States during 1961-1971. On the other hand, same gaining States in 1951-1961 like West Bengal, Karnataka (Mysore), Andhra Pradesh became losing States during 1961-1971, with the most striking one being

the case of West Bengal; it gained the largest population due to migration during 1951-1961, but lost population during 1961-1971.

*1981 Census:* Ranks of States based on estimates of inter-decadal migration by place of birth data for the major States of India based on 5 per cent sample data of the 1981 census for males and females are as follows:

| Male | | Females | |
|---|---|---|---|
| **Rank Order of Gaining States** | **Rank Order of Losing States** | **Rank Order of Gaining States** | **Rank Order of Losing States** |
| 1. Maharashtra | 1. Uttar Pradesh | 1. West Bengal | 1. Uttar Pradesh |
| 2. Gujarat | 2. Bihar | 2. Maharashtra | 2. Kerala |
| 3. West Bengal | 3. Kerala | 3. Orissa | 3. Haryana |
| 4. Orissa | 4. Tamil Nadu | 4. Gujarat | 4. Andhra Pradesh |
| 5. Punjab | 5. Andhra Pradesh | 5. Karnataka | 5. Bihar |
| 6. Haryana | 6. Madhya Pradesh | 6. Rajasthan | 6. Madhya Pradesh |
| 7. Karnataka | | | 7. Punjab |
| 8. Rajasthan | | | 8. Tamil Nadu |

***Rural-urban migration in India:*** According to 1971 Census, an analysis of State-wise internal-migration gives us some idea about the main lines of population movement with respect to in-migration and out-migration. It was observed that, of all the migrants in 1971:

i) the movements for 70.66 per cent were from rural areas to other rural areas;

ii) the percentage of persons born in rural areas and enumerated in urban areas was 14.88;

iii) the percentage of persons born in urban areas and had migrated to other urban areas was 8.75;

iv) the percentage of persons born in urban areas and migrated to rural areas was 4.88.

v) Unclassified migrants were 0.83 per cent.

It is, thus, clear that migration in India is mainly from one rural area to another rural area and that its volume from rural areas to urban areas is comparatively very small, indicating that the pull factor does not seem to be operating yet vigorously or may be operating only in the case of metropolitan cities.

### 3.4.4 Causes of Migration

Traditionally people use to move from the place of birth to destination for the cause of work (livelihood, employment) in the case of males, and as a consequence of marriage to matrimonial home in case of women (except in the case of matrilineal society). Now-a-days people use to move from rural to rural, rural to urban, urban to urban or urban to rural for education, job, marriage and for the causes of natural disasters like drought, earthquake, floods and famines.

The causes of migration can be broadly classified as two types: i) Push factors, and ii) Pull factors (Lewis, 1982).

i) ***Push factors***: These are the factors related to the place of origin which are unfavourable conditions forcing or prompting the persons to move out to other places. These factors include: a) decline in or exhaustion of local natural resources, decrease in demand for the local resources, loss of employment for any reason, oppressive, repressive or discriminatory treatment because of political, religious and ethnic origins, among others, alienation from a community for any reason, voluntary retreat from a community for better opportunities outside, or forced retreat or displacement due to natural calamities such as floods, fire, draught, earthquake, epidemic, etc.

ii) ***Pull factors:*** These are the factors related to the place of destination or arrival which attract or motivate the people from other areas/places. These include: superior opportunities for employment in one's occupation or to enter a preferred occupation or to earn more income; opportunities to obtain desired specialization in education or for specialised training; preferable environment and living conditions in terms of climate, housing and other facilities; dependency movements – movement of dependents to join the bread winner or migration of a bride to join her husband, etc; and line of new or different activities, environment or people.

## 3.4.5 Consequences and Constraints of Migration

Since migration is a often a voluntary action, societal values and norms are involved, and therefore, the manner in which these are manifest in individual and group behaviour, in relation to both the migrant and non-migrant population has wide-spread consequences. Migration has an effect on many aspects of human activity and at several geographical scales. It can bring about changes in several spheres such as demographic, economic, social, cultural, political, etc and at several scales of analysis such as individual, community, societal, national and international. As result, there will be some constraints to migration (Lewis, 1982). So, in this section we will touch upon the consequences of migration as well as constraints to migration.

### 3.4.5.1 Consequences of Migration

Migration has its effects or consequences on:

- the size and structure of the society in general;
- the community of origin and the community of destination; and
- the individual migrants themselves.

These consequences are briefly presented below.

a) ***Societal consequences:*** Migration acts as an agent for the transformation of a society from a traditional one to modern one. It acts as a means by which more advanced form of human activity spreads to different parts of the world and therefore forms an essential part of the modernization process. Migrants often take with them skills which form the basis of the economies of the

'new lands'. Migration also strengthens the development of economic infrastructure such as roads and transportation facilities. While these are some advantages of migration to the society, it also causes considerable social and political problems in terms of unemployment, unskilled labour force, group tensions, violent population, disruption of agricultural production, etc. Increase in slum-settlements, increase in the cost of housing, pollution, raising cost of living, changes in family norms and standards, social values, and related problems could be seen as the consequences of migration to cities. In the process of attempts to solve such social, environmental and political problems, it leads to a slowing down in developmental process or reduced rate of economic change.

b) ***Community consequences***: The community consequences of migration depend upon intensity of migration, its differential nature and social composition of the communities involved. Continuous in-migration of young migrants accelerate the birth rate of the communities involved. On the other hand, continuous out-migration of young people leads to falling birth rate resulting in consequential natural decrease in the growth of the population. Among the differentiating factors which have been shown to generate social change include: socio-economic status, education, ethnicity, occupation, language and religion. More often than not migrants are innovators and prospective leaders within a community. Sometimes, large scale rural to urban migration promotes intensive urban growth and social segregations at series of different stages in cities and depopulation and decreasing rural communities.

c) ***Individual consequences***: These are related to the extent to which the individual's needs and aspirations are (being) met in the host community as well as his own adaptation to new surroundings – social, economic, political, cultural, etc – and involves adjustment, participation, acculturation and process of assimilation.

### 3.4.5.2 Constraints to Migration

The constraints to migration mainly depend upon the following: i) Market situation, and ii) operation of public policy. Access to resources, roles and functions of individuals and institutions involved in the supply, allocation and utilization of resources such as employment and housing to a large extent influence the market situation. The goal of public policy should be to develop and promote the benefits of society as a whole rather than the personal objectives of selected groups or members. Any biased approaches to the market situation and the public policy will act as major constraints to migration. At present, the market situation and operation of public policy at national and international level vary widely because of the effects of increasing industrialization, urbanization, modernization, globalization and liberalization. Further, non-availability of official information on safety and security situation at the place of destination could also be considered as constraints to migration in general, and at international level in particular.

**Check Your Progress**

**Notes:** a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under "Answers to 'Check Your Progress' Questions".

5) What are the indices that one could derive from migration data for analysis and understanding of migration?

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## 3.5 LET US SUM UP

In this Unit, we have dealt with the three components of population change viz. fertility, mortality and migration with emphasis on their concepts and measures / indices and factors influencing them. We have also touched upon the sources of data related to these determinants and their differentials based on various aspects. We have also covered the consequences and constraints of migration. All these must have provided you broader perspective of how, when and to what extent the changes take place in the population at local, national and international levels.

## 3.6 ANSWERS TO 'CHECK YOUR PROGRESS' QUESTIONS

1) *Fecundity:* Fecundity refers to "the physiological capacity of a man, a woman, or a couple to participate in reproduction (i.e. the capacity to produce a live child or children)." Fertility, on the other hand, "refers to the actual reproductive performance of an individual or a couple or a group. It is important to differentiate between fecundity and fertility. From the above, it is clear that the fecundity is the actual capacity to reproduce children while fertility refers to the number of children actually produced. While there is no direct measurement for fecundity, fertility can be studied from the statistics of births, though, of course, the fertility of an individual is limited by his/her own fecundity, which refers to the physiological capacity to reproduce.

2) *Natural Fertility:* As defined by Henry (1953) natural fertility is "fertility of a human population that makes no deliberate effort to limit births." Fertility may be considered to be natural if no contraception or induced abortion is used. Practices such as prolonged breastfeeding and / or abstinence after childbirth do also tend to lower fertility, but when such practices are adopted without any intention of controlling fertility, the results of fertility is considered as natural.

Natural fertility is affected by contraception. Contraception refers to measures which are taken in order to prevent sexual intercourse or coitus from resulting in conception. A contraceptive method is sometimes termed as a birth control method, though "birth control" is used in a broader sense to include intentional abortions, sterilization and complete abstinence from coitus. Contraception refers to all measures taken for the prevention of conception or of birth.

3) The main sources of data on fertility include: i) vital registration system, ii) population census, iii) sample surveys, iv) research reports, and v) national family household surveys.

4) The various measures or indices of mortality include: i) Crude Death Rate (CDR), ii) Age-Specific Death Rate (ASDR), iii) Cause-Specific Death Rate (CSDR), iv) Comparative Mortality Index, v) Standard Mortality Ratio (SMR), vi) Average Expectation of Life at Birth or Average Life Expectancy, and vii) Standardized Death Rates (SDR).

5) The indices or measures that are used to analyse and understand migration from the relevant data can be grouped into two categories: i) direct measures, and ii) indirect measures.

*The direct measures* are based on data obtained from direct questions asked during a census on the movements of persons. These questions cover the following items: (a) the place of birth of the person, (b) the last or previous place of residence of the person, (c) the duration of stay of a person at the present place of residence. Accordingly, the direct measures for estimating migration is done using the data: i) Based on place of birth, ii) Based on duration of residence, iii) Based on place of last residence, iv) Based on place of residence at a fixed prior date.

*Indirect Measures for Estimating Net Internal Migration:* The growth in the population of any area or region is due to a natural increase (excess of births over deaths) as well as to migratory movements. If the population counts of an area at two points of time are available and if the number of births and deaths, which had occurred in that area is also known, it is possible to compute the expected population count at the end of the interval even in the absence of any data on migration. The difference between the observed (actual population count at the end of the period) and the expected population gives the estimate of the net change due to migration. Such estimates can be arrived at by adopting: a) the use of vital statistics, and b) the use of estimates of the probability of survival. Accordingly, the indirect measures include: a) The Vital Statistics Method, b) The Survival Ratio Method, and c) Migration Rate.

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**Suggested Readings**

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