
UNIT 1 POPULATION DYNAMICS AND EPIDEMIOLOGY

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1.1 INTRODUCTION

Research conducted in the field of population parameters such as birth weight, life expectancy at birth etc. has given us scientific evidence regarding the influence of these factors on nutritional status of the population in general. In addition, the experience in developing programmes has generated ideas about the inter-relationship between population parameters and nutritional status of people. In this unit, focussed efforts will be made to familiarise you with important vital events such as births (fertility), marriages (nuptiality), diseases (morbidity), deaths (mortality), and their levels, trends and determinants. As you go through this unit, you would realise that these vital statistics are of crucial importance in planning for public health and improving the quality of life of people.

The various fertility and mortality rates important from the point of view of public health which are discussed as part of this unit will help to acquaint you with the method of computation, importance of the vital rates as well as available statistics.

Objectives

After going through this unit, you should be able to:

- describe the levels and trends of various population parameters in India and other Asian countries and at regional levels;
- compute major rates and ratios related to marriages, births, deaths, growth and other vital events;
- identify major determinants and patterns of vital events; and
- explain the prevalence and control of major diseases.

1.2 ROLE OF VITAL STATISTICS IN PUBLIC HEALTH

How do you think vital statistics can be of help for a community/country? There are many ways in which vital statistics can be of use. In fact, changes in vital rates help to monitor *the progress in overall socio-economic development of a community/country*. Fertility and mortality rates in a community are indicators of overall health and nutrition (i.e. quality of life) of a community and hence show the level of socio-economic development and the need to improve and accelerate the same.

Analysis of vital statistics helps the Government (policy and programme planners) to plan for health services for reaching the general population and improving health related socio-economic conditions. One can set objectives for achieving targets (like reducing mortality among children, reducing maternal deaths during child birth etc.) and vital rates/statistics can help in finding out whether targets are achieved or not.

Another reason for collecting vital statistics is that it helps to compare the health and nutritional status of people of two communities/countries and also the same community/country over a period of time. Thus, knowledge on various vital events during different five year plan periods and census decades will help programme managers, planners and administrators to know the impact of developmental programmes particularly their successes over time.

1.3 VITAL STATISTICS IN ASIAN COUNTRIES

Most vital statistics are expressed as vital rates. Let us define this term. When the vital statistics of fertility/morbidity/mortality are expressed as *number of people with a state of illness or number of events (e.g. births/deaths) in relation to total population at risk (group of people having certain similar characteristics like age, sex, region etc.)* is termed as vital rates. This definition of vital rates may seem a little difficult to you, when you read it for the first time. However, by carefully glancing at it again, you will surely be able to understand it.

Although India was more or less similar in developmental aspects with many Asian Countries, vital statistics varied among these countries. How did it happen? It might be due to differential progress achieved by Asian countries through differential emphasis given to one or the other priority areas of development in the recent past. For instance, certain countries and regions have given highest priority for education, health, family planning and infrastructural development. But certain other countries have given highest importance to industrialisation and/or agricultural development neglecting social development. In this context, China, Thailand, DPR Korea, Malaysia, Sri Lanka have made good progress in planning and infrastructure. Consequently, they attained rapid modernisation and improvement in quality of life of the population. On the other hand, the Government of India gave highest priority for industrialisation and agriculture, neglecting the social

development. We have just mentioned these differential models of development which have contributed to differences in several vital events. While many of the progressive Asian countries rapidly brought down their mortality and morbidity rates, India is still lagging behind, You may compare the rates of vital events of some Asian countries given in the following Table 1.1.

Table 1.1: Vital Events in Asian Countries

Asian Countries	CBR (2019)	IMR (2019)	CDR (2019)	Female life expectancy at birth
China	11	7	7	79
DPR of Korea	14	13	9.2	76
Malaysia	17	7	5	78
Thailand	10	8	8	81
Sri Lanka	16	6	7	80
India	18	28	7	71

CBR: Crude Birth Rate; IMR: Infant Mortality Rate; CDR: Crude Death Rate

Source: World Development Indicators, 2020.

Let us now find out how this information regarding vital rates is collected and processed.

1.4 SOURCES OF DATA ON VITAL STATISTICS

The main sources of data on vital statistics are:

- 1) Census
- 2) Population Registers
- 3) Sample Registration Scheme
- 4) National Sample Surveys
- 5) Health Services Records
- 6) Special Surveys
- 7) Disease Registers

Before learning more details about each of these sources, you should remember that each of these sources have their own limitations and a country cannot solely depend on a single source. Usually information from various sources is compiled together to get vital statistics. So let us now get familiar with the main sources of data on vital statistics.

Census

Let us first define the meaning of the term “Census”. Census means complete counting of all individuals/houses (individuals-population-Census; houses-housing-Census) in a country on a fixed date preferably once in 10 years. Census provides information on age, sex, religion, occupation, literacy, income etc. of the population. The first census in our country took place in 1872 and subsequently it is being conducted once in ten years. In India the latest census was held in 2011.

How do you think the population census can help in computing vital statistics/rates for a country? As you read this unit further, you will realise that the population census provides useful basic information for calculating vital rates. Similarly, housing census helps to analyse environmental conditions (such as water supply, toilet facilities, availability of space per person, etc.).

Population Registers

In some countries, such as Sweden, Finland, Belgium, Israel, Taiwan and Korea, data about population can be obtained from continuously maintained population registers, in which the name of each person in the country is entered. Important migratory movements of individuals are also registered. The primary objective of setting up this system of population registers is to establish the identity of individuals and control them. The registers, however, are also used to obtain such demographic information as current population size, internal migration, data on vital events, etc.

Sample Registration Scheme

As you know, in every community records of births, deaths and marriages are kept by either the local authorities or by religious leaders. If these records are complete and kept systematically, they can be used for estimation of fertility, mortality and marriage rates.

However, there is one limitation. In our country these records are usually not complete. This is because of ignorance, illiteracy, indifference and poor systems of management. There is no incentive also to register deaths, births and marriages. Hence, people usually do not report these vital events promptly. In spite of this, systematic analysis of these records do help to provide vital statistics of some public health significance.

National Sample Survey

The main objective of the National Sample Survey has been to collect data on some important socio-economic aspects on a comprehensive basis for the whole country through its various rounds by using the technique of sample survey. The First Round of the National Sample Survey (NSS) was conducted in 1950; since then, information on different items has been collected through various rounds of the NSS. The topics covered so far include the following: fertility mortality, population growth, economically active population, family planning, employment and unemployment, consumers, expenditure patterns, housing conditions, manufacturing industries, physically handicapped persons.

Health Service Records

Information can also be obtained from health service records kept by the health sector for administrative purposes (e.g. maternal mortality in hospitals, disease specific morbidity, information about birth weight, height during infancy and childhood arm circumference of children, information on immunization and prevention and control of certain endemic diseases).

Though health service records provide useful data for vital statistics, they

have their limitations unless kept properly. Their limitation is that they are kept for administrative purposes rather than monitoring purposes and that too only at places where health services are utilised.

Special Surveys

Household surveys undertaken by the members of a community, village agents, local officials or researchers are very useful in providing information on age-specific and disease-specific mortality. These (when carried out at the national level) are more frequently used for providing information for vital statistics/rates.

Disease Registers

Disease registers maintained by various hospitals provide data on mortality and morbidity for selected specific diseases and the treatment given.

Check Your Progress Exercise 1

1) Define the following:

a) Vital Rates

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b) Population Census

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c) Sample Survey

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2) How do you think vital statistics can be helpful for health programme planners and policy makers?

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1.5 FERTILITY MEASURES AND DETERMINANTS

As you know lower mortality rates in a community often indicate better nutritional status. How would you interpret lower fertility rates in a community? Do they indicate a good or bad state of nutrition? In India, high fertility rates and insufficient food availability at the household level for a sizeable section of the population, results in poor nutritional status especially of women. Lowering fertility rate is important not only for population control but also for improving women's health and nutrition. Let us now learn about the various fertility rates which are computed from the point of public health significance.

Crude Birth Rate (CBR)

The number of live births per 1000 estimated mid-year population of a community in a given calendar year. It can be calculated by using the following formula.

$$\text{Birth Rate} = \frac{\text{Number of live births in a year in a given area}}{\text{Estimated mid - year population}} \times 1000$$

The average population is ordinarily taken as the mid year population. Census counts are used for the calculation in the census year.

It is one of the major determinants of population growth in any country.

Birth rates are observed to be higher in the developing countries when compared to the developed world. For example, the birth rate in India is 20 (SRS 2018) when compared to 12 in Sweden, 11 in UK and 11 in USA. (World Development Indicator, 2020). The birth rates are however, declining gradually in the developing countries. In India, it has declined from 43 in 1960 to the present figure of 20.

The causes of high birth rate are:

- • Early puberty: Indian girls attain puberty early, i.e. between 12 and 14 years.
- • Early marriages
- • Poverty and low standard of living with its implications for child survival is associated with high birth rates and vice-versa.
- Low literacy rates especially the low female literacy level is associated with high birth rate.
- Value of children: Children are viewed as labour and economic assets leading to high fertility.
- Low prevalence of family planning and adoption: The use of family planning methods to adopt a small family norm is yet to make a substandard impact on the population explosion.

General Fertility Rate (GFR)

This is a measure of fertility. It is defined as the number of live births per 1000 women in the reproductive age group (15-49 years) in a given year

$$\text{GFR} = \frac{\text{Number of live births in an area during the year}}{\text{Mid - year female population in the age group of 15 - 49 years in the same area during the same year}} \times 1000$$

GFR is considered to be a better indicator of fertility than the crude birth rate as only the women in child bearing ages are included in the denominator. However, you may note that all the women included in the denominator need not bear children.

A more precise measure of fertility is available which is known as *Age specific fertility rate* where the number of live births are computed per 1000 women in a specific age group. This gives a better picture of fertility pattern and serves as a sensitive indicator of the achievements of the family planning programme.

The General Fertility Rate in 2018 (SRS 2018) in India was 70.4. It was higher in rural India (77.4) when compared to urban areas (56.7). It may interest you to know that GFR is lowest in Kerala (48.6) highest in Bihar (99.8) followed by Uttar Pradesh (91.4), Madhya Pradesh (91.2) and Rajasthan (86.0). The figure for age specific fertility rate indicates that the peak age of fertility in women is between 25-29 years. The fertility rate remains almost equally high in the age group of 20-24 years. There are urban-rural differences in the fertility rates and fertility is high in rural India.

Total Fertility Rates

Total Fertility Rate gives the average number of children a woman would bear through her entire reproductive life.

TFR is computed by summing up the age specific fertility rates per woman, an example is shown in Table 1.2.

Table 1.2: Calculation of total fertility rate (TFR) for a State for a given year

Age Group	Birth	Female Population	Age specific Fertility rate
10-14	300	165,000	10.8
15-19	11,000	179,000	61.5
20-24	20,000	192,000	104.2
25-29	22,000	222,000	99.1
30-34	20,000	213,000	93.9
35-39	10,000	212,000	47.2
40-44	2,000	210,000	9.5
45-49	500	200,000	2.5

Sum of age specific fertility rate = 419.7

TFR = 419.7 x 5 = 2098.5 Live births per 1000 female state residents in 2000 who live through reproductive years.

$$= \frac{2098.5}{1000} = 2.1 \text{ live births per woman.}$$

This fertility indicator is independent of the age and sex composition of the population. It indicates the approximate magnitude of completed family size.

The TFR of India was 2.2 in 2018. TFR was higher (2.4) in rural areas compared to the urban region (1.7) in 2018. It is again very high in Bihar (3.2) and Uttar Pradesh (2.9) when compared to other state. At the national level a declining trend of TFR has been noticed. TFR has declined from 3.2 in 2000 to 2.2 in 2018 (SRS Bulletin, 2018).

Net Reproduction Rate (NRR)

NRR is the average number of live female children that would be born to a woman, with the existing fertility and mortality pattern in the age group of 15-49 years.

NRR indicates the number of live female children that are going to replace a mother within the reproductive period.

The NRR in India was estimated to be 1.1 (World Population Prospects, 2008). According to the United Nations Population Prospects, India will fall below a NRR level of 1.0 in the period 2020-2025.

1.6 EPIDEMIOLOGICAL METHODS : MORBIDITY, MORTALITY AND THEIR DETERMINANTS

As you know, malnutrition is high in certain segments of the population e.g. children and pregnant mothers. Mortality rates in general as well as age-specific mortality rates reflect the incidence of malnutrition in a particular community. Let us learn about the various mortality rates and indices that are associated with malnutrition in a community. Any reduction in these mortality rates would require an improvement in nutrition, health care and environmental conditions.

Crude Death Rate (CDR)

Crude Death Rate is defined as the deaths per 1,000 population per year in a given Community.

CDR serves as an indicator of the health status of people. Though it is not considered as a perfect measure of health status, a decline in death rate indicates improvement in health status of the population. A sharp decline in death rate due to control of certain communicable diseases by improved health services without a similar decline in birth rate in our country is leading to a high growth rate.

The present death rate in India is 6.2 (SRS 2018) when compared to) 8.6 in Sweden, 9 in UK and 8.7 in USA (World Development Indicators, 2020). Death rate has declined in India from a figure of 8.5 in 2000 to the present figure of 6.2 in 2018 (SRS, 2018).

Infant Mortality Rate (IMR)

Infant Mortality Rate is defined as deaths under one year per 1000 live births in a given year.

$$\text{IMR} = \frac{\text{Number of deaths of infants under the age of 12 months in one year}}{\text{Total live births in the same area in the same year}} \times 1000$$

Infant Mortality Rate is considered as a sensitive index of health status and living standard of people. When you compare the mortality figures, you will observe that deaths below one year will be the highest when compared with any other age group. You will also see that the immediate causes of death among infants are different from that of adults. There are several other determinants of mortality which vary for different age groups, regions and communities. Major determinants of mortality include poverty, poor nutrition, illiteracy, poor sanitation, life style factors, pollution and adulteration, age at marriage, large family size and short spacing of births.

Diarrhoeal diseases, respiratory diseases and undernutrition are considered to be the main causes of high infant mortality. Any health programme specifically aimed at infants brings about a direct and quick reduction in infant mortality rate.

The decline in infant mortality can be achieved, as has been seen in the developed countries, by

- improvement of standard of living;
- control of communicable diseases;
- availability of better medicines like various antibiotics and their utilisation;
- availability of better health care facilities including safe deliveries and
- balanced diet and safe drinking water.

These are certain high priority interventions to control infant and child mortality. But many more are needed.

Infant mortality rate in India is 32 per 1000 live births (SRS, 2018). It is higher in rural areas (36) when compared to urban areas (23). When you compare these figures with infant mortality rate in developed countries (around 15 per 1000 live births), it is very high. But one encouraging factor in infant mortality is its trend of gradual decline, say from 53 in 2008 to 32 in 2018 (SRS Bulletin 2018). The decline is seen in both urban as well as in rural areas.

Neonatal Mortality Rate

Infant deaths occurring within 4 weeks or 28 days of birth are called neonatal deaths.

Neonatal mortality rate is defined as neonatal deaths per 1000 live births in a given population.

$$\text{Neonatal Mortality Rate} = \frac{\text{Number of deaths under 28 days of age}}{\text{Total live births}} \times 1000$$

It may be interesting for you to know that nearly half of total infant deaths occur during the first 28 days of life. Most of these deaths are considered to be caused by injuries occurring during delivery besides unscientific procedures followed in conducting delivery. Other causes of neonatal deaths are congenital disorders, prematurity, certain blood disorders, condition of placenta and cord, diarrhoeal diseases and acute respiratory infections. The neonatal mortality rate in India was 23 in 2018 (SRS 2018) which is still quite high compared to developed countries (2.8 for UK, 3.7 for USA, World Development Induction, 2020).

Perinatal Mortality Rate

Perinatal Mortality Rate is defined as the deaths (still births) occurring in late foetal life, i.e., 28 weeks of gestation or more and deaths under one week after birth in infants weighing over 1000g. at birth.

$$\text{Perinatal Mortality Rate} = \frac{\text{Late foetal deaths (still births) + deaths under one week in infants weighing over 1000 g at birth}}{\text{Total live + still births weighing over 1000 g at birth}}$$

Perinatal Mortality may be due to:

- i) complications in mothers during pregnancy or delivery
- ii) complications in placenta
- iii) disorders in the infant

You may however remember the following main causes:

- Low birth weight
- Injuries during birth
- Congenital malformations
- Infections after birth

Several factors have been identified to influence these main causes. They are:

- mother's age (early pregnancy, i.e., less than 19 years or late pregnancy, more than 35 years).
- space between pregnancies (less spacing).
- unsatisfactory progress of the pregnancy.
- poor nutritional status of the mother.
- low socio-economic status of the mother.
- lack of availability and non-utilisation of health services,
- improper delivery by non-qualified birth attendants.

Perinatal mortality is considered as a sensitive indicator for antenatal care (care during pregnancy), natal care (care during delivery) and post-natal care (care after birth).

Even in developed countries, the perinatal mortality is high and attempts are being made to control this mortality. In developing countries like our country

the infant mortality (mortality during the first year of life) is very high and masks the perinatal mortality rate.

The perinatal mortality rate in India is reported to be 22 when compared to figure of 5.1 in the developed country like U. K.

Post-Neonatal Mortality Rate

Post-neonatal mortality rate refers to the deaths of infants during 28 days to one year of their life per 1000 live births.

$$\text{Post - Neonatal Mortality Rate} = \frac{\text{Deaths of infants during 28 days to under one year}}{\text{Total live births}} \times 1000$$

Nearly 60% of all infant deaths occur between one month to below one year of the infant's life. These deaths can be prevented. This will become clear to you if you know what are the causes of deaths during this period of life. The causes are: diarrhoeal diseases; acute respiratory infections; communicable diseases for which immunization is available like whooping cough, diphtheria, tuberculosis; malnutrition and accidents. You will now realise that deaths during this period are mainly due to the vicious cycle set up by malnutrition and infection, one leading to the other eventually leading to high mortality rates.

Post-neonatal mortality rate in India is around 9 per 1000 live births when compared to 0.86 in Sweden.

Toddler Mortality Rate (TMR)

Children between 1 and 4 years are known as toddlers or pre-school age children.

The number of deaths in the 1 to 4 years age group children per 1000 such children is known as Toddler Mortality Rate.

The infant mortality rate has long been used as an indicator of the health status of a population. However, now it is being realised that 1-4 years mortality rate is much more sensitive. As you know pre-school age (1-4 years) is a time of combined nutritional and emotional stress. These children are much more prone to infection and malnutrition than infants as they suffer from dietary inadequacies due to poor complementary feeding and exposure to infections from the unsanitary environment. It has been estimated (according to a projection) that IMR in India as compared to developed countries was 10 times higher while the 1-4 mortality rate was 30 to 50 times higher.

The second year of life runs the highest risk of dying. Toddler mortality rate reflects the economic, educational, cultural and nutritional status of the community. So toddler mortality rate is taken as an indicator for several developmental programmes including nutrition programmes. It is now considered as the most sensitive indicator of the health status of the population.

In India, toddler mortality is 5.78 per 1000 children of the 1-4 years age group (UN IGME estimate) and it is observed that the decline in child

mortality is very slow reflecting that there is a need to strengthen the developmental and nutrition programmes in the population.

Maternal Mortality Rate

Maternal mortality rate is defined as number of deaths of mothers while pregnant or within 42 days of termination of pregnancy excluding accidental causes in every 100000 pregnant women.

$$\text{Maternal Mortality Rate} = \frac{\text{Number of deaths from puerperal (relating to child birth) causes}}{\text{Number of pregnant women in the area}} \times 100000$$

The maternal mortality rate reflects the quality of maternal services available to the population. It also indicates the proportion of morbidity among pregnant mothers usually at the rate of 1:20 i.e., for every death of one mother in pregnancy there can be 20 such women who are ill. The major causes of maternal mortality are toxaeimias, haemorrhage and sepsis. In addition, anaemia, associated heart and lung diseases, illegal abortions, are the other causes.

The key factors governing maternal mortality are:

- i) The mother's age: The ideal child bearing age is between 20 and 30 years. Conception at ages below 20 or above 30 years of the mother poses higher risk for the mother as well as the new born.
- ii) Birth interval: Short birth intervals or lack of spacing has higher risk for both the mother and the child.
- iii) Parity: High parity, *i.e.* more number of births in the case of the mother poses risk to her life.
- iv) Undernutrition: The prenatal nutritional status of the mother and low dietary intake during pregnancy causes a severe risk to the mother. Undernutrition leads to high maternal mortality.

All these four factors are also interrelated and play a greater role than medical causes in high maternal mortality in India and other developing countries.

Maternal mortality rate in India in 2016-2018 was around 113 per 100,000 pregnant women (SRS 2020). In developed countries, the figure is around 7 in UK 17.4 in United States and 4 in Sweden. (WHO, 2019).

Check Your Progress Exercise 2

- 1) Fill in the blanks:
 - a) IMR refers to the number of deaths below..... years of age per 1000 live births.
 - b) Neonatal mortality rate refers to the number of deaths under.....days of age per 1000 live births.
 - c) Toddler mortality rate refers to the number of deaths inyear old children per 1000 live births.
 - d)is the most sensitive indicator of health status of the children of a particular community.

2) How do you think estimation of the following helps in planning for public health?

a) Maternal mortality rate:

.....

b) Toddler mortality rate:

.....

1.7 OTHER POPULATION PARAMETERS

The vital statistics about other factors which can influence public health are life expectancy, sex ratio, literacy rates, etc. Let us learn about them in some detail.

Population Growth Rate

Growth rate is a measure of population change comprising addition of new borns and net migrants to the population and subtraction of deaths.

$$\text{Growth Rate} = \frac{\text{Live births} + \text{Net migrants} - \text{Deaths during the year}}{\text{Mid - year population}} \times 1000$$

Growth rate includes the natural rate of increase in population and also net migration of population. The growth rate is not uniform in the world. The rate is higher in India (0.97%) when compared to a rate of 0.58% in US (World Population Prospects, 2019).

Natural Increase Rate

Natural Increase Rate indicates net change in the population on account of births and deaths which are the two crucial vital events determining population change.

$$\text{Natural Increase Rate} = \text{Crude Birth Rate} - \text{Crude Death Rate}$$

The Natural Increase rate in India was reported to be 10.7 in 2015-2020 (World Population Prospects, 2019).

Sex Ratio

Sex ratio is defined as the number of females per 1000 males. Sex ratio under favourable social condition viz, higher literacy rates and good socio-economic conditions is in favour of females.

According to SRS, 2018, the sex-ratio of India stands at 899. This is a marginal improvement from the 2011 census, which had recorded 940 females for every 1000 males. According to the, SRS, 2018, the sex-ratio among major states ranged from 843 in Haryana to 957 in Kerala.

Life Expectancy

The average number of years an individual is expected to live with the existing schedule of mortality.

Life Expectancy at birth

Average number of years a new born baby can be expected to live with the existing schedule of mortality.

Life Expectancy at a given age

The average number of additional years a person would live from a given time considering the existing pattern of mortality.

Life expectancy is a sensitive measure of health status, considered as an indicator of socio-economic development. Increase in the expectancy of life is due to improvement of health status of the population. Life expectancy at birth is partly dependent on infant mortality. Hence, life expectancy is lower in developing than in developed countries because of the higher infant mortality rates in the former.

Calculation of expectancy of life is based on statistical abstraction from the existing age specific death rates. Life expectancy at birth in India is gradually rising and is presently 69.66 years for both sexes 69.5 is for male and 72 for female in 2019.

Low Birth Weight

Weight of the new born below 2500 g. at the time of birth is considered as low birth weight.

New borns with a low birth weight are considered to be at high risk and mortality rates are very high in this group. Those surviving will be highly prone to various infections and also growth retardation.

The number of children born with weight less than 2500g. in our country is in the range of 25-30 per cent.

Check Your Progress Exercise 3

1) Fill in the blanks:

a) Birth Rate = $\frac{\text{Estimated mid-year population}}{\text{Estimated mid-year population}} \times 1000$

b) Population Growth Rate = $\frac{\text{Mid-year population}}{\text{Mid-year population}} \times 1000$

c) General Fertility Rate = $\frac{\text{Mid-year female population in the age group of 15-49 years in the same area and same year}}{\text{Mid-year female population in the age group of 15-49 years in the same area and same year}} \times 1000$

So far, you have read about actual vital statistics of our country Let us now read about the Millenium Development Goals.

HIGHLIGHT 1**Millennium Development Goals**

Do you know about the Millennium Development Goals? In September 2000, 189 nations agreed on vision for the future: a world with less poverty hunger and disease, great survival prospects for their mothers and their infants, better educated children, equal opportunities for women, and a healthier environment; a world in which developed and developing countries worked in partnership for betterment of all. This vision took the shape of eight Millennium Development Goals. All UN member States including India agreed to try to achieve these goals by the year 2015. These Eight Millennium Development Goals are as follows:

1. to eradicate extreme poverty and hunger;
2. to achieve universal primary education;
3. to promote gender equality and empower women;
4. to reduce child mortality;
5. to improve maternal health;
6. to combat HIV/AIDS, malaria, and other diseases;
7. to ensure environmental sustainability; and to develop a global partnership for development.

These goals had specific targets and indicators. Table 1.3 gives information on the progress made by India towards achievement of these health related Millennium Development Goals achieved by 2015.

Table 1.3 : Health indicator targets to be achieved by 2015

	Health Indicators	Present	2015 Target ^d
1	Poverty and hunger		
	Population below minimum level of dietary energy consumption (%)	22 ^a (2004-2006)	19
	Under-weight (<-2SD) children (%) under 5 years	40 ^b (2005-2006)	27
2	Child mortality		
	Infant mortality rate (per 1000 live births)	40 ^c (2013)	27
	Under-five mortality rate (per 1000 live births)	49 ^c (2013)	41
	One-year-old children immunized against measles (%)	74 ^d (2009)	>90
3	Maternal health		
	Maternal mortality ratio (per 100,000 live births)	167 ^c (2013)	109
	Births attended by skilled health staff/safe deliveries (%)	87.1 ^c (2013)	84

4	HIV/Malaria/Tuberculosis		
	HIV prevalence in 15-49 years (% population)	0.27^e (2011)	to halt the growth of HIV/AIDS spread and also targets to reverse the spread
	Malaria Annual Parasite Incidence (Per 1000 Population)	0.88^f (2014)	to halt the growth of malaria incidence and also targets to reverse the spread
	Tuberculosis prevalence (per 100,000 population)	2.11^g (2013)	to halt the growth of TB incidence and also targets to reverse the spread
5	Water and sanitation		
	Population with access to improved water source (%) Combined Rural Urban	87.8^h 86.9 90.1 (2012)	81 80 94
	Population with access to improved sanitation (%) Combined Rural Urban	46.9ⁱ 3.7 81.4 (2011)	68 72 72

Sources:

- a- The state of food insecurity in the world 2009. Economic crisis – impacts and lessons learned. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome.
- b- National Family Health Survey (NFHS - 2005-06)
- c- Sample Registration System Bulletin 2013
- d- The Coverage Evaluation Survey, 2009
- e- HIV Estimation 2012, D/o AIDS Control
- f- Directorate of National Vector Borne Disease Control Programme
- g- Ministry of Health and Family Welfare
- h- National Sample Survey (NSS) 2012
- i- Census 2011

From table 1.3 it is very clear that India is moderately on track, while considering the targets of reducing child mortality as the sharp decline in the recent years in Infant Mortality and Under Five Mortality are likely to take us very near to the target. Also achieving the desired target for ensuring sanitation facility is lagging behind. Similarly, the Country has to strive more to reduce the maternal mortality to reach the desired level.

The MDG achieved its goal by 2015. The MDG's helped to lift more than 1 billion people out of extreme poverty, to work against hunger, to enable more girls to attend school than ever before and to protect our planet. Number of deaths of children under 5 yrs dropped. In developing countries under weight children under 5 yrs fell. New HIV infections declined and existing cases of TB declined. Target of access to safe drinking water was met. A further process was needed to agree and develop development goals from 2015-2030. In this context Sustainable Development Goals (SDG) were adopted by UN General Assembly. A brief review follows:

Sustainable Development Goals

On 25 September 2015, the 193 countries of the UN General Assembly adopted the 2030 Development Agenda titled “*Transforming our world: the 2030*”

Agenda for Sustainable Development". The Official Agenda for Sustainable Development outlines 17 Sustainable Development Goals and its associated 169 targets. This included the following goals:



Goals 1-3 directly address health disparities, primarily in developing countries. These three goals address key issues like Poverty, Health, Hunger and food security. Targets for these three goals are the following:

	TARGETS	
GOAL 1: No Poverty	1.1: By 2030, eradicate extreme poverty for all people everywhere.	1.2: By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty.
GOAL 2: Zero Hunger	2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	2.2: By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
GOAL 3: Good health and well being	3.1: By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	3.2: By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under 5 mortality to at least as low as 25 per 1,000 live births.

1.8 LET US SUM UP

In this unit you have learnt about various vital rates (fertility as well as mortality rates) how they are computed, their importance and their use in planning effective health services.

You have learnt that the 1-4 year mortality rate (toddler mortality rate) is the most sensitive indicator of the health status of a population. It is very high in our country, compared to the developed countries. Various schemes are in progress to achieve goals of health.

Fertility rate, birth rate, growth rate, general fertility rates are also high in our country. In this unit you have learnt about methods of computation of each of the fertility rates and their present figure.

1.9 GLOSSARY

Antenatal	: Before birth
Census	: Complete counting of all individuals on a fixed date
Congenital	: Estimating from birth or before
Crude	: Approximate
Gestation	: Pregnancy
Neonatal	: Infant of 4 weeks old or 28 days old
Puerperal	: Pertaining to child birth
SRS	: Sample Registration System
Vital	: Biological events with significance e.g. births, deaths etc

1.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) a) **Vital Rates:** When the vital statistics of morbidity/fertility/mortality are expressed as number of people in a state of illness or number of events (e.g. births/deaths) in relation to total population at risk, it is termed as vital rates.
 - b) **Population Census:** Complete counting of all individuals in a country on a fixed date. It is normally carried out once in ten years.
 - c) **Sample Survey:** Survey of a sample of population for finding useful information like births/deaths/marriages/divorces, etc. Vital Statistics provide useful information about the overall health/nutritional status of a population. It also tells policy makers which age group of population/area needs more health services. It also helps them in setting and evaluating objectives for achieving certain health related targets. In addition it helps them to estimate finances needed for the health programmes.
- 2) • Setting goals for improving health

- Planning health services
- Assessing impact of health services
- Comparative assessment of health status in two or more different groups of people

Check Your Progress Exercise 2

- 1) a) one
b) 28
c) 1-4
d) Toddler mortality rate (1-4 year mortality)
- 2) a) Maternal mortality rate reflects the quality of maternal services available to the population. In other words it tells about overall health/nutritional status of married women in the reproductive age group.
b) Toddler mortality rate is a sensitive indicator of the health status of the community because the first 1-4 years of life is the time of combined nutritional and emotional stress for a child. Children are at higher risk of dying at this age. It helps the programme planners for public health in knowing about the state of health of children and the extent of health services needed to reduce the mortality.

Check Your Progress Exercise 3

- 1) a) Number of live births during the year
b) $\text{Live births} + \text{Net migrants} - \text{death during the year}$
c) Number of live births in an area during the year.