SOME BASIC CONCEPTS AND DEFINITIONS IN DEMOGRAPHY

Section 1: Fertility

Crude Birth Rate (CBR): This is the simplest and frequently used measure of the period fertility, which requires minimum amount of information on the birth statistics. It is defined as a ratio of the total number of births during a given year and a given geographical area to the average (or mid-year) population ever lived in that year and geographical area.

Symbolically,

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

Where,

B : is the total number of live births during a given year and geographical area;
P : is the mid-year population that lived in that year and is approximated by the total mid-year population in that year and geographical area;
K : is a constant and usually taken as 1,000.

More importantly, *CBR* cannot be used to compare the levels of fertility for any two populations because they may differ widely in their age-sex, composition.

General Fertility Rate (GFR): General Fertility Rate is the simplest overall measure of fertility. It is defined as the number of births per year per thousand mid-year woman of the childbearing ages.

Symbolically,

$$GFR = \frac{B}{W_{15-44}} * K$$

where,

W_{15-44} *is the total number of women of child bearing age 15-44 at the mid point of the year in a given geographical area. Sometimes we use the total women from age group 15-49 in place of 15-44 depending upon the level of fertility in area.*

The main advantage of the GFR is that it includes the female population in their reproductive ages who are supposed to be exposed to the risk of giving birth. This measure generally used in population projection using component projection method.

General Marital Fertility Rate (GMFR)*:* General Marital Fertility Rate is the overall measure of fertility of married women. It is defined as the number of births per year per thousand mid-year married women within reproductive ages.

Symbolically,

$$GMFR = \frac{B}{W^m_{15-44}} * K$$

where, W^m_{15-44} is the total number of married women of child bearing age 15-44 at the mid point of the year. Like in GFR, we may take 15-49 age group in place of 15-44 in high fertility area

Age-Specific Fertility Rate (ASFR): The age pattern of child bearing in any population is the best revealed by computing age specific fertility rates. The age-specific fertility rates is the number of births per year per women in a given age group in a given year and geographical region,

Symbolically,

$$ASFR(\,_n f_X\,) = \frac{_nB_x}{_nW_x}$$

where, $_nf_x$: is the age-specific fertility rate of women aged x to x+n years.
nWx: is the number of women aged x to x+n years at mid-year in a given year and geographical area
nBx: is the number of births in a year to the women of ages x to x+n years in a given years and geographical region;
n is usually taken as 5 years.

Graphical Presentation of Age Specific Fertility Rates for India
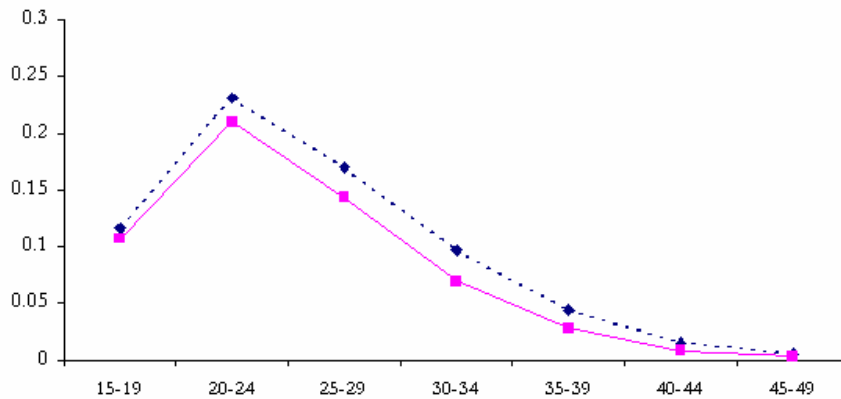
…… NFHS (1992-93) ____NFHS (1998-99),

(Adapted from Chander Shekhar, 2004)

Age-specific Marital Fertility Rates (ASMFR): ASMFR is measured as number of births per year in a given age group to the total number of married women in that age group at mid-year,

Symbolically,

$$ASMFR(_ng_x) = \frac{_nB_x}{_nW^m{}_x}$$

$$_ng_x = \frac{_nf_x}{_nM_x}$$

where,

nWᵐx: is the number of women aged x to x+n years at mid-year in a given year and geographical area

nBx: is the number of births in a year to the married women of ages x to x+n years in a given years and geographical region;

nMx: is the proportion of married women at ages x to x+n.
n is usually taken as 5 years.

Total Marital Fertility Rate (TMFR): **This is an over-all summary measure of marital fertility and is obtained by summing the age-specific marital fertility rate for each age of the childbearing span.**

In other words, total marital fertility rate is the number of children which a married woman of hypothetical cohort would bear during her life time if she were to bear children throughout her married life at the Age Specific Marital Fertility Rates for given year and if none of them dies before crossing the age of reproduction.

Symbolically,

$$TMFR = 5 * \sum_x {}_5 g_x \qquad \text{for x=15,20,…....…44}$$

Mean Age of Child Bearing ($\overline{M}$): This can be calculated from the knowledge of ASFRs:

$$\overline{M} = \frac{\sum_{15}^{40}(x+2.5) * {}_5 f_x}{\sum_{15}^{40} {}_5 f_x} \qquad \text{x=15, 20, 25……..40}$$

This is the weighted mean of the ages of childbearing, weights being the age-specific fertility rates. It is generally observed that in a population of high fertility, the mean age of fertility schedule is usually high and a large fraction of women continue to bear children in the latter years of childbearing. However, in case of the population with low fertility, child bearing (even if it starts late) stops earlier for most of the women, and therefore the mean age of fertility is found to be lower.

Total Fertility Rate (TFR): This is an over-all summary measure of fertility and is obtained by summing the age-specific fertility rate for each age of the childbearing span.

In other words, total fertility rate is the number of children which a woman of hypothetical cohort would bear during her life time if she were to bear children through out her life at the Age Specific Fertility Rates for given year and if none of them dies before crossing the age of reproduction.

Symbolically,

$$TFR = \sum_x f_x \qquad \text{for x=15,16,……….44}$$

$$TFR = 5 * \sum_x {}_5 f_x \qquad \text{for x=15,20,…...….44}$$

Table 1: Total fertility rates taken for India and its major states from SRS, 2002

India and major states	Total	Rural	Urban
INDIA	3.0	3.3	2.2
Andhra Pradesh	2.2	2.3	1.9
Assam	3.0	3.1	1.8
Bihar	4.3	4.5	3.1
Gujarat	2.8	3.2	2.1
Haryana	3.1	3.2	2.5
Himachal Pradesh	2.1	2.1	1.8
Karnataka	2.4	2.6	1.9
Kerala	1.8	1.8	1.7
Madhya Pradesh	3.8	4.2	2.5
Maharashtra	2.3	2.5	2.2
Orissa	2.6	2.7	2.0
Punjab	2.3	2.4	2.0
Rajasthan	3.9	4.1	2.7
Tamil Nadu	2.0	2.1	1.8
Uttar Pradesh	4.4	4.7	3.3
West Bengal	2.3	2.5	1.6

Gross Reproduction Rate (GRR): It indicates the number of daughters of a hypothetical cohort of women by the end of the reproductive life if she bears

the births according to a given schedule of age-specific fertility rates (taking only female births) without experiencing any mortality till the end of her reproductive life. In other words, this measures the capacity of women replace themselves as implied by the set of current fertility rates without taking into consideration the effect of mortality.

Symbolically,

$$GRR = 5\sum_{x=15} \frac{5B^f x}{5W_x}$$

where, $_5B^f_x$: no of female births to women aged x to X+n

In case birth are not tabulated by sex of new born babies, than

$$GRR = TFR * proportion\; of\; female\; births$$

GRR=TFR/(1+SRB)

Where SRB is sex ratio at birth and we assume that it does not very by age of women.
In case of GRR. mortality is not taken into consideration.

Net Reproduction Rate (NRR): NRR is a measure of the number of daughter that would be born to a cohort of women during their lifetime if they experienced a fixed schedule of ASFR and ASMR (age-specific mortality rate), therefore,

$$NRR = \frac{1}{1+SRB}\left[\sum_{x=15} {}_5f_x * \frac{L_x}{l_0}\right]$$

$$NRR = \frac{1}{1+SRB}\left[\sum_{x=15} {}_5f_x * \frac{L_x}{l_0}\right] \quad \text{taking } l_0=1$$

Where, *Lx* is the number of years lived by the women in a given age group. In other words, this is number of daughter who replaces their mothers.

Replacement Level Fertility: The level of fertility where women replace themselves with their offspring. In other words, this is the level of fertility that gives NRR=1. The total fertility rate of level 2.1 children per woman in a population is generally taken as replacement level fertility. The replacement level fertility is the precondition for population stabilization (process to achieve zero growth of population). However, if a population attains replacement level fertility does not mean the size of population get stabilized immediately. This

takes quite sometime and it happens because of population. In other words, acceleration in population growth persists due to a larger number of couples already existing in the reproductive ages in that population. This can be understood by a very simple example of car driving. A driver uses the breaks to stop a car, but it does not stop immediately, it takes few seconds to stop the car completely because acceleration available in the speed of the car.

India's National Population Policy (2000) has its medium-term objective to achieve replacement level fertility by the year 2010 for country as a whole. However, state level variations in the timing of attainment of replacement level fertility are far wide. Four larger northern states Uttar Pradesh, Bihar, Rajasthan and Madhya Pradesh may take few more years beyond 2010. On the other hand, all four southern states are likely to attain the replacement level by the date.

Children Surviving (CS): The total number of children, which a woman has born as live births and they are still alive, is called number of children surviving. In certain situation, children alive but they do not stay with the woman (mother), must be counted in the number of children surviving to a woman.

Children Ever Born (CEB): This fertility indicator is a cohort measure of fertility. CEB is the total number of children a woman has born till the date. This also includes those children, which a woman has born as live births but they died at any time later. Therefore, the following equation can be written by the definitions of CEB and CS.

Children Ever Born (CEB)=Children Surviving (CS) + Children Died (CD)

Parity: It refers to number of birth a woman has had i.e. if a woman has not given any birth she is referred as zero-parity woman. Therefore, a woman who has n number of births is called n-parity woman.

Birth Order: This refers to live birth a woman has had, i.e. if a woman has two births the order of last birth will be second. Therefore, Birth Order starts from one whereas parity starts from zero. Symbolically, to analyse n^{th} order birth women with $(n-1)^{th}$ the parity should be considered.

Parity	:	0	1	2	n-1
Birth Order :		1	2	3	n

According to the requirement, various fertility measures can be derived from the birth order and parity data.

Age-Order Specific Fertility Rates (AOSFR): It is defined as the ratio of the total number of birth of any order (i) in a given reproductive age group x to x+n to the total number of women in that age group. Symbolically,

$$AOSFR(i) = \frac{{}_{n}B^{i}{}_{x}}{{}_{n}W_{x}}$$

Parity Progression Ratio (PPR): This measure of cohort fertility provides the chance of having a child. The parity progression ratio (i) for a woman is defined as the probability that a woman of parity *i* will have at least one more child. It is defined as

$$a(i) = \frac{m_{i+1+}}{m_{i+}}$$

where m_{1+}, m_{2+}, m_{3+} ……………. m_{i+1} are the proportion of married women in a given year who have had 1 or more, 2 or more, ……………..*i*+1or more children.

Section 2: Mortality

Crude Death Rate (CDR): The CDR is the total number of deaths in a given year and a given geographical region to the per thousand mid-year (average) population in the same year and geographical region.

Symbolically,

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

where ***D****: is the total number of deaths in a given year and a given geographical region;*
P*: is the mid-year population of that region in given that year*
K *: is a constant and usually taken as 1.000.*

Note: CDR cannot be used to compare the levels of mortality for any two populations because age-sex compositions of the populations differ widely. Before comparing the crude death rate for two or more population, one should standardize these rates by age structure of the population.

Age-Specific Death Rate (ASDR): ASDR is the total number of deaths per thousand population in a specified age group in a given year and geographical region.

$$ASDR = \frac{{}_nD_x}{{}_nP_x} * 1000$$

where, ${}_nD_x$ is the total deaths in a given age group x to x+n and nPx is the total mid-year population in that age group. Generally, in most of the exercises and analysis, ASDR should be calculated separately by sex as death rates for male and female in different age groups are very different. ASDR more often presented by ${}_nM_x$, which is also called central death rate.

Note: If the line graph drawn between ASDR at y-axis and age at x-axis it shows J-shape pattern for developed countries and U-shape pattern for developing countries because in developing countries mortality rates are comparatively higher at younger ages.

Infant Mortality Rate (IMR): Number of infants dying under one year of age in a year in a given geographical region per thousand live births of the same year and geographical region.

Symbolically,

$$IMR = \frac{D_0}{B} * 1000$$

where,
D_0 *: is the number of infants who died before celebrating their first birthday*
B *: is the total number live births taken place in that year and geographical region.*

Infant mortality rate is treated as the most sensitive indicator of general health and medical facilities available in a community. If mortality conditions improve, the infant mortality rate is immediately affected. *IMR* has been used in many studies assuming a cause of high fertility levels. Many a time the data on infant deaths and births is not necessarily mapped year-to-year basis. In other words, infant deaths that are taking place in a calendar year are not necessarily from those infants who were born in that calendar year. In such a situation, the estimated value of *IMR* will be biased. Therefore, one must adjust such rates by using following mechanism.

Year	Live Births	Infant deaths to the	
		Same Year Birth	Previous Year Birth
1	B1	DS1	D(P1)
2	B2	DS2	D(P2)
3	B3	DS3	D(P3)

The *IMR* will be made a probability measure only after adjusting the rates. The numerator and denominator adjustment methods are used more frequently for this purpose.

(a) Numerator Separation Method:

$$IMR = \left[\frac{D2*(1-f)}{B1} + \frac{f*D2}{B1} \right] * 1000$$

(b) Denominator Separation Method:

$$IMR = \left[\frac{D2}{(1-f)B2 + fB1} \right] * 1000$$

where D2 = DS2+DP2,   f=DP2/D2

DS2 : is the deaths of infants among second year cohort
DP2 : is the deaths of infants among previous year cohort

f:	0.40	0.33	0.25	0.20	0.15	0.05
IMR:	200	150	100	50	25	15

Table 2: Infant mortality rates for India and its major states from SRS 2002.

India and major states	Total	Rural	Urban
INDIA	63	69	40
Andhra Pradesh	62	71	35
Assam	70	73	38
Bihar	61	62	50
Gujarat	60	68	37
Haryana	62	64	51
Himachal	61	63	28
Pradesh	55	65	25
Karnataka	10	11	08
Kerala	85	89	56
Madhya Pradesh	45	52	34
Maharashtra	87	90	56
Orissa	51	55	35
Punjab	78	81	55
Rajasthan	44	50	32
Tamil Nadu	80	83	58
Uttar Pradesh	49	52	36
West Bengal			

Child Mortality Rate: It is defined as the total number of deaths of children aged 1 to 4 in given year and geographical region and to the 1000 population of the same age in that year and same geographical regions.

$$Under5Mortality = \frac{\text{Number of deaths of children aged 1 to 4 year in given year and region}}{\text{total population aged 1 to 4 in the given year and a given region}} * 1000$$

Neonatal Mortality Rate (NMR): Number of infants dying within the first month (4 weeks)/(upto 28 days) of life in a year and geographical region per thousand live births of the same year and geographical region.

$$NMR = \frac{\text{Deaths of Infants upto 4 weeks}}{\text{Number of live births}} * 1000$$

Early Neonatal Mortality Rate (ENMR): Number of infant deaths during the first seven days of life in a year and geographical region per thousand live births in the same year and geographical region.

$$ENMR = \frac{\text{Deaths of Infants in the first week of life}}{\text{Number of live births}} * 1000$$

Perinatal Mortality Rate (PMR): Number of stillbirths/late foetal deaths (after 28 weeks of gestation) plus deaths with in first week of life in a year and geographical region per thousand births (live and still) in a year and geographical region.

$$PMR = \frac{\text{Foetal Deaths after 28 weeks of gestation} + \text{deaths of newborns within 7 days}}{\text{Number of live births during the same year}} * 1000$$

Post Neonatal Mortality Rate (PNMR): Number of infant deaths after 28 days to less than one year (between 4 weeks to 52 weeks) of age per thousand live births in a given year.

$$PNMR = \frac{Number\ of\ deaths\ of\ Newborns\ between\ 4\ weeks\ and\ less\ that\ 1\ year\ old\ in\ a\ year}{Number\ of\ live\ births\ during\ the\ same\ year} * 1000$$

Maternal Mortality Ratio (MMR): Number of deaths of women while pregnant or within 42 days of termination of pregnancy from any cause related to pregnancy/childbearing and childbirth per 100,000 live births in a given year.

$$MMR = \frac{Pregnancy/\ childbirth\ /abortion\ related\ Deaths\ of\ pregnant\ women\ and\ women\ after\ terminatio\ n\ of\ pregnancy\ within\ 6\ weeks}{Number\ of\ live\ births\ during\ the\ same\ year} * 100,000$$

Maternal Mortality Rate (MMRT): Number of maternal deaths while pregnant or within 42 days of termination of pregnancy from any cause related to pregnancy/childbearing and childbirth per 100,000 women in reproductive ages 15-49. It is equal to GFR*MMR, Where GFR is measured per woman.

$$MMR = \frac{Number\ of\ maternal\ deaths\ of\ women\ in\ age\ 15-49}{Number\ of\ women\ in\ age\ 15-49\ in\ a\ given\ year} * 100,000$$

Foetal Death: It is used for deaths prior to the complete expulsion or extraction from its mother of *a product of conception* at any point of time of pregnancy.

Still Birth: It is used for death of foetus after completing 28 weeks and till the time of birth.

Incidence Rate: is defined as the number of NEW cases of specified diseases occurring in a defined population during a specified period of time. It is given by the formula

$$Incidence\ Rate = \frac{Number\ of\ new\ cases\ of\ specified\ disease\ during\ a\ given\ time\ period}{Population\ at\ Risk} * 1000$$

Prevalence Rate: It is defined as the number of all current cases (old and new) of a disease at one point in time in relation to a defined population. It is given by the formula

$$Pr\ evalence\ Rate = \frac{Number\ of\ new\ and\ old\ cases\ of\ specified\ disease\ existing\ at\ a\ given\ point\ in\ time}{Estimated\ population\ at\ the\ same\ point\ in\ time} * 1000$$

Time Reference for Mortality in Childhood and Infancy
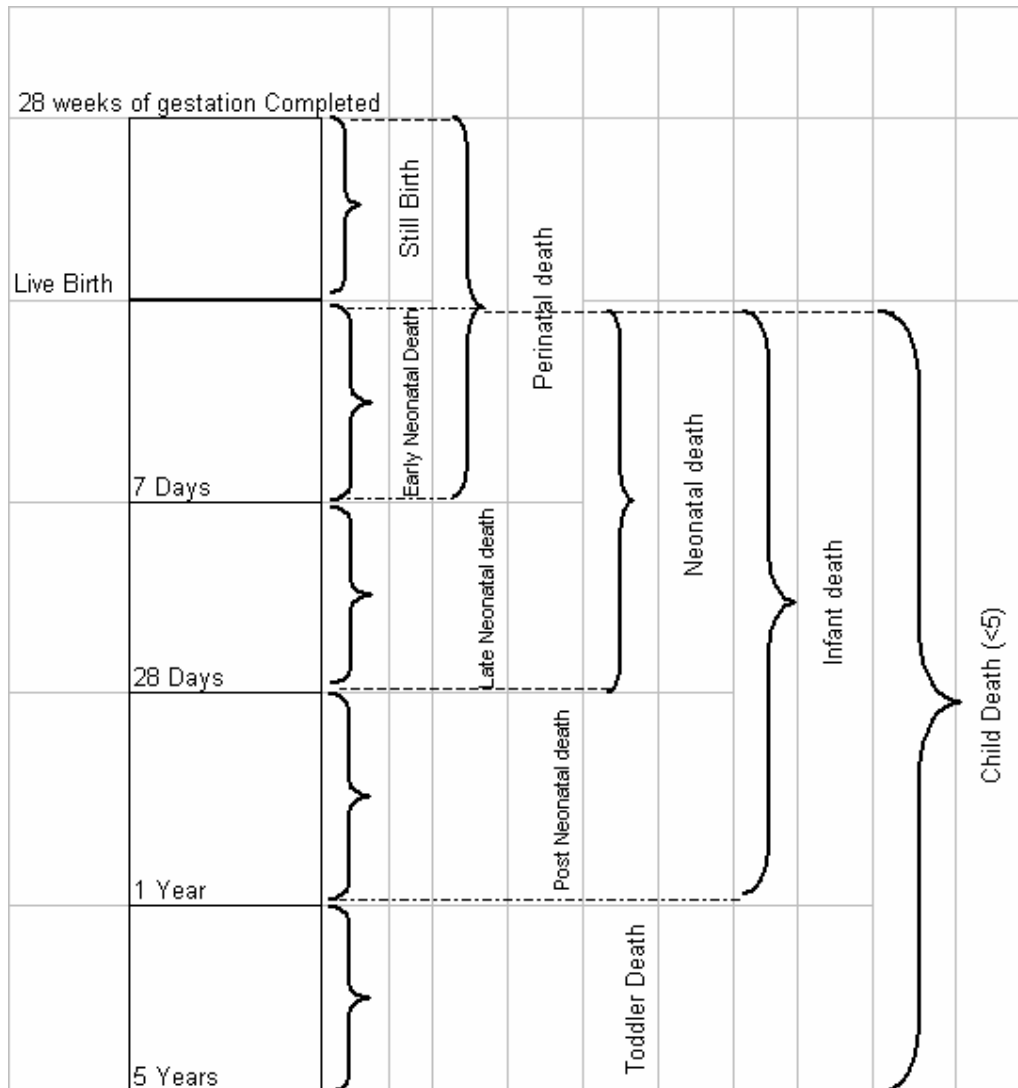
Life-table Columns:

Life table combines mortality experience of a population at different ages in a single statistical model. It describes the life history of a hypothetical group, or cohort of people, as it is depleted gradually by health. It can be used to answer the question such as what proportion of the born children will live to celebrate their 25th birth day and how many of them will be able to cross 50 years of age and so on. The basic input in the life table is Age-Specific Death Rate (ASDR) that can be converted into probability of dying before reaching

age x ($_nq_x$). There are several formulae given to estimate the values for $_nq_x$ from the given values of ASDR.

Col 1: Age Groups (X to X+n)

Col 2: Probability of dying before reaching age X+n ($_nq_x$)

There are various methods available in population studies that provide the opportunities to estimate the probability of dying before reaching a given age by age specific mortality rates.

Col 3: The number of persons living at exact age 'X' (l_x)

This columns is taken arbitrarily, generally it is taken as 100000, which called radix of the life table.

Col 4: Number of deaths out of l_x persons during the period of next n years ($_nd_x$)

$$_nd_x = l_x * (_nq_x) = l_x - l_{x+1}$$

Col5: The number of person years lived by the lx during the interval x to x+n (nLx)

$$_nL_x = 1/2(l_x + l_{x+1})$$

For age 0 and 1, the following formula is used

$$L_0 = 0.3l_0 + 0.7l_1$$
$$L_1 = 0.3l_1 + 0.7l_2$$

Col6: Total lifetime after age x. This is total number of person years lived by the survivors l_x in the future

$$Tx = _nL_x + _nL_{x+n} + \ldots\ldots\ldots\ldots\ldots L_y$$

Where, $\quad T_y = L_y = l_y/m_y$

And m_y denoted the central death rate of the last age

Col 7:

Expectation of life at birth (e^0_0): Average number of years a newborn
child is expected to live under current mortality conditions. It is the last column of life-table.

$$e^0_x = T_x/l_x$$

$$e^0_0 = T_0/l_0$$

Section 3: Frequently used Terminology in Demography

Literacy Rate: This defines as the number of literate individuals in given year and geographical area express in percentage to the population eligible population (age 6+) in a given year and geographical area.

$$LiteracyRate = \frac{Total\,number\,of\,literate\,persons\,(age\,6+)\,in\,given\,year\,and\,geogarhich\,area}{Total\,population\,age\,6\,and\,above\,in\,a\,given\,year\,and\,geographial\,area} * 100$$

Gross Enrollment Rate (GER): Number of pupils enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the relevant official age groups.

Net Enrollment Ratio (NER): Number of pupils in the official age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group. i.e. for primary level NER can be written as follows;

$$NER = \frac{Total\,number\,of\,pupils\,of\,age\,6 - 11\,enrolled\,in\,primary\,level}{Total\,population\,in\,age\,6\,and\,11} * 100$$

Note: In some cases Gross Enrollment Rate can be more than 100 percent because of repetition of pupils in the same class, where as Net Enrollment Rate will never go beyond 100 percent.

Sex Ratio at Birth: there is no one to one correspondence in the male and female births. Biologically, male and female foetuses do not have equal chance to survive during the gestation period. Male foetus is relative higher chance to survive during the gestation period than female foetus. An examination of the sex ratios of registered births for a large number of countries over a wide range of periods indicated that sex ratio at births generally comes around 105 i.e. 105 male babies per 100 female babies.

Sex Ratio: Number of females per thousand males in a population. In international context, it is the reverse and given in terms of per hundred instead of per thousand.

Symbolically,

$$Sex\ Ratio = \frac{P^f}{P^m} * 1000$$

where, P^f and P^m total population of female and total population of male respectively.

Populati
on Density: Number of persons per sq. km. of total surface area. According to 2001 census, the population density in India is 319 persons per square kilometer.

Growth Rate: The growth rate of a population refers to the number of individuals growing per year per 100 individuals of that population. There are three methods mostly used to estimate population growth.

Linear: Linear growth rate can be calculated from the following formula;

$$r = \frac{1}{t} * \left[\frac{P_t - P_0}{P_0} \right]$$

where,   r : is the linear growth rate of population between time 0 to t
        t : is the time interval between one census to other census
        Pt : is the population at t time point (generally recent year population)
        P_0 : is the population at initial time point

Geometric: Geometric growth rate can be calculated from the following formula;

$$r = Anti\ log_e \left[\frac{1}{t} * log_e \left[\frac{P_t}{P_0} \right] \right] - 1$$

where,   r : is the geometric growth rate of population between time 0 to t
        t : is the time interval between one census to other census
        Pt : is the population at t time point (generally recent year population)
        P_0 : is the population at initial time point

Exponential: The exponential growth rate is most appropriate to study the growth rate of the population because it works on the concept of logistic growth. Exponential growth rate of a population can be calculated as follows;

$$r = \frac{1}{t} * log_e \left[\frac{P_t}{P_0} \right]$$

where,   r : is the exponential growth rate of population between time 0 to t

        t : is the time interval between one census to other census

        Pt : is the population at t time point (generally recent year population)

        P_0 : is the population at initial time point

N.B.: Calculated values should be multiplied by 100 to get the growth rate in term of percentage in all the three type of growth rate.

Balancing Equation: The most basic method in demography for decomposing population change into its components

$$P_t - P_0 = B - D + I - O$$

Where P_t = population at the end of the period; P_0 = population at the beginning of the period; B = births during the period; D = deaths during the period; I = in-migration during the period; and O = out-migration during the period.

Dependency Ratio (DR): proportion of children less than 15 and elderly 65+ relative to the population of "working ages" i.e. 15-64. It is a sum of young-dependency ratio (Child Dependency Ratio) and Old Dependency Ratio (Aged Dependency Ratio).

$$Child \ Dependency \ Ratio = \frac{Total \ Population \ age \ (0 - 14)}{Total \ Population \ age \ (15 - 64)} * 100$$

$$Aged \ Dependency \ Ratio = \frac{Total \ Population \ age \ (65+)}{Total \ Population \ age \ (15 - 64)} * 100$$

Age-Pyramid: It is detailed picture of the age-sex structure of a population. Consisting of bars representing age groups in ascending order pyramided on one another. The number, or percentage, in an age group is indicated by length of its bar from central axis. Absolute pyramids show differences in overall size of total population and in number at each age. Percent pyramids show relative differences in population size at each age-sex group.
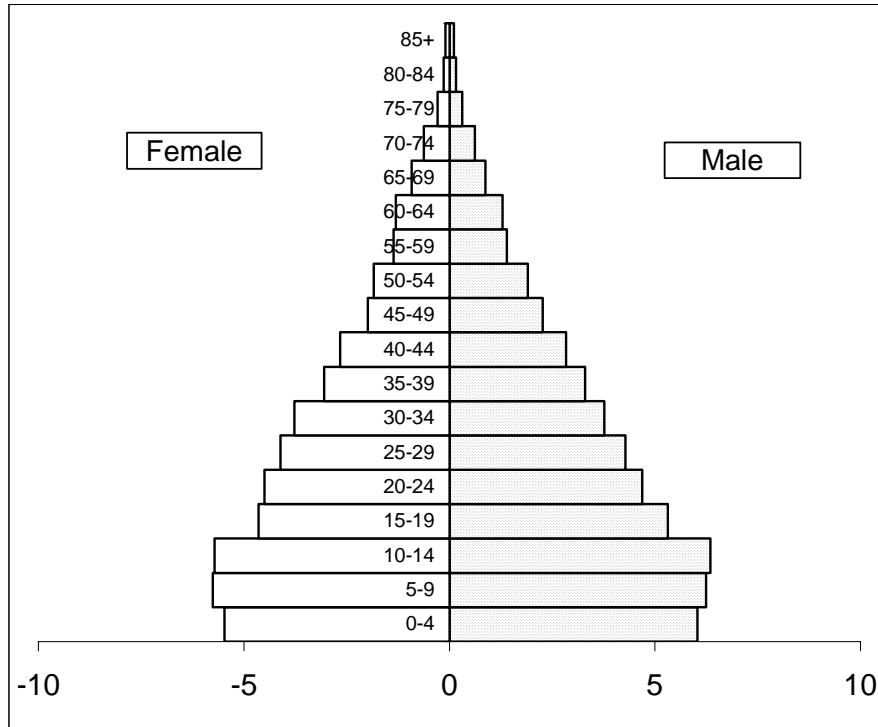
Note: Age-distribution has been taken from SRS, 1999 and Population from Census of India, 2001.

Concept of Stable, Stationary and Quasi-Stable Population

Stable Population: If a population increase (or decrease) at a constant rate, the population is said to be *stable population*. Further, a stable population holds the following properties;

(a) It has fixed age and sex distribution over time
(b) Population is closed for migration either way (out or in)

Stationary population: If the size of a population is constant and its composition according to age and sex also remain constant overtime, then such a population is known as *stationary population*. The life-table population is said to be stationary population. The properties of stationary population are as follows;

(a) Births and Deaths are equal in number and are uniformly distributed over the years
(b) Emigration is equal to Immigration equal during the years (population closed to migration)

Quasi-Stable Population: If the fertility in a population attains to constant rate and the mortality rate in that population still changing gradually.

Section 4: Family Planning

Acceptor Data: A woman who visits the programme to receive service and/or advice with the intention of using it can be termed or recoded as an acceptor, irrespective of whether it beings her first visit or any subsequent visits. There are two terms again prescribe the clarity in programme implementation from acceptors- Programme acceptors and Method acceptors. A person can become a programme acceptor only once when she/he visits a programme for the first time. Method acceptors involved such acceptor who may or may not come to programme to change the earlier methods. Later one is based on the method that how many persons have chosen a specific method. Therefore, the same woman/man may be counted twice under a programme if she/he has changed her/his method.

User Data: User data is an important dimension to study of programme impact is to get the number of women who are utilizing the service under a programme at a given point of time (may be in a year). This takes into account not only the acceptors of a particular year but also the previous years. It provides how many of these cumulated acceptors are currently practising the programme methods. User is a prevalence concept.

Couple Protection Rate: The service statistics provides us the concurrent data on the acceptors of year-to-year basis. In a programme the acceptors of IUD and sterilization are assumed to be protected to the pregnancies. In addition, generally half of the pills and condom acceptors are assumed to be protected. Now adding the acceptors from all the above four methods and dividing by the total eligible women (married women in reproductive ages) in percent provides the couple protection rate. However, this rate does not take into account the attrition rate for eligible couples in case of sterilization where an acceptors is assumed to be protected forever and retention rate in case of IUD acceptors. To get the purely programme effect one needs to adjust the attrition and effects. Following procedure can be seen to adjust such effects;

For sterilization:

(I)   on an average a woman reaches menopause at age of 45,
(II) mortality for the sterilized couple is the same of the general population and deaths are uniformly distributed
(III) husband are on an average 5 year older than the wife

Let X= average age at tubectomy or the age of the wife at the time of husband's vasectomy.

$S(m,i,j)$ = proportion of males aged i surviving upto age j
$S(f,i,j)$ = proportion of females aged i surviving upto age j
$S(c,i,j)$ = proportion of wives aged i surving in the married upto age j

=S(f,i,j) * S(m,i+5,j+5)

The total protection conferred by a sterilization is (45-x) if both husband and wife will survive till the wife reaches the age of 45; otherwise It would be ½(45-x) if either or both die before the wife reaches the age of 45.

So adjustment factor for sterilization

AF= (45-x) S(c,x,45) + ½ [1-S(c,x,45)]

For IUD:

In case of IDU, a life table technique is used to get the retention rate for IUD acceptors where women are followed up during a specific (generally the life span of IUD). Thus the estimated retention rate can be represented by R(t)

CYP (index)= Sterilization cases * AF+IUD cases*R(t)+1/2 (Pills + condom) acceptors

Generally for last 30 years (15-45) sterilization acceptors are considered to get CYP. For IUD only last three years IUD acceptors are considered because in India available IUD has the life of three years. in case of Pills and condom only one current acceptor are considered.

Effective Couple Protection Rate: All contraceptive methods do not have equal effectiveness (success rate) against the protection of pregnancy. Therefore, we need to multiply the number of couples recoded with specific method by its user-effectiveness. The couple protection rate calculated with the obtained figures is called effective couple protection rate.

Contraceptive Prevalence Rate: It is important to study the number of user relation to number of eligible women. Eligible women constitute the married women in reproductive age groups. The rate is defined as the total number of users per 100 eligible women at give time t.
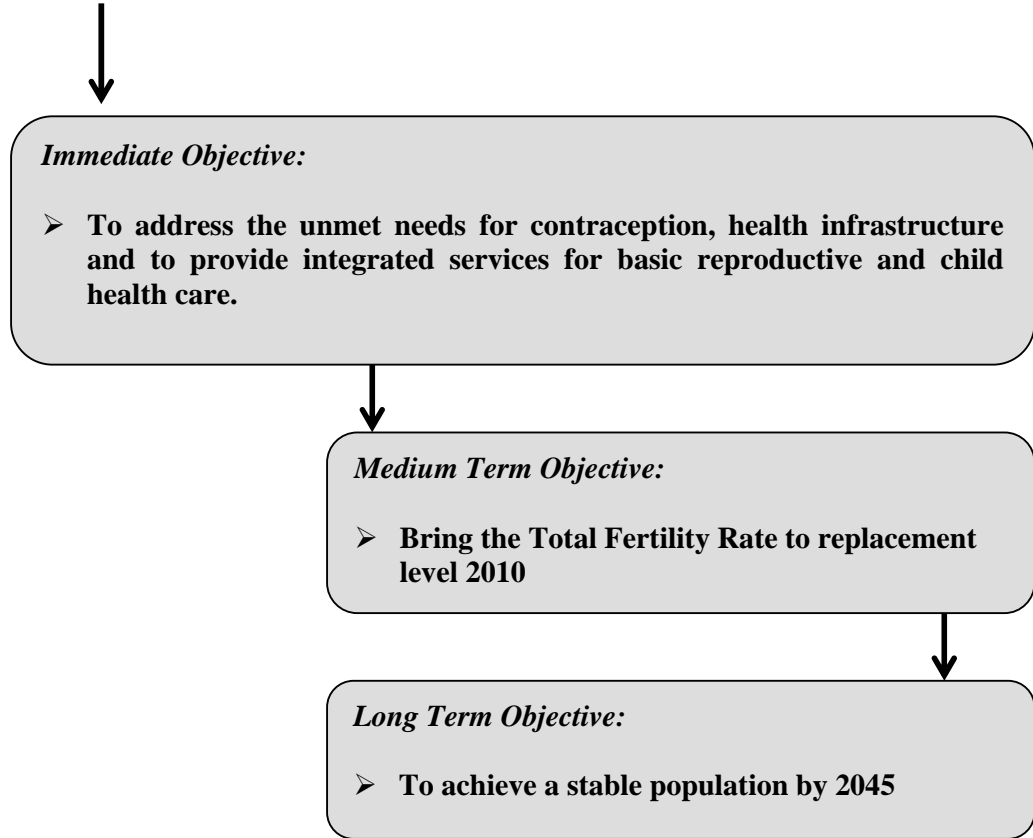
$$CPR = \frac{U}{EW} * 100$$

where, U: is the total number of user at given year t.

EW: is the total number of eligible women (married women in age group 15-44/15-49)

Birth Interval: birth interval is an indirect and intermediate variable to measure the effect of ongoing family planning programmes. This can be calculated as time elapse between two consecutive births, which is mentioned as close birth interval. Open birth interval is calculated as the time gap between marriage and first birth or time gap between survey date and last birth. If the average birth interval in a society for a specific year is higher or

increases over the period, it shows the success of the ongoing programme in that year and social settings.

Objectives of National Population Policy (2000)

Immediate Objective:

➢ **To address the unmet needs for contraception, health infrastructure and to provide integrated services for basic reproductive and child health care.**

Medium Term Objective:

➢ **Bring the Total Fertility Rate to replacement level 2010**

Long Term Objective:

➢ **To achieve a stable population by 2045**

National Socio-Demographic Goals for 2010

1. Address the unmet need for basic reproductive and child services, supplies and infrastructure.

2. Make school education up to age 14 free and compulsory and reduce dropout rate at primary and secondary school levels to below 20 percent for boys and girls.

3. Reduce IMR to below 30 per 1000 live births.

4. Reduce maternal mortality rate to below 100 per 100,000 live births.

5. Achieve universal immunization of children against all vaccine preventable diseases.

6. Promote delayed marriage for girls.

7. Achieve 80 percent institutional deliveries and 100 percent by trained persons.

8. Achieve universal access to information/counseling and services for fertility regulation and contraception with a wide basket of choices.

9. Achieve 100 percent registration of birth, deaths, marriage and pregnancy.

10. Contain the spread of AIDS and promote great integration between the management of RTI and STI and the National AIDS Control Organization.

11. Prevent and control communicable diseases.

12. Integrate Indian Systems of Medicine (ISM) in the provision of reproductive and child services and in reaching out to household.

13. Promote vigorously the small family norm to achieve replacement level of TFR.

14. Bring about convergence in implementation of related social sector programs so that family welfare becomes a people centered programme.