INTRODUCTION

- **Fecundity:** **The physiological capacity of women to reproduce.**

- **Fertility:**
  - **In demography,**
    - **it is the actual birth performance of a group of women or to the relative frequency with which the birth occurs in total population or in the population exposed to it. This is the Result of fecundity**

Importance

- Fertility behavior of a given time gives shape to the future age-sex structure

- Hence, studying the fertility behavior has an implication on the overall welfare planning process

- Produce the alterations in the size of a population

Sources of Data:

There are three sources:

- ❑ Registration of vital events

- ❑ Sample Registration System (SRS)

- ❑ National family health surveys (NFHS)

MEASURES OF FERTILITY

Uses:

- Quantify the birth performance of a population over a period of time.

- Used to compare the fertility levels of a number of population, during a particular time interval

- Exhibit a time trend in fertility in a population in the study of differential fertility by various socio-economic, racial and ethnic groups.

Crude Birth Rate (CBR)

❑ **Ratio of the total number of live birth to the average population ever lived during a given year and geographical area.**

$$\text{Crude Birth rate} = \frac{B}{P} \times 1000$$

❑ Where B = Total No. of live births in a given year & area.

P= Mid year population of the year

- **Merits**
  - Requires minimum data on fertility
  - Easy to interpret
- **Demerits**
  - Cannot be used to compare the levels of fertility for any two populations because they may differ widely in their age-sex composition.
  - It is not a fertility rate as it includes all the population either exposed or not exposed to the risk of child bearing.

General Fertility Rate (GFR)

➢ Simplest measure of fertility

➢ Defined as the number of births per year per thousand mid-year woman of the child bearing ages.

$$GFR = \frac{B}{W_{15-49}} \times 1000$$

W_{15-49} = total number of women of child bearing age 15-49 at the mid point of the year in a given geographical area.

Advantages:

❖ It includes the female population in their reproductive ages who are supposed to be exposed to the risk of giving birth.

❖ Generally used in population projection using component projection method.

- Overall measure of fertility of married women.

- It is the number of births per year per thousand mid- year married women within reproductive ages.

Symbolically,

$$GMFR = \frac{B}{W^m_{15\text{-}49}} \times 1000$$

$W^m_{15\text{-}49}$ = total no. of married women of child bearing age 15-49 at the mid-point of the year

Age Specific Fertility Rate (ASFR)

- Age pattern of child bearing in any population is the best revealed by computing age specific fertility rates.

- It is the number of births per year per women in a given age group in a given year and geographical area.

$$ASFR(_nf_x) = \frac{_nB_x}{_nW_x}$$

$_nB_x$ = No. of Births to the women of ages x to x + n yrs in a given yr and area.

$_nW_x$ = No. of women aged x and x + n years at mid-year in a given year and area

n is usually taken as 5 years.

Age Specific Marital Fertility Rate(ASMFR)

- Measured as the ratio of no. of births per year in a given age group to the total no. of married women in that age group at mid-year.

$$\text{ASMFR } (_ng_x) = \frac{_nB_x}{_nW^m_x} = \frac{_nf_x}{_nM_x}$$

$_nW^m_x$ = no. of women aged x to x + n years at mid-year in a given year and area

$_nB_x$ = no. of births in a yr to the married women of ages x to x+n yrs in a given yrs and area

$_nM_x$ = proportion of married women at ages x to x+n

Total Marital Fertility Rate (TMFR)

- An over all summary measure of marital fertility,

- Obtained by summing the age- specific marital fertility rate for each age of the child bearing span.

$$\text{TMFR} = 5 \times \sum_{x} {}_{5}g_{x}$$

for x= 15,20.25…40

In this case n=5

Total Fertility Rate (TFR)

Number of children which a women 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.

$$TFR = \sum_x f_x \quad \text{for single year ASFR.}$$

$$TFR = 5 \times \sum_x {}_5f_x \quad \text{for 5year ASFR.}$$

For x = 15, 20, 25…….

In this case n=5

Gross Reproduction Rate (GRR):
Measure of population replacement

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 reproductive life .

$$GRR = 5 \sum_{x=15} \frac{{}_5B^f x}{{}_5W_x}$$

${}_5B^f x$ = no. of female births to women aged x to x + 5.

Limitation of GRR: It dose not consider the mortality of the cohort of women.

$$GRR \simeq \frac{f_B}{B} \times TFR \quad , \quad \frac{f_B}{B} = \frac{\text{No. of female Births}}{\text{Total No. of Births}}$$

Net Reproduction Rate (NRR):

NRR is GRR adjusted for mortality schedule of cohort of women

Number of daughter that would be born to a cohort of women during their lifetime if they experience a fixed scheduled of ASFR and ASMR , therefore,

$$\text{NRR} = 5 \sum_{x=15} \frac{{}_n B_x}{{}_5 W_x} \times {}_5^f \Pi_x$$

$${}_5^f \Pi_x = \text{survival rate} =$$

$$\frac{\text{Mean size of the cohort of women of age x to x+5}}{\text{Initial size of the cohort}}$$

(Continued……….)

Replacement Level Fertility:

- ☐ Women replace with their offspring
- ☐ This is the level of fertility that gives NRR=1.
- ☐ Generally takes the value, the total fertility rate of level 2.1 children per women in a population.
- ☐ It is the precondition for population stabilization (process to achieve zero growth of population)

❖ **Children Surviving (CS)**

   Total number of children , which a women has born as live births and they are still live.

❖ **Children Ever Born (CEB)**

   It is a cohort measure

   It is the total number of children a women has born till the date. Also include those children , which a women has born as live births but they died at any time later.

❖ **Parity**

   Number of birth a women has given

Exercise:

The following table gives the population of a country for the year 1951, together with the estimated numbers of births and deaths based on a special vital statistics enquiry conducted in the country. Calculate

1. Crude death rate for the total population and for males and females.

2. Crude birth rate for the total population,

3. General fertility rate,

4. Total fertility rate,

5. Gross reproduction rate, and

6. Net reproduction rate.

Age	Males		Females		Births		Survival Rates
	Population	Deaths	Population	Deaths	Males	Females	
0 - 04	442532	18623	434980	17308			
05 - 09	419042	1809	416736	1709			
10 - 14	393543	984	384616	1638			
15 -19	308269	1233	314056	1329	3578	3343	0.914
20 -24	257852	1289	269340	1481	7293	6690	0.899
25 - 29	230629	1776	236187	1677	6775	6361	0.844
30 - 34	204188	1633	203477	1465	4233	4187	0.868
35 - 39	182270	1588	176534	1289	2999	2685	0.852
40 - 44	162509	1967	145037	1233	593	725	0.834
45 - 49	128784	2138	122949	1352	129	128	0.819
50 - 54	102971	1905	96589	1188			
55 - 59	80717	2478	78311	1605			
60 - 64	58899	3099	58142	1980			
65 - 69	37797	2428	39099	2468			
70+	45099	5981	48866	7175			