# FACULTY OF NURSING

# Population dynamics, Demographic trends

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# Introduction

"A population is the number of organisms of the same species that live in a particular geographic area at the same time with the capability of interbreeding"

Population have a major impact on the development and the achievement of socially inclusive and economic development. It influences consumption and availability of natural resources and together with consumption level and efficiencies determine environmental sustainability.

- The health of an entire population is determined by aggregating data collected on individuals.
- Judgments regarding the level of health of a particular population are usually made by comparing one population to another, or by studying the trends in a health indicator within a population over time.

# HEALTH STATUS

❑Multi-dimensional concept : Measured in terms of

1) absence of physical pain, physical disability, or a condition that is likely to cause death

2) emotional well-being

3) satisfactory social functioning.

# Population dynamic

It is the branch of life sciences that studies short-term and long-term changes in the size and age composition of populations and the biological and environmental processes influencing those changes.

**or**

Population dynamics refers to how populations of a species change over time. It is focuses on these changes how, when, and why they occur in environment.

## Demography

is the branch of science which deals with the study of human population. An accurate idea of the vital events like crude rate, birth rate, and changing pattern of population is of paramount importance for a nation.

# Key feature of population

- Size

- Density

- Dispersion

  (clumped, even/uniform, random)

1. Size:

   Number of individuals in an area.

- Growth Rate: Birth Rate (natality) - Death Rate (mortality)

(How many individuals are born vs. how many die)

- Birth rate ($b$) − death rate ($d$) = rate of natural increase ($r$).

2. Density:

Measurement of population per unit area or unit volume.

- Formula:

$$D_p = N/S$$

- Population Density = No. of individuals ÷ Unit of space

- Dispersion

  It describe their spacing relative to each other or it is the tendency for population to be found in tight cluster, dispersed across a large landscape.

  Three type of dispersion;

-    Uniform
-    Random
-    clumped
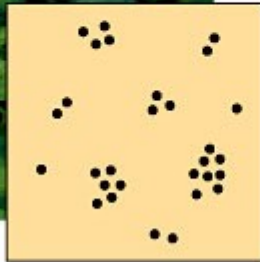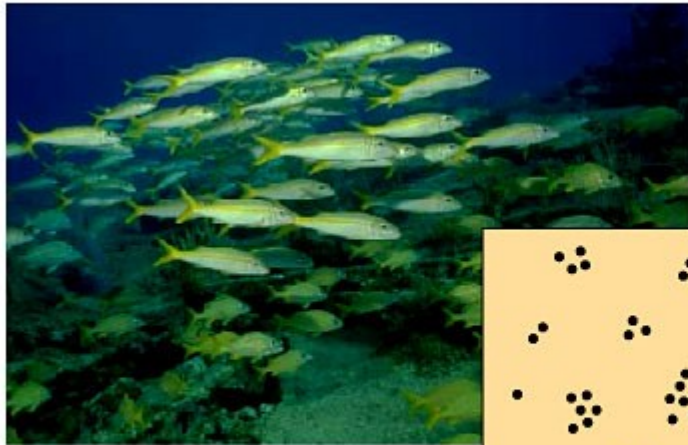
- Uniform dispersion

  It is the tendency for population to be found evenly distributed about their habitat.
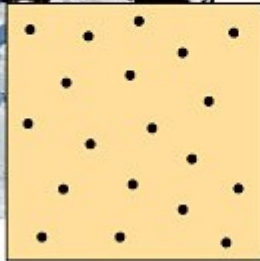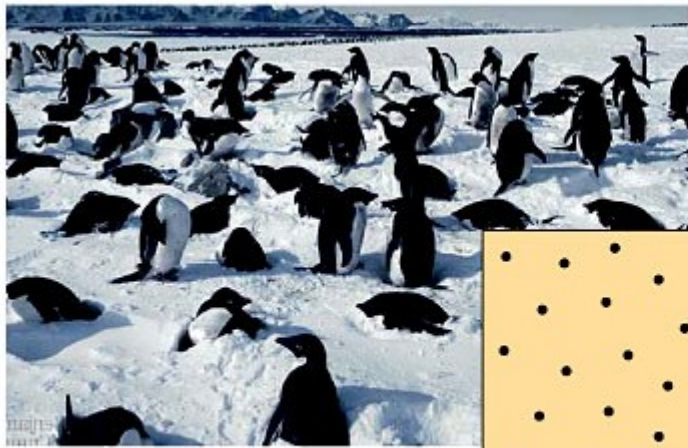
- Random dispersion

  Is the tendency for population to be found randomly about their habitat.
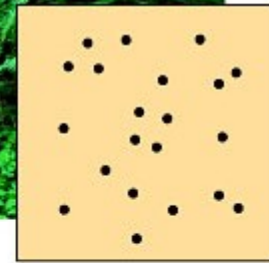
- Clumped dispersion

  In which individuals are clustered together or individual are clumped together in group.

(a) Clumped

(b) Uniform

(c) Random

# factor that affecting POPULATION

❑ Birth

❑Death

❑Migration



Legend:
- Immigration over 10% of population
- Immigration under 10% of population
- Emigration under 10% of population
- Emigration over 10% of population
- No data
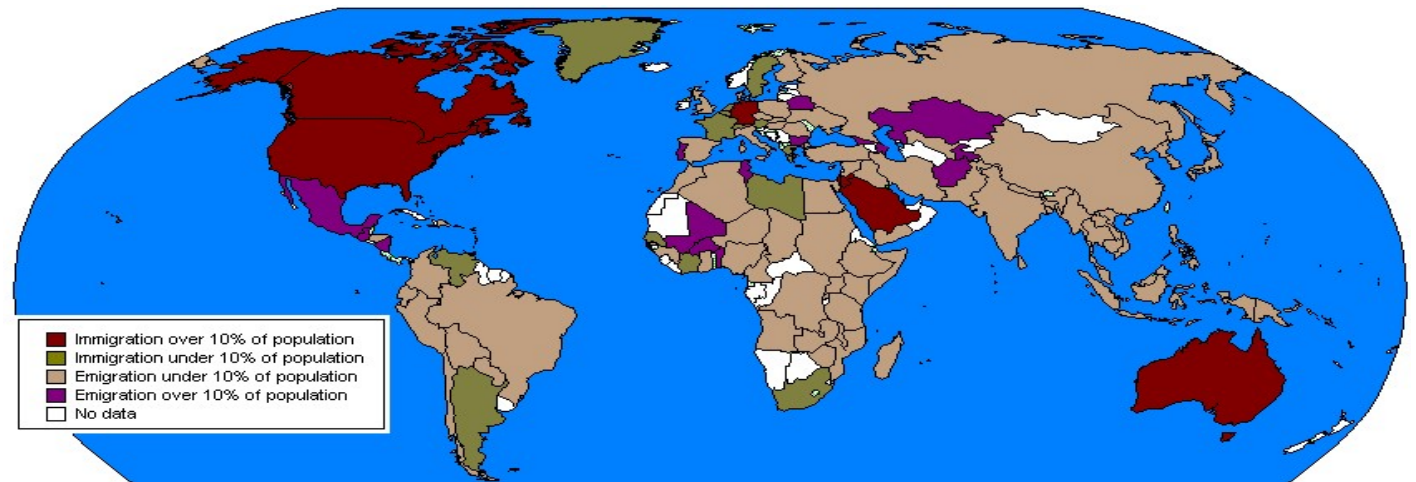
# Other factor that affect population growth

Limiting factor- Any factor that restricts the existence of organisms in a specific environment.

Ex -  Amount of water

      Amount of food

      Temperature

Carrying Capacity- the maximum population size that can be supported by the available resources

- There can only be as many organisms as the environmental resources can support.

- Ex; Renewable resource [ water, light]

  Nonrenewable resource [ land]

# Need for Population Education
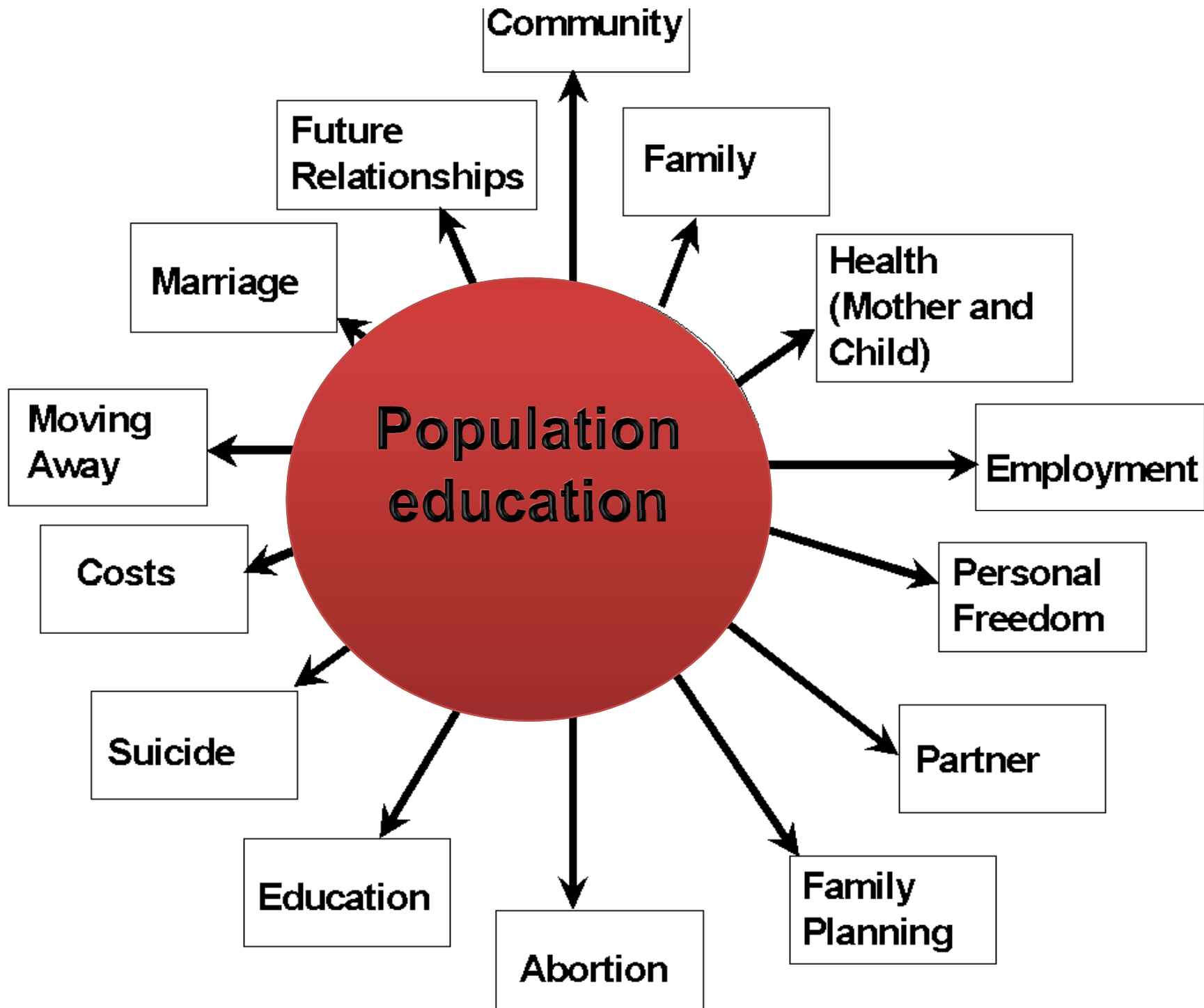
# Demographic trends

- With a population of 1169 million by the year 2007. India is the second most populous country in the world current population of India in 2017 is 1.35 billion (135 crores)

# Definition

- Demography & demographic trends is the study of the growth, structure & movement of human population. It focuses on enumerations (censuses).

- Which take stock of a population at a moment in time & also flow of vital events- birth , death, marriages & migration movement.

# Vital statistics

- Vital statistics is defined as that branch of biometry which deals with data & the law of human mortality, morbidity & demography

- Vital events are collected compiled & the resulting statistics are known as vital statistics.

## Definition:

- Statistics concerning the important events in human life, such as births, deaths, marriages, and migrations.

OR

- Data detailing the rates of birth, death, disease, marriage and divorce in a population.

# Demographic data and vital statistics are useful tools in:

- Determining a community's health status
- Deciding what's the best way for providing health services
- Planning a public health program
- Evaluating a program's effectiveness
- Comparing the health status of one nation with other.

# Source of vital statistics in Indian

- Population census
- Civil registration system
- Sample registration system
- Demographic sample surveys such as those conducted by the national sample surveys organization (NSSO)
- Health surveys

# Population census

- The task of census taking was completed in two phases

1. First phase- known as House- listing
2. Second phase- known as population

# Civil Registration System (CRS)

- Civil registration system popularly known as birth & death registration system is the recording of vital events i.e. live birth , still birth & deaths.

- Registration records are useful primary as legal documents & secondarily as a sources of statistics

- Registration of birth & death is being done under Act 1969

# Sample Registration system (SRS)

- Initiated in 1969-70 for want of complete registrations from CRS

- Provide reliable annual estimates of birth, death & infant mortality rate at the state & national level separately for rural & urban area

- Also provides child mortality rate (CMR) total fertility rate , sex ratio at birth & 0-4 age . Institutional delivery , Medical attention before death

# National sample surveys organization (NSSO)

- Now known as national sample survey office. Is an organization under the ministry of statistics of the government of INDIA

- Largest organization in India conducting regular socio-economic surveys (like house hold, consumer expenditure, employment & unemployment, health & medical services etc)

# Cont..

- Established in 1950
- Topic to be decides in a particular survey round
- NSSO every year bring out report on status of estimation of agricultural production in India.

# Health survey

- It provide comprehensive data about the health and sickness status of the population as a whole. In health surveys the following data given below

1. National family health survey (NFHS)

2. Reproductive & child health survey

3. Annual heath survey (AHS)

# Cont..

- Concurrent evaluation of NRHM

- Multiple indicator cluster survey (MICS)

- Longitudinal ageing study in India (LASI)

# MORBIDITY

# AND

# INDICATORS OF HEALTH

# The indicators of health may be classified as follows:

- Mortality indicators
- Morbidity indicators
- Disability rates
- Nutritional status indicators
- Health care delivery indicators

# Cont…

- Utilization rates
- Indicators of social and mental health
- Environmental indicators
- Socioeconomic indicators
- Health policy indicators
- Indicators of quality of life

# MORTALITY

- Mortality is the condition of being mortal, or susceptible to death; the opposite of immortality

# LIMITATION IN MORTALITY DATA

- Incomplete reporting of death
- Lack of accuracy
- Lack of uniformity
- Changing coding system and changing fashion in diagnosis
- Diseases with low  vitality

# USES  OF
# MORTALITY DATA

# Cont...

- In explaining trends and differentials in overall mortality
- Indicating priorities for health action and allocation of resources
- In designing intervention programmes and Assessment and monitoring of public health problems and programmes
- Gives clues for epidemiological research

# Important causes of maternal death

| Causes | % |
|---|---|
| hemorrhage | 20-25% |
| Infection | 15-20% |
| PIH | 12-15% |
| Unsafe abortion | 10-13 % |
| Obstructed labour | 8% |
| Anemia | 15-20% |
| Other indirect causes | 5-10% |

# Factors associated with maternal mortality

- Age
- Parity
- Socio- economic status
- Antenatal care
- Substandard care

# Steps to reduce maternal mortality (safe motherhood )

- Health sector action
- Community society & family action
- Health planners / policy makers action
- Legislative & policy action

# MORTALITY INDICATORS AND MORTALITY RATES AND RATIOS

# CRUDE DEATH RATE

- It is defined as the number of death per 1000 estimated midyear population per year in a given community. It indicates the rate at which people are dying.

Crude Death rate =

no: of death occurred in an year x 1000

Estimated mid  year population

# The crude death rate summarizes the effect of two factors;

- Population composition
- Age – specific death rates
- **Death rate of India :** 6.23 deaths/1,000 population (July 2009 est.)

# EXPECTATION OF LIFE

- Life expectancy at birth is "the average number of years that will be lived by those born alive into a population if the current age specific mortality rates persist"

# Cont…

- It is estimated for both sex separately.
- Life expectancy is a good indicator of socioeconomic development in general.
- As an indicator of long term survival, it can be considered as a positive indicator.
- Help to identify what is happening to overall standard of living of people in India.

# Cont..

One of the broadest standard of living measure is the life expectancy - the average expected lifespan of an Indian is ;

- **Total population:** 69.89years
  **male :** 67.46years
  **female :** 72.61 years (2009 est.)

# Infant and maternal mortality rate (IMR & MMR) :-

- Infant mortality rate is defined as " the ratio of infant deaths registered in a given year to the total number of live birth registered in the same year; usually expressed as a rate per 1000 live births"

   IMR=

   $$\frac{\text{No. of death under 1 yr age in 1 yr} \times 1000}{\text{No. of live birth during that year}}$$

# Cont…
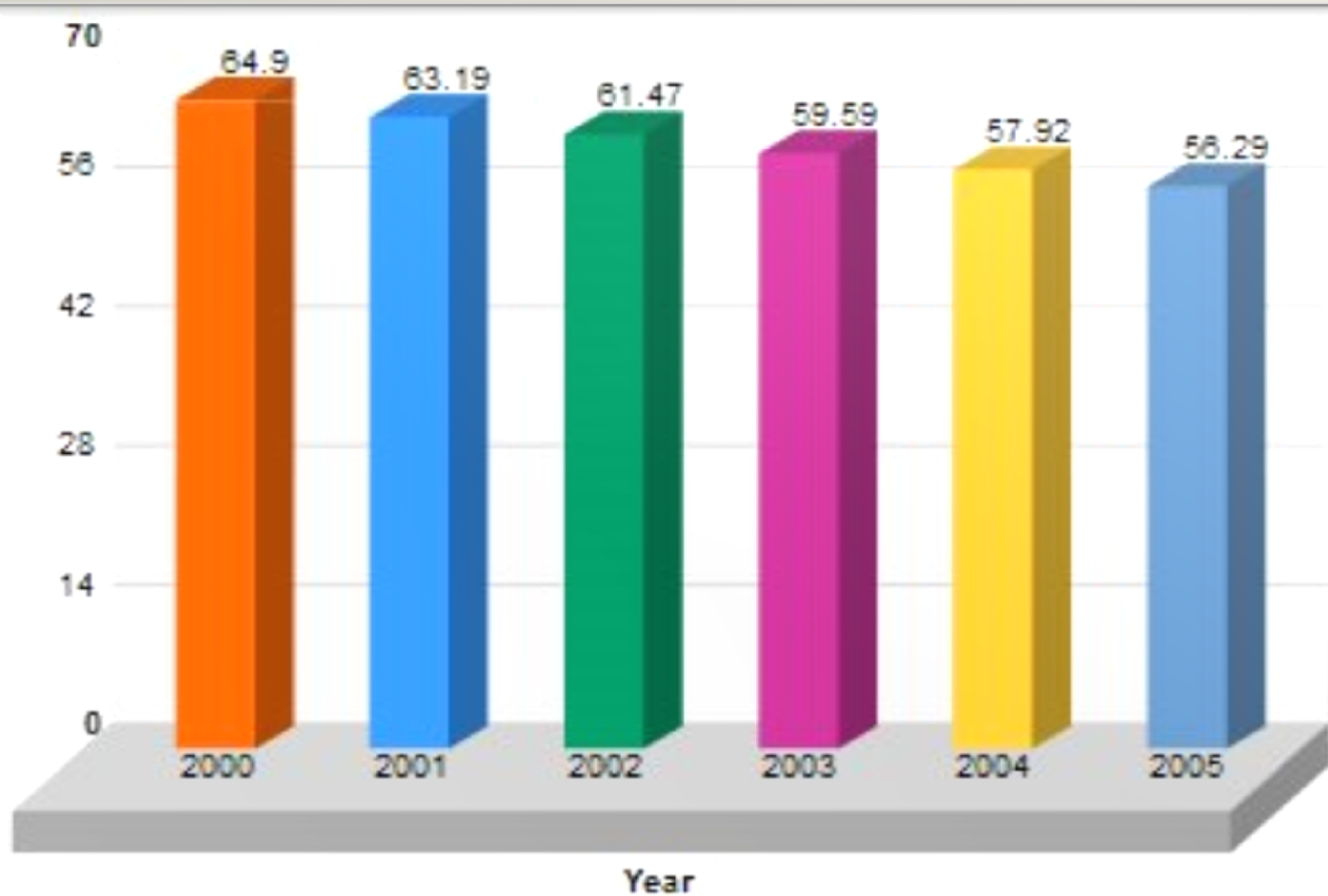
- **Infant mortality rate:**

-  **total:** 30.15deaths/1,000 livebirths

    **male:** 34.61deaths/1,000 livebirths

    **female:** 25.17 deaths/1,000 livebirths (2009 est.)

# NEONATAL MORTALITY RATE

- Neonatal mortality rate:

No. of death, under 28 days of age occurred during a year x 1000
      no of live birth during that year

# INDIA'S INFANT MORTALITY RATE

# MATERNAL MORTALITY RATE

## a. Maternal mortality



Other maternal
22%

Hemorrhage
28%

Unsafe abortion
13%

Sepsis
15%

Obstructed labor
8%

Hypertensive disorders
14%

## b. Maternal morbidity



Other maternal
22%

Hemorrhage
18%

Sepsis
16%

Unsafe abortion
26%

Hypertensive disorders
9%

Obstructed labor
9%
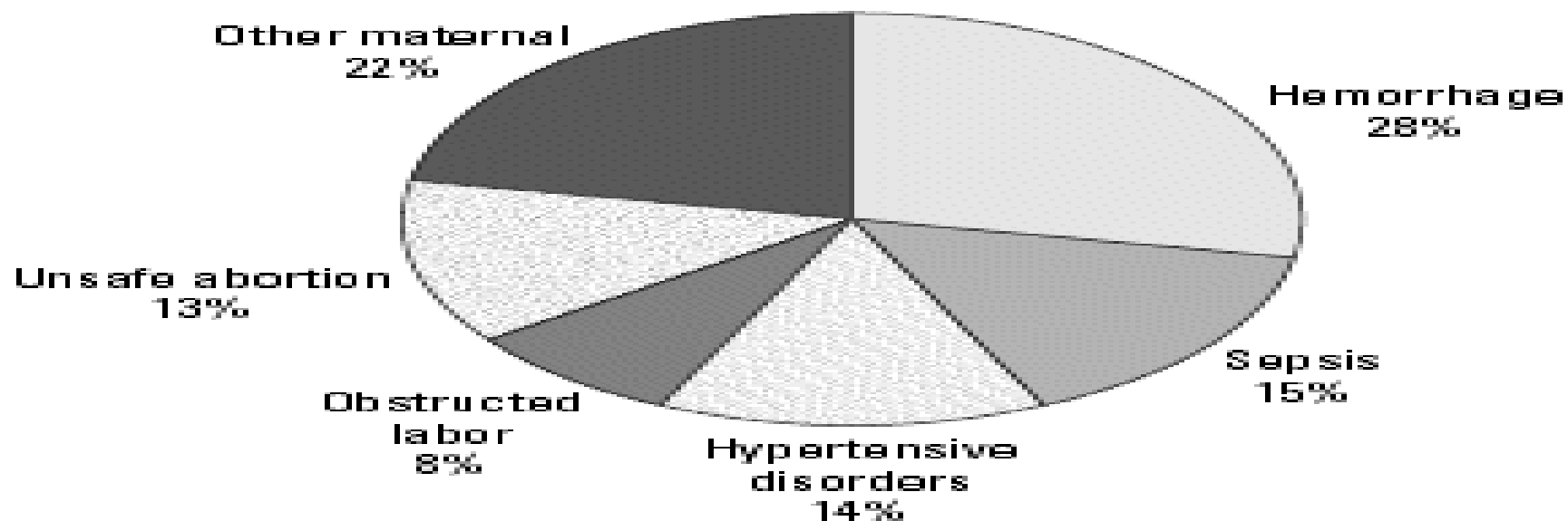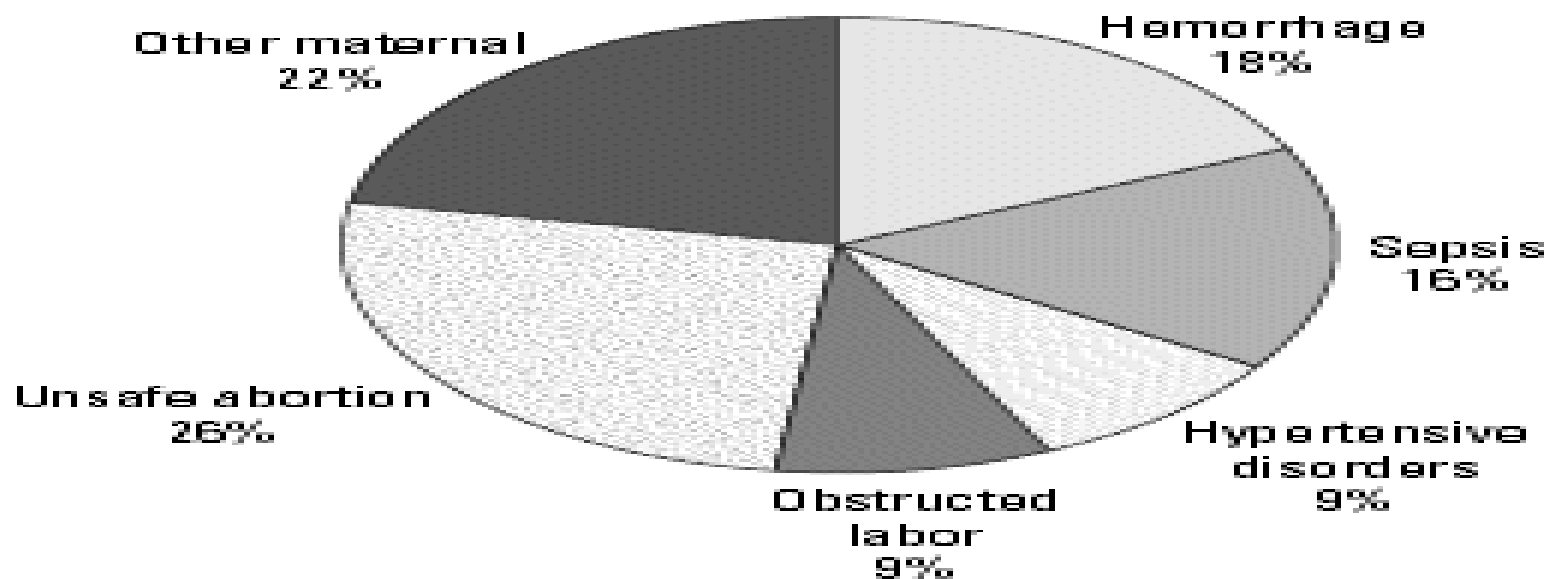
Source: Mortality: WHO 2004d; Morbidity: Murray and Lopez 1998.

Note: Nonobstetric (indirect) causes of death and morbidity, such as tuberculosis and malaria, have been excluded.

# CONT..

**Maternal death** is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration ,and the site of pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

**MMR** =

No of female death from pregnancy,child birth,or Puerperial causes in an year                                    x1000

\ no of live birth in same area during that year

# FETAL DEATH RATES

The WHO subdivided the fetal death based on gestation as follows :

- Early                         : under 20 weeks
- Intermediate  : 20 to 27 weeks
- Late                           : 28 weeks and over

The still birth rate (late fetal death rate) correspond to

**Still birth rate =**

$$\frac{\text{No of fetal death, 28wks of gestation or more occurred during a yr } \times 1000}{\text{No of live birth plus late fetal death during that year}}$$

- **Late fetal death rate =**

  No of fetal death,28 week of gestation Or more occurred during a yr   x1000

  \  No of live births during that  year

# CHILD MORTALITY RATE (UNDER 5 MORTALITY RATE)

It is defined as the number of death at age 1-4 yrs in a given year ,per 1000 children in that age group at the midpoint of the year concerned. It thus excludes infant mortality.

# UNDER 5 PROPOTIONATE MORTALITY RATE

It is the proportion of total death occurring in the under 5 age group . This rate can be used to reflect both infant and child mortality rate . In communities where sanitation is poor the proportion may exceed to 60%.

- **Child mortality rate**

**No. of death of children less than 5 years of age in a given year** x 1000

\ **No. of live birth in the same year**

# Disease specific mortality

Mortality rates can be computed for specific diseases. As countries begin to extricate themselves from burden of communicable disease, a number of other indicators emerged as measures of specific disease problem.

# PROPOTIONAL MORTALITY RATE

It is useful to know what proportion of total death are due to particular disease.(eg cancer)

The simplest measure of estimating the burden of a disease in the community is proportional mortality rate. ie, the proportion of all death currently attributed to it. Proportional mortality rate for a specific disease; is

= **No of deaths from the specific disease in year** x 100

/Total death from all causes in that year

# CASE FATALITY RATE

$$\frac{\text{Total no of death due to a particular disease}}{\text{Total no of cases with same disease}} \times 100$$

- It determines the killing power of a disease

- It is simply the ratio of death to case

- It is typically used in acute infectious diseases( eg: food poisoning, cholera etc)

# Specific mortality rate:-

- This rate can be made specific with regard to any subgroup

  of the population such as

- age specific death rate for group A

- sex specific death rate for sex M or F

- cause specific death rate for cause C.
- A refers to a specific age; C refers to specific cause of death; M and F refers to their gender .

Age specific death rate for A

- = $\dfrac{\text{No. of death of age A in an year}}{\text{Estimated population of age A midyear}} \times 1000$

sex specific death rate for group M=

$\dfrac{\text{No. of death of sex M in an year}}{\text{estimated population of sex M midyear}} \times 1000$

Cause specific rate=

$\dfrac{\text{No. of death due to cause C occurred in a year}}{\text{estimated midyear population}} \times 1000$

# Adjusted or standardized rates:

- If we want to compare the death rates of two populations with different age- composition, we can use 'age adjustment "or "age Standardization'". There are three ways of computing standardized death rates –

1. direct and

2. indirect standardization.

3. Non obstetric or fortuitous death

# Direct Standardization ($SDR_1$)

- calculates a weighted average of
  the *region's* **age-specific mortality rates**

# Direct Standardization:

- **SDR$_1$** = [$\sum$ **age groups** ($M_{ar}$ $P_{as}$)]/$P_s$ x 1000
- $M_{ar}$ is the age-specific mortality rate for the region. $P_{as}$ is the number of people in the age group in the standard population. $P_s$ is the total standard population.

# Indirect Standardization ($SDR_2$)

uses **age-specific mortality rates** from
the *standard* population to derive **expected deaths** in
the *region's* population.

# INDIRECT STANDARDISATION

- **$SDR_2 = D_r/[\sum_{\text{age groups}} (M_{as} P_{ar})] \times CDR_s$**
- $M_{as}$ is the age-specific mortality rate for the standard population.
  $P_{ar}$ is the number of people in the age group in the region's population.
  $D_r$ is the number of deaths in the region.
  $CDR_s$ is the crude death rate for the standard population.

# Non obstetric or fortuitous death

- Accident,
- Typhoid
-  infectious diseases

# MORBIDITY

- Morbidity has been defined as "any departure, subjective or objective, from a state of physiological well being" .
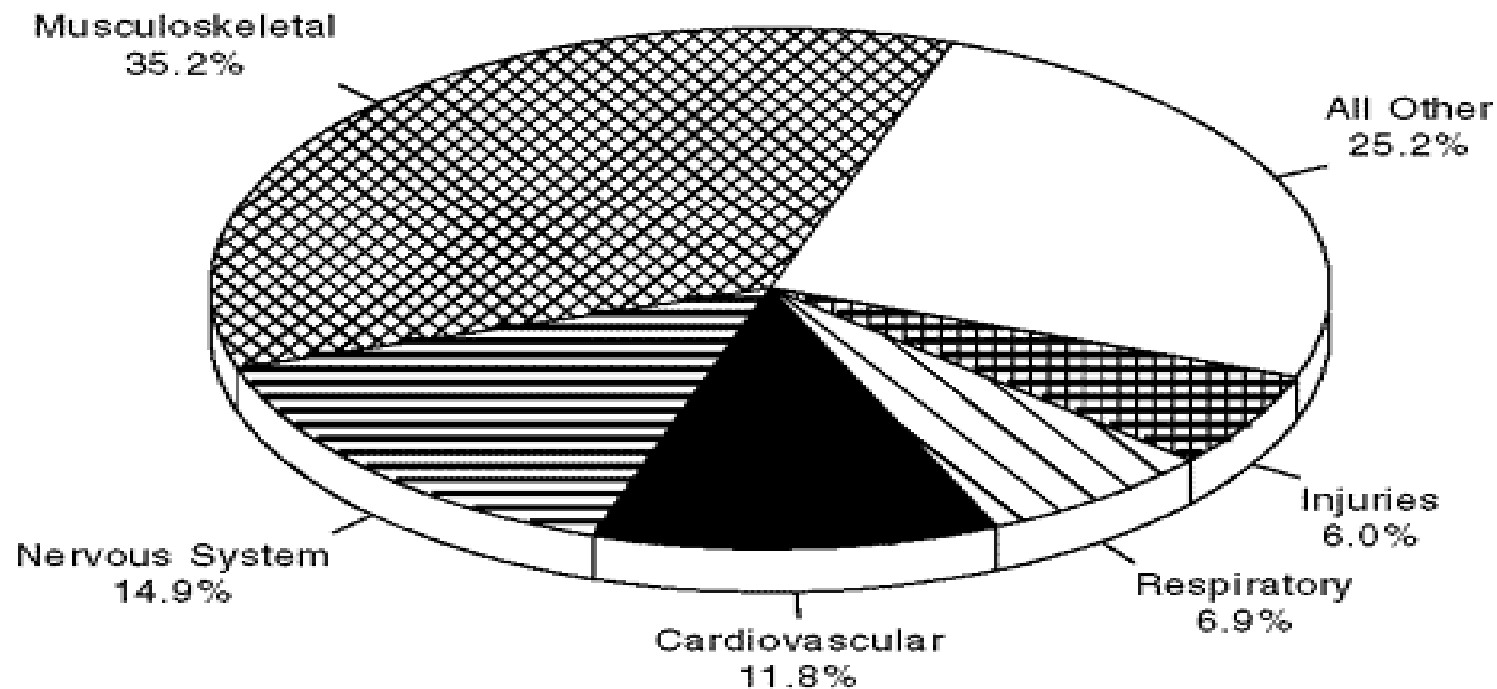- The  problem is equivalent to such terms as sickness , illness, disability etc.

- The WHO Expert committee on Health Statistics noted in its 6th report that morbidity could be measured in terms of 3 units-
-  a. person who ill ;
- b. the illness that these persons experienced
- c. the duration of these illness.

# The value of morbidity data is summarized as;

- They describe the nature and extend of the disease load in the community and thus assist in the establishment of priorities
- They usually provide more comprehensive and more accurate and clinically relevant information on patient characteristic.
- They act as starting points for etiological studies, and thus play a crucial role in disease prevention
- They are needed for monitoring and evaluation of disease control activities

# DISTRIBUTION OF MORBIDITY COSTS DUE TO LONG-TERM DISABILITY BY DIAGNOSTIC CATEGORY, CANADA, 1993

Musculoskeletal
35.2%

All Other
25.2%

Injuries
6.0%

Respiratory
6.9%

Cardiovascular
11.8%

Nervous System
14.9%

$38.3 billion classifiable by diagnostic category

# Morbidity indicators:-

- To describe health in terms of mortality is misleading. This is because the mortality indicators do not reveal the burden of ill health in a community , as for example mental illness and rheumatoid arthritis. Therefore morbidity indicators are used to supplement mortality data to describe the health status of a population.

- Morbidity statistics have also  their own drawback; they tend to overlook a large number of condition which are subclinical   or inapparent, that is, the hidden part of the iceberg of disease.
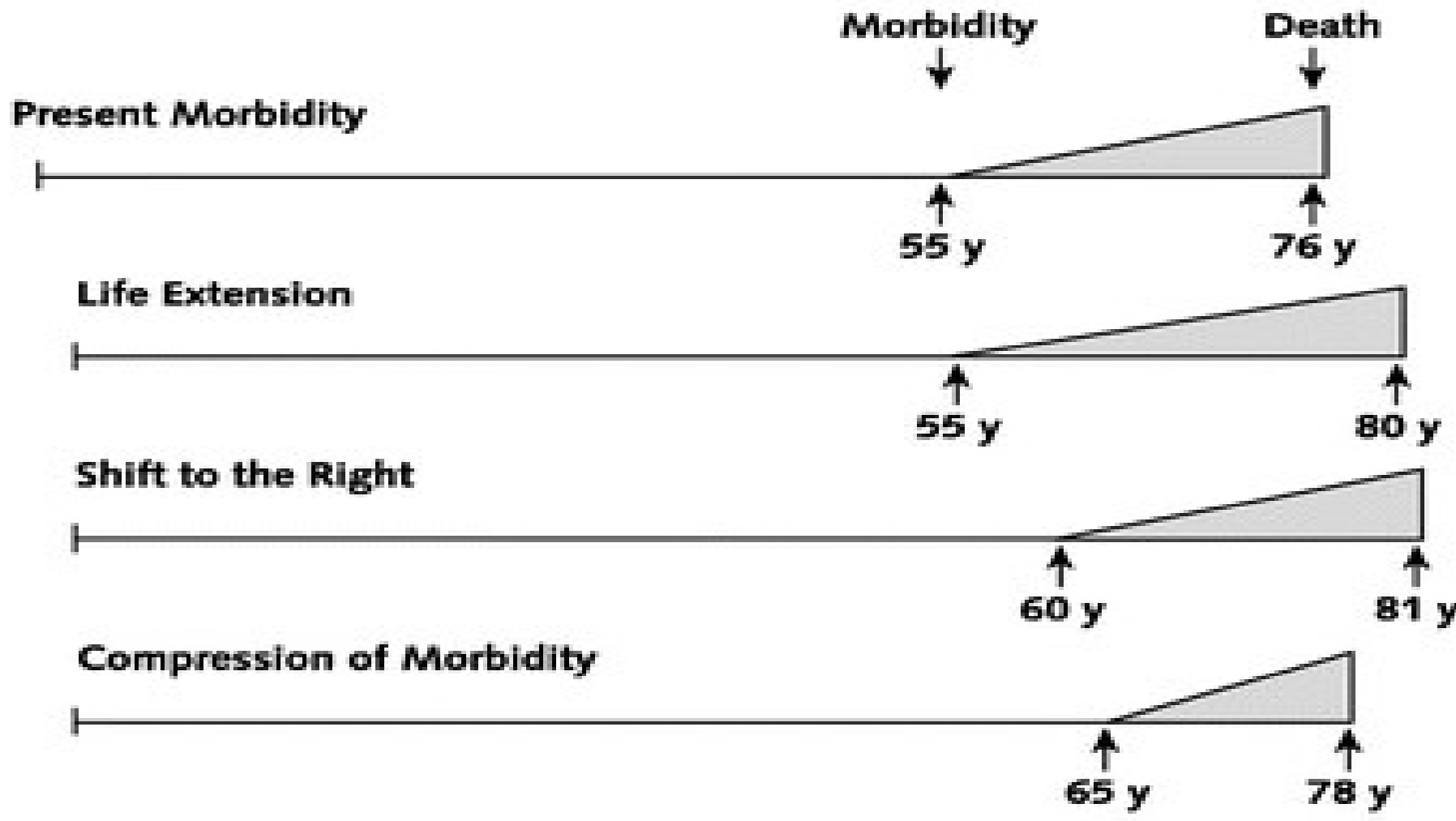
# The following morbidity rates are used for assessing the ill health in the community.

- Incidence and prevalence

- Notification rates

- Attendance rate at outpatient department, health centers ,etc

- Admission readmission and discharge rates

- Duration in hospital and Spells of sickness or absence from work or school.

# Compression of Morbidity Theory

- In 1980, Dr. James Fries, Professor of Medicine, Stanford University introduced the compression of morbidity theory. This theory states that "most illness was chronic and occurred in later life and postulated that the lifetime burden of illness could be reduced if the onset of chronic illness could be postponed and if this postponement could be greater than increases in life expectancy." (Fries, 1980).

Present Morbidity

Morbidity | Death

55 y | 76 y

Life Extension

55 y | 80 y

Shift to the Right

60 y | 81 y

Compression of Morbidity

65 y | 78 y

# Role of nurse in vital statistics

- Collection of information
- Observing the information collected by health worker
- Editing / classification of data
- Attractive presentation of the data
- Sending data to concerned offical / institution
- Analysis of collected data
- Making community diagnosis & providing treatment

# Cont…

- Spreading importance of vital statistics
- Creating awareness regarding registration
- Having knowledge regarding data collection/ communication
- Work efficiently as a link in health information management system
- Participation in health survey
- Making entries in the register

# Health problems in Mother:-

First trimester:-

- Bleeding
- Breast tenderness.
- Constipation
- Discharge
- Fatigue
- Nausea & vomiting

- Leaking urine
- Miscarriage
- Ectopic pregnancy
- Hyper emesis Gravidarum.

# Second trimester:-

- Backache
- Bleeding gums
- Breast enlargement
- Frequent micturation
- Headache
- constipation

- Skin changes
- Varicose veins
- Weight gain
- Bleeding
- Quickening
- Severe dizziness.

# 3<sup>rd</sup> trimester:-

- Backache
- Bleeding
- Discharge
- Braxton Hicks contraction
- Breast enlargement



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- Heart burn
- Constipation
- Shortness of breath
- Swelling
- Weight gain.

# Health problem in neonates:-

- Birth injury
- Pre- maturity
- Post maturity
- Pneumothorax in newborn
- Apnea of pre- maturity
-  Hyper- billirubinemia.

- Anemia in the neonates.
- Polycythemia in the newborn
- Sepsis in the newborn.

# Journal study -1
# Neo-natal mortality high in India, says UNICEF
# ( Ruchi Gupta)

Neonatal mortality or death within 28 days of birth is high in India, according to the latest UNICEF report. According to the UNICEF's statistical review "Progress for Children-A World Fit for Children," out of the estimated 2.1 million child-mortality in India, one million are during the neonatal period (within 28 days of birth).

- Malnutrition underlines up to **half of under-five deaths globally,** followed by neonatal causes in 37 percent of cases,

- pneumonia (19 pc), diarrhea (17 pc), malaria (8 pc), measles (four pc), injuries (three pc), AIDS (three pc) and other reasons (10 pc).

   **India has the largest number of deaths due to pneumonia**.

- In 2006, for the first time in the world, the number of children dying before their fifth birthday fell below 10 million to 9.7 million, the report said.

- In 2010 it 1s 63 per 1000 live births, in India.

- **India with 2.1 million under-five child deaths contributes to about 21 percent of the global burden of child deaths.** India has the largest pool of 9.4 million children, who have never been immunized in the world.

# SUMMARY

- Population dynamics
- Demographic trends
- Vital statistics
- Maternal mortality
- Neonatal mortality
- Maternal morbidity
- Role of nurse

thank
you