Textbook of

Community Health Nursing–II

for GNM Nursing Students

(As per the New Syllabus of INC for GNM)

2nd Edition

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Health Information System

LEARNING OBJECTIVES

After the completion of the unit, the readers will be able to:

- Explain the concepts of health information system.
- Discuss the uses of health information system.
- Explain the vital statistics, its importance.
- Appreciate the role of community health nurse in health information system.

UNIT OUTLINE

- Introduction
- Health Management Information System Planners
- Sources of Health Information System
- Vital Statistics
- Important Rates and Indicators
- Useful Rates and Indicators
- Vital Health Record
- Basic Statistical Methods
- Statistic Average
- Measures of Dispersion or Variability
- Descriptive Statistics
- Responsibility of Community Health Nurse in Vital Statistic

KEY TERMS

Biostatistics: A branch of statistic concerned with mathematical facts and data relating to biological events.

Data: Discrete observation of the event.

Frequency: The rate at which an event is repeated.

Frequency polygon: Diagrammatical representation obtained by joining the mid-points of the histogram blocks.

Health information system (HIS): A system in which collection, utilization, analysis and transmission of information is done for conducting health services, training and research.

Health statistics: Statistical information regarding health and diseases.

Histogram: Pictorial diagram of frequency distribution.

Information: When the data is processed by reducing, summarizing and adjusting for variations and transformation into information.

Information system: A system that provides information support to the decision-making process.

Mean: A measure obtained by summing up all the observations and dividing by the total number of observations

Median: The middle observation obtained by arranging all observations in ascending or descending order.

Mode: Most frequently occurring observation in a series.

Pictogram: Small pictures or symbols used to present the data.
Range: Difference between the highest and lowest figure in a given sample.
Rate: Measurement of specific event, condition or disease in a given population within a specific time period.
Statistics: Science of counting.
System: A system is a collection of components that work together to achieve a common objective.
Vital statistics: Numerical data regarding important incidents in a community and analysis of this data.

INTRODUCTION

Health information provides the state of health of the population. The information regarding health can be assessed and monitored from the people. But in this present era of information technology an effective health information system is an essential requirement. A well developed and modern information system can help to furnish the required information about health problems and needs which can help the policy makers and managers to plan their health services adequately.

HEALTH MANAGEMENT INFORMATION SYSTEM PLANNERS

The health management information system incorporates all the data needed by policy maker, clinicians and health services planners to improve and protect the health of the population. Thus, the health management information system may be defined as **"An information system specially designed by WHO 2004** to assist in the management and planning of health program as opposed to delivery of care". Let us discuss the important elements of Health Information System:

Definition of Health Information System

"A mechanism for the collection, processing analysis and transmission of information required for organizing and operating health services, and also for research and training". Therefore, health information system is a process whereby health data (input) are recorded, stored, retrieved and processed for decision making (output). Decision making broadly includes two aspects, which are:

- **Managerial aspect:** Managerial aspects include planning, organization and control of healthcare facilities at the national, state and district level.
- **Clinical aspect:** Clinical aspect can be subdivided into:
  1. Providing operational care
  2. Training of medical personnel to generate appropriate human resources and facilitate research and development activities in various fields of health and medicine.

Must Know

Distinction between data and information

Data and information are two different aspects. Data is the discrete observations of the attributes or events. It has got very little meaning when considered alone. Data collected from operating healthcare system or institutions are inadequate for planning. Data has to be processed or transformed into information by reducing them, summarizing them and adjusting them for variations such as age and sex composition of the population so that comparisons over time and place are possible. It is the transformation of information through integration and processing with experience and perception based on social and political value that produces intelligence. Data that are not transformed into information and information that are not transformed into intelligence to guide decision makers, policy makers, planners, administrators and healthcare personnel themselves are of little value.

Concepts of Health Information System

Health information system is a basic tool of management for planning health services. It is an integral part of the national health system. Health management information incorporates all the data needed by policy makers, clinicians and health services users to improve and protect the health of the population. The concepts of health information is to provide reliable, relevant, up to date, adequate timely and reasonably complete information to the health managers at all levels, i.e., central, state and district. It includes sharing of technical and scientific information by all health personnel participating in the health services of a country and also to provide at periodic intervals, data that will show the general performance of the health services and to assist planners in studying their current functioning and trends in demands and work load. However, it is very difficult to get the information at the community level. But it is true that no country at present has constructed system of health information in operation; however, this concept is receiving much attention. In the past few decades, the whole science of health has undergone a considerable change. In 1973, the World Health Assembly stressed the need for complete reconstruction of health information system.

Objectives of Health Information System

- To provide reliable, latest and useful health information to all levels of health officer and administrators.
- To create electronic medical records.
- To improve clinical and diagnostic services.
- To amend health policies and working system on the basis of feedback received from health information system.
- To provide information about periodical and time bound programs and for mid-term evaluation.
- To provide early alerts on disease trend and cause of death as per international codes for disease surveillance and rapid action.
- To monitor identified indicators and to get comparison of efficiency and performance among hospitals.
- To provide evidence-based effective and responsive hospital management.
- To provide tools for effective health policy making and planning.

Characteristics of Health Information System

A World Health Organization (WHO) expert committee identified the characteristics shown in Figure 9.1 to be satisfied by the health information system:

- The system should be problem oriented.
- Information should be based on population.
- The system should express information in short and in imaginative form (e.g., tables, graphs, charts and percentage).
- The system should employ functional and operational terms (e.g., episode of illness, treatment regimens and laboratory test).
- Facility for data feedback must be present in the system.
- Latest technology should be used in information system.
- Unnecessary data and figures should not be present in the system.

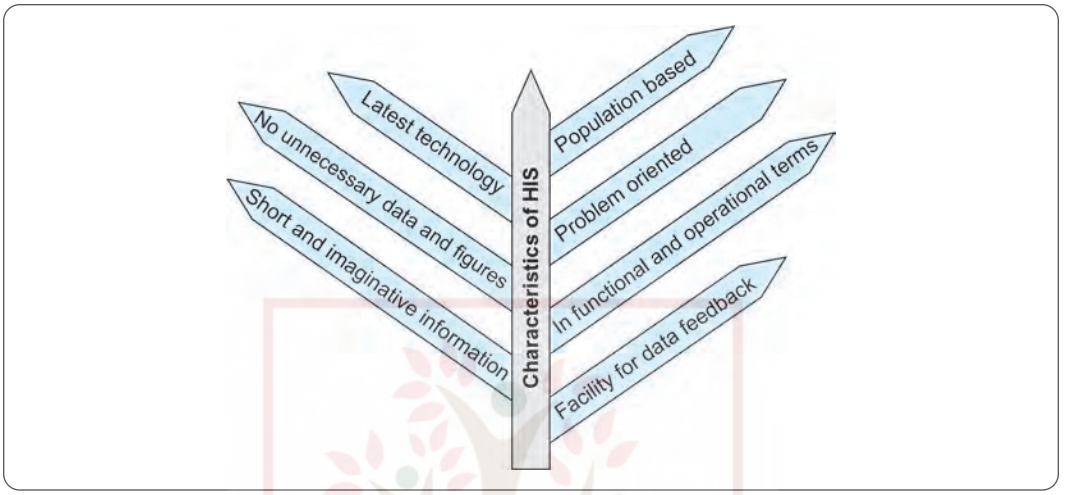

Figure 9.1: Characteristics of health information system

Fields of Health Information System

Health information system is multifaceted. It includes demography, vital statistics, health system input, output, health determinants, health economics, health statistics, health infrastructures resources and the outcomes, financial statistics and environmental health statistic, etc.

Components of Health Information System

The health information system is composed of several related systems (Fig. 9.2). According to WHO, A comprehensive health information system requires information and indicators on the following subjects.

- Demography and vital statistics
- Environmental health statistics
- Health status, i.e., mortality, morbidity, disability and quality of life
- Health resources: Facilities, beds and manpower
- Utilization and nonutilization of health services, attendance, admissions, waiting lists
- Indices of outcome of medical care
- Financial statistics and cost expenditures related to particular subjects.

Uses of Health Information System

- Used to measure the health status of the people and to quantify their health problems and medical care needs.
- Used to utilize for planning, administration and effective management of health services and health programs.
- Used to assess whether the health services provided are fulfilling their objectives in terms of their effectiveness and efficiency.
- Used to compare local national and international health status. For such comparisons data needs to be subjected to rigorous standardization and quality control.

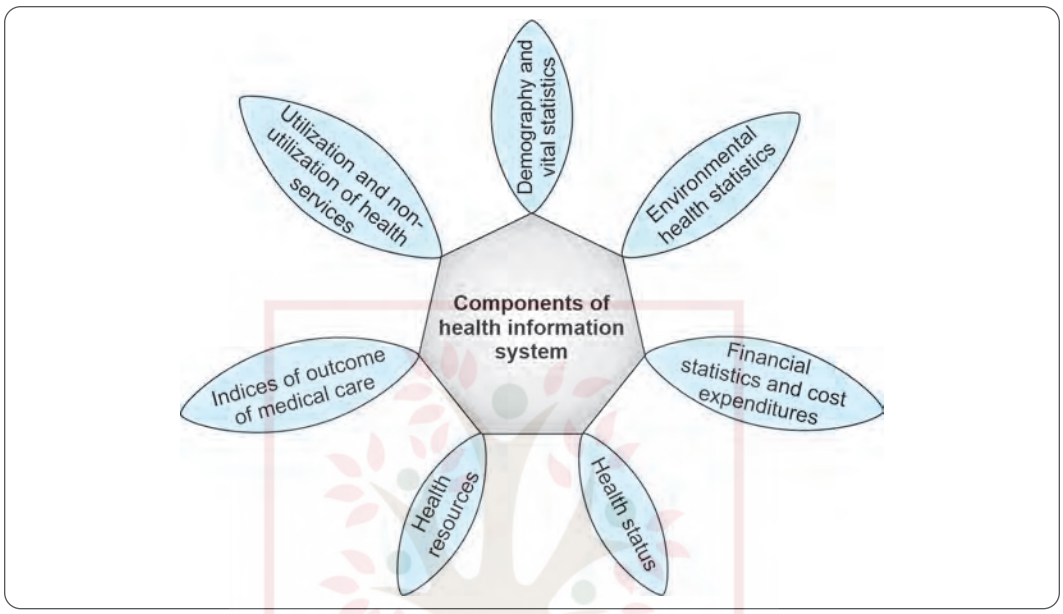

Figure 9.2: Components of health information system

- Used for assessing the attitudes and degree of satisfaction of the beneficiaries with the health system
- Used to research into particular problems of health and diseases
- Used to coordinate the efforts of partners and countries in the field of health indictor measurements and use, health data management and evaluation of health information system.

SOURCES OF HEALTH INFORMATION SYSTEM

The main sources of health information are the central government and state government agencies. The lifeblood of a health information system is the routine health statistics. Information requirement will vary according to the administrative level at which planning is envisaged. The information requirement of public health administrator will differ from hospital administrator. The main sources discussed are as follows:

Census

Census is defined by the United Nations as "the total process of collecting, compiling and publishing demographic, economics and social data pertaining at a specified time or times, to all people in a country or delimited territory." In most of the countries of the world it is taken at regular intervals of 10 years. The first census in India was conducted in 1881 and the last was held in 2011. Census provides demographic information, i.e., total count of population and its breakdown into groups and subgroups such as age, sex distribution. It also provides social and economic characteristics of the people and the conditions under which they live, work and their income. These data provide a framework of reference and baseline information for planning action and research not only in the field of medicine, human ecology and social science but also in the entire government system.

Population census provides baseline data (such as population by age and sex) needed to compute vital statistics and other health demographic and socioeconomics indicators. Without census data, it is not possible to obtain quantified health demographic and socioeconomic indicators.

Registration of Vital Events

The United Nations defines a vital events registration system as "legal registration statistical recording and reporting of the occurrence of, and the collection, compilation, presentation, analysis and distribution of statistics pertaining to **vital events,** i.e., live births, deaths, fetal deaths, marriages, divorces, adoptions, legitimations, recognitions, annulments and legal separation." Registration of vital events has been the foundation of vital statistics. India had passed the Births, Deaths and Marriage Registration Act in 1886. But it was unreliable because of illiteracy, ignorance, lack of concern and motivation. To improve the vital events registration system, the Government of India promulgated the Central Birth and Death Registration Act in 1969 which came into force on April 1, 1970. The time limit for registering the events of birth is 21 days uniformly all over India. Vital events provide information of birth rate and death rate in the population. The primary health workers are responsible in collecting and recording these events in the community.

Sample Registration System

Sample registration system (SRS) is major sources of health information. It was started in India in the mid-1960s to provide reliable estimates of birth and death rate at the national and state level. SRS is more reliable information of birth and death rate, age-specific fertility and mortality rates, infant under five and adult mortality rate, etc. SRS is dual record system consisting of continuous enumeration of birth and death by an enumerator and an independent survey every 6 months by an investigator supervisor.

Notification of Diseases

Notification of diseases provides valuable information about fluctuation in disease frequency. It also provides early warning about new occurrence or outbreaks of diseases. The primary function of notification is to effect prevention and control of the diseases. Notification is also an important source of morbidity data, i.e., incidence and distribution of certain specified diseases which are notified. List of notifiable diseases vary from country to country and even in the same country, from state to state and between urban and rural area. The notification system is linked up with the vital statistics machinery. Earlier the notification was the responsibility of village chowkidar but now the responsibility is shifted to multipurpose health workers.

Hospital Records

The hospital records provide a basic and primary source of information about diseases prevalent in the community. It provides information about age, sex, diagnosis, time interval between occurrence and hospital admission. The main drawback of hospital data are:

- They provide information on only those patients who seek medical advice.
- Mild cases may not report to hospital.
- Subclinical cases are always missed.
- Population served by hospital cannot be defined.

Disease Register

Morbidity registers are valuable source of information. These registers contain not only the certain diseases and conditions but also provide information about duration of illness, case fatality and survival. These registers allow follow-up of patients and provide a continuous account of the frequency of diseases in the community. Even in the absence of a defined population base, useful information may be obtained from registers on the natural course of diseases, especially chronic diseases in different parts of the world. If the reporting system is effective, the registers can provide useful data on morbidity from a particular disease, treatment given and diseases-specific mortality.

Record Linkage

The term "record linkage" refers to describe the process of bringing together record related to one individual (or the family), the records originating in different times or places. Medical record linkage implies the assembly and maintenance for each individual in a population of a file of the more important records relating to his health. The events commonly recorded are birth, marriage, death, hospital admission and discharge. The main problem of record linkage is the volume of data that can accumulate. Record linkage has been applied on a limited scale, e.g., twin studies, measurement of morbidity, chronic epidemiology.

Epidemiological Surveillance

Epidemiological surveillance is carried out in countries where particular diseases are endemic and where special controls eradication programs have been instituted, such as national diseases control programs against malaria, tuberculosis, leprosy, filariasis, etc. As a part of these programs surveillance system are conducted to report on the occurrence of new cases and on efforts to control the disease, e.g., immunization program has brought considerable decline in morbidity and mortality rate.

Other Health Service Records

A lot of information can be obtained in the records of hospital outpatient department, primary health centers, subcenters, polyclinic, private practitioners, child health center, school health records, diabetic and hypertension clinic, etc. The drawback of these records is that they relate only to a certain segment of general population.

Environmental Health Data

The environmental data is also very important source for the identification and quantification of factors causative of diseases. The health statistics are sought to provide data on various aspects of air, water, noise pollution, harmful food additives, industrial toxicants, inadequate waste disposal and population explosion with increased production and consumption of goods. Collection of environmental data remains major problem in the future.

Health Manpower Statistics

Health manpower statistics is the information about the number of physicians, dentist, pharmacists, veterinarians, hospital nurses, medical technicians, and others. Their records are maintained by the state medical/dental/nursing councils and the directorates of the medical education.

Population Survey

The routine statistics collected from the above sources do not provide all information about health and diseases in the population. Therefore, population survey is supplement to the routinely collected statistics. The statistics available for cholera, malaria, plague, respiratory diseases, fever and diarrhea are extremely useful for public health administration. The term health survey is applied to any aspects of health, i.e., morbidity, mortality, nutritional, status, etc. The types of surveys to be covered under health survey are:

- **Surveys for evaluating the health status of a population** that is community diagnosis of problem of health and diseases. It is information about the distribution of these problems over time and space that provide fundamental basis for planning and developing the needed services.
- **Surveys for investigation of factors affecting health and diseases.** It includes environment, occupation, income and circumstances associated with the onset of illness, etc. These surveys are helpful for studying natural history of the disease and obtaining more information about etiology and risk factors of diseases.
- **Surveys relating to administration of health services:** In this survey health services expenditure on health, evaluation of population health needs and unmet needs, evaluation of medical care, etc., are used. Population survey can be conducted in any setting. Population health survey may be cross-sectional, longitudinal, descriptive or analytic or both. Survey methods are classified into four types:
  - Health interview (face-to-face) survey
  - Health examination survey
  - Health records survey
  - Mailed questionnaire survey

Other Routine Statistics Related to Health

- **Demography survey** includes population density, movement and educational level.
- **Economic survey:** Consumption of consumer goods as tobacco, dietary fats and domestic coal, sales of drugs and remedies, information concerning per capita income, employment and unemployment data.
- **Social security survey:** Scheme and medical insurance schemes make it possible to study the occurrence of diseases in the insured population. Other useful data include sickness absences, sickness and disability benefits rates.

Nonquantifiable Information

Health planners and decision makers require lots of nonquantifiable information on health policies, health legislation public attitudes, program costs, procedure and technology. Health information system has multi-disciplinary inputs. There should be proper storage, processing and dissemination of information.

VITAL STATISTICS

Vital statistics have been used to denote facts systematically collected and complied in numerical forms relating to or derived from records of vital events, namely live birth, death, fetal death,

marriage, divorce adoption, legitimating, recognition, annulment or legal separation. Vital statistics are derived from legally registrable events without including population data or a morbidity statistic.

Meaning of Statistics

The word statistics is derived from the Italian word "statista" which means statesman or a German word "statistic" which means a political state.

Definition of Statistics

It is a science and art of dealing with variation in such a way as to obtain reliable **statistics** may be called the science of counting.

Meaning of Vital Statistics

Vital statistics is concerned with the study of human population. Vital statistics means numerical data regarding important incidents occurring in a community and the method of analysis of this data. The important incidence means birth, marriage, diseases and death, etc.

Some Definitions Used in

- **Vital statistics:**
  - Vital statistics is data/record regarding marriage, birth, diseases and death on the basis of which community health and development are studied. **—Benjamin**
  - Vital statistic is the numerical description of birth, death, abortion, marriage, divorce and adoption and judicial separation. **—UNO**
  - Vital statistic is a part of demography and collective study of mankind. It deals with the data related to vital events.
  - Vital statistic is a branch of biometry that deals with data and law of human morbidity, mortality and demography. Vital statistics include birth, death, fetal death, marriage divorces and separation, and are considered primarily from the point of view of physical, mental and social wellbeing of the total community and of the individual. The health status cannot be judged simply by decline in mortality rate but it should also include the morbidity statistics.
- **Biostatistics:** It is the branch of statistics which is concerned with mathematical facts and data relating to biological events.
- **Health statistics:** It includes all statistics information required for the administration of health agency and would comprise not only vital statistics but also a good deal of other numerical information. Usually it is limited to health data and includes the data on all matter of sickness like morbidity, illness and ill health.
  - **Health statistics measurement:**
    - Measurement related to the state of health which includes sickness and death.
    - Measurement affecting health, i.e., nutrition, housing and environmental factors.
    - Items of services: Preventive, promotive and curative. Sources of vital health statistic are same as that of health information system.

Function of Vital Statistics

- It represents facts in a definite form.
- It converts the mass of numbers into useful information.
- It is used as machinery in health information system.
- It helps in formulating and testing hypothesis.
- It helps in planning effective strategy for future.
- It helps in production.
- It facilitates comparison.

Purpose of Vital Statistics

- **Administrative purpose:** It provides clues for administrative action and create administrative standard of health activities.
- **Health program organization:** It determines success or failure of specific health program or undertakes overall evaluation of public health work.
- **Legislative purpose:** To promote health legislation at local, state and national level.
- **Government purpose:** To develop policies and procedures at state and national level.
- Basis of social reform.

IMPORTANT RATES AND INDICATORS

- **Rate:** The rate is the primary measurement in descriptive epidemiology.
- **Definition of rates:** Rate may be defined as measurement of a specific event, condition or disease in a given population within a specific time period.
  Rate can be expressed in a formula as:

$$\text{Rate} = \frac{\text{Number of people affected in given time period}}{\text{Total population in a same area}}$$

  Rates may be used for the comparison between groups. Specific rates have concern with specific events, time period, causes or specific group. By using rates, it is possible to compare events that occur at different time and place and different people. Rates present demographic data and morbidity data.
- **Demographic rates:** When the demographic data are converted into rates, they become very meaningful for the assessment of community health status. The rate consists of two parts, a numerator and denominator. The numerator is composed of the number of conditions or events of interest occurred within specified period of time. Denominator is the total population at risk during the same period of time. If the time period is long the population at risk is estimated at mid period such as mid-year.

General Principles of Calculation

- Numerator must include all of the events that are being measured such as deaths of cases and each of those must be in the denominator.
- Everyone in the denominator must be at risk for the events in the numerator because rate is a fraction or proportion.

- It is necessary to multiply by a base which is usually a multiple of ten. The procedure removes the decimal point and makes composition of the rates easier.
- Any base multiple of ten may be chosen that results in the rate above the volume of one. The rate should be reasonable size not a factor.

$$\text{Rate} = \frac{\text{Number of events occurring in a period of time}}{\text{Population at risk during the same period of time}} \times 1000$$

USEFUL RATES AND INDICATORS

Rates are calculated from the total number of events which occur in a defined geographical area during a calendar year. Rates include:

- Annual rate
  - Crude rate
  - Specific rate

$$\text{Crude rate} = \frac{\text{Number of total events in an area during the year}}{\text{Estimated mid-year population of the same area during the same year}} \times 1000$$

$$\text{Specific rate} = \frac{\text{Number of total events in specific population in an area during the year}}{\text{Estimated mid-year population of the same area during the same year}} \times 1000$$

- **General marital fertility rate (GMFR):** It is the "number of live births per 1000 married women in the reproductive age group (15–44 or 49 years) in a given year."

$$\text{GMFR} = \frac{\text{Number of live birth in a year}}{\text{Mid-year married female population in the age group of 15–49 year}} \times 1000$$

- **Age-specific fertility rate (ASFR):** Age-specific fertility rate is "defined as the number of live births in a year to 1000 women of any specific age group." The ASFR throws light on the fertility pattern. They are the sensitive indicators of family planning achievement.

$$\text{ASFR} = \frac{\text{Number of live birth in a particular age group}}{\text{Mid-year female population of the same age group}} \times 1000$$

- **Birth rate:** Birth rate is defined as "the number of live births during a year per thousand estimated mid-year population." It is represented by the formula.

$$\text{Birth rate} = \frac{\text{Number of live births during the year}}{\text{Estimated mid-year population}} \times 1000$$

- **Death rate:** The death rate "is defined as the number of deaths per 1000 estimated mid-year population in one year." It is given by the formula.

$$\text{Death rate} = \frac{\text{Number of deaths occurred during the year}}{\text{Estimated mid-year population}} \times 1000$$

- **Specific death rate:** The death rate due to specific cause, e.g., cholera in specific group, age, sex, occupation, social class and specific period annual, half yearly, monthly are called specific death rate.
  - $\text{Diseases-specific death rate} = \frac{\text{Number of deaths among males during the year}}{\text{Estimated mid-year population}} \times 1000$
  - $\text{Sex-specific death rate of males} = \frac{\text{Number of deaths among males during the year}}{\text{Estimated mid-year population}} \times 1000$
  - $\text{Time-specific death rate} = \frac{\text{Number of death in 2014}}{\text{Estimated mid-year population}} \times 1000$
  - $\text{Age-specific death rate} = \frac{\text{Number of death of specific age group during the year}}{\text{Estimated mid-year population}} \times 1000$
- **Infant mortality rate:** It is the number of infant deaths under one year of age per 1000 live births in one year. It is represented by the formula.

$$\text{Infant mortality rate} = \frac{\text{Number of deaths under one year of age}}{\text{Total live birth in the year}} \times 1000$$

- **Neonatal mortality rate:** Deaths occurring within 28 days of birth are called neonatal deaths.

$$\text{Neonatal mortality rate} = \frac{\text{Number of death under 28 days of age}}{\text{Total live birth}} \times 1000$$

- **Perinatal mortality rate:** It is the mortality of infants occurring during the period from 28 weeks of gestation to 7 days after birth per 1000 total births. It includes total stillbirths and deaths under 1 week.

$$\text{Perinatal mortality rate} = \frac{\text{Fetal death of 28 weeks gestation + deaths under 7 days after birth}}{\text{Total live birth + still birth}} \times 1000$$

- **Maternal mortality rate:** According to WHO "Maternal mortality rate expresses the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy from any cause related or aggravated by the pregnancy or its management not from accidental or incidental cause."

$$\text{Maternal mortality rate (MMR)} = \frac{\begin{array}{c}\text{Total number of female deaths due to complications of pregnancy, child birth of within 42 days of delivery from puerperal causes during the given year}\end{array}}{\text{Total number of live birth in the same year}} \times 100{,}000$$

- The multiplying factor can also be 1000, 10,000 and 100,000 if no deaths decline considerably
- **General fertility rate (GFR):** It is better measure of fertility than the crude birth rate because the denominator is restricted to the number of women in the child-bearing age, rather than the whole population.

$$\text{General fertility rate (GFR)} = \frac{\text{Number of live birth in an area during the year}}{\text{Mid-year female population of age 15–45 years in the same area in the same year}} \times 1000$$

- **General marriage rate (GMR):** It is defined as the number of marriages during a year per thousand persons of age 15–45 years.

$$\text{GMR} = \frac{\text{Number of marriages within one year}}{\text{Number of unmarried persons of age 15–49 years}} \times 1000$$

- **Pregnancy rate (PR):** It is the ratio of number of pregnancies in a year to married women in the age group of 15–45 years. The number of pregnancies includes all pregnancies whether these had termination as live birth, stillbirth or abortions or had not yet terminated.

$$\text{PR} = \frac{\text{Number of pregnancies within one year}}{\text{Number of women of reproductive age (15–45 years) in the same year}} \times 1000$$

- **Abortion rate:** The annual number of all types of abortions usually per 1000 women of childbearing age (usually defined as age 15–44 years).
- **Age-specific marital fertility rate:** It is the number of live birth in a year to 1000 married women in any specific age group.

$$\text{ASMFR} = \frac{\text{Number of live births in a particular age group}}{\text{Mid-year married female population of the same age group}} \times 1000$$

- **Total fertility rate (TFR):** Total fertility rate represents the average number of children a woman would have if she were to pass through her reproductive years in each age group. It is computed by summing the age specific fertility rate for all ages, if 5 years of age groups are used the sum of the rates is multiplied by 5. This measure gives the appropriate magnitude of "completed family size".

$$TFR = 5 \times \sum_{15-19}^{45-49} \frac{ASFR}{1000}$$

- **Total marital fertility rate (TMFR):** Average number of children that would be born to a married woman if she experiences the current fertility pattern throughout her reproductive span

$$TMFR = 5 \times \sum_{15-19}^{45-40} \frac{ASMFR}{1000}$$

- **Gross reproduction rate (GRR):** Average number of girls that would be born to a woman if she experiences the current fertility pattern through her reproductive span (15–44 or 49 year) assuming no mortality

$$GRR = 5 \times \sum_{15-19}^{45-49} \frac{ASMFR}{1000}$$

- **Net reproductive rate (NRR):** NRR is defined as the number of daughters a newborn girl will bear during her lifetime assuming fixed age specific fertility and mortality rates.

$$NRR = \text{Women} \xrightarrow{\text{gave birth}} \text{Daughter} \xrightarrow{\text{birth given to}} \text{girl born}$$

NRR is similar to GRR but takes in to account that some females will die before completing their productive lifespan

- **Marriage rate:** It is the number of marriages in the year per 1000 population.

$$\text{Crude marriage rate} = \frac{\text{Number of marriage in the year}}{\text{Mid year population}} \times 1000$$

- **Expectation of life or life expectancy:** Expectation of life or life expectancy at a given age is the average number of years which a person of that age may expect to live according to the mortality pattern prevalent in that country. Demographers consider it as one of the best indicators of a country's level of development and of the overall health status of its population.
- **Proportional mortality rate (PMR):** It is commonly used to study diseases pattern by cause in settings where population denominators are not available. The proportional mortality can be calculated by sex, age, group or any other appropriate subdivision of the population. Proportional mortality rate is simple and potentially useful way of portraying the burden of a specific disease within a population and PMR provides a way to compare population.
- **Morbidity indicators:** Morbidity is the state of departure from physiological well-being. The various morbidity indicators are incidence rate, prevalence rate, notification rate hospital attendance, admission and discharge rate, etc.
- **Incidence rate:** It indicates the number of new cases of a particular disease in a defined population during a specific period of time. Incidence rates provide a direct measure of the rate at which new cases occur in a given population. It serves as a valuable tool for the study of the causes of diseases, incidence rates are more useful in assessing the risk of acute diseases. Examples of incidence rates are hospital admission rate, case attack rate, secondary attack rates, etc.

$$\text{Incidence rate} = \frac{\text{Number of new cases of a disease starting illness in a defined period}}{\text{Mid-year population at risk during the same year}} \times 1000$$

- **Attack rate:** It is similar to the incidence rate and represents the incidence of illness among the exposed population during the specified time period and expressed as a percent.

$$\text{Attack rate} = \frac{\text{Number of new cases of a specified disease occurring in a particular place during the specified time interval}}{\text{Total populations at risk during the same time interval}} \times 100$$

- **Prevalence rate:** It indicates the number of existing cases (new and old) of a disease in the total population at a particular point of time. Prevalence rate is a ratio rather than rate. It is of two types:
  1. **Point prevalence:** It is defined as the number of all current cases (new and old) of a disease at one point of time in relation to a defined population

$$\text{Point prevalence} = \frac{\text{Number of all current cases (new and old) of a specified disease during a particular period of time interval}}{\text{Total population at the same point of time}} \times 100$$

  2. **Period prevalence:** It is defined as the number of cases (old and new) existing during a defined period of time expressed in relation to a defined population

$$\text{Period prevalence} = \frac{\text{Number of all existing cases (old and new) of a specified disease during a particular period of time interval}}{\text{Estimated mid interval population at risk}} \times 100$$

Prevalence rate may be affected by treatment. As the diseases is cured prevalence rate may be decreased. Prevalence rates are useful in:
- Planning the disease control program
- Administration of hospital
- For treatment and rehabilitation

- **Disability rate:** A disability is an umbrella term converging impairments, activity limitations and participation of restrictions. These include days of restricted activity, bed disability day, and work loss day. A disability may be present at birth or occur during a person's lifetime.
- **Healthcare delivery indicators:** They are doctor population ratio, doctor nurse ratio, population bed ratio, etc. These indicators show the availability and distribution of health services.
- **Environmental indicators:** These indicators represent the quality of physical and biological environment. They include the proportion of population who get safe water and also indication relating to pollution of air, light and water.
- **Social and mental indicators:** These indicators include suicides, homicides, smoking, alcoholism, violence and drug abuse.

- **Utilization rates:** Health usually investigated by this indicator to provide additional information on health status in use of health services. The percentage of children and mothers immunized, bed occupancy rate, length of hospital stay, percentage of people using family planning method, etc.
- **Socioeconomic indicators:** These include the rate of population growth, family size, housing, literacy rate, unemployment rate and per capita income, etc.
- **Others:** The health policy indicators, social indictors, basic needs indicators and health for all indicators.

VITAL HEALTH RECORD

The United Nations define a vital events registration system as including legal registration statistical recording and reporting of the occurrence of and the collection, compilation, presentation and distribution of statistics relating to vital events such as:

- Birth registers
- Death registers
- Fetal death registers
- Marriage registers
- Divorce registers
- Adoption registers
- Judicial separation registers

Therefore, the vital health records include the following records:

- Birth records
- Death records
- Fetal death records
- Marriage records
- Divorce records
- Adoption records
- MTP and abortion records
- **Morbidity records:** These records provide valuable information about the course of diseases, its duration, case fatality and survival. Natural cases of disease can be obtained from registers:
- Antenatal records
- Postnatal records
- **K sheets:** K sheets are maintained in the hospital setting and these give information about geographical area, age, sex duration of the hospital stay, distribution of diagnosis, association between diseases and hospital staff, period between diseases and hospital stay.

The distribution of patients according to social and geographical characteristics and cost of the hospital case, such information can be of great value in the planning and healthcare services.

Central Birth and Death Registration Act 1969

For the compulsory registration of birth and death, the Government of India promulgated a "Central Birth and Death Registration Act" which came into force on April 1, 1970. The Act makes registration of births and deaths compulsory throughout India. The time limit in registration of birth and death is 21 days uniformly all over India. In case of default, a fine up to ₹50 can be imposed. The parents or institution such as hospitals, nursing homes, hostels, jails or Dharamshalas where an indication of birth and death has happened, will register it with the concerned register.

Recent Update

The Registration of Births and Deaths (Amendment) Bill, 2023 was passed by the Lok Sabha and came into effect on October 1, 2023. The bill amends the Registration of Births and Deaths Act, 1969 to create a database of registered births and deaths at the national and state level. The bill's objectives include:

- Promoting uniformity and comparability in birth and death registration across India.
- Making birth and death registration mandatory for state governments.

Uses of Vital Health Records

- Vital health records help to determine the status of health of individual, family and community.
- Help in investigating the health problems and needs of the people so that health planning can be done to solve these problems.
- Help in making improvement in the administration.
- Help in evaluating the health program.
- Useful in health offices and institution in collecting data.
- Provide basis in formulating plans in the health service. These are the symbols of future plans.
- Useful for analysis of the trends of health statistics.
- Useful for making health programs.
- Useful in comparing the health status of one nation with another.
- Serve as an important tool for research related to health.
- The vital health records are of legal necessity.
- These are the basis of social reforms.
- These are the important tools for the epidemiologists.

BASIC STATISTICAL METHODS

Statistical data once collected must be arranged purposively in order to bring out the important points clearly and strikingly. The data is classified, analyzed and tested for accuracy by statistical methods. The data which is obtained directly from the individual is called primary data. The data which is obtained from records is called secondary data. The method of presenting statistical data is:

- Tables
- Charts
- Diagrams
- Graphs
- Picture
- Special curves

Tabulation

This is the first step before the data is used for analysis and interpretation. It can be simple or complex depending upon the number of measurements of a single set or a multiple set of items (Tables 9.1 and 9.2).

General Principle of Tabulation

- Tables should be numbered, e.g., Tables 9.1 and 9.2, etc.
- Title must be given to each table and the title should be brief and self-explanatory.
- Heading of rows or columns should be clear and concise.

TABLE 9.1: Simple table showing population of India in different years

Year	Population
1901	238,396,000
1921	251,321,000
1981	685,185,000
1991	843,930,000
2001	1027,015,247
2011	1210,193,422

Source: Census of India, 2011.

TABLE 9.2: Complex table showing population of India in different years with percentage of tuberculosis infection and annual mortality rate per 100 cases.

Year	Population in millions	Infection per 100 population	Annual mortality per 100 cases
1961	439.23	1.75	0.36
1981	685.18	2.74	0.57
2001	1052.50	4.21	0.88

Central Tuberculosis Division Government of India
Source: ADGH (TB) Government of India, New Delhi.

- The data must be presented according to the size or importance, chronologically, alphabetically or geographically.
- If the percentages or averages are to be compared they should be placed as close as possible.
- Table should not be very large.
- No abbreviation should be written.
- Total and grand total should be shown at the end of the table.
- Vertical arrangement is better than horizontal one because it is easier to scan data from top to bottom than from left to right.
- Footnotes should be given.
- Frequency distribution table: (Table 9.3) In the frequency distribution table the data is first split up into convenient groups (class intervals) and the number of items (frequency) which occur in each group is shown in the adjacent column.

TABLE 9.3: Frequency distribution table showing the percentage of diastolic blood pressure of males and females

Blood pressure	Number of males	Percentage	Number of females	Percentage
70–75	6	6.3	8	14.5
76–80	18	19.0	12	21.9
81–85	46	48.4	25	45.5
86–90	17	17.9	8	14.5
91–95	6	6.3	2	3.6
96–100	2	2.1	–	–
Total	95	100.0	55	100.0

Diagrammatic Representation of Data

Charts and Diagram

The statistical data becomes interesting when it is presented diagrammatically. People will understand it easily and would accept it with greater interest. The impact of picture depends on the way it is drawn.

The following are the rules for constructing diagram and charts:

- Diagrams presented should be attractive and of proper size.
- The data presented by diagram should be simple.
- Measurements should be easy and useful.
- The facts should be clearly classified in a diagram.
- Every diagram or chart should have a heading.
- Symbolic presentation and its explanation is essential.
- Minimum use of words and figures.
- Diagram should be meaningful and should present reality.

Bar Chart

In bar charts a set of numbers is exhibited by the length of a bar. The length of bar is proportional to the magnitude to be represented. Bar charts are popular media of presenting statistical data because they are easy to prepare and enable values to be compared visually. The bars are usually separated by appropriate spaces for neat and clear presentation. A suitable scale must be chosen to present the length of the bar. A simple bar chart is shown in the Figure 9.3.

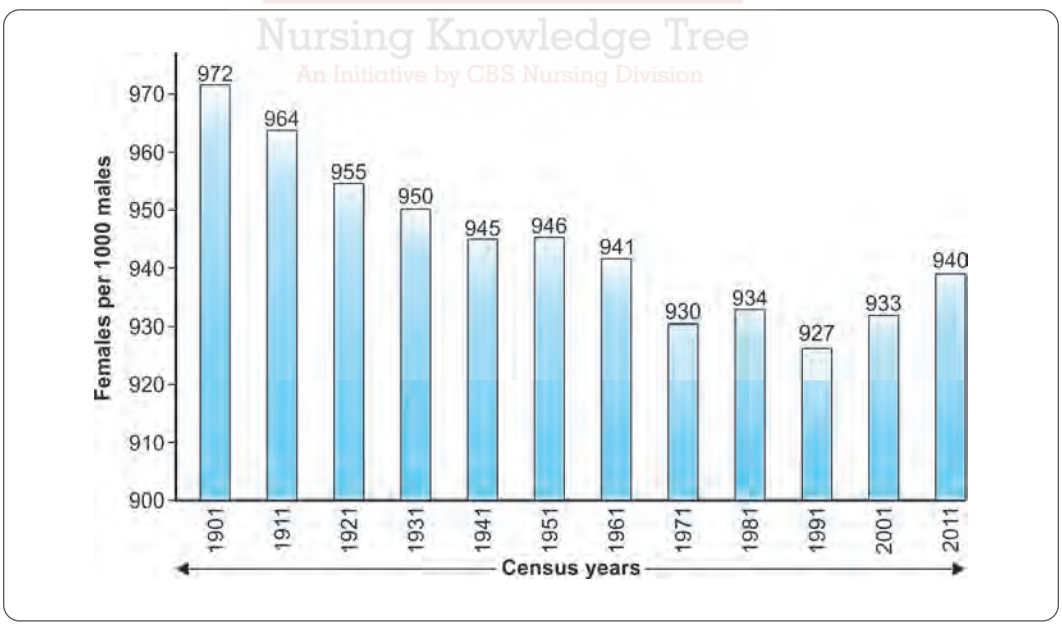

Figure 9.3: Bar chart showing females per 1000 males in subsequent census years

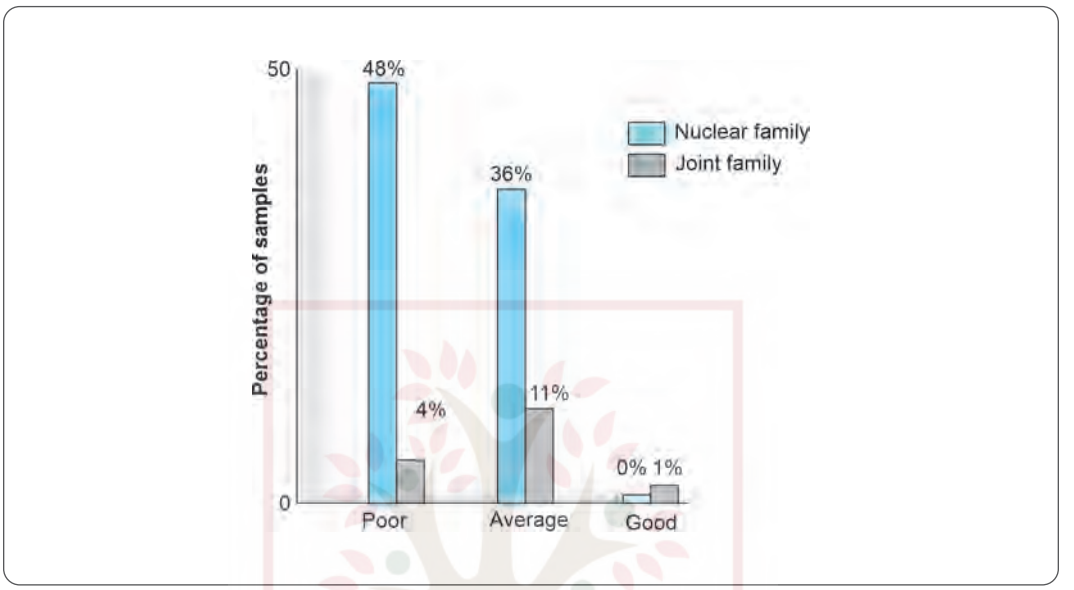

Figure 9.4: Multiple bar chart showing the percentage distribution of level of knowledge about ill effects of smoking among 13–19 years age in nuclear and joint familiar

Multiple Bar Charts or Compound Bar Chart

In this type of bar charts two or more bars can be grouped together when different types of data are to be compared at once. One type of data can be identified by the same color or design as shown in Figure 9.4.

Figure 9.4 shows poor knowledge among 48% boys belonging to nuclear family against 4% boys from joint family. Average knowledge was shown "among" 36% boys of nuclear family and 11% of joint family. Good knowledge was presented by 1% boys from joint family and 0% from nuclear family.

Histogram

It is a pictorial diagram of frequency distribution. It consists of series of blocks (Fig. 9.5). The class intervals are given along the horizontal axis and frequency along the vertical axis. The area of each block or rectangle is proportional to the frequency. Area of the rectangle varies with the frequency. The height of rectangle alone will indicate the frequency if the class interval is uniform.

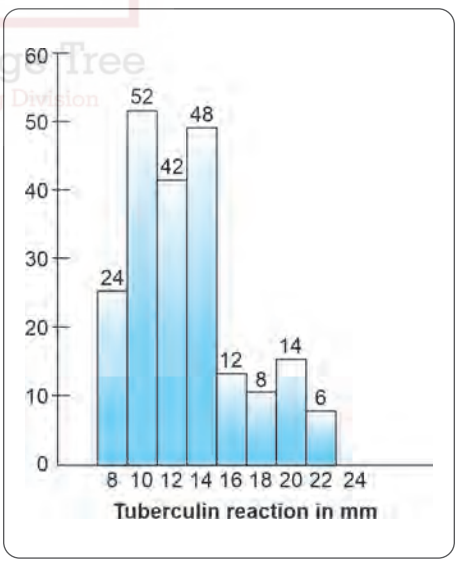

Figure 9.5: Histogram showing tuberculin reactions in 206 persons never vaccinated

Frequency Polygon

It is also a diagram of frequency distribution developed over a histogram. It is obtained by joining the mid-points of class intervals at the height of frequencies by straight lines (Fig. 9.6). It gives a polygon, i.e., figure with many angles.

Tuberculin reaction in 206 persons has been given in Table 9.4.

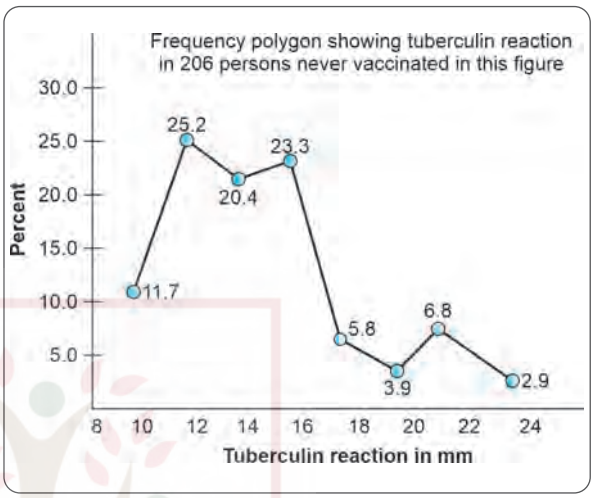

Figure 9.6: Frequency polygon

Line Diagram

This is a frequency polygon presenting variations by lines. It is used to show the trend of events with the passage of time. Figure 9.7 shows the population trends in India from 1901 to 2011. Here the class interval is 10 years.

Pie Charts or Sector Diagram

This is another way of presenting discrete data of qualitative characters (Fig. 9.8). Instead of comparing the length of a bar, the area of segment of a circle is compared. The area of each segment depends upon the angle. The degree of angle shows the frequency and area of the sector. It gives comparative difference at a glance. Size of each angle is calculated by multiplying the class percentage with 3.6, i.e., or by the formula

$$\text{Class percentage with 3.6, i.e } \frac{360}{100} \text{ of by the formula}$$

$$\frac{\text{Class frequency}}{\text{Total observation}} \times 360^\circ$$

TABLE 9.4: Tuberculin reaction in 206 persons

Reaction in mm	Frequency	Percentage
8–10	24	11.7
10–12	52	25.2
12–14	42	20.4
14–16	48	23.3
16–18	12	5.8
18–20	8	3.9
20–22	14	6.8
22–24	6	2.9
Total	206	100.0

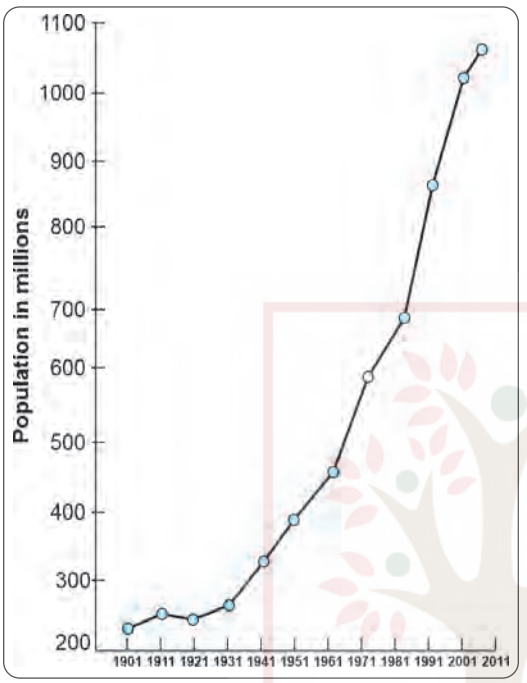

Figure 9.7: Line diagram showing population trends in India

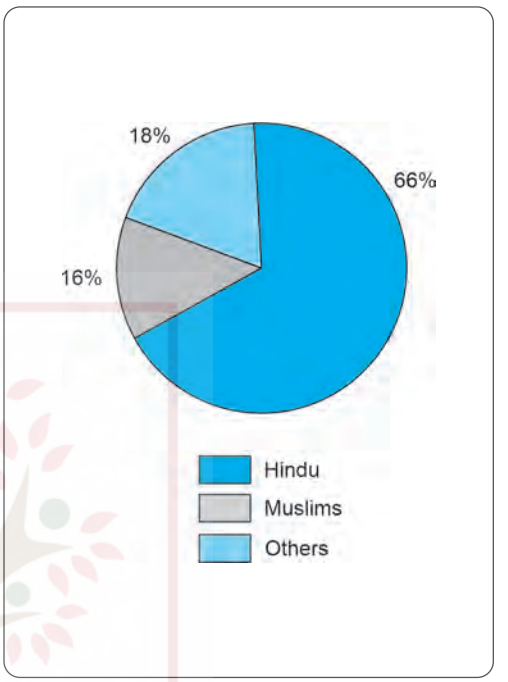

Figure 9.8: Pie diagram showing percentage distribution of samples according to religion

One hundred samples were selected of 13–19 years boys to assess the knowledge on ill effects of smoking to find out association between different variables.

The percentage of samples according to religion—in a description study to assess the knowledge and attitude on ill effect of smoking, the 66% of samples were Hindus, 16% of the samples were Muslims where as 18% of the samples practiced other religion (Fig. 9.8).

Pictograms

In pictogram in spite of presenting traditional charts, data are made clear with the help of picture or symbols. It is a popular method to impress the frequency if the occurrence of events to common man such as number of patients admitted, discharged, accidents, deaths, number of operations, etc. Figure 9.9 shows the population per physician in different countries.

Statistic Maps

When the statistical data refer to geographical or administrative area, it is presented either as "shaded maps or dot maps" according to suitability. The shaded maps are used to present data of varying sizes. The areas are shaded with different colors or different intensities of the same color which is indicated in the key. Figure 9.9 shows the doctor's population ratio in different countries.

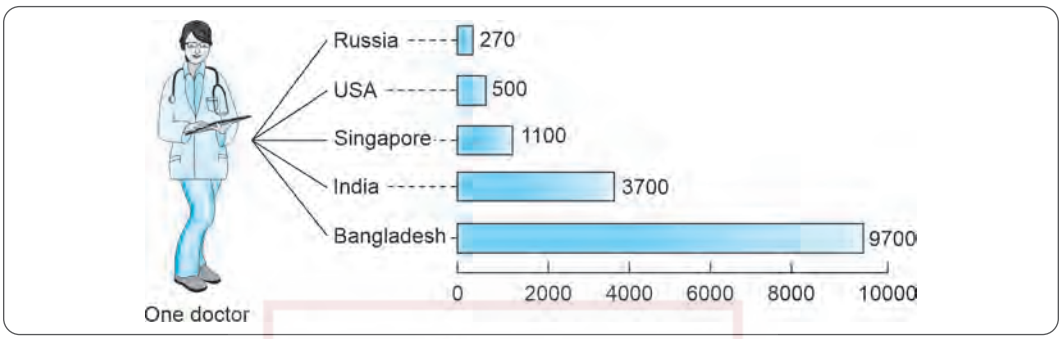

Figure 9.9: Population per physician in different countries

STATISTIC AVERAGE

Average is a general term which describes the center of services. There are three common types of averages or measures of central position or a central tendency, i.e.,

- Mean
- Median
- Mode

Mean

This measure implies arithmetic average or with arithmetic mean which is obtained by summing up all the observations and dividing the total by the number of observations.
The operation of adding is called summation and denoted by the sign $\sum$.

The individual observation is denoted by the sign η. and the mean is denoted by the sign $\overline{X}$ (called 'x' bar)
The mean is calculated as: $\overline{X} = \frac{\sum}{\eta}$

Example: The hemoglobin level of six subjects of same age and same sex are 13, 14, 12, 13, 11, 12 Calculate the mean hemoglobin.

Solution:

The mean hemoglobin = $\frac{13+14+12+13+11+12}{6} = 12.5$

by applying the formula,

$$\overline{X} = \frac{\sum}{\eta}$$

where X is mean hemoglobin, $\sum$ is the sum of number of observations added and η is number of observations.
Hence, Mean hemoglobin is 12.5.
Mean is the one central value which is most commonly used in statistic methods.

TABLE 9.5: Median of diastolic blood pressure

Diastolic blood pressure	Diastolic blood pressure
80	72
72	76
83	80
85	83
87	85 medians
90	87
76	90
95	92
92	95

Median

When all the observations of a variable are arranged in either ascending or descending order, the middle observation is known as median.

To obtain the median the data is first arranged in an ascending or descending order of magnitude and then the value of the middle observation is located which is called median. For example, the diastolic blood pressure of nine subjects is shown in Table 9.5. The data is arranged in ascending order in the right column of Table 9.5. It shows the median is 85 which is the value of middle observation.

Mode

Mode is the most frequently occurring observation in a series. It is the most frequently item or the most fashionable value in a series of observations. For example, the diastolic blood pressure of 20 subjects was: 85, 75, 81, 79, 71, 95, 75, 77, 75, 90, 71, 75, 79, 95, 75, 77, 84, 75, 81, 75.

The mode or most frequently occurring value is 75. Mode is rarely used in medical studies. The advantages of mode are that it is easy to understand and is not affected by the extreme items. The disadvantage is that the exact location is often uncertain and often not clearly defined that is why it is not often used in medical statistics.

Out of the three measures of central tendency, mean is better and is utilized more often because it uses all the observations in the data and is further used in the test of significance.

MEASURES OF DISPERSION OR VARIABILITY

Measure of variability of observations helps to find how individual observation is dispersed around the mean of large series. There must be individual variation. If we examine the data of blood pressure or height or weight of a large group of individuals, we may find that the values may vary from person to person. Even within the same individual there may be variation from time. There are several measures of variation or dispersion of which the widely used are:

- **Range:** The range is the simplest measure of dispersion. It is defined as the difference between the highest and lowest figures in a given sample. For example, the range from the diastolic blood

pressure of ten individuals can be calculated by subtracting the lowest reading from the highest one:

83, 75, 81, 79, 71, 90, 75, 95, 77, 94

In this series, the highest reading is 95 and the lowest one is 71.

Range is 95 – 71 = 24

The range is not of practical importance as it indicates the extreme value only and nothing about the dispersion of values between the two extreme values.

- **Mean or average deviation:** It is the average of the deviation from the arithmetic means. It is given by the formula.

$$MD = \sum \frac{(x - \bar{X})}{x}$$

Where x is the series of reading and $\bar{X}$ is the arithmetic means and $(x - \bar{X})$ is the deviation from mean. The mean deviation from the diastolic blood pressure of 10 individual is 83, 75, 81, 79, 71, 95, 75, 77, 84, 90.

$$\text{Arithmetic Mean} = \frac{83+75+81+79+71+95+75+77+84+90}{10} = 81$$

$$\bar{X} = 81$$

	Mean deviation	
Systolic BP x	Arithmetic mean $\bar{X}$	Deviation from the mean $(x - \bar{X})$
83	81	2
75	81	–6
81	81	0
79	81	–2
71	81	–10
95	81	14
75	81	–6
77	81	–4
84	81	3
90	81	9
Total = 810		**Total = 56 (ignoring ± sign)**

$$\text{Arithmetic Mean} = \frac{810}{10} = 81$$

$$MD = \sum \frac{(x - \bar{X})}{x}$$

$$= (x - \bar{X}) = 56$$

$$MD = \frac{56}{10} = 5.6$$

- **Standard deviation:** It is defined as "root – means – square – deviation." It is denoted by the Greek letter sigma (σ) or by the initial SD. It is the most frequently used measure of deviation. Standard deviation is calculated from the formula.

$$\text{Standard deviation (SD)} = \sqrt{\sum \frac{(x - \bar{X})}{\eta}}$$

The above formula is used when the sample size is >30.

Example: The diastolic blood pressure of 10 individual is: 83, 75, 81, 79, 71, 95, 75, 77, 84, 90. Calculate SD.

Solution:

x	$\bar{X}$	$x - \bar{X}$	$(x - \bar{X})^2$
83	81	2	4
75	81	–6	36
81	81	0	0
79	81	–2	4
71	81	10	100
95	81	14	196
75	81	–6	36
77	81	4	16
84	81	3	9
90	81	9	81

$x = 81$, $\eta = 10$

$$\text{SD} = \sqrt{\sum \frac{\left(x - \bar{X}\right)^2}{\eta - 1}} = \sqrt{\frac{482}{10 - 1}} = \sqrt{\frac{482}{9}} = \sqrt{53.55} = 7.31$$

$\eta = 10$
SD = 7.31

The basic significance of standard deviation is that it is an abstract number that it gives us an idea of the spread of dispersion. The larger the standard deviation the greater is the dispersion value about the means than 30. For smaller size this formula tends to underestimate the standard deviation and needs correction which is done by subtracting the denominator by 1 (η– 1) from η.

Therefore, standard deviation (SD) can be calculated by the formula:

$$\text{SD} = \sqrt{\sum \frac{\left(x - \bar{X}\right)^2}{\eta - 1}}$$

The steps for calculating the standard deviation are:

1. First of all, take the deviation of each value from the arithmetic means
2. Square each deviation
3. Add up the squared deviation
4. Divide the result by number of observations η or (η – 1) in case sample size is <30
5. Take the square root which gives the standard deviation

DESCRIPTIVE STATISTICS

Definition

Descriptive statistics is the study of the amount and distribution of the diseases or health status within a population by person place and time.

It usually includes the determinants of incidence, prevalence and mortality rates for diseases in large population group. This is according to the characteristics such as age, sex, race, social customs, habits, etc. The descriptive statistic also describes the occurrence of diseases in relation to person, place and time. It is the first step in epidemiological investigations and provides data about the distribution and frequency of diseases or health-related states of the population by identifying the characteristics with which the diseases in question seems to be associated. It provides answers to the following questions:

- When the disease is occurring? Time distribution.
- Where is it occurring? That is place distribution.
- Who is getting the diseases? That is person distribution.

The procedures involved in descriptive methods are:

- Defining the population to be studied
- Defining the diseases under study
- Describing the disease by time, place and person
- Measurement of diseases
- Comparing with known indices
- Formulation of an etiological hypothesis

Defining the Population to be Studied

The descriptive studies are carried out in population; therefore population should be defined in terms of total number, age, sex, occupation and sociocultural characteristics, etc. Population defined should be large or whole population in an area or just a representative sample may be taken.

Defining the Diseases Under Study

Once the population under study is defined or specified then the diseases or condition under study to be defined stating its signs and symptoms and how diseases will be measured. If the definition is not valid it would lead to errors in presentation and findings would not be comparable with other findings.

Describing the Diseases by Time, Place and Person

After defining diseases the epidemiologist describes the occurrence of disease or health related events or characteristics with in the population in terms of time, place, and person.

- **Time distribution:** Three types of time distribution occur, i.e.
  1. **Short-term fluctuation:** The best-known short-term fluctuation in the occurrence of a disease is an epidemic.
  2. **Periodic fluctuations:** This refers to the seasonal variation in occurrence of a disease, e.g., many communicable diseases, like measles upper respiratory infections, malaria, and measles occur usually in early spring, whereas respiratory infections show rising trend in winter month
  3. **Long-term fluctuations:** This refers to changes in the occurrence of diseases over a long period of time generally many years or decades. Secular trend implies a definite upward or downward movement in occurrence of some diseases. Diabetes mellitus, hypertension and coronary heart diseases are showing an upward trend, whereas typhoid, diphtheria and polio are showing a downward trend.
- **Person distribution:** The descriptive study describes the occurrence of a disease by person according to age, sex, occupation, marital status, habits, social class, ethnicity, behavior, stress, migration, etc.
  - **Age:** Age is related to diseases as shown here:
    Childhood—measles
    Middle age—cancer
    Old age—atherosclerosis
  - **Sex:** Sex is another host characteristic linked with diseases occurrence. Certain chronic diseases are more common in women than men, e.g., hyperthyroidism and obesity are more common in women than men, whereas lung cancer and coronary heart diseases are more common in men than women.
  - **Occupation:** Different occupations are related to different diseases such as a person working in coal mines have silicosis occurring commonly and farmers working in fields have farmers lung diseases.
  - **Ethnicity:** Tuberculosis, sickle cell anemia and cancer are found to be distributed in certain racial and ethnic origin groups.
  - **Social class:** Disease distribution also shows social class difference. The upper classes show higher prevalence of coronary heart diseases, hypertension and diabetes, whereas lower class shows nutritional deficiency diseases and lower life expectancy.
  - **Behavior:** Certain behavior factors such as cigarette smoking, alcoholism and over eating are associated with coronary artery disease and obesity.
  - **Stress:** Stress has been shown to be related to susceptibility to diseases and patient's compliance with medical regimen, etc.
- **Place distribution:** By studying the distribution of a disease in different population of the geographical area, we gain perspective on the fascinating difference in disease pattern not only between the countries but also within the countries. The environmental change, standard of living, diet and other etiological factors influence the disease pattern in different geographical areas. The difference may be classified as:

- **International difference:** Cancer of the oral cavity and uterine cervix are exceedingly common in India as compared to industrialized countries.
- **National difference:** Distribution of endemic goiter, leprosy, malaria and nutritional deficiency diseases has all shown variations in their distribution in India. Some parts of the country are more affected and others less affected or not affected at all. Such distribution exists in every country. Such information is needed to show areas which are affected with diseases for providing proper healthcare services.
- **Rural urban difference:** Diseases, like cardiovascular disease, mental illness and drug abuse is more common in urban areas whereas skin diseases and warm infestations are more common in rural area.

- **Local distribution:** Diseases distribution may vary within the inner part and the outer part of the city. Infected sources of water in a particular area of city may cause outbreak of cholera or other water-borne diseases.

The geographical differences in disease distribution are important as these provide information about the sources of diseases, mode of spread to make etiological hypothesis.

Characteristics to be assessed in descriptive epidemiology in relation to person place and time.	
Person	Age, sex, occupation, marital status, ethnic group and race, social class and family variables.
Place	Natural boundaries, political subdivisions, environmental factors, urban/rural differences, international comparisons.
Time	Secular trends, cyclic changes, seasonal.

Measurement of Diseases

The disease is measured in term of morbidity, mortality and disability. Measurement of mortality is straightforward. Morbidity has two aspects: Incidence rate and prevalence rate.

1. Incidence rate can be obtained from the longitudinal studies
2. Prevalence rate can be obtained from cross sectional studies.

Descriptive study may use longitudinal design or cross-sectional design to obtain estimates of magnitude of health and diseases problems in human population.

Cross-sectional studies: It is the simplest form of an observational study. It is based on a single examination of a cross section of population at one point in time. The results of which can be projected on the whole population, provided the sampling has been done correctly. Cross-sectional study is also known as prevalence study.

Longitudinal study: In longitudinal study the observations are repeated in the same population over a prolonged period of time longitudinal study is used:

- To study the natural history of the diseases and its further outcome
- For finding out the incidence rate—a rare occurrence of new cases in the community
- For identifying the risk factors of diseases, longitudinal studies provide valuable information which cross-sectional study may not provide.

Comparing with the Known Indices

Comparisons between different population and subgroups of the same population are made about disease incidence and prevalence rates. It helps to know the disease etiology and identify those groups of population which are at risk for some diseases.

Formulating an Etiological Hypothesis

By knowing the distribution of diseases, hypothesis can be made out about disease etiology.

Uses of descriptive epidemiology:

- Provides data regarding the magnitude of the diseases and types of disease problems in the community in terms of morbidity and mortality rate and ratio.
- It provides clue to disease epidemiology and help in the formulation of an etiological hypothesis.

RESPONSIBILITY OF COMMUNITY HEALTH NURSE IN VITAL STATISTIC

The medical and nursing personnel have got an important role in health information system. The community health nurse is responsible for health information and vital statistics in her area. Some important responsibilities of community health nurse are listed as under.

- Collection of information regarding vital statistics in her area.
- Observation of the information collected by the health personnel working under her and guiding them.
- Classification of the data collected from nursing and health workers of her area working under her.
- Presentation of the data through tables, bar diagrams maps, etc., according to the need.
- Forwarding the data collected to the concerned official/institutions.
- Analyzing the data, making community diagnosis and provide treatment.
- Spreading the importance of vital statistics in the community, creating awareness regarding registration of vital events.
- Keeping up to date knowledge of data collection and communication.
- Taking an active role in health surveys.
- Maintaining all registers in the health centers regarding inpatient, outpatients and disease registers, etc.

Summary

- Health information system may be defined as "a mechanism for the collection, processing, analysis and transmission of information required for organizing and operating health services and also for research and training" therefore health information system is a process whereby health data (input) are recorded, stored, retrieved and processed for decision making.
- The concept of health information system is to provide reliable, relevant, up to date, adequate, timely and reasonably complete information to the health agencies at all levels, i.e., central, state and district.
- Components of HIS are demography, vital statistics health statistics, i.e., mortality, morbidity, disability and quality of life, health resources and utilization of health services, indices of outcome of medical care and financial statistic.

Contd...

- Sources of HIS are census, registration of vital event, sample registration system, notification of diseases, hospital records, disease registers, record linkage, epidemiology, surveillance, health data, health manpower statistics, population survey and other routine statistics related to health and nonquantifiable information.
  - Vital statistic is concerned with the study of human population, i.e., numerical data regarding important incidents occurring in a community and the method of analysis of this data. The important incidence such as birth, marriage, diseases and death, etc.
  - Important rates and indicators include birth rate, death rate, specific death rate, infant mortality, rate, neonatal mortality rate, perinatal mortality rate, maternal mortality rate, etc.
  - Morbidity indicators are incidence rate, attack rate, prevalence rate disability rate, environmental indicators social and mental indicators and socioeconomic indicators, etc.
  - Vital health records include birth register, death registers fetal death registers marriage registers divorce registers, adoption registers MTP and abortion registers, morbidity registers MCH records and k sheet, etc.
  - Basic statistical methods include tabulation, charts, diagrams, graphs, pictures and special curves. The statistic averages are mean, median and mode. Measure of dispersion include range, mean or average deviation and standard deviation.
  - Descriptive statistics is the study of the amount and distribution of the disease or health status within a population by person, place and time. It includes the determination of incidence, prevalence and mortality rates for diseases in large population.
  - Measurement of diseases is morbidity, mortality and disability. Descriptive study may use longitudinal design or cross-sectional design.
- Descriptive epidemiology provides data regarding the magnitude of the diseases and types of disease problems in the community in term of morbidity and mortality, rates and ratios.
- Responsibilities of community health nurse in vital statistic are collection of information regarding vital statistics in her area; observing the information collected by the health worker, classification of the data collected; presentation of data through tables, charts, bar diagrams maps, etc. according to need and forwarding data collected to the concerned officials.

STUDENT ASSIGNMENT

LONG ANSWER TYPE QUESTIONS

1. Describe the concept and components of health information system.
2. Explain the sources of health information system.
3. Describe the basic statistical methods.
4. Explain the mean, median and mode by giving examples.

SHORT ANSWER TYPE QUESTIONS

1. List the uses of health information system.
2. Define vital statistics. State the functions and purpose of vital statistic.
3. Write about the descriptive statistics.
4. Write short notes on the following:
   a. Tabulation
   b. Histogram
   c. Frequency polygon
   d. Pie chart
5. Define the following terms:
   a. Birth rate
   b. Death rate
   c. Infant mortality rate
   d. Neonatal mortality rate
   e. Specific death rate
   f. Maternal mortality rate

MULTIPLE CHOICE QUESTIONS

1. Which is not correct about the primary data?
   a. Interviews
   b. Observations
   c. Hospital records
   d. Questionnaire

2. The scientific study of the human population is:
   a. Demography
   b. Sex ratio
   c. Family welfare
   d. Urbanization

3. Registration of birth should be done within:
   a. 7 days
   b. 21 days
   c. 10 days
   d. 8 days

4. The Central Birth and Death Registration Act came into force on:
   a. 1st April 1970
   b. 14th Oct 1969
   c. 1st January 1950
   d. 1st Dec 1972

5. To calculate vital statistic the population is taken as on:
   a. 1st January
   b. 1st April
   c. 1st July
   d. 31st December

6. **Which of the following is incorrect about statistics?**
   a. It presents facts in definite form
   b. It converts data into information
   c. It is a tool of politicians
   d. It is used for comparison and help in prediction and planning effective strategy for future

7. **The study of collection and analysis of data regarding birth, death, fetal death, marriage, divorce and legal separation is:**
   a. Statistics
   b. Health statistics
   c. Biostatistics
   d. Vital statistics

8. **The sources of vital health statistic are:**
   a. Census
   b. Records of hospitals and health centers
   c. Journals publishing periodic events
   d. All of the above

9. **The basic statistical method are:**
   a. Tables and charts
   b. Diagrams and graphs
   c. Pictures and special curves
   d. All of these

10. **The statistical averages include:**
   a. Mean
   b. Median and mode
   c. Both (a) and (b)
   d. None of these

ANSWER KEY

1. c **2.** a **3.** b **4.** a **5.** c **6.** c **7.** d **8.** d
9. d **10.** c

Textbook of
Community Health Nursing–II for GNM Nursing Students

Salient Features

- Completely revised and updated compendium aligned with the revised INC syllabus for GNM Nursing Students
- This book reflects perfect integration of Theoretical and Clinical aspects for dual understanding of the concepts
- Recent updates on demographic data and stats have been provided giving a glimpse of the latest advancements in community health segment.
- Important National Health Programs and Policies have been extensively covered throughout the book
- A new chapter on *Management of Biomedical Waste* has been added keeping the syllabus as well as the students' requirements in mind.

Learning Objectives given in all the units focus on the areas that a student shall gain after completing the unit.

LEARNING OBJECTIVES

After the completion of the unit, the readers will be able to:

- Explain the health systems in India.
- Identify the areas of responsibility of central government, state government, center and state with regard to healthcare.

Every unit starts with a **Unit Outline** that gives the glimpse of the content covered in the unit.

UNIT OUTLINE

- Introduction
- Health
- Community
- Public Health
- Community Health
- Community Health Nursing
- Organization of Health System in India

Important terms used in the unit are enlisted under **Key Terms.**

KEY TERMS

- **Community:** A group of people living together in a particular geographical area.
- **Community health:** It is the science and art of preventing disease, prolonging life and promoting health through organized efforts. This includes informed choices of society, organization, public and private sectors, community and individual.

High Yield Points are covered to add extra value to student's knowledge.

High Yield Point

The UNICEF is promoting a campaign known as GOBI campaign to encourage four strategies for a "Child Health Revolution".

G: For growth charts to better monitor child development
O: For oral rehydration to treat all mild and moderate dehydration
B: For breastfeeding
I: For immunization against measles, diphtheria, polio, pertussis, tetanus and tuberculosis

Must Know boxes covering valuable facts are strategically placed to highlight critical information, ensuring readers are well-informed of key concepts and important details.

Must Know

Branches of Rehabilitation

- Medical rehabilitation—Restoration of function.
- Vocational rehabilitation—Restoration of the capacity to earn a livelihood.
- Social rehabilitation—Restoration of family and social relationship.
- Psychological rehabilitation—Restoration of personal dignity and confidence.

Several **images and diagrams** have been used at relevant places to simplify the concepts for the students.

Figure 6.9: Components of minimum needs program

Numerous Tables are used in the text to provide you with necessary data and information to supplement the text.

TABLE 7.19: Advantages and disadvantages of Cu-T

Advantages	Disadvantages
• An effective contraceptive • Fertility can be restored • Inexpensive and easy to use • Does not require continuous supervision	• Pain and bleeding • Ectopic pregnancy may occur • Spontaneous expulsion may take place • Infection of pelvis

Nursing Consideration boxes are covered throughout the book for implementation of better clinical practices.

Nursing Considerations

Elements of Case Management

The case management of a sick child brought to the first level health facility includes the following steps:

1. **Outpatient health facility (OPD cases)**
   - Assessment
   - Classification and identification
   - Referral, treatment or counseling of child's caretaker
   - Follow-up care

Recent update keeps students aware of all the latest advances and developments in the field.

Recent Update

Electronic Vaccine Intelligence Network (eVIN)

The Government of India has rolled out an Electronic Vaccine Intelligence Network (eVIN) system that digitizes the entire vaccine stock management, their logistics and temperature tracking at all levels of vaccine storage – from national to the subdistrict. This enables program managers to have real time view of the vaccine stock position and their storage temperature across all the cold chain points providing a detailed overview of the vaccine cold chain logistics system across the entire country.

Student Assignment in the form of comprehensive exercises in each and every unit will facilitate structured learning and revision of the material provided in the respective units.

STUDENT ASSIGNMENT

LONG ANSWER TYPE QUESTIONS

1. Explain briefly the major health problems in India.
2. Describe the major communicable disease problems in India.

About the Author

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