**HED 324
VITAL STATISTICS IN HEALTH EDUCATION**

Course Team   Dr. Moses Folusayo Adeola (Course Writer)
Department of Human Kinetics and Health
Education, Kogi State University, Anyigba.
Prof. Shehu Adaramaja (Editor)
Department of Health Promotion and
Environmental Health Education, University of
Ilorin.

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COURSE GUIDE HED 324

Application of statistics in Public Health issues including population estimation and predicting surveys of population characteristics, health needs and problems analysis of health trends in epidemiologic research, treatment and programme evaluation, programme planning, budget preparation and justification, operational and administrative decision making as related to health education, issues such as morbidity rate, mortality rate etc. should be discussed.

COURSE COMPETENCIES

This course aims at providing you with relevant information on vital statistics in health education.

COURSE OBJECTIVES

By the end of this course, you will be able to:

(i)   Define the concepts of health education and vital statistics.
(ii)   List the uses of vital statistics
(iii)   State the problems confronting the collection of vitals statistics in health education and ways of improving collection vital statistics data.
(iv)   Explain the sources of vital statistics in health education
(v)   Describe various types of epidemiological studies
(vi)   State various types of health indicators
(vii)   List the uses of health indicators
(viii) Explain the concepts of morbidity and mortality rates
(ix)   List measures of morbidity statistics
(x)   State the uses of morbidity statistics
(xi)   Describe the measures of mortality statistics

WORKING THROUGH THIS COURSE

You need to read this course materials, each unit with good understanding you should be able to execute the self-assessment exercises in each of the units very correctly.

STUDY UNITS

There are 13 study units in this course divided into three modules. The modules and units are presented as follows:

MODULE 1 Concepts of Health and Vital statistics

Unit 1   Concepts of Health and Health Education
Unit 2   Concept and uses of vital statistics
Unit 3   Sources of vital statistics

MODULE 2 Epidemiological Studies

Unit 1   Epidemiological Studies
Unit 2   Health Indicators

MODULE 3 Health Care Statistics

Unit 1   Definition of ratio, rate, proportion and percentage
Unit 2   Morbidity Statistics
Unit 3   Mortality Statistics

MODULE 4 Health related data collection

Unit 1   Scales of Measurement
Unit 2   Descriptive Statistics
Unit 3   Measure of Dispersion

MODULE 5 Sample and Sampling Technique

Unit 1   Population and Sample
Unit 2   Sampling Techniques

REFERENCES AND FURTHER READING

Apart from the references listed below at the end of each unit, there is a list of references for further readings. You are advised to consult the listed references and materials. You are also expected to utilize the internet for related materials on the course. This will help widen your knowledge and understanding of the course.

Adamu, S. O. & Johnson, T. L. (1997). *Statistics for beginners Book 1.* Ibadan: Saal Publications.

Bowling, A. (1997). *Research methods in health*. Buchingham: Open University Press.

Bhopai, R. S. (2017). *Concepts of Epidemiology: Integrating the ideas, theories, principles and methods of Epidemiology.* (3rd ed. Oxford, U.K Oxford University Press)

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals.* Ibadan: His Lineage Publishing House.

PRESENTATION SCHEDULE

The presentation schedule gives you the important dates for completion of your computer-based tests, participation in forum discussions and participation at facilitation. Remember, you are to submit all your assignments at the appropriate time. You should guide against delays in submitting your computer-based tests.

ASSESSMENT

There are two main forms of assessments in this course that will be scored: the Continuous Assessment and the Final Examination. The continuous assessment shall be in three fold. **There will be three Computer Based Assessments. The computer-based assessments will be given in accordance to university academic calendar. The timing must be strictly adhered to**. The Computer Based Assessments shall be scored a maximum of 10% each. Therefore, the maximum score for continuous assessment shall be 30% which shall form part of the final grade.

The final examination for HED 123 will be maximum of two hours and it takes 70 per cent of the total course grade. The examination will consist of 70 multiple choice questions that reflect cognitive reasoning.

FINAL EXAMINATION AND GRADING

The final examination in this course carries 70%. You are expected to sit for this final examination in your various Study Centres.

HOW TO GET THE MOST FROM THE COURSE

To get the most in this course, you need to have a personal laptop and internet facility. This will give you adequate opportunity to learn anywhere you are in the world. Use the intended learning outcome (ILOs) to guide your self-study in the course. At the end of every unit, examine yourself with the ILOs and see if you have achieved what you need to achieve.

Carefully work through each unit and make your notes. Join the online real time facilitation as scheduled. Where you missed the scheduled online real time facilitation, go through the recorded facilitation session at your on free time. Each real time facilitation session will be video recorded and posted on the platform.

In addition to the real time facilitation, watch the video and audio recorded summary in each unit. The video/audio summaries are directed to salient part in each unit. You can access the audio and videos by clicking on the links in the text or through the course page.

FACILITATION

You will receive online facilitation. The facilitation is learner centered. The mode of facilitation shall be asynchronous and synchronous. For the asynchronous facilitation, your facilitator will:

- Present the theme for the week;
- Direct and summarize forum discussions;
- Coordinate activities in the platform;
- Score and grade activities when need be;
- Upload scores into the university recommended platform;
- Support you to learn. In this regard personal mails may be sent;
- Send you videos and audio lectures; and podcast.
- For the synchronous:
- There will be eight hours of online real time contact in the course. This will be through video conferencing in the learning management system. The eight hours shall be of one-hour contact for eight times.
- At the end of each one-hour video conferencing, the video will be uploaded for view at your pace.
- The facilitator will concentrate on main themes that students must-learn in the course.
- The facilitator is to present the online real time video facilitation time table at the beginning of the course.
- The facilitator will take you through the course guide in the first lecture at the start date of facilitation.
- Do not hesitate to contact your facilitator. Contact your facilitator if you:
- Do not understand any part of the study units or the assignment.
- Have difficulty with the self-assessment exercises
- Have a question or problem with an assignment or with your tutor's comments on an assignment.
- Also, use the contact provided for technical support.

- Read all the comments and notes of your facilitator especially on your assignments: participate in the forums and discussions. This gives you opportunity to socialize with others in the programme. You can raise any problem encountered during your study. To gain the maximum benefit from course facilitation, prepare a list of questions before the discussion session. You will learn a lot from participating actively in the discussions.
- Finally, respond to the questionnaire. This will help the university to know your areas of challenges and how to improve on them for the review of the course materials and lectures.

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MAIN
COURSE
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MODULE 1   CONCEPT OF HEALTH AND VITAL STATISTICS

UNIT 1   CONCEPTS OF HEALTH AND HEALTH EDUCATION

CONTENTS

1.0   INTRODUCTION

Health is a difficult concept to define but much easier to explain for people to understand especially looking from the positive health perspective which one easily sees. Health is the ability of a person to live a life socially and economically acceptable to self and others at a particular period and within the context of one's environment and genetic make-up. Health is the ability and capacity of an individual to cope with all of daily demands to effectively function physically, mentally, socially, emotionally, spiritually, and in line with the person's inheritance. It is an individual personal asset that enables one to meet normal needs and challenges of life. It is a means to an end in achieving one's desire e.g. excelling in academics, sports, commerce.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- define health
- state the characteristics of health
- explain the dimensions of health

- describe the determinants of health
- define Health Education.

3.0 MAIN CONTENT

3.1 Definition of Health

There are different definitions of Health as perceived by different experts in the field of medical/health sciences. According to World Health Organisation, "Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity". Also, the Churches Medical Commission of World Council of Churches believes that "Health is a dynamic state of wellbeing of the individual and society; of physical, mental, spiritual, economic, political and social wellbeing of being in harmony with each other, with the natural environment and with God.

Health may at first be perceived as a mirage since human life is generally characterised by disadvantages, struggles and dangers while the adaptation to these might result in failures and eventually in diseases. Urwin, Carr and Leeson (1997) believed we can have a definition of health from the perspective of idea of the need to explore the question of what is health; and this can be done by comparing some of the following statements and comments:

Statement A- A health need exists when health is absent.

Comment- This represents a fairly narrow view of health i.e. health is the absence of disease. What about health in terms of well-being or achieving individual health potential?

Statement B - No matter how healthy they are, people generally have health needs.

Comment - This is probably nearest to the truth. All individuals have health needs either to maintain health or to improve their level of health.
Statement C- Health needs, can be predicted by factors such as age, gender and social position.

Comment - This is a rather impractical statement at the individual level, though it is relevant at the population level. It is true to say for example that many women might benefit from certain intervention programmes, such as cervical screening; but from a particular woman's point of view women's health needs are dynamic and individualistic. This emphasizes the skills of the practitioner who assists with the discovery of the need.

Statement D- If you are unaware of your health needs that must likely mean it is not important to you.
Comment- This statement doesn't really hold water. Until you have knowledge of your health needs, you cannot make an informed choice of whether to act on them or not.

Your comments may differ from Urwin's, Carr's and Leeson's comments to the four statements above and may also differ in your conception of HEALTH. Cribb (1993) also considered the following as three kinds of definition of health:

i.   Health is disease-freedom.
ii.   Health is well being.
iii.   Health is personal capacity or resources for living.

Though various definitions of health from different authors exist, the fact still remains that the improvement in the quality of life has become a necessity of life. This is seen in man's applying promotive, preventive and curative principles of medicine, but health still remains a relative concept (Mathur, 2008).

Positive total health is the ability to have a socially and ending life and this in terms of look, feeling and reactions to issues and way of doing things at home, in places of worship, neighborhood, work environment, play as well as recreational settings.

3.2   Characteristics of a Healthy Person

Characteristics of a healthy person are: (i) wholeness of the body, weight normal for age and height and the height is the average for the community to which one belongs (ii) ability to move, walk, run, climb stairs, jump with ease and elegance (iii) possession of good language skills and speaking ability to communicate effectively with others (iv) hearing and seeing normally without the aid of gadgets as well as good development of the senses of taste, smell etc. (v) sufficient manual dexterity in using instruments, implements as well as in driving motorized vehicles (vi) being emotionally stable without overreacting to painful/pleasant stimuli (vii) having calm disposition and being capable of dealing successfully with stressful situations (viii) being heterosexually active and fertile (ix) being free of pains, aches, discomforts (difficulties in breathing, eating, urinating, defecating etc.) depression, disorientation, sores, limps, bleeding tendencies and other symptoms ,(x) falling asleep soon after lying down on bed and after 4-6 hours of undisturbed sleep waking up refreshed and revitalized (xi) all actions being well within the prescribed legal limits (xii) being good relationship with family members, friends, colleagues, neighbors, and

others he or she follows, the 'be good and do good' principle (xiii) now and then for few seconds to minutes, finds "self" melting away as mind and body is filled With the universal principle (Rao, 2011).

Health therefore, is a pillar of human success and so must be guarded jealously. In this text, we are not going to examine the health continuum concept but that we need to appreciate that as a particular point in time, a person may consider himself or a health professional may (after observation or examination) consider a person healthy or not healthy. It is therefore necessary, that factors influencing or serving as determinants of health status of man be understood. From a holistic approach of health i.e. the multifactorial causation, web of causation perspective, Prabhakara (2003) believed that social, economical, political and environmental issues influence health and those factors like food, education, housing, animal husbandry, agriculture industry, information technology do have an impact on health. Also Clement (2012) noted that in its broades sense, health is a dynamic state in which people adapt to changes in internal and external environments so as to maintain a state of well-being. Genetic and psychological variables, intellectual and spiritual dimensions constitute the internal environment. Physical environment, social relationships and economic variables are external environment outside people and these also influence their health.

3.3   Dimensions of Health

Arising from the WHO 1948 definition of health as "a state of complete physical, mental and sodas well-being and not merely an absence of disease or infirmity", there are three major widely accepted dimensions of health namely: physical, mental and social, but other dimensions also exist

i.   ***Physical Health or Well-Being:*** This refers to acceptable body weight, height movements, functional state of sense organs and systems of the body. This is what a person means by saying "I am okay" i.e. the body is working well. Tools arid techniques used in various combinations for the assessment of physical health in medicine according to Park (2005) include:
i.   Self-assessment of overall health.
ii.   Inquiry into symptoms of health and risk factors.
iii.   Inquiry into medications.
       iv.   Inquiry into level of activity (e.g. numbers of days of restricted activity within a specified time, degree of fitness).
       v.   Inquiry into use of medical services (e.g. the number of visits to a physician, number of hospitalisations) in the recent past.

vi.   Standardised questionnaire for cardiovascular diseases.
vii.   Standardised questionnaire for respiratory diseases.
viii.   Clinical examination.
Ix.   Nutrition and dietary assessment,
x.   Biochemical and laboratory investigations.

ii.   *Mental Health or Well-Being:* This is ability to function effectively with self and others despite daily stresses and demands of life in private and public settings. A person that enjoys good mental well-being is able to enjoy life in terms of keeping self-tidy and appealing to people around, making and keeping friendship and relationship in normal daily life at various places. It is others that may actually pass judgment on one's mental health status in terms of the ability of a person to cope with challenges of life which may reflect on how one thinks, sleeps, relates, dresses, and works normally. Most importantly, a person that is enjoying mental well-being knows and accepts personal strengths and weaknesses.   He or she demonstrates normal self-confidence, memory and reactions to issues and objects around him.

iii.   *Social Health or Well-Being.* This is the ability to relate well with others in all spheres of life. Such factors as level of education, family background, culture, income, peer group or previous friendship, marital life, availability of social services influence one's social well-being. A social well-being person must have social skills and see self as part of social network in a given group, society or community. A person enjoying good social health loves self and others, relates well with others at different setting, respects others for who they are, and performs his or her duties willingly to self, family, friends, religious leaders, fellow workers, nation etc.

The three major dimensions form one's health triangle. Health triangle explains that one must see how the three relate together. For example, knocking one's head against a wall can affect ability to do well thereafter in one's daily task and the pain can make one aggressive or touchy/irritable with others around. It is, therefore, important that one must not neglect any of the dimensions.
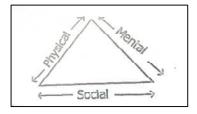

Fig. 1.1: Three main sub-divisions of health

iv.   ***Spiritual Health or Well-Being Dimension:*** Spiritual health or well-being relates to individual's belief in supernatural forces that shape events of life. It also includes one's basis for action, purpose of life, ethical issues that must be addressed because of the belief that one will eventually accounts for one's actions or inactions. It helps to find meaning to internal and external influences on one's health status.

v.   ***Emotional Health or Well-Being.*** This is the ability to cope well with challenges of life and make necessary adjustments to those challenges of daily living.

3.4   Determinants of Health

There are so many factors that influence or determine our health status and the list is endless. Determinants of health are factors influencing the health of a person which are many. When they affect a person, they are referred to as host factors but when outside a person they are regarded as environmental factors.

Bradley (1977) listed the following as factors influencing or determining the health of people: personal hygiene, preventing pollution, refuse disposal, available curative health services and their use, prevalence of disease or disease vectors, family size, family spacing, antenatal care, maternity services, under-fives dinks immunisation/state of Immunity, other health services, age, occupation, level of education/literacy, shelter/housing, climate, ignorance about health/health education, state of nutrition (eating habits, available food, food production, marketing), economy,   poverty,   family   income/budgeting,   roads   and communications, availability of drug, cultural beliefs and customs.

As good as the above listing is, all of them and others not mentioned might be bewildering. All of them can be categorised as four major factors:

i.   ***Human Biology.*** This consists of health outcomes induced by heredity or genetics of the individual, natural growth pattern, and aging. It is the pivot on which other three factors rely as little can be done about one's genetic make-up unless through genetic counselling for future generations. For example, diseases like mental illness, obesity, diabetes mellitus, eye problems have been linked to heredity or that such diseases "run" in families.

ii.   ***Environment:*** Most things that affect our health are external to the human body. Environment includes all those factors related to

health that are external to the human body. We have less individual ability to control our environment but more can be done by the entire community to control and prevent contaminated food, pollution of air, noise, water, spread of communicable diseases. Provision of good road networks, traffic control, testing of drivers against alcohol consumption, fire prevention, good drainage, good housing, security of lives and properties do have influence on one to have good physical, mental, and emotional health. Lonely rural areas may also be detrimental to health in some circumstances if there is no social support or necessary amenities.

iii.   *Lifestyle.* Under this category are, the decisions, actions, and condition of living like drug misuse and abuse, feeding habits, exercise behavior, engaging in recreational activities, smoking, careless driving, pie-martial and extra-marital sex, etc. which may be self-imposed or imposed by socio-economic conditions that do affect one's health status.

iv.   *Health Care Organization.* This category in health field concept especially in developed countries has received the most attention and funding. In developing countries, many health professional training schools are also fashioned after the developed ones wherein society has been made to develop a dependence on health care organisation. Emphasis is always on provision of medical Practice, nursing, hospitals, dental services etc. while the benefits to be derived from health-related changes in the environment and lifestyle are usually overlooked. Quality of life and longevity are more pronounced where quality health services are not only accessible but also affordable.
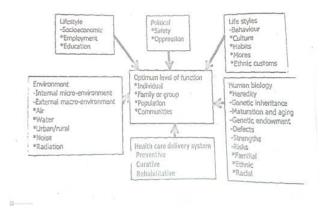

Figure 1.2: Factors Influencing Health

Other determinants of health include the following:

v.   **Socio-Economic Factors:** Literacy, income level, type of occupation one engages In have a way of determining one's health status. For example literate people access available care more than non-literate ones as income level determines one's ability or inability to pay for quality health care while some occupations make workers more prone to diseases or injuries than others. To a large extent, individual and community health Status or the national health status is dependent on such factors as economic, education, type of jobs or occupation etc. of individuals or people.

vi.   **Gender.** Health status can be related to one's gender due to biological make-up of men and women and their expected roles. For example reproductive system disorders are not the same based on the two sexes.

vii.   *Age:* There are certain diseases that are common or more virulent in certain developmental period of life than others. For example, whooping cough, cold, measles are more common among children, sexually transmitted infections (gonorrhea, syphilis, etc.) are more common among youths and degenerative diseases (osteoporosis, diabetes, and hypertension) are common among the aged. Immunity acquired from mothers considerably protect children from tetanus and measles.

viii.   *Political Will:* In all nations of the world, often times the political will of government in designing, implementing or support good health programmes often determine the health status of people. In Nigeria, there are beautiful result oriented health policies but usually the ability of the government to support fully in terms of funding, appropriate legislation, supervision, monitoring and evaluation is always the problem. Most international donors or agencies of health programmes even suffer from this poor government apathy and sometimes there are cases of corrupt enrichment of government officials due to their mishandling of donor agencies fund leading to poor execution of programmes.

In the light of the above, Lucas (2002) asked "Why is the health system in Nigeria failing so badly in comparison with her neighbors and other countries?" In answering the question, Lucas believed that various

reasons could account for the failure of the Nigerian health system and these include; shortage of human resources, failure within the public sector, poor infrastructures and neglect of the civil society. Nigeria has more highly rated health professionals, more medical schools than other neighboring nations and beyond. Regrettably, it records more death, diseases and disability. Though Nigerian professionals and academics are highly regarded all over the world, her health system does not benefit from their knowledge and experience. Nigerian experts serve well in WHO and in other international agencies but back in Nigeria, they are not appreciated or make little use of their expertise that other nations are benefiting from.

3.5   Definition of Health Education

Health education has been defined in many ways. It can be defined as a discipline, course of study, approach, method or concept that focuses on the promotion of voluntary positive health behaviors through well-planned educational means.

Health education goes beyond trying to improve health literacy or knowledge and includes fostering social skills, motivations, self-efficacy, beliefs, values, practices, behaviours, and environment necessary to improve health of individuals, families and communities. It involves encouraging the right behaviours and values that can promote the health of people.

Health education can be considered as any combination of planned learning experiences based on sound theories that provide in individuals, groups and communities that opportunity to acquire appropriate information and skills needed to make quality health decisions (Gold and Minner, 2002).

The World Health Organisation (1998) defined health education as "consciously constructed opportunities for learning involving some form of communication designed to improving knowledge and developing life skills, which are conducive to individual and community health"

Health education seeks to encourage opportunities and actions that will predispose, enable and reinforce healthy living for individuals, families, groups and communities. Health education can take place within the school, home, hospitals, workplace and public places. Health education should be considered as a community activity in which every member needs to be involved. It requires inter-sectoral multi-disciplinary support and community participation to improve the health needs of people.

A broad purpose of health education is to encourage people to value health ad an essential asset and making people know how they themselves can take appropriate actions to promote their health as individuals and that of their communities (Ogunwale, 2014).

4.0   CONCLUSION

Having read this unit and successfully completed the self-assessment test, it is assumed that you have attained understanding of the introduction knowledge of Health and Health education.

5.0   SUMMARY

In this unit, you have learnt about the definition of Health, dimension of Health, and definition of Health education.

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is Health?
2.   List 5 characteristics of Health.
3.   Define the concepts of Health Education.

7.0   REFERENCES/FURTHER READING

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals*. Ibadan: His Lineage Publishing House.

UNIT 2   CONCEPTS OF HEALTH EDUCATION AND VITAL STATISTICS.

CONTENTS

1.0   INTRODUCTION

Vital statistics, as a scientific discipline is a subdomain of demography, the study of the characteristics of human populations. Vital statistics comprises a number of important events in human life including birth, death, fetal death, marriage, divorce, adoption, legitimation and recognition.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- describe Health Education
- define Vital Statistics
- explain vital statistics system
- discuss the use of vital statistics
- explain vital statistics events.

3.0   MAIN CONTENT

3.1   Definition of Vital Statistics

Vital statistics is the application of statistical principles to analyze and describe the vital events of life; birth, death, morbidity risk, etc. Vital statistics is a branch of biometry that deals with data and the law of human mortality, morbidity, and demography. Vital statistics are those statistics that, for a designated population group; describe the number and characteristics of the vital events which are taking place therein.

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Vital statistics are conventionally numerical records of marriages, birth, sickness and death by which the health and growth of a community may be studied. Vital records may be defined as those concerned with live births, deaths, fetal deaths (stillbirths), marriages, divorces, adoptions, annulments and separations, in short, all the events which have to do with an individual's entrance into or departure from life and other societal basic institutions.

Lucas and Giles (2003) believed that vital statistics are records of certain vital events: birth, death, marriages and divorces obtained by registration. Also, Mathur (2008) asserted that vital statistics relate to numerical facts, and their analysis which are concerned with vital events of health and welfare of the community in particular to human beings. It is also known as 'Book Keeping of Humanity' which is a bigger science called biometry. Logan and Lambert (1979) as cited by Moronkola (2008) affirmed that maps and milestones of public health is vital statistics and principal sub-divisions of it are:

1.　　　Demographic statistics (population, marriages and fertility)
2.　　　Mortality Statistics (numbers and cause of death) and
3.　　　Morbidity　statistics　(illness　and　injuries,　incapacity, hospitalication etc.).

Vital and health statistics are quantitative data (numbers) about births, marriages, divorces, diseases, medical institutions, doctors, paramedical personnel and health resources. What vital statistics does is to answer questions as pertaining to many health and population issues like what is the composition of those who are well or ill in a given area in terms of their age, sex, marital status, what is the ratio between the health and the infected etc. (Moronkola, 2018)

A vital statistics system can be defined as including the legal registration, statistical recording and reporting of the occurrence of and the collection, compilation, analysis, presentation, and distribution of statistics pertaining to "vital events". Also, United Nations defined vital statistics system as the total process of collecting by civil registration, enumeration, or indirect estimation, information on the frequency of occurrence of vital events, selected characteristics of the events and the persons concerned, and the persons concerned, and the compilation analysis, evaluation, and dissemination of these data in summarised statistical form.

3.2 Uses of Vital Statistics

For the people and the nation, vital statistics is of much importance,

(i) For individual

Vital statistics have much of use for the individuals, for example, a child's birth certificate, that is being issued by the registering authority, is a crucial document that has the data of date, time, place, and percentage of the child, also it authorised child's identity as the citizen of the respective country.

A birth certificate is a legal document that is deployed in various tasks such as for taking admission in school, for obtaining a passport, to migrate in another country, etc. likewise, a marriage certificate keeps the record of the marital status of a complete, death certificate records the no more existence of a person in the world.

(ii) For legal usage

Vital statistic are legally extremely beneficiary, such as issued certificates related to birth, death, marriage, divorce, e.t.c are legally important. for exampl , a death certificate is necessary and an important legal document for the settlement of property of the expired person , for claiming his/her insurance policy etc.

(iii) Health and family planning programmes

Vital statistics relating to births and deaths can be used in health and family planning programmes of the government. The causes of deaths, and the mortality rates of different categories help in assessing the health condition of the people. Accordingly, the state can formulate such health programmes as malaria eradication, polio and smallpox immunization, tuberculosis, etc. In keeping with the requirement of the population, the government can open hospitals, maternity and child welfare centres etc.

(iv) For the study of social conditions

In other to study the birth and death rate, divorce rate, widow remarriage, widowhood etc, vital statistics are of much use, it reflects the currents situation/conditions of the society as well as its customs and traditions.

(v)   For Administrators and planners

Related to trend and population growth under the various age group and as a whole , vital statistics provide data and information that help planners and administrators for proposing and preparing polices for health, education, housing , transporting and communications, food supplies etc.

(vi)   For the nation

Vital statistics are of much importance for the nation. They help in analyzing the population trends at any given point of time. They try to fill the gap between two censuses.

They relate to the composition, size, distribution and growth of population. It is on their basis that population projections can be made. Vital statistics help in formulating policies for providing social securing to the people. Even the rules for immigration and emigration can be framed on the basis of population growth data. Vital statistics are also used for updating electoral rolls and demarcation of constituencies.

Also, Moronkola (2018) mentioned that vital statistics have the following specific usefulness:

(I)   To plan health services e.g manpower, financing, budgeting.
(II)   To determine health priorities to find out what are the main problem and needs.
(III)   To evaluate the use of existing services.
(IV)   To carryout clinical trails and research.
(V)   To show improvement in the community health
(VI)   To influence health polices and to obtain grant for project
(VII)   To show the relationship between health and factors such as age, sex, occupation and environmental conditions.
(VIII) To provide vital information in clinical care e.g. height, weight, temperature, blood pressure.
(ix)   To detect epidemics.
(x)   To monitor environmental condition.
(xi)   To estimate the cost of illness and cost of service.
(xii)   To provide international unit of measurement or compare nation's   health status.
(xiii)   Helps to guide in health legislation at various levels of government.
(xiv)   Helps government in data for health policies.
(xv)   Preparing population estimates and projections.
(xvi)   Construction of life tables.
(xvii) Starting points in retrospective epidemiological studies.

(xviii) In cohort and period studies.
(xix) Preparing health indicators, such as infant mortality rates, neonatal mortality rates, maternal mortality etc.

3.3   Definitions of Selected Vital Events

The World Health Organisation (WHO) promulgates several vital statistics definitions as part of the International Classification of Diseases (ICD). These definitions are in-cooperated in regulations adopted by the World Health Assembly and which each WHO member country has agreed to follow. The International standard definitions for selected vital events are given below.

Live birth: Is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy which after such separation, breathes or shows any other evidence of life, such as the beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born. All live-born infants should be registered and counted as such irrespective of the period of gestation or whether alive or dead at the time of registration, and if they die at any time following birth they should also be registered and counted as deaths.

Death: is the permanent disappearance of all shreds of evidence of life at any time after live birth has taken place (post-natal)- cessation of vital functions without capability of resuscitation). This definition, therefore, excludes fetal deaths.

Fetal Death: Is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, the death is indicated by the that after such separation the fetus does not breathe or show any other evidence of life, such as the beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.

Still Birth: is defined as synonymous with late fetal death, that is, one of twenty-eight completed weeks of gestation or over.

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

Marriage: This is the legal union of persons of the opposite sex (or in recent times, the legal union of the same gender). The legality of the union may be established by civil, religious, or other means as recognised by the laws of each country; and irrespective of the type of marriage, each should be reported for vital statistics purposes.

Divorce: This is a final legal dissolution of a marriage, that is, the separation of husband and wife by a judicial decree or pronouncement which confers on the parties the right to civil and/or religious remarriage, according to the laws of each country.

Adoption: This is the legal and voluntary taking and treating of the child of other parents as one's own, in so far as provided by the laws of each country.

Annulment: This is the invalidation or voiding of a marriage by a competent authority, according to the laws of each country, which confers on the parties the status of never having been married to each other.

Legal Separation: This is the disunion of married persons, according to the laws of each country, which does not confer on the parties the right to remarry

4.0   CONCLUSION

Having read this unit and completed the assignments, it is assumed that you have attained an understanding of the introductory knowledge to vital statistics.

5.0   SUMMARY

In this unit, you have learnt about the definition of health education, the definition and uses of vital statistics and some selected vital events in vital statistics.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Define the concept of vital statistics
2.   List four vital events.

7.0   REFERENCES/FURTHER READING

Gold, R.S & Minner, K. R. (2002). Report of the 2000 joint committee on   Health Education and promotion technology. *Journal of school Health, 72, pp.3-7.*

Lucas, A. O. & Gilles, H. M. (2003). Short Textbook of Public Health
    Medicine for the Tropics. (4th ed.). *London: Hodder Arnold*.

Moronkola, O. A. (2018). Vital statistics for health professionals.
Ibadan: *His Lineage*.

Ogunwale, O. A. (2014). Concept of Health Education and Health
    Promotion, In, F. O. Oshiname, O. L. Olaitan & O. A. Ogunwale.
    (Eds.). (2014). Emerging & Reemerging Issues in Health
    Promotion for Healthy Living, Ibadan. Barayok Publication.

World Health Organisation (1998) *Health promotion, glossary Geneva*,
    Switzerland.

UNIT 3   SOURCES AND PROBLEMS CONFRONTING COLLECTION OF VITAL STATISTICS

CONTENT

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Main sources of vital statistics
        3.2   Specific sources of vital statistics
        3.3   Problems confronting collection of vital statistics
        3.4   How to improve vital statistics data collection
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

Vital statistics is about data or records and as such there must be sources wherein the y can be obtained. Also, vital statistics are of much importance for the people and nation. Therefore, in this unit, you will learn about the sources of vital statistics and the problems confronting collection of vital statistics.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- explain the three main sources of vital statistics
- describe the specific sources of vital statistics
- discuss the problems confronting vital statistics collection.

3.0   MAIN CONTENT

3.1   Main Sources of Vital Statistics

Three main sources of vital statistics include; census, morbidity survey and civil registration system.

It should be known that vital statistics have to do with people rather than with things and, consequently, this branch of statistics has perhaps the second oldest history in the world.

1.   **The population censes:** This is also known as human inventory which is the most fundamental and far-reaching statistical enquiry that can be undertaken, provides a picture of the population and its characteristics at one moment of time.
2.   **Morbidity Survey:** This is a method for estimating the prevalence and/or incidence of disease in a population. A morbidity survey is usually designed simply to ascertain the fact as to diseases distribution.
3.   **Civil Registration System:** This is defined as the continuous permanent and compulsory recording of the occurrence of vital events. Civil registration is performed under a law and regulation so as to provide legal basis to the records and certificates made from the system. A well developed and functioning civil registration of all vital events including births, marriages and deaths and issues relevant certificates as proof of such registration. Civil registration promotes efficient government planning, effective use of resources and aid, and more accurate monitoring of progress towards achieving the sustainable development goals. This is the preferred source of vital statistics as it collects information soon after the events occur using standardised administrative mechanisms by trained individuals. Because civil registration is compulsory and universal, the resulting vital statistics are comprehensive and accurate and not subject to response or sampling errors that arise when vital statistics are estimated using household surveys or censuses.

3.2   Specific Sources of Vital Statistics

Hospitals, clinic and maternities, dispensaries health centers records.

- Hospitals, clinics, etc. are good sources of data on morbidity and mortality rates, utilisation of health care services as well as efficiency of health facilities. Last, (1987) affirmed that charts from spells of inpatient care in hospitals are especially important sources of information for planning and evaluation of hospital services.
- **Surveys**
  Health surveys are usually used by international health agencies and Federal Ministry of Health to find out the prevalence of certain health conditions and practices. Such surveys may reveal contraceptive use, prevalence of smoking or substance abuse and utilisation of health care services. For these to be meaningful, qualified officer with adequate knowledge of sampling techniques and epidemiological principles must carry out the surveys.

- **Research institutes/programmes**

  Research institutions or programme relating to health or social services can provide data necessary for health care planning and management. Teaching hospitals, non-governmental organisations (NGOs), Medical Research Institutes, Postgraduate theses, dissertations and commission research are good sources of health data.

- **School Health Records**

  School health service activities concerning the health of individual pupils, staff in the areas of their medical, dental examinations, screening results and treatment must be recorded for future use. It must be noted that adequate, accessible and continuous health records are essential not only for assessment but also for follow-up, health counselling, emergency care, disease control and school management of guidance of exceptional person and young people.

- **Vital Registration**

Registration of birth, death, marriage are usually carried out in hospitals, local governments, population offices and other designated offices. Immigration, emigration data may also be regarded as part of vital registration.

Some vital events that issued certificates and information necessary on various forms or certificates includes:

Prevention and control

Birth   Name of the child, parents' name, place of birth, nationality of parents, weight at birth, health status (e.g any form of handicapping conditions) address and occupation of parents.

Birth certificate

THIS CERTIFIES THAT…………………………… WAS BORN TO ………….AND ………………IN THE CITY OF…………. STATE OF…………. ON THE ………….DAY OF…………..A.D. 200……………..AT…………………………………………….in witness whereof this maternity has caused this ATTENDING PHYSICIAN/MIDWIFE certificate to be signed by its authorized officer…………………………HOSPITAL No………………..By…………………………………………….Birth weight FATHER'S NAME……………………….ADDRESS……………………………….MOTHER'S MAIDEN NAME…………..

Certificate of Registration of Birth

I,……………………………………………………………….Registrar of Births in……………………………………………………….Local Government in…………………………………………………..Division of Oyo state of Nigeria do hereby certify that I have this……………..day of ……………………………. ………………………………………….of Birth Register the birth of …………………………………………. male/female born at……………………………………………….on …………………………………..day of ………..,20………………….. The child of …………………………………………………. and ………………………………………………………………..20………………. ……………….

Signature of Registrar

Note: This is a typical certificate of registration of Birth in use within Oyo state, Nigeria.

Death: Name of the deceased, age, nature of illness at the time of death, date and time of death, signature of medical officer present at the point of death, medical qualification and address of the medical officer.

I HEREBY CERTIFY

That I have medically attended…………………........ of[1]……………….
who was apparently[2] of stated to be Aged……………………………years,
that I last saw……………………….on the…………….20………………
at[4]…………………………and that the cause of death was to the best of
my knowledge and belief and herein stated, viz:
Primary cause………………………….Secondary cause…………………
and that the disease had continued …………………………………witness
my hand this……………day of……………Signature
Medical Qualification………………Address………………………..

i.   *State Address*
ii.   *Omit 'apparently' or 'or stated to be' as the case may be*
iii.   *Omit 'aware or' when hour of death is known from the report*
iv.   *State the time*
v.   *State duration of illness if possible.*

Marriage: Names of the couple before marriage as the wife should state maiden name, age, occupation of the couple and their witnesses i.e. best man and best lady, date marriage, place of marriage, condition of health and marital status at the time of marriage.

Fig.3.1

Census to Bamiduro (2012) is an exercise involving all the three areas of application of statistics and was indeed the origin of statistics as it is the first human statistical activity as documented in history. According to Guptal and Ghal (2007) 'census' is derived from a latin word that means "to estimate or assess". Nowadays, census is defined "as process of collecting, compiling, and publishing demographic, economic and social data pertaining at a specified time, to all persons in a country".

Fig.3.2 Census exercise in progress

Generally,census is viewed as head count of people in a particular area. Information usually required during census fieldwork include name, age ,local government of origin , state of origin ,nationality ,sex ,occupation, marital status , height, weight , religion , level of education , social-economic status

Report of accidents can contribute to mortality data

Fig.3.3

- **Workplace Health Records:**

Health-related data exists in workplace settings, especially where the opportunity for staff health care service is in place. Data related to sick leave, treatment, maternity leave, workplace accidents and related diseases, provide good source of vital statistics.

viii   Miscellaneous/ other sources

Routinely or as the need arises, health-related data may be collected from road safety organisations, insurance companies, prisons, police etc.

Table 3.1: Sources of different types of health statistics

Source	Examples	Type of data
Census	Local, National	Total count, age distribution
Epidemiological surveys questionnaire	Sickness surveys	Current or pass illness sickness absence from work/school
Physical examination	Nutritional survey Goiter survey	Anthropometric measurement Physical examination
Special investigations	Serological survey Tuberculosis survey	Tuberculin sensitivity
Medical institutions		
Out-patient clinics	Health center	Attendance record
Special clinics	Specific groups e.g. maternal and child welfare	Health profile of women and children
In-patient services	Specific disease clinic e.g. tuberculosis, sexually transmitted diseases	Clinical records, laboratory results, autopsy data.
Data collected for other purpose	General hospitals Specialist hospitals	
Routine medical examination	School entrants, pre-employment/army recruits insurance	Nutritional status, immunization rates, profile of health of young adults. Baseline data, prevalence of risk factors.
Sickness absence records	Schools Industry	Early warming of epidemis

Source: Lucas A. O. & Gilles, H. (2003) short textbook of public health medicine for the tropics. London: Hodders Arnold pp. 13

Viewed from hospital administration perspective, Watzalf (1996) saw census statistics as a ratio, percentages and averages related to the length of stay, occupancy, bed turnover and total number of patients present at a specific time within the institution. These can be utilized by health care administrators and health information managers to evaluate the current status of health care facility, to plan for future health care events, to determine why differences in length of stay are seen between patients

as well as overall analysis of how much, how ling and by whom the health care facility is being used.

Table 3.2: Hospital Census Statistics

DEFINITION	FORMULA
Daily inpatient census (number of inpatients present at census taking plus any inpatients who were both admitted and discharged after the census taking time the previous day	Formula is presented as the definition
Inpatient service day (unit of measure including services received by patients in one 24hour period. Synonymous: patient day, inpatient day, census day, beg occupancy day)	Formula is presented as definition
Inpatient bed count (number available inpatient beds occupied and vacant) on any given day. Note: not all beds are included in the inpatients bed count. These include beds in examination rooms, therapy, labor rooms and recovery rooms as well as bassinets. Bed sets up for temporary use are not included)	Formula is presented as definition
Average daily inpatients census (average number of inpatients in a facility for a given period of time)	Total no of inpatients service day for a period/Total number of days in that period
Length of stay (average length of stay of inpatients discharged during a specified period)	Duration of hospitalization for one patient: day of admission is not counted unless it is the day of discharge and or the day of discharge is not counted unless it is the day of admission. Either method is correct if done consistently
Average length of stay (average length of stay of inpatients discharged during a specified period)	Total inpatient service days / Total no of discharges (includes deaths
Inpatient bed occupancy ratio (proportion of inpatient beds occupied defined as the ratio of inpatient service days to inpatient	Total inpatient service days or discharge x 100 / Total inpatient bed count x no of days in the period

bed count days in the specified period. Synonyms: percentage of occupancy, occupancy percentage)	
Bed turnover rate (number of times a bed, on the average, change occupants during a given period of time).	Direct formula: <u>No of discharges (including deaths) of period</u> Average bed count during the period Indirect formula: <u>Occupancy rate x number of days in period</u> Average length of stay

Source: Watzlaf. V. J. M. (1996). Research statistics and epidemiology in M. Abdelhak, S. Grostick, M. A hanker and E. Jacobs (EDS). Health information: Management of a strategic resources (pp 280-319). Philadelphia: W.B Saunders Company.

Problems confronting collection of vital statistics in developing countries.

In many regions of the world, births, marriages, divorces, and deaths are not universally and routinely registered, and the causes of death are not documented. This means that people lack the documents they need to prove their identity to get access to basic services, including laws in some countries that require the signature of a husband or father on official registration documents.

Research by the World Bank shows that more than I.1 billion people worldwide are unable to prove who they are. It is estimated that the birth of nearly one-quarter of children under the age of 5 worldwide and never been recorded or registered. And yet, one of the Sustainable Development Goal targets specifically 16.9- is to provide legal identity for all by 2030, including birth registration.

Below are some of the problems militating against data related to vital statistics in developing countries.

i.   Many people are ignorant of the importance of vital statistics.
ii.   Many officers responsible for collection or reporting of data related to vital statistics are not committed to their work.
iii. High dependence on affidavits to replace non-possession of birth certificates and burial of people without death certificates for   official business.
iv.   Inadequate health workers in towns and villages make the collection   of vital data difficult.

v.   Notifications of vital events of life are poor due to ignorance and less or no sanctions.
vi.   Poor data collection and storage processes.
vii.   Outdated and inadequate legal frameworks governing civil registration and vital statistics.
viii.   Lack of political vision.
ix.   Inadequate operating budgets
x.   Lack of coordination between government departments.
xi.   Stigma associated with teen births or single mothers.
xii.   Socio-cultural practices around death.
xiii.   Legislation contradicts social norms.
xiv.   Direct and indirect costs associated with registration, such as fees and travel.

How to improve vital Data Collection in Developing Countries.

Below are some areas that can be considered in improving vital data collection in developing countries.
i.   Health education of the populace on importance of vital statistics.
ii.   Employment of more health workers and building their capacity
in   effective vital data collection, storage and use.
iii.   Improvement of road networks.
iv.   Improvement in ICT availability to help health workers to be
more   effective.
v.   Appropriation sanctions against acts that prevent effective vital data collection, storage and utilisation.
vi.   Establishment of more health facilities and health records departments in all health centres with adequate trained man
power.
vii.   Demanding for original birth certificates for school entry and job placements.
viii.   Providing adequate operating budgets for vital statistics data collection.

4.0   CONCLUSION

This unit has provided you with information on the sources and problems confronting collection of vital statistics data. More information is made available to you through the texts attached to this unit to further your understanding of the topics.

5.0   SUMMARY

In this unit, you have learned the sources and uses of vital statistics, you are encouraged to increase your understanding of the content of the study by looking through the texts attached to the unit.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Mention the three main sources of vital statistics.
2.   State four problems confronting collection of vital statistics.
3.   Mention separately, three essential information that each of the following certificates/forms must have; birth, death and marriage.

7.0   REFERENCES/FURTHER READING

Bamiduro, T.A. (2012). Statistics and search for the truth: A biometrician's view in university of Ibadan Inaugural Lecture Series. 2003-2006 3. Ibadan: *University press*.

Gupta, P&Ghai, O.P. (2007). Textbook of preventive and   social medicine (2nd ed.). New Delhi: *CBS publishers and Distributors*.

Moronkola, O.A. (2018). Vital statistics for health professionals. Ibadan: *His Lineage*.

**MODULE 2   EPIDEMIOLOGICAL STUDIES AND
                HEALTH INDICATORS**

Unit 1   Epidemiological Studies
Unit 2   Health Indicators

**UNIT 1   CONCEPT OF EPIDEMIOLOGY AND
                TYPES OF EPIDEMIOLOGICAL
                STUDIES**

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
       3.1   Definition of Epidemiology
       3.2   Aims and Objectives of Epidemiology
       3.3   Types of Epidemiological Studies
       3.4   Uses of Epidemiological Studies
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

From an etymological perspective, the word "epidemiology" can be divided into the Greek roots "epi", "demos", and "logos", which respectively mean "upon", "people", and "the study of" Historically, epidemiology has focused on population. Level factors regarding communicable infectious diseases, but it has evolved to include non-communicable infectious diseases, chronic diseases, infant health and environmental and behavioural health. Today, it is a wide-encapsulating umbrella that encompasses any health-related issues that may influence the overall health of a population, such as environmental exposures, injuries, natural disasters, and terrorism, to name a few. It is a multifaceted branch of medicine, fundamentally guided by systematic scientific inquiry via ratios, probabilities and other statistical calculations, focusing on the incidence, distribution and factors concerning diseases and health outcomes within a specific population.

2.0 OBJECTIVES

By the end of this unit, you will be able to:

- define epidemiology
- states the objectives of epidemiology
- explain the types of epidemiological studies.

3.0 MAIN CONTENT

3.1 Definition of epidemiology

Epidemiology may be defined as the study of the distribution and determinants of disease in human populations, it is the study of the distribution and determinants of the health related states or events in specified populations and the application of the study to control health problems. World Health Organisation (WHO) defined epidemiology as "the study of the distribution and determinants of health and disease in human populations to enable health services to be planned rationally, disease surveillance to be carried out and preventive and control programmes to be implemented and evaluated".

3.2 The Objectives of Epidemiology

i.   To identify the etiology or the cause of a disease and the risk factors that is, factors the increase a person's risk for a disease.
ii. To describe the distribution and magnitude of health and disease problems in human population.
iii. To determine the extent of disease found in the community.
iv. To provide data essential to the planning implantation and evaluation of services for the prevention, control and treatment of disease and setting priorities among those services.
v.   To study the natural history and prognosis of disease.
vi. To evaluate both existing and new preventive and therapeutic measures and modes of health care delivery.
vii. To provide the foundation for developing public policy and making regulatory decisions relating to environmental problems.

3.3   Types of Epidemiological Studies

Epidemiological studies generally fall into four broad categories:

i.   Cross-sectional studies.
ii.   Case-control studies.
iii.   Cohort studies.
iv.   Intervention studies/Ecological study.

i. Cross-Sectional Study: Across-sectional study, studies a whole population or a random sample of a population and collects information about current disease state (i.e. Prevalent disease) and also measures exposures of interest. In some instances, the study may base on a period of time. The principal advantages of the cross-sectional study are normally that it is relatively in expensive and can be conducted within a short timescale. The principal disadvantage is the lack of information on temporally of disease state and exposures.

ii. Case-Control Study: in this type of study persons with the disease of interest are identified (cases) together with a sample of those without the disease (controls). The cases and controls are then compared with respect to their exposure to potential risk factors. The case control approach is particularly suitable when the disease is rare and when the aim is to investigate the effect of many exposures on one disease.

iii. Cohort Study: A cohort study involves one or more groups of subjects defined by their exposure status and free of the disease of interest being followed through time to identify disease unset. The purpose is to determine whether initial exposure status influences risk of subsequent disease.

Two particular types of cohort study are the prospective cohort study and the retrospective cohort study. In the prospective approach, cohort(s) are identified by their exposure status presently and are followed-up' to determine any future disease onset. The retrospective approach identifies the exposure status of cohort(s) in the past and in a parallel sense they are 'followed-up' until the present time, when their disease status is determined. The latter approach will undoubtedly be quicker and less expensive but may not always be appropriate or possible. The major advantages of a prospective study are that it can be determined which exposure is measured and how.

iv. Ecological: This study describes the patterns or trends on a geographic level and can be used to explore potential associations between community level exposures and disease. However, ecological study is the least informative, as they are unable to reliably estimate

individual exposures, ecological study evaluates the relationships between an exposure and a disease in some aggregate group of individuals but not specific individuals, such as those living in a country community, or a neighborhood.

3.4 Uses of Epidemiological Studies

The following are the uses of epidemiological studies.

i. For community diagnosis of the presence, nature and distribution of health and disease among the population and the dimensions of these in incidence, prevalence and mortality; taking into account that society is changing and the health problems are changing.

ii. To estimate the frequency of a disease and find associations suggesting potential causes.

iii. To study the occurrence of disease or death with time as a variable. Such a study is referred to as a historical study.

iv. To help in the prevention and control of disease.

v. To aid in the search for causes of disease.

vi. To study the working of health services. This begins with the determination of needs and resources proceeds to analysis of services in action and finally, attempts to appraise such studies can be comparative between various populations.

vii. In identifying syndromes from the distribution of clinical phenomena among sections of the population.

viii. To aid in the detection of pre-symptomatic and latent disease.

4.0 CONCLUSION

In this unit, you have learnt the definition of epidemiology, types and uses of epidemiological studies.

5.0 SUMMARY

In this unit, you have learnt the definition, types and uses of epidemiological studies. The self-assessment exercise you attempted were meant to provide you opportunities of testing your understanding and amount of learning you have achieved after having studied this unit. The references that have been provided you were meant to broaden your knowledge and understanding required in this unit.

6.0 TUTOR-MARKED ASSIGNMENT

1. What is epidemiology?
2. State the four types of epidemiological studies.
3. List various uses of epidemiological studies.

7.0   REFERENCES/FURTHER READING

Bhopal, R.S. (2017). 'Concepts of Epidemiology.' *International Journal of   Epidemiology. 46* (4), pp.1347.

Ogbalu, A.I. (1997). *Public Health Education*. Onitsha. Nigeria University Publishing Company.

Pearce, N. (2012).Classification of Epidemiological Study Designs. International Journal of Epidemiology 41: 393-397.

Silman, A.J., Macfarlane, G.J. & Macfariane, T. (2018).Which Types Of Epidemiological Study? Oxford Medicine Online.

Smith, G.D. (2001). The Uses of Uses of Epidemiology. *International Journal of Epidemiology*. 30 (5) 1146-1155

UNIT 2   HEALTH INDICATORS

CONTENTS

1.0   INTRODUCTION

Government at each level always claim that they take the health of their people with all the seriousness it deserves, although citizens, professional unions, media and informed members of the society including civil societies often doubt this assertion. Social commentators also criticize governments on high level of corruption that male huge public spending by government incomparable with the quality of life of the people. Quality of life, according to WHO, is the condition of life resulting from the combination of effects of complete range of factors such as those determining health, happiness, education, social and intellectual attainments, freedom of action justice and freedom of expression (Moronkola, 2018).

However, for us to know whether there is effect of public spending or health intervention on citizens' lives, there must be visible changes in peoples' lives and the social environment. Although, health as a wholistic concept may be difficult to measure quantitatively or in units, nevertheless there must be those things that indicate changes have occurred. Indicators are those variables that help to measure or show whether changes have occurred or not, since it is not easy or possible to measure change. Indicators help to track the expected changed.

2.0 OBJECTIVES

By the end of this unit, you will be able to:

- Define health indicator
- State the characteristics of health indicators
- Discuss the various types of health indicators
- Mention the uses of health indicators

3.0 MAIN CONTENT

3.1 Definition of health Indicators

Health indicators are normally used for community generally or district or country so as to compare the healthiness of a part of the country to another part of the country or with another nation.

Through this, one is able to compare as well as evaluate the health services in a part of a country or the entire country itself. Medical also social scientists have also evolved some indicators to judge the quality of life and health (Health indicators are quantifiable characteristics of a population which researchers use as supporting evidence for describing the health of a population or are quantitative or statistical measures or instruments used for the measurement of health status of an individual or defined group (Etches, Frank, DiRuggiero and Manwel, 2006 & WHO, 2018).

1.2 Characteristics of Health Indicators

Owing to the fact that indicators have been adjudged to be scientific, ideal indicators have the following characteristics;

a. Should be valid i.e. they should actually measure what they are supposed to measure
b. Should be reliable and objective i.e. the answers should be the same if measured by different people in similar circumstances
c. Should be sensitive i.e. they should be sensitive to changes in the situation concerned
d. Should be specific i.e. they should reflect changes only in the situation concerned
e. Should be feasible i.e. they should have the ability to obtain data needed and;
f. Should be relevant i.e. they should contribute to the understanding of the phenomenon of interest

3.3   Types of Health Indicators

Appropriate indicators will give what a health community is, Lai, Adarsh and Pankaj (2009) as cited by Morankola, (2018) recorded that a community can be said to be healthy when it enjoys sound health where disease and death rate is acceptably low, it is not threatened with bad environment, its economy is sound, and the health practices are sound and based on scientific evidence. Also the community literacy levels are high, it has balanced sex ratio demographically, people live long, quality of life is good, and human development index is high.

Some of the health indicators enumerated by Mathur (2008) cited by Moronkola, (2018) are;

i.   Mortality indicators

a.   Crude death rate
b.   Standardised death rate
c.   Specific death rate
- Infant mortality rate
- Early neonatal mortality rate
- Late neonatal mortality rate
- Prenatal mortality rate
- Child mortality rate
- Maternal mortality rate
- Disease specific death rate
- Still birth rate
- Proportional mortality rate

ii.   Morbidity rates
d.   Incidence rate
e.   Prevalence rate
f.   Disease notified rate
g.   Epidemic rate
h.   Employees sickness benefit
i.   Hospital/PHC attendance

iii.   Disability rates
j.   ESL disability benefits
k.   Sick leave absence from service
l.   Accident rate resulting in disability
m.   Insurance data seeking disability benefits

iv.   Nutritional delivery system
n.   Anthropometric measurements of pre-school and school children (height, weight, mid-arm   circumference, head circumference, skinfold   thickness).
o.   Prevalence of low birth weight infants (below 2,500   gram).

p.   Prevalence of maternal anemia's and deficiency   diseases
v.   Health delivery system
q.   Doctor – Population
r.   Population; bed ratio in hospitals PHCS.
s.   Specialized health worker: Population
t.   Completed immunization versus vulnerable   population
u.   Percentage budget expenditure on health of the total   budget expenditure on health of the total budget of   the state
v.   Number of diseases under control and eradication programme
w.   The extent the MCH services are available and utilized
x.   Nurse: bed ratio

Environmental indicators
y.   Extent of overcrowding
z.   Sanitary houses
aa.   Extent of availability of safe drinking water to population
bb.   Air population levels

Other indicators
cc.   Literacy rate
dd.   Poverty line
ee.   Per capital income
ff.   Population growth
gg.   Eligible couples' rate
hh.   Marriage rate
ii.   Social securities
jj.   Life expectancy at birth
kk.   Indicators of social and mental health
ll.   Socio-economic indicators
mm.   Health policy indicators
nn.   Health status indicators

3.4   Uses of Health Indicators

The development of indicators is not an end in itself merely to observe and document the spatial or temporal distribution of the things being measured. Rather, the reason indicators are used in public health is to drive decision making for health. The ultimate objective is to improve the health of the population and reduce unjust and preventable inequalities.
Below are some main uses of health indicators:

i.   **Description**: Health indicators can be used, for example, to describe health care needs in a population and the disease burden in specific population groups. The description of a population's health needs can guide decisions about the extent and nature of unmet needs, the inputs needed to address the problem, and the

groups that should receive the greatest attention, among other functions.

ii.   **Forecast or prognosis**: Health indicators can be used to anticipate results with regard to the state of health (forecast) of a population or a group of a patients (prognosis). These indicators are used to measure individual risk and prognosis, as well as forecast disease burdens in populations. Additionally, they can forecast the risk of disease outbreaks, thereby helping to prevent epidemics or half the territorial spread of particular health problems.

iii.   **Explanation**: Health indicators can facilitate an understanding of why some individuals in a population are healthy and other are not. In this context, one can analyze indicators in relation to social determinants of health, such as gender roles and norms. Ethnicity, income, and social support, in addition to interrelatedness of these determinants.

iv.   **System management and quality improvement:** The production and regular monitoring of health indicators can also provide feedback to improve decision-making in various systems and sectors. For example, the notable improvements in the quality of data and indicators generated in PAHO member countries are due in large part to improved national health information system to collect, analyze and monitor a set of basic health indicators.

v.   **Evaluation**: health indicators can show the results of health interventions. The monitoring of such indicators can detect the impact of health policies, programmes, services, and action. Various

vi.   **Advocacy**: Indicators can serve as tools to support or oppose particular ideas and ideologies in different historical and cultural contexts. An example is the eloquence with which politicians invoke certain health indicators to defend or oppose particular policies or governments. The use of health indicators for advocacy is one of the most important strategies for progress because it can guide political decisions to improve levels of health in the population.

vii.   **Accountability**. Health indicators can provide needed information on risks, disease and mortality patterns and health related trends overtime for a wide range of audiences and users such as governments, health professionals, international organizations, civil society, and the general community. Providing these groups with the information to monitor a population's health situation and trends is vital for social control, evaluation, and institutional monitoring.

viii.   **Research**: Simple observation of the temperal and spatial distribution of health indicators in population groups can

facilitate analysis and lead to a hypothesis to explain observed trends and discrepancies.

ix. **Measure Gender Gaps**: Gender sensitive indicators measure gaps between men and women resulting from differences or inequalities in gender roles, norms and relations. They also provide evidence as to whether differences between men and women as revealed by a health indicator (mortality morbidity, risk factors, attitude toward seeking health services), are the result of gender-based inequalities. Constructing

4.0   CONCLUSION

Having read the unit and successfully considered the self-assessment questions, it is assumed that you have good understanding of health indicators.

5.0   SUMMARY

In this unit, students have learnt meaning, characteristics, types and uses of health indicators

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is Health Indicators?
2.   List five uses of Health Indicators.
3.   Mention three types of Health Indicators.

7.0   REFERENCES/FURTHER READING

Etches, V, Frank, J, DI Ruggiero, E & Manueel, D. (2006). Measuring population health: A review of indicators. *Annual Review of public Health*.27; 29, 55

Moronkola, O.A (2018).*Vital Statistics for health professionals.* In Ibadan; His Lineage publishing House.

Pan American Health Organisation (2018).*Health indicators; conceptual and operational considerations*, Available at http;//www.Paho.   Org/English/gov /cd45-14-e.pdf.

World Health OrganiSation. *Reproductive Health indicators, guidelines for their generation, interpretation and analysis for global monitoring.*   http.//apps.   Who, int/iris/bitstream//0665/43185//9/924156315xeng. Pdf.

MODULE 3   HEALTH CARE STATISTICS

Module Introduction

In the last module you have learnt about concepts of epidemiology and health indicators. In this module you will learn about health care statistics.

Unit 1   Definitions of Rate, Ratio, Proportion and Percentage
Unit 2   Morbidity Statistics
Unit 3   Mortality Statistics

UNIT 1   DEFINITIONS OF RATE, RATIO, PROPORTION AND PERCENTAGE

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Definition of Rate
        3.2   Definition of Ratio
        3.3   Definition of Proportion
        3.4   Definition of Percentage
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

In health care statistics, the concepts of rate, ratio, proportion and percentage are essential and very important for understanding vital statistics in health-education.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- define the concepts of rate and ratio
- explain the concept of proportion and percentage.

3.0   MAIN CONTENT

3.1   Definition of Rate

Rate is the number of people with specific characteristics divided by the total number of people or the number of times and event did occur compared with the number of time it could have occurred. The two major elements of rate are (i) a numerator; which is the number of times an event occurred. (ii) denominator: which is the population of people in which the event could have occurred. In other word, the numerator is the absolute number of occurrence of the event being studied in a specified time. The denominator is the reference population (or population been studied) at some time. It is necessary to note that a rate is determined and it is expressed in the following manner 20 in 1000, 2 in 100, 1 in 100,000, 10 in 1,000,000 etc.

3.2   Definition of Ratio

Ratio is the comparison of one thing to another. It shows a relationship between two numbers or things. It is calculated by dividing one quantity by another, which may or may not be of the same type. e.g births to deaths, marriages to divorces. It is expressed as 20:1000, 1:100,000 etc.

3.3   Definition of Proportion

Proportion is when the numerator is a subset of the denumerator. A proportion tends to be expressed as a percentage (%). It is the observed relative frequency of an event and provides an estimate of probability. Proportion is usually expressed as fraction like $^{20}/_{1000}$, $^{1}/_{100}$, $^{1}/_{100,000}$

3.4   Definition of Percentage

Percentage is based on a whole, divided into 100 parts, e.g. a traction such as 1/5 may be expressed as a percentage by first converting the fraction into a decimal by dividing the numerator by the denominator 5 to obtain 0.2. The decimal is then converted into a percentage by multiplying the decimal by 100, which can be accomplished by moving the decimal point two places to the right and affixing a percentage sign. The result is 20 percent.

Table1.1: Example of Ratios, Proportions, Percentages and Rates

Ration	Proportion	Percentage	Rate per (100,000)
1:100	$^1/_{100} = 1.0$	1.0	1,000 in 100,000
3:10,000	$^3/_{10,000} = 0.0003$	0.03	30 in 100,000
250:100,000	$^{250}/_{1000,000} = 0.0025$	0.25	250:100,000

Source: Watlaf, V.J.M. (1996) Research statistics and epidemiology in M. Abdelhak, S. Grestick, M. A. Hanker and E. Jacobs (Eds) Health Information Management of a strategic resources (P 280-319) Philadelphia, W. B. Saunder Company.

4.0 CONCLUSION

This unit has provided you with definitions on rate, ratio, proportion and percentage. More information is made available to you through the texts attached to this unit to further your understanding of the concepts understudied.

5.0 SUMMARY

In this unit you have learned the concepts rate, ratio, proportion and percentage. You are encouraged to increase your understanding of the content of this unit by looking through the texts attached to the unit. Your level of understanding of this unit is indicated by how much you have performed in the assessment exercise.

6.0 TUTOR-MARKED ASSIGNMENT

Define the following concepts: ration, rate, proportion.

7.0 REFERENCES/FURTHER READING

Breslow, L. (2006). 'Health Measurement in the Third Era of Health.' *American Journal of Public Health. 96,* (1).pp.17-19.

Moronkola, O. A. (2018). Vital Statistic for Health Professionals. Ibadan. His Lineage.

Pan American Health Organisation. (2018). Health Indicators, Conceptual and Operational Considerations. Washington D. C.

Watzalf, V.J.M. (1996). 'Research, Statistics and epidemiology,' In, M. Abdelhak, S. Grostic, M. A. Hanker & E. Jacobs. (Eds.). *Health Information: Management of a Strategic Resources.* (pp. 250-319). Philadelphia. W. B. Saunders Company.

UNIT 2   MORBIDITY STATISTICS

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Contents
       3.1   Definition of Morbidity
       3.2   Uses of Morbidity Statistics
       3.3   Sources of Morbidity Statistics
       3.4   Measure of Morbidity Statistics
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

Morbidity in simple language means to be sick, diseased, not in good state of health, ill, etc. There are many factors that may make one not to be enjoying good state of health or be sick which are: genetic make-up, gender, living condition, nutritional intake, lifestyle (e.g. sexual lifestyle, smoking, alcohol consumption) ignorance/few level of education, no support, stress, poor water supply, health services availability/utilisation, etc. It is noteworthy that if morbidity is taken care of by individuals and government/community, there would be less of mortality.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- Define morbidity
- State the uses of morbidity statistics
- List the sources of morbidity statistics
- Mention two principle measures of morbidity statistics.

3.0   MAIN CONTENT

3.1   Definition of morbidity

Morbidity is the measurement of the occurrence of diseases, injuries and disabilities in populations. A morbidity is a value describing the presence of disease in the population or the degree of risk to an event. Morbidity can be expressed as measuring incidence and prevalence.

Morbidity statistics are concerned with the amount and types of illness that occur in the community. The sources of available data vary from place to place and from time to time. They include, for example attendance for primary care, hospital out-patient and admissions, as well as statutory sources and special registers for particular conditions.

3.2   Uses of Morbidity Statistics

(i)   Control of infectious disease
(ii)   Planning for development of preventive services
(iii)   Ascertaining of relationship to social factors
(iv)   Planning for provision of adequate treatment services
(v)   Estimation of economic importance of sickness
(vi)   Research on efficacy of preventive and therapy measure
(vii)   National and international study of distribution of disease and impairments.

3.3   Sources of Morbidity Statistics

There are wide range of sources of morbidity statistics. Logan and Lambert (1979) cited in Moronkola (2018) classified them according to a broad scheme of modes of collection:

i.   Specific Reporting
-        Notification of infectious disease
-        Notification of industrial disease
-        Reports congenital disease
-        Abortion notification
-        Reports of infectious disease from general practices and from microbiological laboratories.
ii.   Disease registers (e.g. cancer, coronary heart disease).
iii.   Routine, abstracts of clinical records (continuous, sporadic).
iv.   Records of medical care in special groups schools, armed forces, civil service etc. pensioners and veterans medical records, home visiting and nursing services. Special clinics (e.g. tuberculosis, sexually transmitted diseases.
v.   By products of other procedures social security scheme and voluntary health plans and funds certification of certain conditions   for special benefits or allowances.
         Life Insurance records
vi.   Special surveys (continuous or sporadic)
         -        Health interview
         -        Health examination
         -        Mass diagnostic and screening surveys (e.g. tuberculosis).
         -        Census enumeration of sick person or of certain defects.

3.4   Measurement of Morbidity Statistics

There are two principal measures of morbidity statistics.

A.   **The incidence rate**: This is defined as the number of new cases of a disease or other health condition reported, divided by the population at risk for the disease (exposed population) in a specific place during a specific period of time. In other word, it is the number of newly outbreak of disease cases reported within a period of time divided by population of the people at the time in the community. Incidence rate can be measured in two different ways:

i.   **The incidence risk:** This is the probability that a person initially free from the disease develops it at some time during the period of observation. It is usually expressed as percentage or, if small, at per 1000 persons

ii.   **Incidence rate:** This is the rate of contracting the disease among those still at risk when a person contracts the disease, they are no longer at risk. The number of new cases is related not to those initially at risk but to the average number at risk during the period, multiplied by the length of the period or equivalently to the total number of person -years at risk (per year) during the period. It is usually multiplied by 1000 and expressed per 1000 person years at risk.

Calculation method:

Incidence rate = number of new cases of specific disease during a year x 100

Estimated population for the period (point of time)

Example: In Ajegunle the number of new cases of cholera among children in September, 2003 was 1580 and the population of the children was 70,000. Find out the incidence rate

Incidence rate = $\frac{1580 \times 100}{70,000}$

= 2.3 or 2.0 percent of children in Ajegunle.

Incidence risk: No of new cases of disease in a specified period of time

No at risk of contracting disease at beginning of period

Incidence rate: No of new cases of disease in a specified period of time

No of person years at risk during period

(Average number of risk of contracting disease

during period x length of the period).

Uses of Incidence rate: it is essentially used for analyzing the occurrence of new events in population and their related factors.

B.   The prevalence: This is defined as the number of existing cases of disease or other event divided by the number of persons in population at that specific time. It is the measurement of the proportion of the population that has a specific illness at a specific time. Prevalence may be measured either at a single point (point prevalence) or over a period of time (period prevalence)

Point Prevalence Rate:- Number of person with disease of a particular

point in time
Total Population

Calculation method of prevalence rate

Prevalence rate:- Number of specific disease during a period x 100
Estimated population for the period

Example:- In August 2016 in Sagbama, the number of children in and out of school living withj athletes foot was 500 out of the 8,000 children in the town. Find out the prevalence rate.

Prevalence rate: 500 x 100
                                8,000
=   6.28 or 6.3 percent of children in Sagbama.

Uses of Prevalence Rate: It is essentially used for planning and organizing existing resources and services as well as for obtaining additional support, when necessary.

4.0   CONCLUSION

In this unit, you have learnt about definition of morbidity, uses of morbidity, sources of morbidity statistics and measures of morbidity statistics.

5.0   SUMMARY

In this unit, students have learnt about morbidity statistics. The self-assessment exercise, you attempted were meant to provide you opportunities of testing your understanding and amount of learning you have achieved after having studied the unit.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Define Morbidity.
2.   State two measures of morbidity statistics.
3.   State Mention three uses of morbidity statistics.

7.0   REFERENCES/FURTHER READING

Kirhwood, B. R. (1992). Essentials of Medical Statistics. Oxford: Blackwell scientific publications.

Moronkola, O. A. (2018). Vital Statistics for Health Professionals. Ibadan His Lineage Publishing House.

Pan American Health Organisation. (2016). Care Indicators: Health situation in the Americas. http://iris.paho.org/xm/uv/handle/1234456789/31289

World Health Organisation. (2015). Global reference list of 100 care health indicators. http://www.who.int/healthinfo/indicators 2015/en/

UNIT 3   MORTALITY STATISTICS

CONTENTS
1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Definition of Mortality Rate
        3.2   Uses of Mortality statistics
        3.3   Types of Measures of Mortality
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

Mortality statistics forms an essential component of health information system at national and international levels. These figures reflected the changing disease pattern of a country this helping in better utilization of available resources.

2.0   OBJECTIVES

By the end of this unit, you will be able to:
- define mortality
- mention the uses of mortality statistics
- describe various types or measures of mortality statistics.

3.0   MAIN CONTENT

3.1   Definition of Mortality

Mortality rate is a measure of the frequency of occurrence of death in a defined population during a specified interval. It is the number of deaths (in general, or in a specific cause) in some population, scaled to the size of that population, per unit time. Mortality rate is typically expressed in units of deaths per 100 individuals per year. The formula for the mortality of a defined population, over a specified period of time is:

Deaths occurring during a given time period x 10

Size of the population among which the death occurred
Mortality is a negative component of natural and total population movement which influenced decrease in the total population size.

Mortality especially infant mortality is an important indicator of living standard. Population mortality data are extremely important for objective evaluation of inhabitants' health and for a country's social policy.

Mortality trends are influenced by factors of person, place and time and mortality rate can be determined by several factors including nationality, age, socio-economic status, life style, heredity, health status, level of health care. However, causes of death are different for different types of death rates as postoperative, maternal death rates may not be caused by same factors.

3.2   Uses of Mortality Statistics

Data on mortality are used for many purposes.

(i)   They are required as inputs into population projection, which themselves are used for a variety of policy related and planning purposes.

(ii)   On a shorter time scale, mortality statistics provide an important indicator of the health and well-being of a population. Mortality statistics are required to estimate summary measures of population health, for example, the life expectancy at birth as well as to understand differentials in population health among different sub-groups in the population.

(iii)   Probably most importantly, mortality statistics provide information about the nature and efficacy of health care delivery systems. Thus, for example, if high levels of child mortality are observed, that may spur interventions to improve child health through changing models of care and service provision, availability of immunisation programmes etc. To be truly useful, however, it is important that information is not only collected in the numbers of deaths by age and sex, but also to be able to attribute death to its underlying cause.

(iv)   Also, where information n cause of death is collected, data on mortality can assist in helping policymakers understand a country's trajectory through the epidemiological transition. For this reason, it is recommended practice that the process of certifying death records not only the basic demographic characteristics of the deceased, but also for a cause of death and occupation to be recorded.

(v)   Information on cause of death is also important for epidemiological studies. The links between exposure to asbestos

and higher mortality were first identified by observing that people who worked in environments with high levels of asbestos particles present suffered not only elevated mortality, but also tended to have higher death rates from lung-related diseases.

3.3   Measures of Mortality Statistics

(i) **Maternal Mortality rate:** The number of maternal deaths by the number of women years in the reproductive age (15-49). Maternal deaths are defined as "The death of a woman while pregnant or within 4.2 days from the end of the pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.
Example: Amina Specialist Hospital, Kano had total 3,000 discharges in March 2010 including 500 obstetric discharges and 25 obstetric deaths maternal death rate $\underline{25 \times 100} = 5.0\%$
                                                500

Therefore, 5.0 percent of obstetric patient discharge during March 2010 died or rather the maternal mortality rate for March 2010 was 5.0 percent.

(ii) **Infant Mortality Rate:** The number of deaths of children under 1 year of age per thousand) divided by the total number of live births in the population during a given year.   Example, Livingstone Hospital, Enugu are the following discharge analysis report for 2 or 3 sharing the following

Living birth – 200
Infant discharges – 80
Infant deaths – 14
Infant mortality rate:- $\underline{14 \times 100}$
                                        80×14
                        $= 14.89$ percent or 14.9 percent

We can safely say that 14.9 percent of infants in Livingstone Hospital, Enugu in 2013 died or that the infant mortality rate was 14.9 percent.

(iii) **Crude Death Rate or Crude Mortality Rate:** Crude death rate is the ration of the number of deaths, which occur in a population during a calendar year. The total mid-year population on that year.

(iv)   Age-Specific Mortality Rate: This is a mortality rate limited to a particular age group. The numerator is the number of deaths in that age group; the denominator is the number of persons in that age group in the population.

(v)   Cause Specific Mortality Rate: This is the mortality rate from a specified cause for a population. The numerator is the number of deaths attributed to a specific cause. The denominator remains the size of the population at the midpoint of the time period. The fraction is usually expressed per 100,000 population.

(vi)   Neonatal Mortality Rate: This is the deaths of children under or before 28 days of age during a given time period. That is the neonatal period covers birth up to but not including 28 days.

The numerator of the neonatal mortality rate therefore is the number of deaths among children under 28 days of age during a given time period. The denominator if the neonatal mortality rate, like that of the infant mortality rate, is the number of live births reported during the same time period. The neonatal/mortality rate is usually expressed per 1,000 live births.

Example: Livingstone Hospital, Enugu gave the following discharge analysis report for 2013 on neonatal.

Neonatal discharges - 170
Neonatal deaths – 6
$$= \frac{6 \times 100}{170 + 6} = 3.4 \text{ percent or 3.0 percent}$$

We can therefore explain that 3.0 percent of the neonatal discharged died or that neonatal mortality rate was 3.0 percent.

4.0   CONCLUSION

This unit has provided you information on mortality statistics. Information you obtain from the unit are meant to enrich your knowledge and understanding of this important aspect of vital statistics in health education.

5.0   SUMMARY

In this unit, you have learnt about definition of mortality, uses of mortality statistics and measures of mortality statistics endeavour to go through all the tents and on line links that have been provided you in this unit.

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is mortality rate?
2.   State 3 measures of mortality statistics.

7.0   REFERENCES/FURTHER READING

Barker, D.J.P. & Rose, G. (1990). *Epidemiology in Medical Practice*. (4th ed.). Eminburghi Churchill Livingstone.

Centers for disease control and prevention. (2004). *Health*. United States. Huyathsville.

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals*. Ibadan. His lineage publishing house.

Pan American Health Organisation. (2018). *Health Indicators. Conceptual and operational considerations*.   Available https://wwwpaho.org/englishgov /cdk 045-14-1pdf

Wikipedia.org.mortalityrate (online). The last revision 2021-03-29 (cit. 2021-03 30) http://en.wikipedia.org/wiki/mortality-rate. Retrieved from http://ww w.wikilectures.eu/index. ph?title=mortality & oldid = 21131

Woodward, M. (2005) Epidemiology; study design and data analysis, second ed. United Kingdom: Chapman and Hail/CRC.

MODULE 4 HEALTH RELATED DATA COLLECTION AND PRESENTATION

Module Introduction
In the last module you have learnt about morbidity statistics. In this module you will learn about health related data collection and presentation.

Unit 1   Scales of Measurement
Unit 2   Descriptive Statistics
Unit 3   Measure of Dispersion

UNIT 1 SCALES OF MEASUREMENT

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Scales of Measurement
        3.2   Characteristics of Different Scales of Measurement
        3.3   Frequency Distribution
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

Variable (data) are usually collected or measured and organised along the following scales of measurement. There are four scales of measurement.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

•   explain the various scales of measurement
•   list the characteristics of each scales of measurement.

3.0   MAIN CONTENT

3.1   Scales of Measurement

There are four scales of measurement which are explained below.

1.   Nominal data scale

It labels observations into different categories. It gives names to things. They are also known as qualitative or categorical data. The data are only used as names which their numerical value have no meaning. For example we may decide to assign 1 to male and 2 to female, 4 can be given to married, 5 to single, 6 to widow and 7 to separated. All these values are just to categorize or show distinction between each category. They are for identification, name calling and so addition, subtraction, multiplication and division i.e. arithmetic operations cannot be applied to nominal data. For example, in responding to category of health workers, the list will have medical doctor, pharmacist, nurses, midwives, health educator, community health extension workers etc. While it is possible to have differences in two measurements in nominal scale, it is impossible to determine quantitative difference but qualitative one. However, they can be numbered that look more or less like name. 1 for male or 2 from female does not confer any or less like name. 1 for male or 2 for female does not confer any form of superiority. Ward 9 is not necessary spacious than Ward 10 in a health facility.

2.   Ordinal data scale

Observations are categorised and can be ordered sequentially. For example, patients can be labelled as emergency, mild and stable cases showing differences and not magnitude of the difference but direction of the relationship between one and the other case. They are also known as ranked data. Example are: (i) Ordinal positions of siblings in a family (ii) Number giving to babies born in the birth register in hospitals (iii) The regimen of drugs given or the order in which a drug is given. They make one category different from other in ordered form or sequence. However, they do not show interval between the values and so cannot be used for arithmetical/mathematical equation.

3.   Interval data scale

It is an ordered set of categories but with intervals of same size which makes it possible to know value differences which do not happen in ordinal data. Intervals do not really have zero value or depicts absence even when zero values exists for convenience sake. For example, when measuring with a tape or ruler a 2cm distance is same at every point on the tape or ruler. When the temperature is 0°C, it does not mean there is absence of temperature and a 30°C yesterday morning does not necessarily mean it is half of this morning 60°C. Ratio of one value of an object to another is irrelevant on an interval data scale.

4.   Ratio Scale

It has all attributes of an interval scale but also with absolute zero point. The ratio of number do not reflect ratio of magnitude. A value of zero in ratio scale means absence. Differences can be measured and can also be described in terms of ratio.

Reflecting on all the scales of measurement, we can rightly say that a measurement of a property has a nominal scale if the numbers shows that one unit is of more property than the other and it is interval scale when the number reflects not only difference but also with the amount of the difference from another while a ratio scale in addition to all characteristics of earlier scales give the extent of times difference trait exist between one unit and another one.

3.2   Characteristics of different scales of measurement

1.   Characteristics of Nominal data scale

i.   The numeric value are merely the names of categories.
ii.   The numbers are used only to make categories distinct.
iii.   The value does not indicate any magnitude.
iv.   The value do not indicate any relationship
v.   No arithmetic operation can be used on the numbers
vi.   Statistics manipulation is extremely limited

2.   Characteristics of Ordinal data scale
i.   The numeric values show the order of sequences.
ii.   The value is not a measure of magnitude.
iii.   The interval between values does not indicate magnitude.
iv.   The values do not show relationships by order of sequence.
v.   The values cannot be used in mathematical equations.
vi.   Statistical manipulation is somewhat limited.
3.   Characteristics of Interval Data scale
i.   The numeric values show both order and magnitude.
ii.   The interval between integer value is equal.
iii.   A zero value does not indicate absolute zero.
iv.   The values show relationship by order and magnitude.
v.   The values cannot be used to form ratios.
vi.   Statistical manipulation is not very limited.
4.   Characteristics of Ratio scale
i.   The numeric values show both order and magnitude.
ii.   The interval between integer values is equal.
iii.   A zero value does indicate absence of the thing measured.
iv.   The value can be used to form ratios.

v.   The value show relationships by order and magnitude.
vi.   Statistical manipulation is not limited.

3.3   Frequency distribution

This is the way of presenting set of disorganised scores or values in order of frequency from highest to lowest or vice versa (especially in computer programmes) and putting same individuals scores together to reflect number of their occurrence or frequency in tables or graphs.

When there are several data in their original form such mass of data is known as raw data which because they are many cannot but useful unless they are organized. However, when they are arranged in either ascending or descending order, then it is known as array of data.

Example 1: Age distribution of 40 patients in a month in a Health Facility

25	24	10	70	63	13	42	33	29	12
70	60	50	32	17	20	41	25	50	66
26	34	23	37	19	20	67	16	55	18
23	36	26	40	15	63	53	8	37	14

Solution: Arrangement of the age of 40 patients in a month, in a health facility in magnitude of ascending order.

10	15	19	23	26	33	37	50	63	67
12	17	20	24	26	34	40	50	63	68
13	18	20	25	29	36	41	53	65	70
14	18	23	25	32	37	42	55	66	70

Frequency distribution ensures both organisation and summarisation of data and it's the basic form of condensing and summarising data.

Ungrouped frequency distribution.

In ungrouped frequency distribution, each observation/score/points is listed in a column in ascending or descending order. Against each listing is the number of observation recorded in frequency (f). As against array of scores/points/point each is not recorded in each time it occurs, frequency distribution does the listing once. Using data we have in Example 1, instead of 40 figures we have, we only have it as shown below.

Ungrouped frequency distribution of age 40 patients in health facility

Age of Patient	F
10	1
12	1
13	1
14	1
15	1
17	1
18	2
19	1
20	2
23	2
24	1
25	2
26	2
29	1
32	1
33	1
34	1
36	1
37	1
40	1
41	1
42	1
50	2
55	2
63	2
66	2
67	1
68	1
70	2

Note that εx = addition of all values of X,… as they occur $\varepsilon x^2 1$ raw data or to get Ex from frequency table is to ensure each values is multiplied by how many times they occur (frequency) and add them together to be denoted as εfx. In the two methods you must ensure that you use all the information in the frequency column as well.
εx^2 = square each value of X^2,… and then add the squared values.

Group frequency distribution tables

When there are many scores or values to deal with, frequency distribution table of the scores looks unwholesome. If we decide to list all of them, the most reasonable thing to do is to find a way of

compressing the values to give a simplified table known as grouped frequency distribution table, grouped means group of scores which are also known as interval that may spread values and the entire table is guided by guidelines.

Guideline 1: the group frequency usually must not be more than 10 intervals. Not few and not many class intervals require sound judgment in a table construction that is meaningful.

Guideline 2: The width of each interval usually is in 5s and 10s but others may be 2, 3, 5, 20, 25, 50 etc. depending on values or scores one is working with.

Guideline 3: start each class interval with a value that is a multiple of the width. For example if the interval width is 5 points, then a multiple of 5 e.g. can be the lowest in each class interval. The bottom interval can be 10 and those in ascending order can be 15, 20, 25, 30, 35, 40 45.

Guideline 4: all intervals must have equal width and cover range of scores. In the data you are working with, none should overlap, there should not be gaps. This translates to mean that a score can only belong to an interval.

Example: Data of safe delivering per 100 pregnant women in 20 health facilities in a state is given thus:

36	34	37	40	36	38	60	51	53	56
62	44	70	68	73	74	79	96	75	60

First determine range by subtracting the lowest from the highest value i.e 79 – 30 = 49.

This implies that 40 rows are needed to provide a simple frequency table then the need for class interval that will not be more than 10 intervals and also with appropriate width. We list the class intervals and how many figures within a particular interval are listed under the frequency column as reflected in the table below:

Table 3: grouped frequency distribution table of safe deliveries

X	F
75 – 79	3
70 – 74	3
65 – 69	1
60 – 64	3
55 – 59	1
50 – 54	2
45 – 49	0
40 – 44	2
35 – 39	3
30 – 34	2

Frequency distribution graphs

It is important to state that diagrams as well as charts are useful ways of representing lasting memorable simple statistical data to people though the original accuracy of data may be hidden. Nevertheless, they give idea of what the data means especially when quick decision needs to be made more than when data are presented in tables or wit more powerful statistics.

Frequency distribution graphs give graphical representations of frequency distribution table. Normally, there are two perpendicular lines known as Y-axis (ordinate) which is the vertical of frequency line and the X-axis (abscissa) which is the horizontal line where scores or values are presented.

Proportions: They measure fraction of the total group associated with each score. For example, in the ungrouped table, there are two patients with $x = 18$. Thus, 2 out of 40 patients had $x = 18$, so the proportion is $2/40 = 0.025$. For each score the associated score can be worked out as proportion $= p = f/n$. Proportions are also known as relative frequencies since they describe frequency in relation to the total number of people or objects involved.

Percentages: Distribution of score is also described in percentages. For example, a nurse may describe monthly successful deliveries in percentages as in 80% had successful deliveries. In finding percentages of each score or value, we need to first find the proportion (p) and thereafter, multiply by 100

Percentage = p (100) = f/n x 100/1
Frequency distribution may also have a percentage column.

4.0 CONCLUSION

You have learnt in this unit the scales of measurement as well as various types of frequency distribution.

5.0 SUMMARY

This unit has discussed the various types of measurement scales and frequency distribution. The scales of measurement include Nominal, Ordinal, Interval and Ratio scales.

6.0 TUTOR-MARKED ASSIGNMENT

1. List the four types of scale of measurement.
2. What is Frequency Distribution?
3. List two types of frequency distribution.

7.0 REFERENCES/FURTHER READING

Adamu, S. O. & Jihnson, T. L. (1997). *Statistics for Beginners Book 1*. Ibadan. Soal Publications.

Bowling, A. (1997). *Research methods in Health*. Buckingham: Open University Press.

Moronkola, O. A. (2018) Vital *Statistics for Health Professionals*. Ibadan. His Lineage Publishing House.

UNIT 2   DESCRIPTIVE STATISTICS (AVERAGES)

1.0   INTRODUCTION

Average is a value in a distribution that other values revolve around. Therefore, it gives a mental picture of what the central value is or likely to be.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- describe the concepts of Mean, Median and Mode.
- explain the attributes of graphical presentation of data
- list various types of graphic presentation of data.

3.0   MAIN CONTENT

3.1   The Mean

The mean is mostly used and it is the sum of the values of a set of observations divided by the number of observations in that set.

For example, the age of community health extension workers in training are:

| 17 | 18 | 20 | 21 | 21 | 33 | 33 | 33 | 30 | 24 |
| 26 | 27 | 28 | 23 | 29 | 31 | 32 | 33 | 36 | 34 |

Find the mean.

$\underline{X} = \frac{\varepsilon x}{N}$

Where $\underline{X}$ = mean, εx = sum of the observed values, N = total number of community health extension workers in training.

$\underline{X} = \frac{\varepsilon x}{N} = \frac{555}{20} = 27.8$

3.2   The Median

The median is the midpoint of observations made when arranged in their order of magnitude. This means that if observation are not in ordered form we need to first arrange them before locating the median. For example, the age distribution of some nursing students for a group assignments is 18, 19, 20, 21, and 22. The median is 20. However, it is not so easy for even observations as there will not be a middle number or score for even observations as there will not be a middle number or score. What we need to do is to locate their middle pair of observations and find their mean/average. The point average between them is the median. For example, if we have the score distribution of some students in vital statistics cours3 to be 45, 50, 60, 61, 62, 65, 67, 69, 70, 71. The median is: $\frac{62+65}{2} = 63.5$

It is important for us to note that we have five observations fall below 63.5 and five observations fall above 63.5

3.3   The Mode

There are situations when we are interested in the most occurring score or observation and the mode is that value occurring most frequently in an array of scores, values or observations. For example, in the following set of age of children immunized in a day: 2, 2, 3, 4, 4, 5, 5, 5, 6, 6, the mode is 5. There may be a situation when two values may have the same frequency of occurrence, in such a situation, the data set is known as bimodal. In a situation where all the scores/values occur one then the data set has no mode. It is important to note that Mean, Mode and Median measures central tendency of array of values.

Major characteristics of Mean

1.   It is the arithmetic average of the measurement in the data set
2.   There is only one for a data set
3.   Its values is influenced by extreme measurements. Trimming can help to reduce the degree of outlier influence
4.   Means of subjects can be combined to determine the mean of the complete data set.
5.   It is applicable to quantitative data only

Major characteristics of Median

1.   There is only one median for data set.
2.   Medians of subject cannot be combined to determine the median of the complete data set.
3.   It is not influenced by extreme measurements.
4.   For grouped data, its value is rather stable, even when the data are   organized into different categories.

Major characteristics of Mode

1.   It is the most frequent or probable measurement
2.   There can be more than one mode for a set of data.
3.   It is not influenced by extreme measurements.
4.   It is applicable to both quantitative and qualitative data.
5.   Mode of subsets cannot be combined to determine the mode of the   complete data set.
6.   For grouped data, its value can change depending on the categories   used.

3.4   Graphic presentation of data

Graphic presentation of data provides usual summary of data and they are more meaningful and fascinating than tables though they are derived from tables. It should be noted that there are underlining principles for arriving at a particular graphic presentation, Pie-chart, Dot, Chart, Line graph, Bar chart, Histogram, Frequency polygon and Pictogram.

Histogram

It is used to display a frequency distribution of continuous-interval data. It looks like the bar graph at the side, although histograms look like bar graphs, they differ because (i) the bars in a histogram should be vertical and the base scale is marked off in equal units whereas there is no base scale in a bar graph. (ii) The widths of the bars in a histogram have meaning. The base of each bars covers a class of values of the variable, the class of values whose frequency is the height of the bar, the width of the bars in a bar graph have no meaning. (iii) The bars in a histogram touch each other (unless some class has frequency of zero). (iv) histogram is used for data collected at either interval or ratio scale why bar chart is for data collected at either nominal or ordinal scale. It is essential also to note that as in bar graphs, our eyes respond to the area of the bars in a histogram and if the heights are frequencies, then the width of all the bars must be equal so as to avoid false impressions. To make histogram of a distribution, we need to:

i.   Divide the range of the data into classes of equal width.
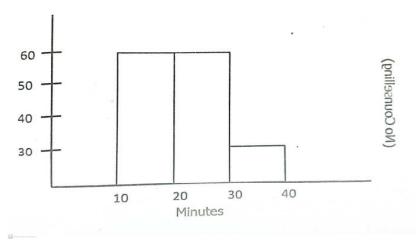ii.   Count the number of observations in each class.
iii.   Draw the histogram.

Fig.2.1: Histogram showing duration of time used for health counselling against drug abuse.

Pie-chart

It reveals how a whole circle is separated or divided into the constituent parts or segments. Each part so divided depicts a proportion of each category for the whole pie-chart. It is used for displaying data in nominal, ordinal and continuous scale. You need to have at the back of your mind that a circle is 360^0 before constructing a pie-chart and each portion is therefore work out to get a corresponding portion. For example, if there are 50 health workers in a primary health care department of a state ministry of health and the distribution is thus: medical doctors – 10, nurses/mid-wives – 20, community health workers – 40 and pharmacy technicians – 10. To get the pie-chart for the distribution of the health workers you need to work it out like this:

(a)   Medical doctors $= \frac{10}{80} \times 360° = 45°$

(b)   Nurses/mid-wives $= \frac{20}{80} \times 360° = 90°$

(c)   Community health extension workers $= \frac{40}{80} \times 360° = 180°$

(d)   Pharmacy technicians $= \frac{10}{80} \times 360° = 45°$

Note: When all the value are added together, the sum must be equal to 360^0.

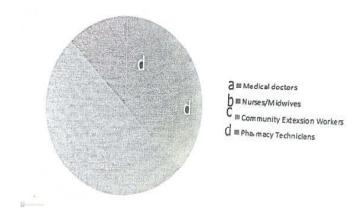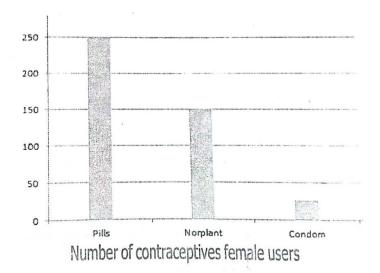The above answers will help in constructing a pie-chart to take care of the distribution.

Fig. 2.2: Pie-chart showing distribution of health workers in a state ministry of health.

Bar chart

They are used to display nominal, ordinal, discrete and continuous data and compare the values of many variables. Such values are frequencies or relative frequencies especially of a nominal variable, i.e. quantitative data. It can be vertical or horizontal in presentations. Most bar graphs are in vertical positions. Watsalf, (1996) said that the discrete categories are shown on the horizontal or x-axis and the frequency is shown in the vertical or y-axis. The purpose of the bar graphs is to reflect the frequency of each variable and each bar vertical scale should begin at zero so that the heights of the bars are proportional to the frequencies. (Number of contraceptives female users; see figure 2.3 below-Horizontal bar chart showing types of and distribution of female contraceptives users.)

Number of contraceptives female users

Dot charts

As the name implies, representation of each category in the whole is displayed through drawing of dots which is easier to draw compared to many graphic displays.
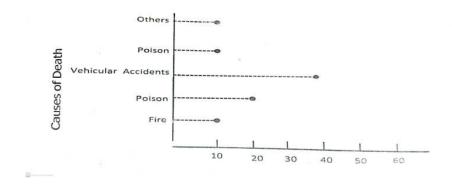

Fig.2.4: showing dot chart about percent of total deaths in a community.

Line Graphs

Line graphs show the behaviour of variable over time and time is marked on the horizontal axis and the particular variable being plotted is marked on the vertical axis.
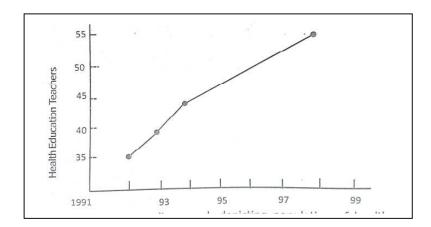

Fig.2.5

Pictogram
It is presentation of data in simple pictures, i.e. the pictures represent the quantities of data.
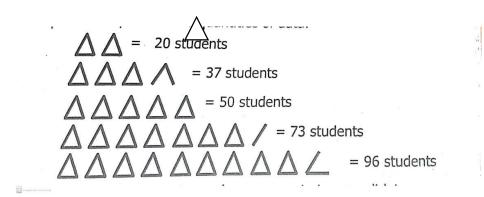

Fig.2.6: Showing data that represent ten candidates.

4.0   CONCLUSION

In this unit you have learnt about descriptive statistics of mean, median and mode, and graphic presentation of data.

5.0   SUMMARY

The unit has explained the meaning of descriptive statistics, types of descriptive statistics and various types of graphic presentation of data.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Explain the following concepts:
        (i) Mean (ii) Median (iii) Mode
2.   Discuss two types of graphic presentation of data.

7.0   REFERENCES/FURTHER READING

.Araoye, M. O. (2004). *Research Methodology with Statistics For Health and Social Sciences*. Ilorin. Nathadex publisher.

Bello, R. & Ajayi, O. O. S. (2001). Research Methods and Statistics Analysis, Ilorin. Hayee Press and Publishing Company Limited.

Moore, D. S. (1991). *Statistics Concepts and Controversies*. (3rd ed.). New York, W.H, Freeman and company.

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals*. Ibadan. His Lineage Publishing House.

UNIT 3   MEASURE OF DISPERSION

CONTENTS

1.0   INTRODUCTION

A measure of dispersion indicates the scattering of data. It explains the disparity of data from one another, delivering a precise view of their distributions. The measure of dispersion displays and gives us an idea about the variation and the central value of an individual item.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- define measures of dispersion
- describe various forms of measures of dispersion
- explain the types of measures of dispersion
- state the characteristics of measures of dispersion.

3.0   MAIN CONTENT

3.1   Meaning of Measure of Dispersion

Measure of dispersion is the extent to which values in a distribution differ from the average of the distribution. It gives us an idea about the extent to which individual items vary from one another and from the central value.

3.2   Types of Measure of Dispersion

There are three main measures of dispersion or variation from the mean:

(i)   Range

It is the simplest method of measurement of dispersion and define the difference between the highest/largest and the lowest/smallest value or item in a given distribution. It is usually view of less importance as it only indicates on the two extreme values and other values between them are lost. For example, the weight in kilogram of patients at a clinic on a day is as follows: 56, 63, 68, 72, 73, 77, 79, 80, 82, and 85.

The highest value is 85 and the lowest 56. The range is expressed as 56 to 85 or by the actual difference which is 29. In grouped data we calculate it as the difference in mid-points of the two extreme categories.

(ii)   The mean deviation

Mean deviation is the arithmetic mean (average) of deviations /D/ of observations from a central value (mean or median)

Mean deviation can be evaluated by using this formula

$$MD = \frac{\Sigma(x - \overline{x})}{N}$$

The earlier data under the range will used to complete mean deviation thus in the following table

Mean deviation table of patients` weight

X	$\overline{X}$	$(X - \overline{X})$
56	73.5	-17.5
63	73.5	-10.5
68	73.5	-5-5
72	73.5	-1.5
73	73.5	-0.5
77	73.5	+3.5
79	73.5	+5.5
80	73.5	+6.5
82	73.5	+8.5
85	73.5	+11.5
735	73.5	71(Ignoring ± sign)

Mean $= \frac{735}{10} = 73.5$

The mean deviation $\frac{71}{10} = 7.1$

(iii)   The Standard Deviation: Standard deviation is the square root of the arithmetic average of the square of the deviations measured from the mean. It is the most frequently used measure of deviation, represented by S.D or σ(Greek letter sigma). It`s formula is

$$S.D = \sqrt{\frac{\varepsilon(X - X)^2}{N}}$$

When N is less than 30, the formula is believed not to accurately determine of lower standard deviation hence NP-I is used instead of N for the denominator with the modified formula thus:

$$S.D = \sqrt{\frac{\varepsilon(X-X)^2}{N-1}}$$

S.D is calculated following these steps:

(ii)   Each deviation is squared $(x-x)^2$
(iii)   All the squared deviations are added up $\varepsilon(x-x)^2$
(iv)   The obtained result is to be divided by N or N-1 as in this café
that   the sample size less than 30 in the data used in calculating mean
         deviation.

STANDARD DEVIATON TABLE

X	(X-X)	(X-X)^2
56	-17.5	306.35
63	-10.5	110.25
68	-5.5	30.25
72	-1.5	2.25
73	-0.5	0.25
77	+3.5	12.25
79	+5.5	30.25
80	+6.5	42.25
82	8.5	72.25
85	11.5	32.25
		738.5

$$S.D = \sqrt{\frac{\varepsilon(X - X)^2}{N - 1}}$$

$$= \sqrt{\frac{738.5}{10-1}}$$

$$= \sqrt{\frac{738.5}{9}} = \sqrt{133.5} \quad = 11.53$$

3.3 Characteristic of a good measures of dispersion

(i)   It should be easy to calculate and simple to understand
(ii)   it should be rigidly defined
(iii)   it should be rigidly defined
(iv)   it should not be affected by extreme values
(v)   it should not be unduly affected by sampling fluctuations
(vi)   It should be capable of further math Ematical treatment and statistical analysis

4.0   CONCLUSION

This unit has provided important information on measures of dispersion which is needed in calculating health statics.

5.0   SUMMARY

The unit discussed the concept of measures of dispersion, types of measures of dispersion and characteristics of a good measures of dispersion

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is measures of dispersion?
2.   Outline the various types of measures of dispersion.
3   State three characteristics of a good measure of dispersion.

7.0   REFERENCES/ FURTHER READING

Araoye, M.O. (2004). *Research Methodology with Statistics for Health and Social Science*. Ilorin: Nathadex Publisher.

Bello, R & Ajay, 0.05(2000). *Research Method and Statistics Analysis*. Ilorin. Hayee Press and Publishing Company Limited

Mc Queen, P.A. & Knussen, C. (2006). *Introduction to Research Methods and Static in Psychology.* Harlour statistics in psychology. Harlour Pearson Education Limited.

Moronkola, O. A. (2018). *Vita Statistics for Health Professionals.* Ibadan. His lineage publishing house. https://byjus.com/commerce/measuresofdispersion.

MODULE 5 SAMPLE AND SAMPLING TECHNIQUE

UNIT 1 POPULATION AND SAMPLE

1.0   INTRODUCTION

It is almost impossible in several cases to screen, survey or carryout a research on the entire population where the health researcher or field officer desire to get relevant data or develop knowledge due to many logistic issues. Therefore, a smaller representative of the population is usually selected known as sample where data is scientifically collected and analyzed in order to have sound evidence in making decisions on matters relating to the population.

2.0   OBJECTIVE

By the end of this unit, you will be able to:

- define the concepts of population, sample and sample unit.

3.0   MAIN CONTENT

3.1   Meaning of Population

Population is the entire entity that may consist of sub-set of entities, units, sub-groups one is interested in while screening, surveying or conducting research. It is the element or people to which we are interested in finding information about or from. When it is very large, very costly economically and time wise, we scientifically get our sample through appropriate sampling technique.

3.2   Meaning of Sample

A sample is a collection of sampling unis drawn from a frame or frames. It is defined as selected group which is a fair representation of the entire population of interest.

3.3   Sample Unit

A sample unit is a single member of a sample and a sample size is the number of individuals or objects that we wish to study out of the population. The implication is that if the population is well sampled irrespective of population size, we can be safe in generalizing our findings to the entire population.

4.0   CONCLUSION

You have learnt in this unit the meaning of population, sample and sample unit.

5.0   SUMMARY

This unit has discussed the meaning of population, sample and sample unit.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Define the concepts of population and sample

7.0   REFERENCES/FURTHER READING

Bello, R. & Ajayi, O. O. S. (2000). *Research Methods And Statistical Analysis*. Ilorin. Hayee Press and Publishing Company Limited.

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals*. Ibadan. His Lineage Publishing House.

UNIT 2   SAMPLING TECHNIQUE

CONTENTS

1.0   INTRODUCTION

In any research, there are process used to select a required portion from the population. This process is known as sampling technique.

2.0   OBJECTIVES

By the end of this unit, you will be able to:

- define sampling

- state reasons for sampling technique

- explain the major forms of sampling techniques.

3.0   MAIN CONTENT

3.1   Meaning of sampling

Sampling is a systematic process used to select a required portion of a target population. In any research, a representative of all population is that sample which has approximately the characteristics of the populations relevant to the research under investigation.

3.2   Reasons for Sampling

It saves time because a whole lot of time that would have been expended on the entire population has been greatly reduced by studying samples of population.

-       It also saves money

-       Sampling enables an investigator to arrive at precision because it enables the researcher to be more thorough.

-       It usually covers greater scope by choosing a group that is a replica   of the whole population

3.3   Probability Sampling Technique

Random sampling technique

As the name suggests, all participants are given equal opportunity of being selected and that those eventually selected are done at random with evidence that all members have the opportunity of probably being selected and those eventually selected are going to be true representative of the population. To achieve this, a sampling frame (comprising all elements of a population with all available identification necessary that will make it possible to select sample at any stage of sampling e.g. telephone directory, voting register, hospital registers) will be used. If the population is larger it is impossible to have register as in register of those who use paracetamol in Nigeria.

i. **Random Sampling:** It is very popular in health grant funded research. No matter how random a sampling is, we must also sample enough to be able to generalize.

ii. **Stratified random sampling:** The entire population is divided into groups (strata) known to be mutually exclusive but exhaustive collectively i.e. each group in a population is unique (e.g. community health extension workers) i.e. mutually exclusive from other health workers but when all the categories of health workers are also uniquely be it in a group and considered together thereafter then they are collectively exclusive as each group is considered. But each group is singly selected through simple random sampling independent of other groups. Stratified random sampling is better than simple random sampling because of inbuilt provision for representativeness of the sampling from each group. Stratified sampling is common in survey work. Efforts should be made to select appropriate sample size from each sample, especially doing it proportionately in each stratum. It can be regarded as a special case of two stage sampling, as a stratified random sample is also a census of the strata or primary units which later followed by stratified random sampling of the secondary units from each selected primary unit.

iii. **Cluster sampling:** This is carried out in stages through the use of hierarchical structures of a population of interest. The elements within the clusters are heterogeneous, but there is homogeneity between the clusters. With this, it is unlike the stratified sampling technique. Though use of survey in geographically separated wide area, it can still be used in on-survey research. For example, if a health product is to be introduced in a community. Households in the community should be regarded as sample units and the sample frame will be a detailed map of all access roads

and individual houses should be selected at random. It can also be seen as a special case of two stage sampling.

In selecting a cluster sampling technique, one need to be guided by the following:

a.   Are the data to be collected by personal or telephone interviewing?   If not, clustering is not necessary.

b.   Are the respondents spread over a wide physical or geographical area? If so, clustering may be appropriate.

c.   Will travel time and costs be high, relative to the actual interviewing? If so, cluster sampling will be economical.

d.   Is the total sample size large enough to permit selecting many clusters? If not, clustering should not be used.

e.   Determine the degree to which those within one are likely to be similar to another or to interact.

f.   Decide on the number of units to be "skipped" between individual   units based on similarity and interaction.

g.   Consider the degree of variance that is likely to exist from one area   to another.

h.   Specify a minimum number of clusters that would still be large enough to "sample" the entire region adequately.

i.   Divide the total sample size by the minimum number of clusters to   obtain the number to be within the cluster.

j.   Select the first or "key" unit in each cluster on a random basis.

k.   Determine the procedure for moving from the key unit to others within the cluster, maintaining random selection (Alreck and Settle, 1985).

iv.   Multisage sampling: Refers to sampling in which the sampling exercise is carried out in stages of smaller and smaller sampling units at each stage or phase. For example, in a three stage sampling design, the researcher first select a primary unit, and out of it a secondary unit, then later a third unit. Any probability sampling plan may be used at each stage of multistage sampling design.

v. **Systematic sampling:** For inconvenience sake, selection from the sampling frame can be done in a systematic way by selecting 10% of a group, one can select by first selecting the third person in the first 10 and 13 in 11-20 group etc.

3.4 Non-probability Sampling Technique

In this method or process, no one in a population of interest has the guarantee of being part of those that will form the sample or be selected which means those selected may not be true representation of the population which limits generalisation of finding. Sampling bias also cannot be ruled out as some groups will be under or over represented sample.

i. **Judgmental sampling:** Experts in the field choose those they believe can provide answers to research questions and this is used in cases where data required can only be collected by limited stakeholder or people. It does not lend itself to generalization of outcome of study as precision of findings or results may not be objective.

ii. **Quota sampling:** In this technique, one draws a fixed quota of study participants from stratum within a population. Quotas reflect relative representativeness of components groups within a population of interest. Alreck and Settle (1985) suggested that in designing a quota sample, the following need to be noted:

    a. Select the variable(s) or characteristic(s) on which to base or define quotas, just as with stratification.

    b. Use a combination of variables to define quotas carefully and be sure it is economical to locate such respondents.

    c. Estimate the variance that is likely to exist among individuals within quota category and the variation to be expected between quota categories.

    d. Decide on the level of confidence required for each quota category based on the information requirements.

    e. Specify the sample size for each quota category to provide the desire confidence level for each.

    f. Provide instructions for inter viewers to qualify respondents by strata membership and assign individuals or group quotas to interviewers.

The weakness of quota sampling are:

i. The total number of cells depends upon the number of control characteristics associated with the objectives of the study, if the control characteristics are large, the total number of cells increases, which may result in making the task of the investigator difficult.

ii.   The chosen control characteristics should be related to the objectives of the study. The findings of the study could be misleading if any relevant parameter is omitted for one reason or the other.

iii.   The investigator may visit those places where the chances of getting the respondents with the required control characteristics are high. The investigator could also avoid some responses that appear unfriendly. All this could result in making the findings of the study less reliable.

iv.   iii.   **Snowball sampling:** Very useful when respondents are difficult to access e.g. drug addicts, psychoactive substance sellers in a community. In this technique, after interviewing a respondent, he/she is asked to identify and bring fellow in the same group of researchers' interest and it goes on like that until a sample size is obtained. Getting a representative sample may be difficult as well as getting the first person.

iv.   **Convenience/accidental sampling:** There is no room for representativeness as the researcher use anybody available in a group of research focus.

v.   **Purposive sampling:** This is taking sample from only the useful indicators area(s), for example one area of the country may be endemic or notorious for a type of disease or health condition say river blindness, childhood diseases or maternal morbidities. Sampling from this area may give a clear indication of what the situation about the disease or health condition is in the entire county. Nevertheless, no matter the sanctity of the outcome of finding, the technique does not lend itself to the principle of randomness and representativeness. However, it is cheap, speedy and practical in having a snappy idea of a situation.

4.0   CONCLUSION

This unit has provided information on various sampling techniques used in selecting sample for a research study.

5.0   SUMMARY

This unit discussed the following:

-        Meaning of sampling technique

-        Reasons for sampling technique

-        Probability sampling technique

-        Nonprobability sampling technique

6.0   TUTOR-MARKED ASSIGNMENT

1.   Explain the following sampling techniques:

(i)   Random sampling

(ii)   Accidental sampling

(iii)   Multistage sampling.

7.0   REFERENCES/FURTHER READING

Moronkola, O. A. (2018). *Vital Statistics for Health Professionals, Ibadan*.   His Lineage Publishing House.

Bello, R. & Ajayi, O. O. S. (2000). *Research methods and statistical analyses*. Ilorin. Hayee Press and Publishing Company Limited.

Watzalaf, W. J. M. (1996). 'Research, Statistics and Epidemiology,' In, M.   Abdelhak, S. Grostick, M. A. & E. Jacobs. (Eds.). *Health Information: Management of a strategic resources*. Philadelphia: W.B Saunders Company.