**POST GRADUATE DIPLOMA IN PUBLIC HEALTH**

**MODULE 6 ASSIGNMENT**

**SUBMITTED TO: AFRICA CENTRE FOR PROJECT MANAGEMENT**

**SUBMITTED BY: RANTSALA BERNARD SANAHA**

**SUBMISION DATE: 31ST MAY 2019**

**Analytical methods of Public Health**

**Introduction**

In this paper, factors that that influence individual and population health status will be discussed. Public health terms will be defined while also dealing with the most important elements of epidemiology including its objectives, studies and triad. The paper will further highlight the importance of statistics in public health.

**Question 1:**

1. **Epidemic:** An epidemic is the rapid spread of infectious disease to a large number of people in a given population within a short period of time, usually weeks or less. Epidemic infectious diseases are generally caused by several factors including a change in the ecology of the host population, a generic change in the pathogen reservoir or the introduction of an emerging pathogen to a host population. Generally, an epidemic occurs when host immunity to either an established pathogen or newly emerging novel pathogen is suddenly reduced below that found in the endemic equilibrium and the transmission threshold is exceeded.

Mausner and Kramer (1985:281) provide that there are two types of epidemics that can be distinguished as common source and propagated or progressive. In general, these can be differentiated primarily by plotting the distribution of cases by time onset (i.e. determining the epidemic curve). Common source epidemics are outbreaks caused by exposure of a group of persons to a common, noxious influence. When the exposure is brief and essentially simultaneous, the resultant cases all develop within on incubation period. In a common source epidemic, the epidemic curve follows a long-normal distribution. That is, if the cumulative proportion of cases are plotted by the log-time of onset, a straight-line result.

Propagated or progressive epidemics result from transmission, either direct or indirect, of an infectious agent from susceptible host to another. This occur through direct person-to-person transmission or it can involve more complex cycles in which the agent must pass through a vector to be transmitted from one human host to another, as in yellow fever and malaria.

1. **Epidemiology:** the term epidemiology is derived from the Greek words: (1) *epi*, upon; (2) *demus*, the people; and (3) *logos,* science. Thus, is a science of events that occur in a community of people (Lancaster:1988:150). Mausner and Kramer (1985:1) further define epidemiology as the study of the distribution and determinants of diseases and injuries in human populations. That is epidemiology is concerned with frequencies and types of illnesses and injuries in groups of people and with the factors that influence their distribution. This implies that disease is not randomly distributed throughout the population, but rather that subgroups differ in the frequency of different diseases.

The definition of epidemiology reflects the major components of the modern discipline: ‘epidemiology is the study of distribution of states of health and of the determinants of deviations from health in populations. The purpose of epidemiology is to identify the etiology of the deviations from health and to provide the data necessary to prevent and control disease through community health intervention. The study of epidemiology focuses on a variety of factors related to the environment and the people in that environment in an attempt to identify the determinants of observed patterns of health.

1. **Chronic disease:** Chronic diseases, often referred to as non-communicable diseases (NCD) usually emerge in middle age after long exposure to an unhealthy lifestyle involving tobacco use, lack of regular physical activity and consumption of diets rich in highly saturated fats, sugars and salt, typified by fast foods. The lifestyle results in higher levels of risk factors such as hypertension, dyslipidaemia, diabetes and obesity that act independently and synergistically. The risk factors are frequently undiagnosed inadequately managed in health services designed to treat acute conditions. Chronic conditions according to Feachem et al (2006:247), are frequently incorrectly considered to have limited impact on the burden of disease in Sub-Saharan Africa, because of the known high relevance of the infectious diseases. Nevertheless, these diseases occur in younger age groups more commonly in Sub-Saharan Africa than in the developed countries and are at least as common in the poor sector of society as in the more affluent.

The current burden of chronic diseases reflects the cumulative effects of unhealthy lifestyle and the resulting risk factors over the life span of people. Some of these influences are present from before a child is born. The foetal origins of adult chronic diseases play a particularly important role in Sub-Saharan African countries. The adequacy of mother’s nutrition before and during pregnancy is the first key component in determining the infant’s birthweight. The latter in its own right is associated with the emergence of chronic disease risk factors in these children.

1. **Morbidity**: Morbidity refers to having a disease or a symptom of disease or the amount of disease within a population. The most commonly used morbidity rates are incidence and prevalence. Incidence is a measure of all new cases arising during a defined period of time, usually 1 year, in a population at risk and is calculated as follows:

**Incidence = No. of new cases of disease in place from time to time**

**No. of persons in a place at midpoint of time period**

For this rate, Lancaster (1988:162) indicates that the denominator uses the population size at the midpoint of the time period. This rate, called a cumulative incidence, is the commonly used for large general population estimates. Other measures of incidence, such as incidence density, are modifications of this rate, used to cohort studies where a defined group of persons is followed over time.

On the other hand, prevalence is a measure of the existing number of cases present in a population at a given time:

**Prevalence = No. of existing cases in a place at given time**

**No. of persons in a place at midpoint of year**

This rate is a function of incidence and duration of the disease. The number of cases of chronic disease with low mortality will tend to accumulate and will result in in an increasing prevalence. Death and recovery are the two most common factors that remove cases from the case load requiring care.

**Question 2: Five (5) objectives of epidemiology**

**Investigation of disease etiology and determination of the natural history of disease**

Because the purpose of epidemiological investigation is to determine the cause of disease, thus providing the data needed for control or eradication, etiological studies represent a major use of epidemiological methods. To prevent the disease, one must identify the causes of the disease and understand the means why which causal agents are transmitted to the human host. In contrast to epidemiological studies, which emphasize the pre-pathogenic or early patho-genesis of disease, research carried on by clinicians, whether by physicians, nurses or other groups, is largely concerned with patient responses to treatment during the later stages in the natural history, since the patients usually studied have sought treatment for symptoms of illness.

Although there are numerous epidemiological studies based solely in hospitalised cases, it is essential to look at studies that concerned with all cases of a disease in population, regardless of their location. Without this spectrum of disease severity, it is impossible to understand the natural history. Thus, epidemiological research often provides a different picture of the disease that do studies derived only from hospital data.

**Identification of risks**

According to Lancaster (1988:165), risk refers to the probability of an unfavourable event. In epidemiology, the term generally refers to the likelihood that people who are without a disease but who come in contact with certain risk factors thought to increase disease risk will acquire the disease. In general, the risk to an individual of developing a particular disease can be estimated only on the basis of the experience of whole populations of individuals. Once this experience is known, the relevant risks can be calculated for persons who are similar to those in that population. Further, population data on disease occurrence can provide data for estimating the effect on disease rates of a community intervention. Epidemiological methods are used to collect the appropriate data and to estimate these risks.

Risk to an individual of developing a disease caused by a particular exposure is derived by comparing the occurrence of disease in a population exposed to the causal agent to the occurrence of disease in a nonexposed population. This measure is called a relative risk ratio and it estimates how much the risk of acquiring a disease increases with exposure to a particular causal agent or known risk factor. Thus, a relative risk ratio of 5:1 implies that the risk of acquiring that disease is five time greater for someone exposed to an etiological agent than for someone not exposed. Relative risk ratios are useful tool for identifying factors that represent increased risk for development of a disease. Diabetes, obesity, hypertension and smoking are considered risk factors for cardiovascular disease because populations with these characteristics show a rate of that disease several times greater that of populations without those conditions or behaviours.

Lancaster concludes that an estimate of the effect on disease occurrence of community intervention to eliminate exposure to a causal agent is provided by a measure called attributable risk. This measure subtracts the rate of disease occurrence in the nonexposed population from the rate of disease occurrence in the exposed population.

**Differential diagnosis and planning clinical treatment**

Descriptive data on, for example, the age and sex incidence of disease, aid the clinician in understanding the condition and in sorting through multiple possible diagnoses with the same or similar symptoms. Recognizing the association of age with prognosis for long-term survival in breast cancer will probably influence treatment and may influence control programs. Breast cancer diagnosed premenopausal tends to be more lethal than postmenopausal breast cancer, thus requiring more aggressive treatment and closer follow-up. Mumps may be mild, self-limiting disease in childhood, but in adult men it can lead to infertility. Thus, community health intervention to reduce susceptibility or to prevent exposure of men who did not acquire infection during childhood is important.

**Community diagnosis and planning of health services**

Epidemiology provides facts about community health. It describes the nature and relative size of the health problems to be dealt with, as well as how they are distributed in terms of geographical location, age group and so on. This kind of information forms the basis for planning the number and types of services required to meet the needs of particular community. A neighbourhood with a high proportion of elderly individuals is likely to have high rates of cardiovascular disease, cancer and other chronic debilitating diseases. Particularly if it is a low-income neighbourhood, elderly residents may lack the financial resources to travel to a distant source of medical care. As a result, health planners need to consider setting up a satellite clinic in the neighbourhood or providing transportation or home services. Maternity and child health services can be planned to meet the needs of community with a young population with a high birth rate. Family planning facilities, well-child centres that include immunization services, and health education programs aimed at prevention of disease through promotion of good health habits may be appropriate.

**Evaluation of health services**

Since many health services are initiated as an effort to treat a community problem identified by epidemiological data, the same data, used as a monitoring device, are useful in evaluation of these services. For example, one means of evaluating effectiveness of a maternity and child health centre established to reduce the rates of morbidity and mortality among mothers and children is to follow closely the morbidity or mortality to see whether they drop and remain low after the health centre is in operation.

**Question 3: Three (3) types of epidemiologic studies**

Occupational epidemiology is the study of health effects of factors to which people are exposed in the workplace environment. These factors may be physical such as heat, noise, radiation or mechanical energy or biological. The rapid growth in the use of potentially hazardous materials has been accompanied by numerous observations of serious health effects in humans as a result of community or occupational exposure. It is important to note that these and other chemical-related epidemics were first discovered by clinicians or by the victims themselves. Epidemiologic studies were used to confirm and extend the basic findings. This points to an important interaction between clinical observation and epidemiology in the environmental or occupational area. When the disease in question is rare in the general population, discovery of its occupational or environmental origins can usually be made by clinical observation. However, when the disease is more common, such as lung cancer or chronic nephritis, epidemiologic study is often needed to distinguish chemical or physical exposures from other causes. The 3 various types of study in occupational epidemiology are discussed subsequently.

**Ecological studies**

Ecology, the age-old study of living organisms in interaction with the environment, provides a model for looking at environmental health. According to Lancaster (1988:306), ecology is concerned with the broad conceptualization of the interrelationships between living and non-living things. Ecology is concerned with both structure and functioning of the organism, it attends to the surroundings as well as that which is surrounded. Ecological studies provide a crude way of exploring associations between occupation or environment and disease. More precisely, these studies are considered to be hypothesis-generating rather than hypothesis-testing in nature. In ecological studies, the group rather than the individual is the unit of comparison.

Disease rate in various groups, usually defined as groups within a specific geographic area, are compared. The variation in rates from one area to another may be explained by correlations between these rates and factors distinct to certain areas. In another type of ecological study, time trends are compared; changes in exposure among various groups may be correlated with observed changes in disease rates. An example would be the comparison of trend in saccharin usage to the trend in bladder cancer rates in the USA.

Mausner and Kramer (1985:305) also provide that ecological studies are subject to ecological fallacy. They state that the conclusions regarding individual risk on the basis of group risk must be made cautiously, because data on individual behaviour that may influence risk have not been collected. One does not know which in the county are currently in the process of developing lung cancer. For example, the correlation between lung cancer and certain industries could be explained by a higher prevalence of cigarette smoking among individuals in the counties with those industries. In addition to that, groups that are too small will have too few cases and unstable rates for the disease in question or will be affected by the migration. Imagine for example, that the majority of residents of the towns with polluted water who developed cancer were men who worked in other towns where they were exposed to carcinogens in the workplace. They actually drank less of the polluted water than did the individuals remaining in the town.

**Cross-sectional studies**

In the cross-sectional study, observations of a group are made during cross-sectional slice in time, usually employing clinical tests, interviews and measures of exposure. Data collection is therefore basically handled in the same way as a screening or periodic health study. All current workers or all living retirees, might be included. Sometimes repeated cross-sectional observations may be combined to compare trends between exposed and non-exposed groups. For example, in a study of pulmonary function in Boston firefighters, a drop in certain indices over a two-year interval was found, compared with the expected loss over the same interval in the general population (Mausner & Kramer:19985:307). The cross-sectional study is especially suited for inquiry into subtle, perhaps even subclinical health effects for which records are unlikely to exist. Since these are essentially prevalence studies, the relationship between health effects and time cannot be readily explored. The prevalence of the health effect is compared among subgroups with varying exposures, ages, personal habits or medical histories.

With the cross-sectional design, the principal weakness lies in the possible relationship between a worker’s having the health problem and the likelihood of his or her appearing in the study group. Since workers who become ill may stay home from work, quit or retire early, at any one time the current workers are probably relatively healthy. The exclusion of some affected workers will obviously minimize an association or decrease the chances of being detected. Conversely, if the presence of the health effects or correlates of exposure make an individual more likely to volunteer for study, an overestimate of the association may occur.

A special type of cross-sectional study is involved when an acute epidemic of illness occurs in the workplace. In that case, the techniques employed resemble those used in classic infectious or foodborne out-break investigations: cases are defined, epidemic curves are plotted, and are compared with non-cases for various potential risk factors.

**Cohort studies:**

Cohort studies are particular form of longitudinal studies that sample a cohort (a group of people who share a defining characteristic, typically those who experienced a common even in a selected period such as birth or graduation), performing a cross-section at intervals through time. Cohort studies are particularly useful and effective in occupational epidemiology. Occupational cohort studies are usually mortality studies, since records of cause of death are generally more accessible and less biased that of illness records. Furthermore, the emphasis is often on cancer mortality, since cancer of most sites is usually ultimately fatal and diagnosis is more accurate for neoplastic disease than for instance, for cardiovascular disease.

The central and unique element of occupational cohort studies is the individual work history. This history, which can be reconstructed to one degree or another through existing records, provides the exposure data for hypothesized disease (Mausner & Kramer:1985:315).

Cohort studies represent one of the fundamental designs of epidemiology which are used in research in the fields od medicine, nursing, psychology and social science. In medicine for instance while clinical trials are used primarily for assessing the safety of newly developed pharmaceuticals before they are approved for sale, epidemiological analysis on how risk factors affect incidence of disease is often used to identify the causes of disease in the first place, and to help provide pre-clinical justification for the plausibility of protective factors. Cohort studies differ from clinical trials in that no intervention, treatment or exposure is administered to participates in cohort design; no control group is defined. Rather, cohort studies are largely about life histories of segments of populations, and the individual people who constitute these segments.

**Question 4:**

1. **Problems associated with epidemiologic studies involving humans**

Often used are hospitalised controls from the same hospital in which cases are diagnosed. There are many selective factors that bring people to hospitals. Selecting controls from the same pool of patients that gave rise to the cases duplicates these selective factors and thereby nullifies their effects. Another point about selection of hospital controls is that they are often selected from a variety of diagnostic groupings. This means that if risk factors are associated with diseases, this effect can be diluted by other patient groups.

In addition, the problem with a retrospective study is that needed information about past events may not be available from routine records or may be inaccurately recorded. Mausner and Kramer (1985:165) contend that if the information is sought by an interview or questionnaire, the informant may have inadequate information about events in the distant past. Further, information supplied by an informant may be biased.

The main problem of prospective study is that it is usually a long, expensive and large-scale undertaking. A large cohort must be followed, particularly if the disease has a low incidence. The need to follow a cohort over a long period of time results in special obstacles. Perhaps the outstanding problem is attrition, the loss of patients from follow-up due to lack of interest, migration or death from other causes. Below is a table that summarizes problems associated with epidemiological studies involving humans:

|  |  |  |
| --- | --- | --- |
| **Retrospective study** | **Advantages** | **Disadvantages** |
| * Relatively inexpensive * Smaller number of subjects * Relatively quick results * Suitable for rare diseases | * Incomplete information * Biased recall * Problems of selecting control group and matching variables * Yields only relative risk |
| **Prospective study** | * Lack of bias in factor * Yields incidence rates as well as relative risk * Can yield associations with additional diseases as by-product * Efficient for studying rare exposures | * Possible bias in ascertainment * Large numbers of subjects required * Long follow-up period * Problem of attrition * Changes over time in criteria and methods * Very costly |

1. **3 guiding principle of the ethical research involving humans**

**Respect for persons:** refers to person’s independence. As a principle in bioethics, autonomy represents an agreement to respect the client’s right to determine a course of action. The agreement to respect autonomy represents the recognition that clients are in charge of their own destiny in matters of health and illness. Potter & Perry (2003:47) add that the purpose of the pre-operative consent, for example, is the assurance in writing that the health care team respects the client’s independence by obtaining permission to proceed.

This is the concept that all people deserve the right to fully exercise the autonomy. Showing respect for persons is a system for interaction in which one entity ensures that another has agency to be able to make choice. An autonomous person is defined as an individual who is capable of self-legislation and is able to make judgements and actions based on his/her particular set of values, preferences and beliefs. Respecting a person’s autonomy thus involves considering his/her choices and decisions without deliberate obstruction.

The standard case for applying respect for persons is when the person receiving the health intervention is of sound mind, fit to make personal decisions and empowered to choose from various options. Other cases involve showing respect to people who for whatever reason are not free to choose among typical range of options when making a decision. In medical research, the term ‘vulnerable populations’ generally refers to individuals whose situations do not allow them to protect their own interests. These include individuals who are minors, prisoners, pregnant, physically handicapped, mentally disabled, old, economically disadvantaged, educationally disadvantage or subordinate groups (e. g, a soldier). These individuals ae entitled to protection, and an additional ethical justification is needed to involve such populations in human subject studies. In such cases, a balance should be established between protecting subjects from exploitation and depriving these subjects of access to the potential benefits of research.

As a result, respect for persons is all about protecting the autonomy of all the people and treating them with courtesy and respect and allowing for informed consent. Researchers must be truthful and conduct no deception.

**Beneficence:** The principle of beneficence promotes taking positive active steps to help others. It encourages to do good for the client. It helps to guide decisions in which the benefits of a treatment may pose a risk to the client’s well-being or dignity. A child’s immunization may cause discomfort during administration, but the benefits of protection from disease, both for individual and for society, outweigh the temporary discomforts. Potter & Perry indicate that the agreement to act with beneficence requires that the best interest of the client remains more important than self-interest. For example, you will not simply practice obedience to medical orders but you will act thoughtfully to understand client needs and then work actively to help meet those needs.

In other words, beneficence refers to the obligation on the part of the researcher to maximise benefits for the individual participant and or society while minimizing risk of harm to the individual. Maximising potential benefits is predicted on sound experimental design, thus research must undergo rigorous scientific review before proceeding to an administrative body that governs the protection and welfare of humans recruited to participate in research activities for review. An honest enumeration of reasonably anticipated risks must be followed by a thorough risk/benefit calculation. Beneficence is the philosophy of ‘Do no harm’ while maximising benefits of the research project and minimising risks to the research subjects.

**Justice:** Justice refers to the principle of fairness. You will often refer to this principle when discussing issues of health care resources. What constitutes a fair distribution of resources may uoinot always be clear. For example, approximately three times more candidates are on waiting list for liver transplants than there are livers available for transplant in the United States. The just distribution of available organs can be difficult to determine. In USA, a national multidisciplinary committee strives for fairness by ranking recipients according to need, rather than resorting to selling organs for profit or distributing them by lottery.

Justice is ensuring reasonable, non-exploitative, and well-considered procedures are administered fairly. The fair distribution of costs and benefits to potential research is fair and equal. The principle of justice addresses the distribution of the burdens of research. That is, it should not be the case that one group in society bears the costs of research while another group reaps its benefits. Issues of justice arise most strongly around questions about the selection of participants.

**Question 5: Definition of the term ‘interdependence’ between factors**

Healthcare is dependent on team works by a variety of healthcare professionals, as determined by the condition of the client with whom or community where the nurse is working. While each of the practitioners is held individually accountable for their acts and omissions, collectively the team strives to work towards a joint goal. There is interdependent collaboration between the nurse and other healthcare practitioners to ensure that this common goal is achieved. For example, the nurse who cannot prescribe medication requires a legal prescription from a medical practitioner to ensure that the client gets correct treatment. Similarly, the medical practitioner requires a report from the nurse regarding the response of the client to the treatment prescribed so that collectively they may decide on the wat forward.

On the other hand, an ecosystem consists of both living and non-living components. The non-living things include soil, water, light inorganic substances. All living things including humans survive and depend on the resources in their environment. The resources in the environment include living and non-living factors. The rate of the growth of population of any species affects the environmental factors. In turn, these environmental factors are affected by the size and growth rate of the population. The growth of population is limited to the carrying capacity of the ecosystem. It is the amount of life any ecosystem can support with the available space, energy, food and water.

Clarke, (2016:154) reiterates that there is interdependence between the agent, host and mode of transmission in communicable diseases. For example, most bacteria and viruses (agents) cause disease by invading the human body directly. Fungi and parasites usually cause human disease incidentally, via primary vectors such as animals, mosquitoes, ticks or other insects. Bacteria, viruses and fungi are responsible for both healthcare associated infection and community-acquired infection. Mode of transmission of an infection can be through direct contact between the source of infection and susceptible host or immediate carrier. In addition, indirect contact takes place when a client or staff member contaminates an item and micro-organisms are transferred from this item to a second person or the environment, and then to a susceptible host.

Vector transmission is another form. Vectors are insects that carry micro-organisms from one host to another. For example, a malaria-infected female mosquito bites a non-infected host (person) and transfers the infecting parasite to the new host. There is also airborne transmission. Airborne transmission takes place where drops of mucous are set free in the air when a person talks, coughs or shouts. Large drops quickly settle on the ground, but smaller ones float around as aerosols that cling to dust particles. The fluid part of the drop evaporates and the pathogens become part of the circulating dust. This dust takes a long time to settle and can infect the environment and any unprotected surface in the process.

Lastly, for infection to develop, there has to be an entry-point for the pathogenic micro-organism in into the body of the new host.

**Question 6: Factors that can lead to an epidemic**

Communicable diseases are primarily infectious and require interaction between a host agent, direct or indirect transmission from the agent reservoir and a host that supports adequate living conditions. Communicable diseases have shaped human life since earliest times. Because humans are the only reservoir for many diseases, microbiologists ponder questions such as ‘which came first, human beings or infectious organisms?’ Lancaster (1988:329) provides that evidence gathered by anthropologists indicate that humans who lived in the Palaeolithic period (18,000-6000 BC) were susceptible to tapeworms and roundworms as well as tetanus and gas gangrene. However, the occurrence of epidemics or outbreaks involving large numbers of people, was not evident until approximately 5000 to 4000 BC. Before then, family groups were largely nomadic and isolated from similar social groups. As the first large cities came into existence and great numbers of persons lived in close proximity, the stage was set for innumerable epidemics of communicable diseases. Occasionally these epidemics came close to exterminating organised society.

Communicable diseases played a significant role in the death and illnesses of people during the colonial period in USA, and they are still leading causes of death even today. In fact, the need to control the spread of communicable diseases rather than the concern for infected individuals stimulated the first health legislation in the US, including the establishment of health departments in colonial America. The following discussion describes various factors that can lead to an epidemic.

**Agent factors**

Infectivity: It is the ability of the organism to spread rapidly from one host to another. High infectivity is not necessarily associated with the severity of disease. For example, chickenpox virus is believed to be one of the most infectious agents in contemporary times but disease is generally self-limited in that there are usually no permanent effects from it.

Invasiveness: It refers to the agent’s ability to spread within the host. An example of this characteristic is the organism treponema pallidum, which is capable of spreading throughout the body.

Virulence: Virulence is the ability to produce severe disease. An example of this agent characteristic is the influenza-A virus, which is capable of producing more severe disease than the influenza-C strains.

Dosage: Lancaster (1988:331) contends that dosage refers to the fact that multiple organisms invading the host are more apt to overwhelm host defences, whereas small numbers of the same organisms are frequently suppressed or tolerated without disease actually occurring. For instance, a host eating a hearty portion of salmonella-infected food would be more likely to get food poisoning than one who ate sparingly of the same food. Also, a mixed or multiple-agent infection often produces more serious effects than separate invasion by the components. For example, the onset of bacteria pneumonia in addition to a generalized influenza syndrome greatly increases the threat to the affected host.

**Host factors**

In general, most disease processes produce the greatest morbidity and mortality in the very young and very old in any given population, but there are some important exceptions. Many viral diseases produce much less disturbance in the young. For instance, mumps are generally tolerated better by young children than middle-aged adults. However, chickenpox in a new-born, although rare, is frequently life-threatening. Other host factors that influence the incidence of communicable diseases are:

* Sex and sex hormones
* Hereditary resistance
* The host’s local and systemic responses
* General health status, including adequate nutritional intake or status

**Environmental factors**

Some factors of the host’s ability to ward off infection are interdependent with environmental factors such as humidity, temperature and crowding. Other environmental factors that influence the incidence of communicable diseases are:

* Atmospheric conditions (pollution and smoke)
* Availability of nutrients (protein and vitamins)
* Contamination of food and supplies

Efficient transmission of most communicable diseases requires that large numbers of people interact. In addition, when people come into contact with animals or their by-products, the risk of contracting certain communicable diseases is increased. For instance, veterinarians are particularly susceptible to brucellosis and rabies, hunters who prepare animal hides are susceptible to anthrax, and bird fanciers are susceptible to psittacosis or parrot fever (Lancaster:1988:331). The quality and safety of any community’s drinking water is usually assured by some municipal authority that has designed its system to meet community needs. Additionally, community building codes usually require that plumbing be designed, installed, and maintained so as to avoid contamination of the water supply. However, in times of natural disasters such as flooding, individual and community plumbing systems can be overwhelmed, causing sewage to mix with drinking. Because sewage contains numerous microbiologic pathogens (such as the hepatis viruses and salmonella), the potential for community-wide epidemic exists if inhabitants consume contaminated water.

**Question 7: Differences between incidence and prevalence of a disease**

In epidemiology, the most important tool for measuring disease is the rate. A rate is a special form of proportion that includes specification of time. The rate is the basic measure of disease occurrence because it is the measure that most clearly expresses probability or risk of disease in a defined population over a specified period of time. A number of different rates of morbidity or illness, are used in public health and epidemiology. All fall into two basic types, rates of incidence and rates of prevalence. The mentioned two types will be discussed in this moment.

Incidence in epidemiology is a measure of the probability of occurrence of a given medical condition in a population within a specified period of time. Incidence tells us the rate at which new disease occurs in defined, previously disease-free group of people. To determine incidence, Mausner and Kramer maintain that it is necessary to follow prospectively a defined group of people and determine the rate at which new cases of disease appear. Certain basic requirements must be met if incidence rates are to be calculated:

1. Knowledge of the Health Status of the Study Population. There must be adequate grounds on which to assess the health of individuals in a population and to classify people as ‘diseased’ and ‘not diseased.’ This information may be determined from health records, if these are accurate, or may require screening or more detailed examination of the population. If groups are to be compared, it is essential that an equivalent amount of information is available for all groups. It may be necessary to disregard certain information if it is available for only a single segment of the study group.
2. Time of Onset. Determination of the date of onset is necessary for studies of incidence. For some events, this determination is relatively simple. The onsets of illnesses such as influenza, staphylococcal gastroenteritis, acute myocardial infarction, and cerebral haemorrhage can often be pinpointed to a specific hour. However, this is not true of certain other conditions, whose onsets may be indefinite. For these, the earliest definite, objectively verifiable event than can be identified must be taken as the time of onset. In cancer, the date of onset is defined by the date of definitive diagnosis, rather than by the date when symptoms were first noted or when a physician became suspicious that the person had cancer.
3. Specification of Numerator: Number of persons vs Number of Conditions. In certain circumstances, more than one event can occur to the same person within a stated time period. This gives rise to two types of incidence rates from the same set of data. Each rate tells us something different. The first gives the probability that any person will develop a cold in one year. The second rate tells us the number of colds to be expected among the group of people in that year. When the number of persons and number of events can differ, the numerator should be clearly specified. Without such specification, it is generally assumed that the numerator refers to persons and an incidence rate represents a statement of probability or risk per person.
4. Specification of denominator. The denominator in incidence rates must consist of a defined population, accurately enumerated. Firstly, since incidence covers a period of time, the number of persons at risk is likely to change. Secondly, since, incidence refers to new cases of disease, theoretically only those who are at risk, should form the denominator. The denominator should not include those who have the disease or those who are not susceptible because they have already had it or have previously been immunized.
5. Period of observation. Incidence rates must always be stated in terms of definite period of time. This is usually one year but can be any length of time. This time period for which a rate is calculated should be long enough to ensure stability of the numerator. For disease of low frequency, incident cases may have to be accumulated over several years. In addition, one must be concerned about the accuracy of the denominator. When possible, the denominator should be drawn from a census year or from the years bracketing a census.

On the other hand, prevalence has two kinds of prevalence rates, point prevalence and period prevalence. Point prevalence attempts to measure disease at one point in time. Despite this aim, the actual collection of data related to a specific day may take longer that one day. For example, the census, which yields figures on prevalence, refers to the population as of April 1 of a given year, although the actual enumeration takes approximately three months. Mausner and Kramer (1985:49) define period prevalence as a compound measure constructed from prevalence at a point in time, new cases and recurrences during a succeeding time period. Period prevalence is frequently preferred to point prevalence or incidence in analysing data on mental illness because of certain problems in the measurement of mental diseases. Exact date of onset needed for incidence is often difficult to determine, as is the presence or absence of mental illness on any given day.

Period prevalence, on the other hand, requires only a determination that the person was mentally ill at some time during a defined period. Below is the summary of the differences between incidence and prevalence:

**Summary of differences between incidence and prevalence of a disease according to Mausner and Kramer**

|  |  |
| --- | --- |
| **Incidence** | **Prevalence** |
| Probability developing disease | Probability of already having disease |
| Numerator counts only new cases | Numerator counts both new and old cases |
| Requires follow-up of individuals in a population to identify new cases | Does not require follow-up |
| Does not depend on the duration of the illness | Depend on duration of the illness (long duration will eventually increase the prevalence of a disease |
| Preferred measure when studying cause and effect | Preferred measure when estimating the population-based burden of chronic disease or attribute |

**Question 8: Importance of data in Public Health**

The health care delivery system has grown into the largest industry in both the developing and developed countries, resulting in considerable effect on the total population, and the society is demanding greater accountability and increased efficiency and effectiveness from the system. Quality assurance or quality control, is the tool used in industry to assure the public that it is getting top value for money spent. Quality assurance is the monitoring of the activities of client care to determine the degree of excellence attained in the implementation of the activities. An assessment of quality is a judgement concerning the process of care, based on the extent to which that care contributes to valued outcomes. Lancaster (1988:233) adds that the quality assurance or quality control process sets standards for care, evaluates care provided, which is based on the standards, and takes action to bring about change when care does not meet standards.

An implicit factor in quality assurance is the accountability of the provider in the delivery of services. Accountability means being responsible for care activities and being answerable to the client for the activities performed. The goals of quality assurance are:

* To ensure the delivery of client care
* To demonstrate the health provider’s efforts to fulfil their societal responsibility.

On the other hand, there are numerous sources of data on morbidity and mortality in the community. Each data source has advantages and limitations. The importance of data in public health will be discussed in chapter.

According to Mausner and Kramer (1985:66), health planning and programming depend on the knowledge of the size and composition of the population, the forces that determine these variables, and the trends anticipated in the future. The importance of accurate population data is recognised by governments everywhere. Census data necessary for accurate description of the health status of the population, since they are the principal source of denominator data foe rates of disease and death. The term ‘census’ which comes from the Latin word meaning ‘to estimate or assess’ means periodic counts or enumerations of a population. Records of population enumerations go back over 5000 years to the Babylonians, Chinese and Egyptians.

Following the disintegration of the Roman Empire, there were relatively few attempts to maintain accurate population records in Europe until the late eighteenth century, when a number of Western European countries instituted a formal census. In this century, the Census of Population has been taken every 10 years since 1790. In addition, other censuses are regularly carried out, original purpose of the Census Population was to count heads in order to apportion the number of legislators each state would send to the House of Representatives in the US.

Lancaster (1988:215) indicates that census data are considered valid, reliable and inexpensive data that are available to the public in several forms. The U.S census data, same as Lesotho’s is updated every 10 years, provide excellent composite data on the population of states, local and political jurisdictions, and census tracts in urbanised areas. The census data may be used to locate client population by age, sex, race, socioeconomic status and housing conditions. Census data maybe used to locate compare trends in states and the nation or between states and localities.

In addition to that, the use of key informants affords the program planner the opportunity to obtain ideas of professional experts, such as nurses, educators, physicians, social workers, the community leaders, the politicians and entrepreneurs who are in touch with the needs of the community and who are in a position to support new community programs. In key informants’ approach, a program planner may avoid some bias by using structured interview guide when communicating with key informants. The structured interview guide also provides an easy mechanism for collating and summarising the data gathered from the key informant.

Community forum is another economical approach to gathering data about needs, size and characteristics of a client group. Being specific about the topic at a forum meeting will make the difference in the usefulness of the data. For example, a discussion of all health needs would provide valuable information but may not be as helpful for program planning. In addition, surveys of existing community agencies providing similar services are essential to the development of a new program or expansion of an existing program. Community resident surveys assesses the need of a community for a service, the acceptability of the service to the community and the willingness of the people to use and pay for a program or a service. Statistical indicators of a disease, prevalence and mortality, and other rates such as case-specific, age-specific and adjusted rates are useful in estimating the nature of the problem, size of the problem and the need for a program within a client population.

**Conclusion**

A major difference between incidence and prevalence is that knowledge of time of onset is not required in a prevalence study. In addition, denominators in prevalence rates always include the entire related population, since the numerator contains old as well as new cases.Aside fromtheir value for planning and programming of health services, descriptive data provide a first step in elucidating the causes of disease by identifying groups with high or low rates of a specific disease. Once such identification has been made, the next step is to determine why the rate is high or low in a particular group. It has been observed that statistics are the vital signs of public health. Local, states and governments collect data on their citizens, starting with birth certificates and ending with death certificates. The importance of data has also been observed when every development donor or partner always start with baseline assessment before intervening in any situation. This is because without data, the impact of their interventions will be difficult to comprehend and as a result there will be futile to implement interventions in limbo. Data assists countries in making strategic decisions and in channelling the resources where there is the most need. It has also been observed that although the environment is filled with potential infect, the human body has a natural system to fight these off. By understanding the fundamentals of interdependence between factors, it is possible to break the chain of infection and stop harmful bacteria from entering the body.

**Bibliography**

Anand, S., Peter, F. & Sen, A. (2004). Public Health, Ethics, and Equity. UK: Oxford University Press

Clarke M. (2016). VLOK’S Community Health 6th Edition. South Africa: Juta & Company

Jamison, D. & Feachem, R. (2006). Disease and Mortality in Sub-Saharan Africa 2nd Ed. USA: The World Bank

Lancaster, S. (1988) Community Health Nursing 2nd Ed. USA: The C.V. Mosby Company

Mausner, J. & Kramer., S. (1985). Epidemiology: An Introductory Text. USA: W.B Saunders Company

Perry P. (2003). Basic Nursing. USA: Mosby Inc