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**AIU Exam – Epidemiology – The Study of Health in a Community**

**Subject of Courses**: Public Health

**What is your Name:**

**What is your Student ID number?**

**Name of study material (video or book)**:

***An Introduction to Community and Public Health***, (**Chapter 3)**

**Link to access study material (video or book):**

[**http://aiustudev.aiu.edu/submissions/profiles/resources/onlineBook/L8i4G3\_Introduction to Community and Public Health-2016.pdf**](http://aiustudev.aiu.edu/submissions/profiles/resources/onlineBook/L8i4G3_Introduction%20to%20Community%20and%20Public%20Health-2016.pdf)

# Introduction to Epidemiology

Before going into detail on the topics of the day which is Epidemiology. It is imperative to give an insight in to subject matter. Epidemiology is “the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to control health problems

Another definition of Epidemiology is that, it is the “study of distribution and determinants of health-related states among specified populations and the application of that study to the control of health problems.” — A Dictionary of Epidemiology

Epidemiological information is used to plan and evaluate strategies to prevent illness and as a guide to the management of patients in whom disease has already developed.

Furthermore, the term epidemiology is derived from Greek words that can be translated into the phrase “the study of that which is upon the people.” The goal of epidemiology is to limit undesirable health events in a community. For example, illness can be limited by identifying the food that is making people sick or determining modifiable risk factors for heart disease. This is accomplished by describing the distribution and determinants of health events to validate new approaches to prevention, control, and treatment. Through these practices, epidemiologists contribute to our knowledge of how diseases begin and spread through populations, and how they can be prevented, controlled, and treated. Some of the uses of epidemiology has been summarized below;

## Uses of epidemiology

The importance of epidemiology cannot be overstated. Epidemiology saves lives and improves global, long-term health. The aims of epidemiology are to prevent and reverse negative health outcomes, and the uses of epidemiology are most important for communities that experience a lot of poverty or instability. Researchers achieve the functions of epidemiology by using the “Five W’s:” Who, What, When, Where, and Why.

**Who:** First, researchers determine who is affected by the event or disease. Is it an entire country? A single neighborhood? Is it inside or outside the US? The aims of epidemiology all involve protecting people, so the communities themselves matter for the research.

**What**: What exactly is impacting the community? Is it an infectious disease? Is it a non-infectious disease like cancer or diabetes? Is it a high risk for terrorism? The objective of epidemiology is to define the problem and figure out how to stop it. There are different functions of epidemiology, but they all ask this question.

**When:** The next objective of epidemiology asks when exactly the event occurred. When did this community start showing symptoms? By figuring out when the problem started, researchers can study correlation and even nail down causes. They’ll notice certain patterns that can make a difference.

**Where**: Epidemiologists ask where the disease or event originated. The scope of epidemiology tracks how far the disease spread.

**Why:** The backbone of epidemiology is figuring out why an event took place. This way, researchers can prevent the event from happening in the future. The “why” question is central to the importance of epidemiology. Some may say that it’s the crux of the epidemiological study definition.

All of the uses of epidemiology involve these five questions. No matter what form of epidemiology you pursue, you’ll delve into these questions all the time**.** However, the uses can be summarized below;

* To study the disease trend since past.
* Community diagnosis.
* Planning and evaluation of health services.
* Evaluation of a new therapy or a new health measure.
* Determining the risk to an individual.
* Identification of syndromes.
* Filling in the gaps in the natural history of the disease.

**Chapter 3**

1. What is an epidemic? A pandemic? Name some diseases that caused epidemics in the past. Name some diseases that are epidemic today.

**ANSWER:**

* An Epidemic can be defined as an any unexpectedly large number of cases of an illness, specific health-related behavior, or other health-related event in a particular population at a particular time and place it is an outbreak of disease over a wide geographical area such as a continent or multiple continents. Occasionally, an epidemic will spread over a wide area, perhaps even across an entire continent or around the world. Such a widespread epidemic is termed a pandemic. The influenza pandemic of 1918 is an example.

The question might be asked: What are diseases called that occur regularly in a population but are not epidemic? These diseases are referred to as endemic diseases. Whether a disease is epidemic or endemic depends on the disease and the population. Heart disease is endemic in America, while in many regions of equatorial Africa, malaria is endemic. The Centers for Disease Control and Prevention (CDC)(link is external and opens in a new window) describes an epidemic as an unexpected increase in the number of disease cases in a specific geographical area. Yellow fever, smallpox, measles, and polio are prime examples of epidemics. An epidemic disease doesn't necessarily have to be contagious. West Nile fever and the rapid increase in obesity rates are also considered epidemics. Epidemics can refer to a disease or other specific health-related behavior (e.g., smoking) with rates that are clearly above the expected occurrence in a community or region. [Centre for disease control - CDC](https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html)

* A pandemic on the other hand is a disease outbreak that spreads across countries or continents. It affects more people and takes more lives than an epidemic. The World Health Organization (WHO) declared COVID-19 to be a pandemic when it became clear that the illness was severe and that it was spreading quickly over a wide area

Some examples of disease that caused epidemics in the past includes. St. Louis encephalitis, Toxic shock syndrome, HIV/AIDS, West Nile virus Mumps and Pertussis. Other examples of new epidemic include; Yellow Fever. Small Pox, measles, and polio.

# Why are epidemiologists sometimes interested in epizootics?

**ANSWER:**

In the first instance, An Epizootic is an epidemic outbreak of disease in an animal population, often with the implication that it may extend to humans. For example, Rift Valley fever (RVF) primarily affects livestock and can cause disease in a large number of domestic animals(epizootics) and the presence of an RVF epizootic can lead to an epidemic among humans who are exposed to diseased animals. Epidemiologists are interested in epizootics because the diseases of animals spread to the human population. Put in another language, an epidemiologist is “an investigator who studies the occurrence of disease or other health-related conditions or events in defined populations. Some epidemics begin as outbreaks of disease in animals, known as epizootics, and then spread to human populations. Examples are bubonic plague that first affects rodents and West Nile fever virus that first affects birds.

1. What does the term endemic disease mean? Give examples of such diseases.

**ANSWER;**

An Endemic disease are disease that occur regularly in a society. Whether a disease is epidemic or endemic depends on the disease and the population. Heart disease is endemic in America, while in many regions of equatorial Africa, malaria is endemic. A disease outbreak is endemic when it is consistently present but limited to a particular region. This makes the disease spread and rates predictable. Malaria, for example, is considered endemic in certain countries and regions Common cold. Other examples of endemic disease include; Lassa fever. Malaria. Polio. Rotavirus. Hepatitis C and Measles.

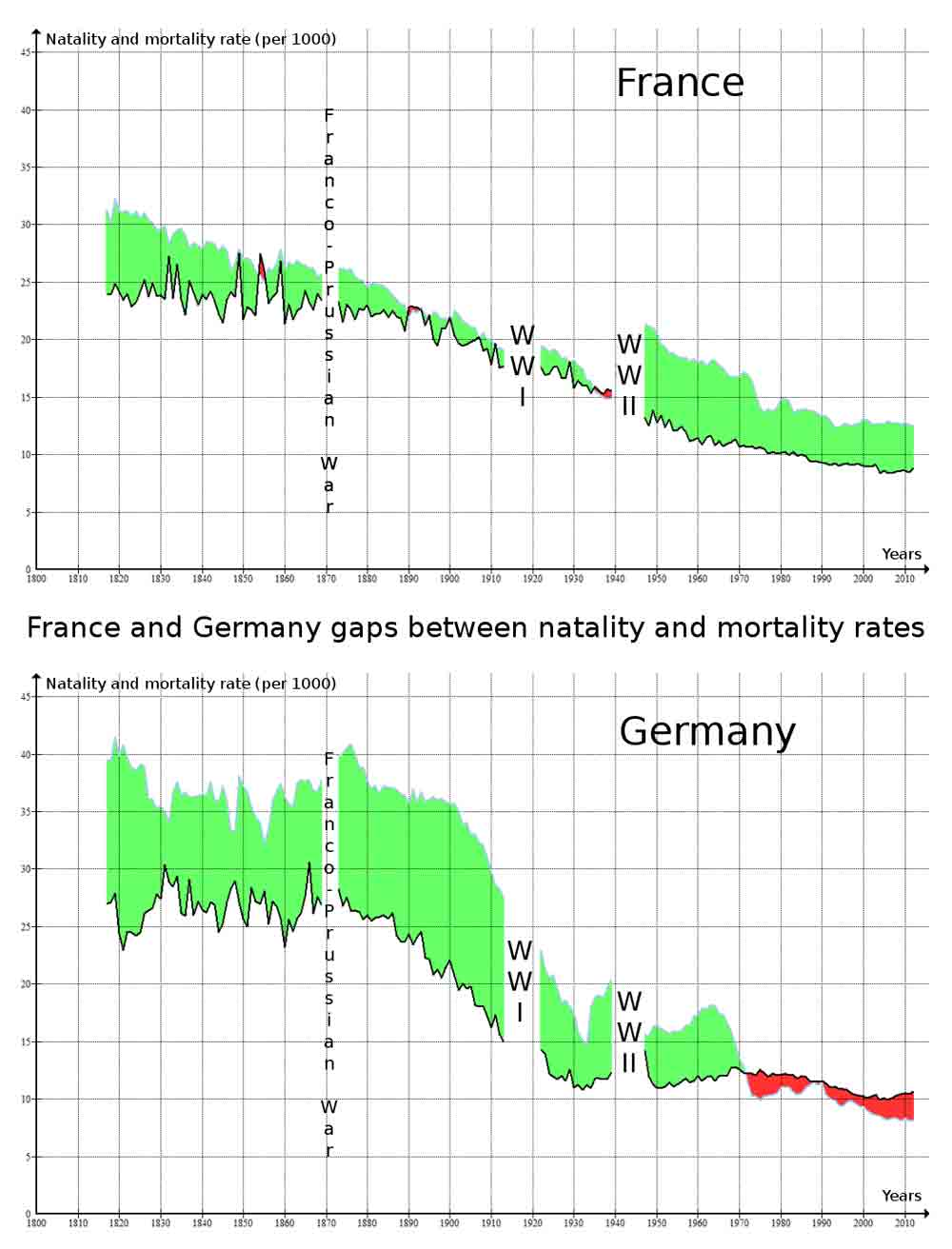
# What is the difference between Natality, morbidity, and mortality?

**ANSWER:**

These measures are mostly used or epidiomolical surveillance and they describe the progression and severity of a given health event. They are useful tools to learn about risk factors of diseases and compare and contrast health events and between different populations. While similar and often related, morbidity and mortality, however, are not identical

* Natality- (birth) refers to birth rate. The number of live births divided by the total population. he totals number of live births per 1000 individuals of a population per year.

### Table 1



**Source:** <https://www.yourarticlelibrary.com/difference/difference-between-natality-and-mortality-explained/11519>

* Morbidity rates is the number of people who are sick divided by the total population at risk. Morbidity is the state of being symptomatic or unhealthy for a disease or condition. Morbidity is another term for illness. A person can have several co-morbidities simultaneously. So, morbidities can range from Alzheimer's disease to cancer to traumatic brain injury. Morbidities are NOT deaths. Prevalence is a measure often used to determine the level of morbidity in a population It is usually represented or estimated using prevalence or incidence. Prevalence describes the proportion of the population with a given symptom or quality. It is calculated by dividing the number of affected individuals by the total number of individuals within a specific population. It is usually presented as a ratio or as a percentage. On the other hand, incidence shows the frequency at which individuals within a specific population develop a given symptom or quality
* Mortality(fatality) rate the number of deaths in population divided by the total population. mortality is related to the number of deaths caused by the health event under investigation. It can be communicated as a rate or as an absolute number. Mortality usually gets represented as a rate per 1000 individuals, also called the death rate. The calculation for this rate is to divide the number of deaths in a given time for a given population by the total population. To keep these values concise and for ease of comparison to other health events, this number can be multiplied by 1000 to reflect the “per 1000” rate of the target population.

Among these concepts, Morbidity and mortality are two types of retrospective information that allows for continuous evaluation of the efficacy of either a specific health care system or an implemented intervention in place.

5. Why are rates important in community health?

**ANSWER**:

Rates are the number of events that occur in a given population in a given period of time Rates are important because health events can be compared from different times and places.

Much of public health assessment involves describing the health status of a defined community by looking at changes in the community over time or by comparing health events in that community to events occurring in other communities or the state as a whole. In making these comparisons, we need to account for the fact that the number of health events depends in part on the number of people in the community. To account for growth in a community or to compare communities of different sizes, we usually develop rates to provide the number of events per population unit. Also, the frequency with which health events occur is almost always related to age. For example, acute respiratory infections are more common in children of school age because of their immunologic susceptibility and exposure to other children in schools. Chronic conditions, such as arthritis and atherosclerosis, occur more frequently in older adults because of a variety of physiologic consequences of aging. Mortality tends to increase rapidly after the age of 40. In fact, the relationship of age to risk often dwarfs other important risk factors. Because the relationship of age to risk is often resistant or impervious to interventions, analysts often remove the effects of differences in age structure when comparing rates across populations by calculating age-adjusted and age-specific rates

6. What is the difference between crude and adjusted rates?

**ANSWER:**

* Crude rates**:** are rates in which the denominator includes the total population. Specific rates are rates that measures morbidity or mortality for particular populations or diseases. Crude rates are relatively easy to obtain and are useful when comparing similar populations. However, crude rates can be misleading when populations differ in age structure or by some other attribute. For example, crude birth rates are normally higher in younger populations, which have a higher proportion of people of reproductive age, than in populations with more elderly people. Conversely, crude death rates are normally higher in older populations. This makes it difficult to use crude rates to compare the risk of death in different populations, such as those of the states of Florida and Alaska.
* Adjustable Rate**:** To show what the level of mortality would be if the age

composition of different populations was the same, epidemiologists use age-adjusted rates. An adjusted rate is an artificially created figure that enables comparison across time and space. It should only be compared with another adjusted rate that was computed using the same "standard" population.

7. Why are prevalence rates more useful than incidence rates for measuring chronic diseases?

**ANSWER**:

Because with chronic diseases it is more important to know how many people have the disease than the onset. Also note that the number of new and old cases of a disease in a population in a given period of time, divided by the total number in that population is prevalent rate while Incidence rate the number of new health-related events or cases of a disease divided by the total number in the population at risk in otherwords, Prevalence is often used as an alternative to incidence in the study of rarer chronic diseases such as multiple sclerosis, where it would be difficult to accumulate large numbers of incident cases. Again, however, care is needed in interpretation. Differences in prevalence between different parts of the world may result from differences in survival and recovery as well as in incidence.

8. What is an infant mortality rate? Why is it such an important rate in community health?

**ANSWER:**

The infant mortality rate is an indicator of a population’s health status. It measures life expectancy and years of potential life lost which is important in community health. The infant mortality rate is the number of infant deaths for every 1,000 live births. In addition to giving us key information about maternal and infant health, the infant mortality rate is an important marker of the overall health of a society. In 2021, the infant mortality rate in the United States was 5.4 deaths per 1,000 live births. ([See Mortality in the United States, 2021)](https://www.cdc.gov/nchs/products/databriefs/db456.htm#section_5). Among the causes of Infant mortality rate include; birth defects, preterm birth and low birth weight, sudden infant death syndrome, Injuries (e.g., suffocation). Maternal pregnancy complications amongst others.

9. What are notifiable diseases? Give some examples.

**ANSWER:**

Notifiable disease are diseases for which health officials request or require reporting for public health reasons. Also, notifiable diseases are infectious diseases that can become epidemic and for which health officials maintain weekly records. Some examples include cancer, hepatitis, HIV, and influenza.

10. In general, contrast the leading causes of death in the United States in 1900 with those in 2013. Comment on the differences.

**ANSWER:**

In In 2013, 2,596,993 deaths were registered in the United States. The crude mortality rate was 821.5 per 100,000. The age-adjusted death rate, which eliminates the effects of the aging population, was 731.9 deaths per 100,000 U.S. standard population. This was a record low.19 Age-adjusted death rates show what the level of mortality would be if no changes occurred in the age makeup of the population from year to year. Thus, they are a better indicator than are unadjusted (crude) death rates for examining changes in the risk of death over a period of time when the age distribution of the population is changing. Death rates and age-adjusted death rates for the 15 leading causes of death in the United States in 2013 are presented in (see Table 3.6).19 Naturally, morbidity and mortality rates vary greatly depending on age, sex, race, and ethnicity. For example, whereas heart disease is the leading cause of death for the general population and especially for older adults (those who have reached 65 years of age), cancer is the leading cause of death for the 45- to 64-year-old age group, and unintentional injuries are the leading cause of death for all age groups between 1 and 44 years.17 There has been a shift in the leading causes of death since the beginning of the twentieth century. When the century began, communicable diseases such as pneumonia, tuberculosis, and gastrointestinal infections were the leading causes of death.22 However, a century of progress in public health practice and in biomedical research resulted in a significant reduction in the proportion of deaths from communicable diseases so that the four leading causes of death today are noncommunicable diseases (see Table 3.7). In 2013, the five leading causes of death in the United States—heart disease, cancer, chronic lower respiratory disease, unintentional injuries (accidents and adverse effects), and stroke—accounted for about 62% of all deaths (see Table 3.7).19 In 2012, the five leading causes of death worldwide were heart.

Summary the leading cause of death are outlined below:

|  |  |  |
| --- | --- | --- |
| **S/N** | **1900** | **2013** |
| 1 | Pneumonia, influenza | Diseases of the heart |
| 2 | Tuberculosis | Malignant neoplasms (cancers) |
| 3 | Diarrhea | Chronic lower respiratory diseases |
| 4 | Diseases of the heart | Accidents (unintentional injuries) |
| 5 | Cerebrovascular diseases (stroke) | Cerebrovascular diseases (stroke) |
| 6 | Nephritis | Alzheimer’s disease |
| 7 | Unintentional injuries (accidents) | Diabetes mellitus |
| 8 | Malignant neoplasms (cancers) | Influenza and pneumonia |
| 9 | Senility | Nephritis, nephrotic syndrome, and nephrosis (kidney diseases) |
| 10 | Diphtheria | Intentional self-harm (suicide) |

11. At what ages is life expectancy calculated? What does it tell us about a population? Which country has the longest life expectancy?

**ANSWER:**

The age period is at birth, 65 years and 75 years of age. It tells us which populations are living the longest on average. Japan has the longest life expectancy (84 years); while Africa have the shortest (51 years) America is at (79 years).

In a nutshell, life expectancy is defined as the average number of years a person from a specific cohort is projected to live from a given point in time. Whereas life insurance companies are interested in life expectancy at every age, health statisticians are usually concerned with life expectancy at birth, at the age of 65 years, and, more recently, at age 75. It must be remembered that life expectancy is an average for an entire cohort (usually of a single birth year) and is not necessarily a useful prediction for any one individual. Moreover, it certainly cannot describe the quality of one’s life. However, the ever-increasing life expectancy for Americans suggests that as a country, we have managed to control some of those factors that contribute to early deaths.

12. What are years of potential life lost (YPLL)? How does calculating YPLL change the way we think about the leading causes of death?

**ANSWER:**

The number of years lost when death occurs before the age of 65 or 75. Because it shows us the years, they should have lived vs the years they actually lived because of a condition. Whereas standard mortality statistics, such as leading causes of death, provide one measure of the importance of various diseases, years of potential life lost (YPLL) provides another, different measure. YPLL is calculated by subtracting a person’s age at death from a predefined, standard age. Each person may have a different life expectancy at any given time, so the age 75 years is often used in these calculations. For example, for a person who dies at age 59, the YPLL-75 is 16. Although age 75 is typically used for calculations, the standard age could be 65, 70, 80, or any other predefined age.

13. How would you define disability-adjusted life years (DALYs)? How would you define health-adjusted life expectancy (HALE)?

**ANSWER:**

Daily adjusted life years can be defined as a measure for the burden of disease that takes into account premature death and loss of healthy life resulting from disability Mortality does not entirely express the burden of disease. For example, chronic depression and paralysis caused by polio are responsible for great loss of healthy life but are not reflected in mortality tables. Because of this, the World Health Organization (WHO) and the World Bank have developed a measure called the disability-adjusted life years (DALYs).26 One DALY is one lost year of healthy life. Total DALYs for a given condition for a particular population can be calculated by estimating the total years of life lost and the total years of life lived with disability, and then by summing these totals. As an example, the DALYs incurred through firearm injuries in the United States could be calculated by adding the total of YPLL incurred from fatal firearm injuries to the total years of life lived with disabilities by survivors of firearm injuries. While Health-adjusted life expectancy (HALE), sometimes referred to as healthy life expectancy, is the number of years of healthy life expected, on average, in a given population or region of the world. The HALE indicator used by the WHO is similar to the disability-adjusted life expectancy (DALE) first reported in the original Global Burden of Disease study.26 The methods used to calculate HALE are beyond the scope of this textbook, but have been described elsewhere.28 Worldwide, HALE at birth in 2013 was 60 years, 8 years lower than overall life expectancy at birth. As with life expectancy, HALE in sub-Saharan Africa is very low—49 years for males, compared with about 70 years for females in high-income countries

14. What is the U.S. Census? How often is it conducted? What types of data does it gather?

**ANSWER:**

The U.S. Census, taken every 10 years, is an enumeration of the population living in the United States. George Washington ordered the first census in 1790 for the purpose of apportioning representation to the House of Representatives. Through the years, the census form has become much more complex than the one filled out more than 200 years earlier. Data are gathered about income, employment, family size, education, dwelling type, and many other social indicators. Copies of the U.S. Census results are available in most libraries and online at [www.census.gov](http://www.census.gov). Census data are important to health workers because they are used for calculating disease. and death rates and for program planning. The U.S. Census is carried out by the Bureau of the Census, located in the U.S. Department of Commerce.

15. What kinds of data would you expect to find in the Centers for Disease Control and Prevention’s Morbidity and Mortality Weekly Report?

**ANSWER:**

* Vital statistics Reports **-** are statistical summaries of vital records, that is, records of major life events. Listed are births, deaths, marriages, and divorces. Detailed reports of data from the birth and death certificates are published in preliminary and final reports each year. The birth reports include data on a wide range of topics including maternal and infant characteristics as well as details about prenatal care and delivery. The death report includes data on death rates, life expectancy, leading causes of death, and infant mortality. In addition to these reports, four to six reports are published each year on special topics related to vital statistics
* Morbidity and Mortality Weekly Report - List of all morbidity and mortality data by state and region of the country, based upon reports from state health department. The report is prepared by the CDC based on reports from state health departments. This report is printed and distributed through an agreement with the Massachusetts Medical Society, publishers of the New England Journal of Medicine. Report contains: outbreaks of disease, environmental hazards, unusual cases, or other public health problems.
* National Health Survey **-** Another source of secondary data is the national health surveys. These surveys are a result of the National Health Survey Act of 1956, which authorized a continuing survey of the amount, distribution, and effects of illness and disability in the United States. The intent of this Act is currently being fulfilled by three types of surveys: (1) health interviews of people; (2) clinical tests, measurements, and physical examinations of people; and (3) surveys of places.
* National Health Interview Survey- In the National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics (NCHS), people are asked numerous questions about their health. One of the questions asks respondents to describe their health status using one of five categories—excellent, very good, good, fair, or poor. It is important to remember that these data were generated by self-reported responses to NHIS questions and not by actual examinations objectively generated in a clinic. As such, respondents may overreport good health habits or underreport bad ones.
* National Health and Nutrition Examination Survey - Another of the national health surveys is the National Health and Nutrition Examination Survey (NHANES). The purpose of the NHANES is to assess the health and nutritional status of the general U.S. population

# 16. Conclusion:

As Epidemiology is the study of disease in populations. Veterinarians and others involved in the preventive medicine and public health professions use epidemiological methods for disease surveillance, outbreak investigation, and observational studies to identify risk factors of zoonotic disease in both human and animal populations. Knowledge of these risk factors is used to direct further research investigation and to implement disease control measures. The three (3) most import concept in this study are Natality. Morbidity and Mortality useful tools to learn about risk factors of diseases and compare and contrast health events and between different populations. While similar and often related, morbidity and mortality, however, are not identical

* Describe the 3 most important concepts you learned in this course.

**ANSWER:**

**The three (3) important concept I learned from this course are;**

* Natality
* Morbidity
* Mortality**.**

WhileNatality(birth) refers to birth rate. The number of live births divided by the total population. the total number of live births per 1000 individuals of a population per year. Morbidity **- rates** is the number of people who are sick divided by the total population at risk. Morbidity is the state of being symptomatic or unhealthy for a disease or condition. It is usually represented or estimated using prevalence or incidence. Prevalence describes the proportion of the population with a given symptom or quality. It is calculated by dividing the number of affected individuals by the total number of individuals within a specific population. It is usually presented as a ratio or as a percentage. On the other hand, incidence shows the frequency at which individuals within a specific population develop a given symptom or quality. **And lastly.** Mortality (fatality) rate the number of deaths in population divided by the total population. mortality is related to the number of deaths caused by the health event under investigation. It can be communicated as a rate or as an absolute number. Mortality usually gets represented as a rate per 1000 individuals, also called the death rate. The calculation for this rate is to divide the number of deaths in a given time for a given population by the total population. To keep these values concise and for ease of comparison to other health events, this number can be multiplied by 1000 to reflect the “per 1000” rate of the target population.

Among these concepts, Morbidity and mortality are two types of retrospective information that allows for continuous evaluation of the efficacy of either a specific health care system or an implemented intervention in place.

## How would you use this knowledge to improve your life and work?

**ANSWER:**

Epidemiologists conduct research to establish the factors that lead to public health issues, the appropriate responses, interventions, and solutions. By using research from the field and in the lab and statistical analysis, epidemiologists can track disease and predict its future outcomes.

Similarly, by achieving a degree in epidemiology, you are poised to work in places such as local health departments, nonprofits, government organizations, academia, the pharmaceutical industry, and more thereby contribution towards better health of the society.

For example, With Columbia Public Health programs ranging from MPH, MS, DrPH, and PhD, students at all levels can gain the necessary knowledge to drive public health initiatives and conduct independent epidemiological research. Our graduates go on to work in roles at companies and organizations ranging in size, scope, and mission, such as: data and Informatics Analysts at medical technology firms, hospitals, and universities, Research Scientists at statewide health departments, Fellows at the Centers for Disease Control and Prevention (CDC) Clinical Trial Associates at international research laboratories, Research and Evaluation Manager at nonprofit organizations. Other areas of employment among our graduates include: Consulting firms, Health insurance companies, Marketing and strategic communications firms, Pharmaceutical and biotechnology or medical device companies.

## How would you use this knowledge to increase your income?

**ANSWER:**

Epidemiologists are health professionals who study human diseases and disease outbreaks and how they spread. They use the information to find ways to treat the disease and stop its spread. An epidemiologist also: Studies the causes of diseases and other health threats, Collects and analyzes data related to public health, Researches disease trends in specific demographics and supervises other health care professionals. In doing this Epidemiologist are paid well top perform these duties. In most cases however, Salaries for an epidemiologist vary depending on the type of employment. Non-government employees generally earn more than their government counterparts, but there are more jobs in government than in the private sector.

## How would you use this knowledge to promote human rights in the world?

**ANSWER:**

When epidemiological research is undertaken, particularly among communities whose dignity is affronted or who suffer discrimination and are thus not fully able to claim the benefits of societal membership, the research proposal should be assessed alongside relevant human rights criteria.

The way a problem is characterized defines the solutions. Social change takes time, but there is a risk with quick technical interventions such as vitamin A capsules for children. The provision of capsules becomes an end in itself, and the issue becomes “lack of vitamin A capsules” rather than a denial of each child's fundamental rights. The underlying problems remain unaddressed.

We do not argue with the provision of distinct services to combat an identified problem in an impoverished environment, because to deny assistance would simply leave people without support. However, this approach cannot be the sole contribution of the scientific community. There may well be a place for decontextualized epidemiological research, but we would argue that the greater endowment to human well-being will emerge from contextualized epidemiological research done in a framework cognizant of and with respect for human rights**.**

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