Module Three Assignment

Biomedical Basis of public Health

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1.**Define a chronic disease with the help of two common examples. What are the characteristics of chronic diseases? How are they managed?**

Chronic diseases are disease of long duration and generally slow in progression and such diseases may last more than three months according to the definition of the U.S National Center for Health Statistics. Chronic disease generally cannot be prevented by vaccines or cured by medication, nor do they just disappear (U.S National Center for Health Statistics). A chronic disease is also a condition that you can control/manage with treatment for many months or years. Epilepsy and diabetes are common examples of chronic diseases. They are disease that persists over a long period of time. Chronic disease can hinder independence and the health of people with disabilities, as it may create additional activity limitations. Chronic disease has the characteristics that put people in sad mood and cause discomfort that even make them to feed that they do not belong to the human race and even reduce their level of thinking because of the conditions they normally find themselves in that result in sudden deaths if the disease is not managed. Relatively, they are likely to cause people to become progressively ill and debilitated, especially if their illness is not managed correctly. Yet for many, and perhaps most, of those who go through this process, psychosocial factors are inextricably intertwined with physiological change and may even be primary (Better et al., 1979). Death is unavoidable, but a life of prolonged ill-health conditions result to family community burden that sometimes makes people even pray for death and will even cause our communities global economic problems and also suffer severe consequences from societies battling chronic diseases (World Health Organization report, Preventing chronic diseases 2005). Chronic disease prevention and control helps people to live longer and healthier lives. They are of long duration and generally slow in progression, the four main types of chronic diseases are cardiovascular diseases (like heart attacks and stroke), cancer, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes (WHO).  Chronic diseases generally may not be prevented by [vaccines](https://www.medicinenet.com/immunizations/article.htm) or cured by medication, nor do they just disappear. Eighty-eight percent of Americans over 65 years of age have at least one chronic health condition (as of 1998). Health damaging behaviors - particularly tobacco use, lack of physical activity, and poor eating habits - are major contributors to the leading cause of chronic diseases throughout the world. People with chronic disease often think that they are free from the disease when they have no symptoms. Having no symptoms, however, does not necessarily mean that chronic disease has disappeared. It is true that chronic diseases have become more prevalent in many countries but they are not [infectious](http://www.imedpub.com/scholarly/infectious-disease-journals-articles-ppts-list.php). Most of these diseases are lifestyle related, driven primarily by the choices we make as an individual. People are constantly adopting unhealthy habits, whether intentionally or not, that may eventually continue to lead to coronary artery disease, ischemic stroke, diabetes, obesity, and some cancers related diseases. Some of the contributors are tobacco and junk food with decreased physical activity. Physical activity, in general, appears to be declining and is attributable to 12% of type 2 diabetes and 22% of coronary heart disease (Satyajit Patra Nov 16, 2018). The good news is that chronic disease can be prevented or controlled through 1) regular participation in physical activity, 2) having a healthy eating hobbies, 3) advoiding smoking that damage your lung, and 4) avoiding excessive alcohol consumption. (NHANES report (1999–2004).

**2.a. Discuss the various infectious agents**: There are major types of infectious agents that include: bacteria, viruses, fungi, protozoa, and helminths. In addition, a new class of infectious agents, the prions, has recently been recognized. A brief discussion and review of the general characteristics of each of these agents and examples of some diseases they cause to human.

**Bacteria:** Bacteria are unicellular prokaryotic organisms; that is, they have no organized internal membranous structures such as nuclei, mitochondria, or lysosomes. Their genomes are circular, double-stranded DNA that is associated with much less protein than eukaryotic genomes. Most bacteria reproduce by growing and dividing into two cells in a process known as binary fission. Despite these commonalities that group them together in their Kingdom, there is a wide range of diversity among bacteria (Anderson RM, 1992).There are a variety of morphologies among bacteria, but three of the most common are bacillus (rod-shaped), coccus (spherical), or spirillum (helical rods). The energy sources for bacteria also vary. Some bacteria are photosynthetic and obtain their energy directly from the sun. Others oxidize inorganic compounds to supply their energy needs. Still other bacteria generate energy by breaking down organic compounds such as amino acids and sugars in a respiratory process. Some bacteria require oxygen (aerobes), while others are unable to tolerate it (anaerobes). Some bacteria can grow either with or without oxygen (facultative anaerobes).

Bacteria are frequently divided into two broad classes based on their cell wall structures, which influences their Gram stain reaction. Gram-negative bacteria appear pink after the staining procedure. Familiar pathogenic gram-negative organisms are Salmonella typhi, which causes typhoid fever, and Yersiniapestis, which causes plague. Gram-positive bacteria appear purple after the Gram stain procedure. Examples of pathogenic gram-positive bacteria are Staphylococcus aureus, which causes skin, respiratory, and wound infections, and Clostridium tetani, which produces a toxin that can be lethal for humans.

**Viruses:** Virus is a small infectious agent that replicates only inside living cells of an organism. Viruses can infect all types of life forms, from animals and plants to microorganism, including bacteria and archaea. Microbiologists have found viruses that infect all organisms, from plants and animals to fungi and bacteria. Viruses, however, are not organisms themselves because, apart from a host cell, they have no metabolism and cannot reproduce. A virus particle is composed of a viral genome of nucleic acid that is surrounded by a protein coat called a capsid. In addition, many viruses that infect animals are surrounded by an outer lipid envelope, which they acquire from the host cell membrane as they leave the cell. Unlike organisms, in which the genetic material is always double-stranded DNA, viral genomes may be double- or single-stranded DNA (a DNA virus), or double- or single-stranded RNA (an RNA virus).

In the general process of infection and replication by a DNA virus, a viral particle first attaches to a specific host cell via protein receptors on its outer envelope, or capsid. The viral genome is then inserted into the host cell, where it uses host cell enzymes to replicate its DNA, transcribe the DNA to make messenger RNA, and translate the messenger RNA into viral proteins. The replicated DNA and viral proteins are then assembled into complete viral particles, and the new viruses are released from the host cell. In some cases, virus-derived enzymes destroy the host cell membranes, killing the cell and releasing the new virus particles. In other cases, new virus particles exit the cell by a budding process, weakening but not destroying the cell.

In the case of some RNA viruses, the genetic material can be used directly as messenger RNA to produce viral proteins, including a special viral RNA polymerase that copies the RNA template to produce the genetic material for new viral particles. Other RNA viruses, called retroviruses, use a unique enzyme called reverse transcriptase to copy the RNA genome into DNA. This DNA then integrates itself into the host cell genome. These viruses frequently exhibit long latent periods in which their genomes are faithfully copied and distributed to progeny cells each time the cell divides. The human immunodeficiency virus (HIV), which causes AIDS, is a familiar example of a retrovirus. Like other infectious agents, viruses cause disease by disrupting normal cell function. They do this in a variety of ways. Some viruses make repressor proteins that stop the synthesis of the host cell's proteins, RNA, and DNA. Viral activity may weaken cell membranes and lysosomal membranes, leading to cell autolysis. Some viral proteins are toxic to cells, and the body's immune defenses also may kill virus-infected cells.

Viruses are classified using a variety of criteria, including shape, size, and type of genome. Among the DNA viruses are the herpes viruses that cause chicken pox, cold sores, and painful genital lesions, and the poxvirus that causes smallpox. Significant RNA viruses that cause human disease include rhinoviruses that cause most common colds; myxoviruses and paramyxoviruses that cause influenza, measles, and mumps; rotaviruses that cause gastroenteritis; and the retroviruses that cause AIDS and several types of cancer.

**Fungi:** The word fungus comes from the Latin word for mushrooms. Indeed, the familiar mushroom is a reproductive structure used by many types of fungi. However, there are also many fungi species that don’t produce mushrooms at all. Being eukaryotes, a typical fungal cell contains a true nucleus and many membrane-bound organelles. Together with bacteria, fungi fulfill the indispensable role of decomposers in our environment. Many fungi also infect plants and animals. Examples of diseases caused by fungi are ringworm and histoplasmosis (a mild to severe lung infection transmitted by bat or bird droppings). Yeasts of the Candida genus are opportunistic pathogens that may cause diseases such as vaginal yeast infections and thrush (a throat infection) among people who are immunocompromised or undergoing antibiotic therapy. Antibiotics reduce the bacterial population normally present in the throat and vagina, allowing the yeast to grow unchecked.

Protozoa are eukaryotic microorganisms. Although they are often studied in zoology courses, they are considered part of the microbial world because they are unicellular and microscopic. Protozoa are notable for their ability to move independently, a characteristic found in the majority of species. Because protozoa do not have cell walls, they are capable of a variety of rapid and flexible movements. Protozoa can be acquired through contaminated food or water or by the bite of an infected arthropod such as a mosquito. Diarrheal disease in the United States can be caused by two common protozoan parasites, Giardia lamblia and Cryptosporidium parvum. Malaria, a tropical illness that causes 300 million to 500 million cases of disease annually, is caused by several species of the protozoan Plasmodium. (Murphy FA; Emerging zoonoses. 1998)

**Helminths** are simple, invertebrate animals, some of which are infectious parasites. They are multicellular and have differentiated tissues. Because they are animals, their physiology is similar in some ways to ours. This makes parasitic helminth infections difficult to treat because drugs that kill helminths are frequently very toxic to human cells.

Many helminths have complex reproductive cycles that include multiple stages, many or all of which require a host. Schistosoma, a flatworm, causes the mild disease swimmer's itch in the United States; another species of Schistosomacauses the much more serious disease schistosomiasis, which is endemic in Africa and Latin America. Schistosome eggs hatch in freshwater, and the resulting larvae infect snails. When the snails shed these larvae, the larvae attach to and penetrate human skin. They feed, grow, and mate in the human bloodstream; the damage to human tissues caused by the accumulating schistosome eggs with their sharp spines results in disease symptoms including diarrhea and abdominal pain. Liver and spleen involvement are common. Another disease due to a helminth is trichinosis, caused by the roundworm Trichinella spiralis. This infectious agent is typically ingested in improperly cooked pork from infected pigs. Early disease symptoms include vomiting, diarrhea, and fever; later symptoms include intense muscle pain because the larvae grow and mature in those tissues. Fatal cases often show congestive heart failure and respiratory paralysis.

**b. Public health has had great success in controlling infectious diseases. Discuss the validity of this statement**

Despite pronounced reductions in the number of deaths due to infectious diseases over the past six decades around the world, even though, infectious diseases are still a public health challenges in low and middle income countries. Public health is achieving great success in controlling infectious diseases throughout the world using common and sample methods that communities and the entire population have been introduced to and now contributing to the great success in controlling infectious diseases all around the world, like proper handwashing, keeping communities and environments safe to reduce infectious and other diseases. Without public health interventions in our current health care while we are always experiencing outbreaks of dangerous viruses how could human savior this Earth. Looking at the previous West Africa Ebola epidemics where public health professionals were in the full front to educate our population on how to live and avoid the virus spreading from one person to another person and even prevent epidemics between countries that now makes us to restored our health systems and even see more linkage in the Liberia health system that we can now build on for improvement, public health professionals again have been using prevailing health data to informed decisions makers to improve the ways we manage and deliver health care interventions. The public health was able to controlled the following diseases Smallpox, measles, and polio, these diseases are viral diseases against which effective vaccines have been developed and which have no nonhuman reservoir. Rabies is an example of a disease that has been successfully controlled in the United States by public health measures why we in other part of African countries like Liberia still struggles to control due to limited resources and poor health systems. Immunization of dogs is the primary barrier protecting humans from the reservoir of the virus, which is wild animals and developed counties like the United State of America has better resources and better systems that enable them to controlled these diseases. By maintaining surveillance and intervening with vaccination when a person has been exposed to a possibly rabid animal, public health has kept the number of human deaths from rabies very low due to many successful interventions. SARS, a new, highly communicable disease first recognized in Asia in 2003, was successfully controlled by the classic public health measures of surveillance, isolation, and quarantine. Success in controlling infectious diseases requires adequate resources and political will to maintain effective immunization programs and ongoing epidemiologic surveillance systems. All these have given Public health a great success in controlling infectious diseases. Diseases for which control has been partly successful have complex transmission patterns related to adverse environmental, social, economic, or unknown determinants; are sometimes transmitted by insect vectors that are difficult to control; and are mostly chronic diseases with long infectious periods that require lengthy periods of treatment. (Taylor LH, 2001)

1. **Discuss the ethical, legal, social, and scientific implications of using genetics and genomics in preventing and treating diseases**

The complete sequencing of the human genome in 2003 has opened doors for new approaches to health promotion, maintenance, and treatment. Genetic research is now leading to a better understanding of the genetic components of common diseases, such as cancer, diabetes, and stroke, and creating new, gene-based technologies for screening, prevention, diagnosis, and treatment of both rare and common diseases. Nurses are on the forefront of care, and therefore will participate fully in genetic-based and genomic-based practice activities such as collecting family history, obtaining informed consent for genetic testing, and administering gene-based therapies. This new direction in healthcare calls for all nurses to be able to effectively translate genetic and genomic information to patients with an understanding of associated ethical issues. Lea, D, (January 31, 2008) “Genetic and Genomic Healthcare.

Genomic medicine is a powerful way to tailor health care at the individual level by using patients' genomic information. By identifying the genetic factors associated with disease, it is possible to design more effective drugs; to prescribe the best treatment for each patient; to identify and monitor individuals at high risk from disease; and to avoid adverse drug reactions ([National Human Genome Research Institute, 2005](http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/vol132008/No1Jan08/GeneticandGenomicHealthcare.aspx#NHGRI05)). One of the National Human Genome Research goals therefore is to “enhance health care through the integration of genomic medicine into mainstream medical practice” ([National Human Genome Research Institute, 2005](http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/vol132008/No1Jan08/GeneticandGenomicHealthcare.aspx#NHGRI05)).

* Privacy and Confidentiality

Who should have access to genetic information? Who owns and controls it?

How can families resolve conflicts when some members want to be tested for a genetic disorder and others do not?

* Discrimination

Should employers be able to require job applicants to take genetic tests as a condition of employment?

* Equitable Access to Genomic Technologies

Resource-poor nations, the uninsured, rural and inner city communities – How might genomic science and treatments be made available to those with fewer resources?

* + Rare genetic conditions – Who will fund the development of treatments for genetic disorders that affect a relatively small number of people?
* Impact of Genetic Information
  + How does a person’s genetic information affect that individual and society’s perception of that individual?
  + How does genetic and genomic information affect members of minority communities?

(Adapted from [Human Genome Project Information, 2007](http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/vol132008/No1Jan08/GeneticandGenomicHealthcare.aspx#HumanGenome))

Ethical, Legal and Social Issues (ELSI) research areas identified as “grand challenges” for the future of genomic research:

* Intellectual Property Issues Surrounding Access to and Use of Genetic Information
* Ethical, Legal and Social Factors that Influence the Translation of Genetic Information to Improve health outcomes
* Issues Surrounding the Conduct of Genetic Research
* Issues Surrounding the Use of Genetic Information and Technologies in Non-Health Care Settings
* The Impact of Genomics on Concepts of Race, Ethnicity, Kinship and Individual and Group Identity
* The Implications for Both Individuals and Society of Uncovering Genomic Contributions to Human Traits and Behaviors
* How Different Individuals, Cultures and Religious Traditions View the Ethical Boundaries for Uses of Genomics

(Adapted from National Human Genome Research Institute (2007)

**Professional Responsibilities**

* Recognize when one’s own attitudes and values related to genetic and genomic science may affect care provided to clients.
* Advocate for the rights of all clients for autonomous, informed genetic-and genomic-related decision making and voluntary action.
* Identify ethical, ethnic/ancestral, cultural, religious, legal, fiscal, and societal issues related to genomic information and technologies.
* Define issues that undermine the rights of all clients for autonomous, informed genetic-and genomic-related decision making and voluntary action.
* Provide clients with accurate, appropriate, and current genetic and genomic information, resources, services, and/or technologies that will support and facilitate decision making.

Adapted from: Essential Nursing Competencies and Curricula Guidelines for Genetics and Genomics ([Consensus Panel, 2006](http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/vol132008/No1Jan08/GeneticandGenomicHealthcare.aspx#ANA06))

4. **Identify two infectious diseases and the possible treatment of each**

**Ebola virus disease** (EVD) is an infectious disease that is also known as Ebola hemorrhagic fever (EHF) or simply Ebola, is a viral hemorrhagic fever of humans and other primates caused by ebolaviruses. Signs and symptoms typically start between two days and three weeks after contracting the virus with a fever, sore throat, muscular pain, and headaches. Vomiting, diarrhea and rash usually follow, along with decreased function of the liver and kidneys. At this time, the Ebola virus has no care, this virus is one of the danger virus that caused people begin to bleed both internally and externally. The 2014–2016 outbreak in West Africa was the largest Ebola outbreak since the virus was first discovered in 1976. The outbreak started in Guinea and then moved across land borders to Sierra Leone and Liberia. The current 2018-2019 outbreak in eastern DRC is highly complex, with insecurity adversely affecting public health response activities. (WHO Ebola Virus Disease, May 30, 2019)

**Possible Treatment**

The virus has no clear recognize treatment for now, Symptoms of Ebola virus disease (EVD) are treated as they appear. When used early, basic interventions can significantly improve the chances of survival. These include:

* Providing fluids and electrolytes (body salts) through infusion into the vein (intravenously).
* Offering oxygen therapy to maintain oxygen status.
* Using medication to support blood pressure, reduce vomiting and diarrhea and to manage fever and pain.
* Treating other infections, if they occur.

## Antiviral Drugs

There is currently no antiviral drug licensed by the U.S. Food and Drug Administration (FDA) to treat EVD in people.

During the 2018 eastern Democratic Republic of the Congo outbreak, four investigational treatments were initially available to treat patients with confirmed Ebola. For two of those treatments, called regeneron (REGN-EB3) and mAb114, overall survival was much higher. These two antiviral drugs currently remain in use for patients with confirmed Ebola.

Drugs that are being developed to treat EVD work by stopping the virus from making copies of itself. (CDC November 5, 2019) Supportive care - rehydration with oral or intravenous fluids - and treatment of specific symptoms improves survival. There is as yet no proven treatment available for EVD. However, a range of potential treatments including blood products, immune therapies and drug therapies are currently being evaluated.

In the ongoing 2018-2019 Ebola outbreak in DRC, the [first-ever multi-drug randomized control trial](https://www.who.int/news-room/detail/26-11-2018-democratic-republic-of-the-congo-begins-first-ever-multi-drug-ebola-trial) is being conducted to evaluate the effectiveness and safety of drugs used in the treatment of Ebola patients under an ethical framework developed in consultation with experts in the field and the DRC.

**TB (Tuberculosis)** is a disease caused by a bacterium called Mycobacterium tuberculosis. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB disease can be fatal. The bacteria can cause two types of illness, latent or active. TB is latent when the body's immune system forms a wall around the TB bacteria so they cannot multiple or spread. A person with latent TB has no symptoms. People can have latent TB for long periods of time. If a person with latent TB does not get treatment, the TB bacteria can "activate" and cause disease, often if the person's health declines due to sickness, stress, or aging. Active TB is when the body cannot adequately fight the TB bacteria and the person has symptoms. (State of Rhode Island Department of Health Report)

Possible Treatment

Medications are the cornerstone of tuberculosis treatment. But treating TB takes much longer than treating other types of bacterial infections. For active tuberculosis, you must take antibiotics for at least six to nine months. The exact drugs and length of treatment depend on your age, overall health, possible drug resistance and the infection's location in the body.

Most common TB drugs: If you have latent tuberculosis, you may need to take only one or two types of TB drug. Active tuberculosis, particularly if it's a drug-resistant strain, will require several drugs at once. The most common medications used to treat tuberculosis include:

* Isoniazid
* Rifampin (Rifadin, Rimactane)
* Ethambutol (Myambutol)
* Pyrazinamide

If you have drug-resistant TB, a combination of antibiotics called fluoroquinolones and injectable medications, such as amikacin or capreomycin (Capastat), are generally used for 20 to 30 months. Some types of TB are developing resistance to these medications as well. Some drugs may be used as add-on therapy to the current drug-resistant combination treatment, including:

* Bedaquiline (Sirturo)
* Linezolid (Zyvox)

**5.**What are some public health responses to emerging infections in your country

[Emerging infections](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app3/def-item/glossary.gl1-d14/), as defined by Stephen Morse of Columbia University in his paper published, Microbial Evolution and Co-Adaptation. They are infections that are rapidly increasing in incidence or geographic range, including such previously unrecognized diseases as [HIV](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app2/def-item/acronyms.g25/)/AIDS, severe acute respiratory syndrome ([SARS](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app2/def-item/acronyms.g58/)), Ebola hemorrhagic fever, and Lassa Fever. Among his many contributions to efforts to recognize and address the threat of emerging infections, Lederberg co-chaired the committees that produced two landmark Institute of Medicine ([IOM](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app2/def-item/acronyms.g31/)) reports, Emerging Infections: Microbial Threats to Health in the United States ([IOM, 1992](https://www.ncbi.nlm.nih.gov/books/NBK45714/)) and Microbial Threats to Health ([IOM, 2003](https://www.ncbi.nlm.nih.gov/books/NBK45714/)), which provided a crucial framework for understanding the drivers of infectious disease emergence ([Box WHO-3](https://www.ncbi.nlm.nih.gov/books/n/nap12586/workshop/box/workshop.box3/?report=objectonly) and [Figure WHO-13](https://www.ncbi.nlm.nih.gov/books/n/nap12586/workshop/figure/workshop.f13/?report=objectonly)). As the papers demonstrate, this framework continues to guide research to elucidate the origins of emerging infectious threats, to inform the analysis of recent patterns of disease emergence, and to identify risks for future disease emergence events so as to enable early detection and response in the event of an outbreak, and perhaps even predict its occurrence. Previously undetected or unknown infectious agents. Ebola is considered as an emerging infectious disease here in Liberia. It was first recognized in 1976 as the cause of twin outbreaks of disease near the Ebola River in the Democratic Republic of the Congo (then known as Zaire) and in a region of Sudan. Some 300 people in each country became infected. (Dobson AP, Carper ER.)

# Several factors of emergence have been identified: microbial adaptation and change, human susceptibility to infection, climate and weather, changing ecosystems, human demographics and behavior, economic development and land use, international travel and commerce, technology and industry, breakdown of public health measures, poverty and social inequality, war and famine, lack of political will and intent to harm. Unfortunately, most of these factors are overrepresented in many countries in Africa. Thus, many emerging diseases are reported from or originated from Africa. According to F. Fenella et all, improve disease assessment through improve public health surveillance could also contribute to the apparent onset and reappearance of some diseases.([F.Fenollar](https://www.sciencedirect.com/science/article/pii/S2052297518300842" \l "!)[1](https://www.sciencedirect.com/science/article/pii/S2052297518300842" \l "!)[O.Mediannikov November 2018](https://www.sciencedirect.com/science/article/pii/S2052297518300842" \l "!)[2](https://www.sciencedirect.com/science/article/pii/S2052297518300842" \l "!)) Lassa fever is an another acute viral hemorrhagic illness caused by Lassa virus, a member of the arenavirus family of viruses. Humans usually become infected with Lassa virus through exposure to food or household items contaminated with urine or feces of infected Mastomys rats. The disease is endemic in the rodent population in parts of West Africa and recently show face here in Liberia.

# Lassa fever is known to be endemic in Benin, Ghana, Guinea, Liberia, Mali, Sierra Leone, Togo and Nigeria, but probably exists in other West African countries as well. Person-to-person infections and laboratory transmission can also occur, particularly in health care settings in the absence of adequate infection prevention and control measures. (Shi Yinglun 2019; Liberia declares health emergency as Lassa fever deaths rise to 21)

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