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**INTRODUCTION**

Chronic diseases have been around as long as humans have. Now, in most industrialised nations and in many developing countries, they are predominate among the leading causes of death in the world nowadays.  For many years, public health practitioners have recognised the increasing burden of chronic illness

Since chronic diseases and Infectious diseases are a continuing threat to all persons, regardless of age, sex, lifestyle, ethnic background, and socioeconomic status. They cause suffering and death and impose a financial burden on society. Although some diseases have been conquered by modern advances such as antibiotics and vaccines, new ones are constantly emerging (e.g., human immunodeficiency virus and acquired immunodeficiency syndrome {HIV/AIDS}, Lyme disease, and Hantavirus pulmonary syndrome), whereas others reemerge in drug-resistant forms (e.g., malaria, tuberculosis, and bacterial pneumonias). Therefore there is need to overcome such conditions in the community.

**Chronic Disease**

Is a disease that is marked by long duration or frequent recurrence, usually incurable but not immediately fatal.

**The two Examples are**

Cancer, diabetes

**Characteristics of chronic disease**

Long lasting, no cure only treatments, many contributing factors, and no immediate death, can lead to disability, develops slowly

**Infectious Agents**

Infectious agents is a term that is generally used to describe and encompass any material that can cause an infection that can lead to a disease. These types of materials are largelyBacterial but also largely comprised of [Viral](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml#Viral), [Fungal](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml#Fungal), [Rickettsias](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml" \l "Rickettsias), [Prions](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml#Prions) and [Parasites](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml#Parasites). Vulnerability and prevalence depends mostly on geography and climate but in a laboratory setting, almost any agent is habitable under artificial means such as climate and humidity control.

**The following below are the various Infectious Agents**

**Bacteria**

Single celled organisms that largely comprise the kingdom Monera and Prokaryota and generally live off other organisms. Bacteria lack a cell nucleus unlike mammalian (eukaryotic) cells and reproduce very quickly through either fission or forming spores. Some bacteria cause disease and others secrete toxins that can lead to disease. These pathogenic strains of bacteria are sometimes resistant to antibiotics, which makes research involving antibiotic resistance genes a tightly regulated field. Healthy bacteria make up the natural flora of our digestive system and play a large role in the human immune system, which ironically fights off infection and disease.

**Viral**

A virus is in a basic sense, a non-living entity, a constant debate among virologists and microbiologists. Typically, a virus is a protein capsule that contains genetic material that can be injected into a host genome. Once the infection occurs, the injected genetic material can lay dormant or it may be expressed immediately but what makes viruses so unique is they rely on the host's intracellular machinery to express the injected genes, which ultimately code for the production of more viral particles until they destroy their host cell and spread to other neighboring cells. Unfortunately, viruses do not respond to antibiotics but anti and retro-viral medications are available for many viruses. [[Return To Top](https://www.cpp.edu/~ehs/portals/biosafety/agents/infectious.shtml#Introduction)]

**Fungal**

Fungus is a eukaryotic multi-celled organism classified as fungi, which differs from other kingdoms such as animals, plants and bacteria. Plants and fungi differ in the make-up of their cell walls. Plants have cellulose and fungi have chitin. Common types of fungus include yeasts, mold and mushrooms to name a few. Certain fungi have been used to create antibiotics like penicillin because these fungi can produce bioactive mycotoxins that not only combat various types of bacteria but also susceptible plants and weeds. Early stages of the fungal lifecycle can involve spores, which can only be destroyed in high heat, high pressure conditions, as they are well adapted to surviving harsh conditions.

**Rickettsias**

Rickettsia is a gram-negative bacterium (pleomorphic) but can only survive inside the cytoplasm of mammalian or eukaryotic cells that serve as a host to the rickettsia. Commonly carried by lice, fleas and ticks, they can often cause disease in humans such as Rocky Mountain spotted fever and typhus. Most rickettsias are susceptible to tetracycline antibiotics.

**Prions**

Prions like viruses are not living and take advantage of the host cellular functions to reproduce. Prions were named by combining "Proteins" and "Infection" because a prion is merely a specific type of misfolded or denatured protein. Once formed, they create accumulations in brain tissue, which leads to necrosis of the once healthy tissue, and cell death occurs. Prions are responsible for transmissible spongiform encephalopathies in a variety of mammals including bovine spongiform encephalopathy commonly referred to as "mad cow disease". Similarly, Creutzfeldt-Jakob Disease (CJD) is the resulting disease in humans.

**Parasites**

Parasites are organisms that require a host to survive. Often times the parasite will obtain a food source from the host but sometimes at the expense of the host, a situation where the parasite robs nutrients from the host. The three most common classes of parasites that can cause disease in humans includes Protozoa, Helminths (worms), and Ectoparasites.

**Public health has had great success in controlling infectious diseases and here are the reasons why I will agree with this statement because of the following achievements.**

During the 20th century, the health and life expectancy of persons residing in the World and United States improved dramatically. Since 1900, the average lifespan of persons in the United States has lengthened by greater than 30 years; 25 years of this gain are attributable to advances in public health. The U.S. government's statistical reporting publication, Morbidity and Mortality Weekly Report (MMWR), reviewed health achievements of the 20th century and profiled ten as listed below.

**Vaccination**

Vaccination has resulted in the eradication of smallpox; elimination of poliomyelitis in the Americas; and control of measles, rubella, tetanus, [diphtheria](https://www.medicinenet.com/script/main/art.asp?articlekey=90657), Haemophilus influenzae type b, and other infectious diseases in the United States and other parts of the world.

**Control of infectious diseases**

Control of infectious diseases has resulted from clean water and improved sanitation. Infections such as typhoid and cholera transmitted by contaminated water, a major cause of illness and death early in the 20th century, have been reduced dramatically by improved sanitation. In addition, the discovery of antimicrobial therapy has been critical to successful public health efforts to control infections such as tuberculosis and sexually transmitted diseases (STDs).

**Decline in deaths from coronary heart disease and stroke**

Decline in deaths from coronary heart disease and stroke have resulted from risk-factor modification, such as smoking cessation and blood pressure control coupled with improved access to early detection and better treatment. Since 1972, death rates for coronary heart disease have decreased 51%.

**Safer and healthier foods**

Since 1900, safer and healthier foods have resulted from decreases in microbial contamination and increases in nutritional content. Identifying essential micronutrients and establishing food-fortification programs have almost eliminated major nutritional deficiency diseases such as [rickets](https://www.medicinenet.com/script/main/art.asp?articlekey=110334), goiter, and pellagra in the United States.

**Healthier mothers and babies**

Healthier mothers and babies have resulted from better hygiene and nutrition, availability of antibiotics, greater access to health care, and technologic advances in maternal and neonatal medicine. Since 1900, infant mortality has decreased 90%, and maternal mortality has decreased 99%.

**Family planning**

Access to family planning and contraceptive services has altered social and economic roles of women. Family planning has provided health benefits such as smaller family size and longer interval between the birth of children; increased opportunities for preconceptional counseling and screening; fewer infant, child, and maternal deaths; and the use of barrier contraceptives to prevent pregnancy and transmission of human immunodeficiency virus and other STDs.

**Fluoridation of drinking water**

 Fluoridation of drinking water began in 1945 and in 1999 reaches an estimated 144 million persons in the United States. Fluoridation safely and inexpensively benefits both children and adults by effectively preventing tooth decay, regardless of socioeconomic status or access to care. Fluoridation has played an important role in the reductions in tooth decay (40%- 70% in children) and of tooth loss in adults (40%-60%).

**Recognition of tobacco use as a health hazard**

Recognition of tobacco use as a health hazard and subsequent public health anti- smoking campaigns have resulted in changes in social norms to prevent initiation of tobacco use, promote cessation of use, and reduce exposure to environmental tobacco smoke. Since the 1964 Surgeon General's report on the health risks of smoking, the prevalence of smoking among adults has decreased, and millions of smoking-related deaths have been prevented

**The Ethical, Legal, Social, and Scientific Implications of Using Genetics and Genomics in Preventing and Treating Diseases**

**Pharmacogenomics and Treatment Response**

Pharmacogenomics is the study of genetic variation that is associated with the variable responses of individuals to any given drug treatment, including individual differences in drug efficacy and susceptibility to adverse effects. This area of genomics provides possibly the best and clearest example of how genomics can be used to bring about more targeted and individualized treatments and actually influence clinical care. This area has already made a number of significant impacts in this regard. Specifically, over the past several years, many associations between genetic variants and drug response have been discovered, including, for example, the now well-known association between CYP2C9 and VKORC1 gene variants and Warfarin.

**Predictive and Disease Susceptibility Testing**

The clinical validity and utility of predictive testing for disease based on genetic information currently varies dramatically depending on the mode of inheritance of the disease, what is known about the specific genetic variants implicated, protective variants that may be important, as well as the degree of redundancy of genetic information with other traditional risk factors that are routinely, easily, and more inexpensively assessed clinically (e.g., family history of disease). For instance, work that has uncovered the genetic variations involved in diseases that are inherited according to simple Mendelian principles has led to the development and availability of predictive genetic tests that have nearly 100% accuracy. Thus, a decade after the Huntington’s disease (HD) gene was mapped to chromosome 4; the pathogenic mutation was localized and identified as a CAG-repeat expansion for which testing is now available to offspring of individuals with the disease. This predictive test has high reliability, validity, and clinical utility given the mode of inheritance of the disease and the fact that the causal mutation is known and can be measured. Furthermore, test results indicating the presence of the CAG-repeat provide information that is not redundant with standard clinical risk factors such as family history (i.e., one can have a family history and still not inherit HD), and therefore, has high clinical and personal utility.

**Personal/Consumer Genomics**

Although highly controversial, leveraging recent findings from GWAS together with high-throughput SNP genotyping technology, a number of companies now offer commercially available tests that aim to calculate an individual’s genetic risk for between 20–40 common, complex diseases using genome-wide genotyping. The purchase of these tests is ultimately initiated by consumers without the obligatory involvement of a health care provider. Costs currently range from $100 to over $2,000 per individual depending on the specific test and the company from which the test is purchased. Neurological/neuropsychiatric disorders which are represented across testing panels for the major personal genetic testing companies include Alzheimer’s disease, multiple sclerosis, and amyotrophic lateral sclerosis.

**Diagnosis, Prognosis, and Monitoring**

In addition to DNA sequence-based testing, which is stable and does not change over the course of a person’s lifetime, genomic biomarkers such as whole-genome gene expression are now starting to be used in diagnosis, prognosis, and monitoring of disease. Such transcriptomic, proteomic, and/or metabolomic profiles, combined with other testing and clinical factors may provide assistance in diagnosing individuals at the earliest possible subclinical stages of disease when preventive strategies can be employed and treatments are more effective, or after a diagnosis has been made but differentiation of disease subtype is needed to guide intervention and drug treatment plans. The use of such markers for diagnosis and subtype differentiation in neuropsychiatric disorders may be particularly useful given the difficulties often encountered in differential diagnosis.

**Infectious diseases are many but here are the two I have identified and selected for this Assignment and they are as follows.**

**Cholera**

Cholera, caused by the bacteria *Vibrio cholerae*, is rare in the [United States](https://www.cdc.gov/cholera/usa/index.html) and other industrialized nations. However, globally, cholera cases have increased steadily since 2005 and the disease still occurs in many places including [Africa,](https://www.cdc.gov/cholera/africa/index.html) [Southeast Asia,](https://www.cdc.gov/cholera/asia/index.html) and [Haiti.](https://www.cdc.gov/cholera/haiti/index.html) CDC responds to cholera outbreaks across the world using its [Global Water, Sanitation and Hygiene (WASH)](https://www.cdc.gov/healthywater/global/index.html) expertise.

Cholera can be life threatening but it is easily prevented and treated. [Travelers](https://www.cdc.gov/cholera/travelers.html), [public health and medical professionals](https://www.cdc.gov/cholera/healthprofessionals.html) and [outbreak responders](https://www.cdc.gov/cholera/outbreak-response.html) should be aware of areas with high rates of cholera, know how the disease spreads, and what to do to prevent it.

**Treatment**

Most persons infected with the cholera bacterium have mild diarrhea or no symptoms at all. Only a small proportion, about 5-10%, of persons infected with *Vibrio cholerae* O1 may have illness requiring treatment at a health center. Cholera patients should be evaluated and treated quickly. With proper treatment, even severely ill patients can be saved.

**Cholera Treatments**

* [Rehydration therapy](https://www.cdc.gov/cholera/treatment/rehydration-therapy.html), meaning prompt restoration of lost fluids and salts through rehydration therapy is the primary goal of treatment.
* [Antibiotic treatment](https://www.cdc.gov/cholera/treatment/antibiotic-treatment.html), which reduces fluid requirements and duration of illness, is indicated for severe cases of cholera.
* [Zinc treatment](https://www.cdc.gov/cholera/treatment/zinc-treatment.html) has also been shown to help improve cholera symptoms in children.

**Malaria**

**Malaria** is a mosquito-borne disease caused by a parasite. People with malaria often experience fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die. In 2017 an estimated 219 million cases of malaria occurred worldwide and 435,000 people died, mostly children in the African Region. About 1,700 cases of malaria are diagnosed in the United States each year. The vast majority of cases in the United States are in travelers and immigrants returning from countries where malaria transmission occurs, many from sub-Saharan Africa and South Asia.

**Malaria Treatment**

Malaria can be a severe, potentially fatal disease (especially when caused by Plasmodium falciparum) and treatment should be initiated as soon as possible.

Patients who have severe malaria or who cannot take oral medications should be given the treatment by continuous intravenous infusion.

Most drugs used in treatment are active against the parasite forms in the blood (the form that causes disease) and include the following:

* Chloroquine
* Atovaquone-proguanil (Malarone®)
* Artemether-lumefantrine (Coartem®)
* Mefloquine
* Quinine
* Doxycycline (used in combination with quinine)
* Clindamycin (used in combination with quinine)
* Tetracycline (used in combination with quinine)
* [Artesunate](https://www.cdc.gov/malaria/diagnosis_treatment/artesunate.html) (not licensed for use in the United States, but available through CDC)

In addition, primaquine and tafenoquine are active against the dormant parasite liver forms ([hypnozoites](https://www.cdc.gov/malaria/about/biology/index.html)) and prevent [relapses](https://www.cdc.gov/malaria/about/disease.html#relapses). Primaquine and tafenoquine should not be taken by pregnant women or by people who are deficient in G6PD (glucose-6-phosphate dehydrogenase). Patients should not take primaquine or tafenoquine until a quantitative test has excluded G6PD deficiency.

**Compliance to International Health Regulations**

The SARS outbreak in 2002 made it clear to the global health authority that international surveillance and disease notification could not be just limited to plague, cholera, and yellow fever and this revelation led to the formation of new International Health Regulations (IHR [2005]) with purpose and scope “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.

Because the IHR (2005) are not limited to specific diseases but apply to new and ever-changing public health risks, they are intended to have long-lasting relevance in international response to the emergence and spread of disease. They also provide the legal basis for important health documents applicable to the international travel and transport and sanitary protections for the users of international airports, ports and ground crossings.

“India being one of the signatories has begun to implement various provisions of the IHR (2005) to establish national and thereby global public health security by preventing and responding to acute public health risks having potential to cross borders and pose threat to other countries.

**Multi-Disciplinarily**

Another key lesson from surveying novel pathogens is the importance of animal reservoirs in the emergence of new infectious diseases. One implication of this is that surveillance in reservoir populations likely to be an effective tool for monitoring risks to humans (Cleaveland, Meslin, and Breiman 2007). On top of this, it may often be the case that most scientific knowledge of the basic biology of an unusual human pathogen lies, at least initially with the veterinary community rather than the medical community. [Palmarini (2007)](https://www.ncbi.nlm.nih.gov/books/NBK45714/) lists a number of examples of this: infectious cancers, retroviruses, lentiviruses, transmissible spongiform encephalopathies, rotaviruses, and papilloma viruses. To this list could be added coronaviruses and ehrlichiosis. More generally, it is now widely recognized that humans share the majority of their pathogens with other animals ([Taylor, Latham, and Woolhouse 2001](https://www.ncbi.nlm.nih.gov/books/NBK45714/)).

Together, these observations underline the importance of close linkages between medical and veterinary researchers, resonating with the “one medicine” concept originally put forward by Schwabe (1969) and seeming especially appropriate in the context of emerging infectious diseases.

**World Health Organization Response**

In 2000, the WHO and partners established the Global Outbreak Alert and Response Network (GOARN) to ensure countries have rapid access to the most appropriate resources and experts for the identification, assessment, and response to public health emergencies of international importance. GOARN provides a global operational framework linking a broad range of public health capacities and expertise to keep the international community alert to the threat of outbreaks, and ready to coordinate support to countries and effectively deploy emergency response teams. GOARN is a multidisciplinary technical collaboration of over 200 technical institutions and networks that works with over 600 partners worldwide, including national public health institutions and hospitals, ministries of health, academic, research and technical institutions, networks, such as laboratories, surveillance initiatives and research agencies, United Nations, and international and nongovernmental organizations.

**Public Health Responses to Emerging Infections**

The 21st century has witnessed the emergence of many new infectious diseases of serious public health implications from severe acute respiratory syndrome (SARS) to avian influenza (AI) humans by a large number. This major public health threat has huge socioeconomic impact and more so in the developing countries like South Sudan.

“An emerging infectious disease (EID) is one that has appeared and affected a population for the first time, or has existed previously but is rapidly increasing, either in terms of the number of new cases within a population, or its spread to new geographical areas”. (e.g. SARS). They also include infectious diseases that have affected a given area in the past, declined with passage of time or were controlled, but again reappeared in increasing numbers.

Sometimes, an old disease reappears in a new clinical form that may often be severe or fatal. These are known as re-emerging diseases, and chikungunya in India is a recent example of such diseases.

**Surveillance**

The first line of defense against any emerging pathogen is its rapid detection and identification. Recent practical experience with [BSE](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app2/def-item/acronyms.g4/) and [SARS](https://www.ncbi.nlm.nih.gov/books/n/nap12586/nap12586.app2/def-item/acronyms.g58/) demonstrates that rapid detection and identification leading to the rapid introduction of preventive measures can prove highly effective in combating outbreaks of novel diseases ([Wilesmith 1994](https://www.ncbi.nlm.nih.gov/books/NBK45714/); [Stohr 2003](https://www.ncbi.nlm.nih.gov/books/NBK45714/)). Moreover, computer simulation studies motivated by concerns about the possible emergence of pandemic influenza suggest that only if a new strain is detected in the very earliest stages and interventions are put in place extremely promptly is there any realistic prospect of curtailing an epidemic ([Ferguson et al. 2006](https://www.ncbi.nlm.nih.gov/books/NBK45714/)).

Surveillance for novel pathogens, however, does present some particular challenges. Initially, this is likely to depend on clinical observation, such as the reporting of clusters of cases of disease with unusual symptoms. Internet surveillance for reports of unusual disease outbreaks is also possible and, in the longer term, generic diagnostic tools—for example, lab-on-a-chip tests for all known human viruses—should become available ([OSI 2006](https://www.ncbi.nlm.nih.gov/books/NBK45714/)).

**Immunization**

Overwhelming evidence demonstrates the benefits of immunization as one of the most successful and cost-effective health interventions known”. Immunization avoids about 2–3 million deaths each year, as well as serious disability from vaccine-preventable diseases including Yellow fever, diphtheria, tetanus and pertussis, rubella, rotaviruses, polio, pneumococcal diseases, mumps, measles, human papillomavirus, polio, hepatitis B, and Haemophilus influenzae type b.

To maximize immunization coverage, national vaccination plans should provide for free or affordable immunizations that are available from most health care providers, public education campaigns to illustrate the importance and safety of vaccinations, monitoring of vaccination rates and their impact on health outcomes, and limited exceptions for individuals who for medical or religious reasons wish to avoid vaccinations. Belize’s Public Health Act 2000 illustrates some important features of a national vaccination strategy: all children are to be vaccinated, vaccinations are to be documented, and any person (including any adult) may be vaccinated free of charge, and public health officials may require any person to be vaccinated or revaccinated if an outbreak occurs. Governments may determine that certain highly infectious diseases warrant compulsory vaccination, although such a requirement may be subject to constitutional protections relating to the right to be free from non-consensual medical treatment, or to freedom of religion.

**Surveillance and response**

The key elements in controlling EIDs depend on rapid clinical diagnosis and detection followed by containment in populations and in the environment. Recent practical experience with BSE and SARS demonstrates that rapid detection and identification leading to the rapid introduction of preventive measures can prove highly effective in combating outbreaks of novel diseases. This surveillance needs to be global, especially considering the unprecedented rates of international travel and trade that can allow new infectious diseases to spread around the world over time scales of days or weeks. A wealth of new technologies are becoming increasingly available for the rapid molecular identification of pathogens but also for the more accurate monitoring of infectious disease activity. Web-based surveillance tools and epidemic intelligence methods, used by all major public health institutions, are intended to facilitate risk assessment and timely outbreak detection. Preparing for emerging disease threats involves not only complying to international regulations, but also strengthening laboratory capacity and communicating appropriately with the public. In some recent cases, these preparatory tasks have been inadequately undertaken due to chronic underinvestment in health care systems.

**Preparedness and Response Unit**

Infectious disease is a growing threat to the health of citizens as the relentless expansion of trade and travel allows new or emerging diseases, and many old infections, to enter our continent. The SARS outbreak in 2003 illustrated how quickly a new virus could spread internationally in the modern age. This was one of the reasons why the EU decided to establish ECDC: to help strengthen Europe’s defences against future disease outbreaks. ECDC’s Preparedness and Response Unit (PRU) monitors emerging threats in the country and internationally, and supports my country Member States in assessing, investigating and responding to them. The unit relies on a set of advanced information technology tools to detect potential threats, with special attention to events threatening more than one Member State. The assessment of such threats is carried out jointly with experts from the Ministry of Health and other Partners on ground.

**Strengthening of global surveillance of infectious diseases**

this includes making certain that national surveillance networks are in place, that they are associated with diagnostic laboratories capable of identifying common pathogens, and that information is rapidly exchanged nationally, regionally and internationally; to this end, greater use of WHO collaborating centres is encouraged;

**Establishment of national and international infrastructure to recognize, report and respond to new disease threats**

specific examples of tasks are: strengthening of national, regional and international laboratory capabilities to include measures to ensure that international reference centres are available and prepared to assist in difficult diagnoses; encouraging the provision of training opportunities and technology transfer among collaborating and reference centres; and streamlining communications among collaborating centres and health resources;

**Further development of applied research**

such an initiative might focus on practical problems of public health such as diagnosis, epidemiology and prevention of infectious diseases that are increasing or threaten to do so; specific tasks could include support for development of inexpensive diagnostic tests suitable for global use, encouragement for establishment and maintenance of quality assurance programmes, and evaluation of standards for basic public health action focused on disease prevention;

**Strengthening of international capacity for infectious disease prevention and control**

Specific guidelines for prevention and control of newly emerging or re-emerging diseases (zoonotic, parasitic, viral, bacterial, foodborne and others) should be prepared, evaluated, distributed and implemented; recommendations could be developed and implemented to reduce the effects of antimicrobial resistance to a minimum, and improve methods of communication and dissemination of information to ensure that guidelines reach the appropriate target groups.

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