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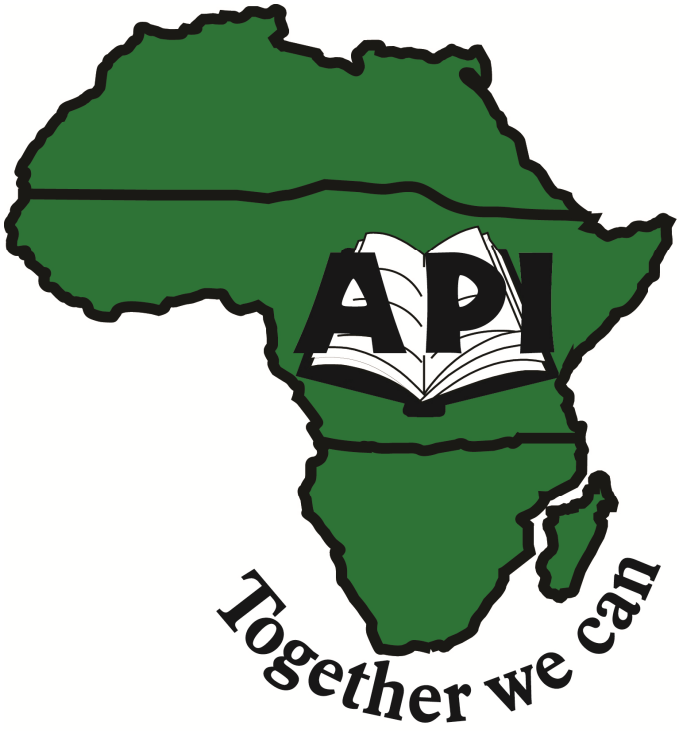

PUBLIC HEALTH
TERM TWO STUDENT'S MODULES
(PHC)
Contents

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COURSE UNIT NAME: IMMUNOLOGY

Course Description

The course deals with understanding the concept of Immunology, branches of immunology, the importance of immunology, immune system, studying various disorders of the human immunity, organs of the immune system, cells in the innate immune system, Immunological Biomolecules and pathogenesis.

Course Objectives

- To help students access a more firm understanding on the wider concept of immunology.
- To enable them learn measures to protect and increase their own immunity by eating balanced diets.
- To increase the students' capacity to identify illnesses that affect the human immunity.

Course Content

Introduction

- Definition of Immunology
- Who is an Immunologist
- Histological examination of the Immune System
- Branches of Immunology
- Essence of Immunology

Immune System

- Meaning of Immune System
- Components of the immune system
- Surface barriers
- Humoral and chemical barriers
- Adaptive immune system

Disorders of Human Immunity

- Immunodeficiencies
- Autoimmunity
- Hypersensitivity
- Other mechanisms

Organs of the Immune System

- Thymus
- Bone-White blood cells
- Spleen-Rich in B and T lymphocytes

Cells in the Innate Immune System

- Mast Cells
- Phagocytes
- Macrophages

Immunological Biomolecules

- Antibodies
- Antigen
- Superantigen
- Histamines

- Cytolysins

Immunity

- Definition of Immunity
- Different types of Immunity

Pathogenesis

- Definition of Pathogens
- Types of Pathogens
- Other Parasites

IMMUNOLOGY MODULE

Discussion Questions to ponder

Define immunology and explain the importance of immunology to the medical fraternity

Discuss different immunisable diseases and their respective impact on the population

Introduction

Immunology is a broad branch of biomedical science that covers the study of all aspects of the immune system in all organisms. It deals with the physiological functioning of the immune system in states of both health and diseases; malfunctions of the immune system in immunological disorders (autoimmune diseases, hypersensitivities, immune deficiency, transplant rejection); the physical, chemical and physiological characteristics of the components of the immune system in vitro, in situ, and in vivo. Immunology has applications in several disciplines of science, and as such is further divided.

Immunology is a science that examines the structure and function of the immune system. It originates from medicine and early studies on the causes of immunity to disease. The earliest known reference to immunity was during the plague of Athens in 430 BC. Thucydides noted that people who had recovered from a previous bout of the disease could nurse the sick without contracting the illness a second time. In the 18th century, Pierre-Louis Moreau de Maupertuis made experiments with scorpion venom and observed that certain dogs and mice were immune to this venomThis and other observations of acquired immunity were later exploited by Louis Pasteur in his development of vaccination and his proposed germ theory of disease. Pasteur's theory was in direct opposition to contemporary theories of disease, such as the miasma theory. It was not until Robert Koch's 1891 proofs, for which he was awarded a Nobel Prize in 1905, that microorganisms were confirmed as the cause of infectious diseaseViruses were confirmed as human pathogens in 1901, with the discovery of the yellow fever virus by Walter Reed.

Immunology made a great advance towards the end of the 19th century, through rapid developments, in the study of humoral immunity and cellular immunity Particularly important was the work of Paul Ehrlich, who proposed the side-chain theory to explain the specificity of the antigen-antibody reaction; his contributions to the understanding of humoral immunity were recognized by the award of a Nobel Prize in 1908, which was jointly awarded to the founder of cellular immunology, Elie Metchnikoff.

Immunologist

According to the American Academy of Allergy, Asthma, and Immunology (AAAAI), "an immunologist is a research scientist who investigates the immune system of vertebrates (including the human immune system). Immunologists include research scientists (Ph.D.) who work in laboratories. Immunologists also include physicians who, for example, treat patients with immune system disorders. Some immunologists are physician-scientists who combine laboratory research with patient care." Imunnologist basically carry out their activities in various sectors which includes science as a whole, laboratories and medicine as a profession, the level of education is rather looked at as doctrate of philosphy, Doctor of Medicine, Doctor of Osteopathic Medicine

Histological examination of the immune system

Even before the concept of immunity (from *immunis*, Latin for "exempt") was developed, numerous early physicians characterised organs that would later prove to be part of the immune system. The key primary lymphoid organs of the immune system are the thymus and bone marrow, and secondary lymphatic tissues such as spleen, tonsils, lymph vessels, lymph nodes, adenoids, and skin and liver. When health conditions warrant, immune system organs including the thymus, spleen, portions of bone marrow, lymph nodes and secondary lymphatic tissues can be surgically excised for examination while patients are still alive.

Many components of the immune system are actually cellular in nature and not associated with any specific organ but rather are embedded or circulating in various tissues located throughout the body.They are several categorise of immunology and they include

Branches of immunology

They are several branches of immunology which include

- Classical immunology
- Clinical immunology
- Computational immunology
- Diagnostic immunology
- Evolutionary immunology
- Immunotherapy
- Systems immunology
- Cancer immunology
- Testicular immunology

Classical immunology

Classical immunology ties in with the fields of epidemiology and medicine. It studies the relationship between the body systems, pathogens, and immunity. The earliest written mention of immunity can be traced back to the plague of Athens in 430 BCE. Thucydides noted that people who had recovered from a previous bout of the disease could nurse the sick without contracting the illness a second time. Many other ancient societies have references to this phenomenon, but it was not until the 19th and 20th centuries before the concept developed into scientific theory.

The study of the molecular and cellular components that comprise the immune system, including their function and interaction, is the central science of immunology. The immune

system has been divided into a more primitive innate immune system, and acquired or adaptive immune system of vertebrates, the latter of which is further divided into humoral and cellular components.

The humoral (antibody) response is defined as the interaction between antibodies and antigens. Antibodies are specific proteins released from a certain class of immune cells (B lymphocytes). Antigens are defined as anything that elicits generation of antibodies, hence they are **Anti**body **Gen**erators. Immunology itself rests on an understanding of the properties of these two biological entities. However, equally important is the cellular response, which can not only kill infected cells in its own right, but is also crucial in controlling the antibody response. Put simply, both systems are highly interdependent.

Clinical immunology

Clinical immunology is the study of diseases caused by disorders of the immune system (failure, aberrant action, and malignant growth of the cellular elements of the system). It also involves diseases of other systems, where immune reactions play a part in the pathology and clinical features.

The diseases caused by disorders of the immune system fall into two broad categories: immunodeficiency, in which parts of the immune system fail to provide an adequate response (examples include chronic granulomatous disease), and autoimmunity, in which the immune system attacks its own host's body (examples include systemic lupus erythematosus, rheumatoid arthritis, Hashimoto's disease and myasthenia gravis). Other immune system disorders include different hypersensitivities, in which the system responds inappropriately to harmless compounds (asthma and other allergies) or responds too intensely.

The most well-known disease that affects the immune system itself is AIDS, caused by HIV. AIDS is an immunodeficiency characterized by the lack of CD4+ ("helper") T cells and macrophages, which are destroyed by HIV.

Clinical immunologists also study ways to prevent transplant rejection, in which the immune system attempts to destroy allografts os

Developmental immunology

The body’s capability to react to antigen depends on a person's age, antigen type, maternal factors and the area where the antigen is presented. Neonates are said to be in a state of physiological immunodeficiency, because both their innate and adaptive immunological responses are greatly suppressed. Once born, a child’s immune system responds favorably to protein antigens while not as well to glycoproteins and polysaccharides. In fact, many of the infections acquired by neonates are caused by low virulence organisms like Staphylococcus and Pseudomonas. In neonates, opsonic activity and the ability to activate the complement cascade is very limited. For example, the mean level of C3 in a newborn is approximately 65% of that found in the adult. Phagocytic activity is also greatly impaired in newborns. This is due to lower opsonic activity, as well as diminished up-regulation of integrin and selectin receptors, which limit the ability of neutrophils to interact with adhesion molecules in the endothelium. Their monocytes are slow and have a reduced ATP production, which also limits the newborns phagocytic activity. Although, the number of total lymphocytes is significantly higher than in adults, the cellular and humoral immunity is also impaired. Antigen presenting cells in newborns have a reduced capability to activate

T cells. Also, T cells of a newborn proliferate poorly and produce very small amounts of cytokines like IL-2, IL-4, IL-5, IL-12, and IFN-g which limits their capacity to activate the humoral response as well as the phagocitic activity of macrophage. B cells develop early in gestation but are not fully active.

Monocytes: An Artist's Impression

Maternal factors also play a role in the body's immune response. At birth most of the immunoglobulin is present is maternal IgG. Because IgM, IgD, IgE and IgA don't cross the placenta, they are almost undetectable at birth. Although some IgA is provided in breast milk. These passively acquired antibodies can protect the newborn up to 18 months, but their response is usually short-lived and of low affinity. These antibodies can also produce a negative response. If a child is exposed to the antibody for a particular antigen before being exposed to the antigen itself then the child will produce a dampened response. Passively acquired maternal antibodies can suppress the antibody response to active immunization. Similarly the response of T-cells to vaccination differs in children compared to adults, and vaccines that induce Th1 responses in adults do not readily elicit these same responses in neonates.By 6-9 months after birth, a child's immune system begins to respond more strongly to glycoproteins. Not until 12-24 months of age is there a marked improvement in the body's response to polysaccharides. This can be the reason for the specific time frames found in vaccination schedules.

During adolescence the human body undergoes several physical, physiological and immunological changes. These changes are started and mediated by different hormones. Depending on the sex either testosterone or 17-β-oestradiol, act on male and female bodies accordingly, start acting at ages of 12 and 10 years.

There is evidence that these steroids act directly not only on the primary and secondary sexual characteristics, but also have an effect on the development and regulation of the immune system.

There is an increased risk in developing autoimmunity for pubescent and post pubescent females and males. There is also some evidence that cell surface receptors on B cells and macrophages may detect sex hormones in the system.

The female sex hormone 17-β-oestradiol has been shown to regulate the level of immunological response. Similarly, some male androgens, like testosterone, seem to suppress the stress response to infection; but other androgens like DHEA have the opposite effect, as it increases the immune response instead of down playing it As in females, the male sex hormones seem to have more control of the immune system during puberty and the time right after than in fully developed adults. Other than hormonal changes physical changes like the involution of the Thymus during puberty will also affect the immunological response of the subject or patient.

Immunotherapy

The use of immune system components to treat a disease or disorder is known as immunotherapy. Immunotherapy is most commonly used in the context of the treatment of cancers together with chemotherapy (drugs) and radiotherapy (radiation). However, immunotherapy is also often used in the immunosuppressed (such as HIV patients) and people suffering from other immune deficiencies or autoimmune diseases.

Diagnostic immunology

The specificity of the bond between antibody and antigen has made it an excellent tool in the detection of substances in a variety of diagnostic techniques. Antibodies specific for a desired antigen can be conjugated with a radiolabel, fluorescent label, or color-forming enzyme and are used as a "probe" to detect it. However, the similarity between some antigens can lead to false positives and other errors in such tests by antibodies cross-reacting with antigens that aren't exact matches.

Evolutionary immunology

Study of the immune system in extant species is capable of giving us a key understanding of the evolution of species and the immune system.

A development of complexity of the immune system can be seen from simple phagocytotic protection of single celled organisms, to circulating antimicrobial peptides in insects to lymphoid organs in vertebrates. However, it is important to recognize that every organism living today has an immune system that has evolved to be absolutely capable of protecting it from most forms of harm; those organisms that did not adapt their immune systems to external threats are no longer around to be observed.

Insects and other arthropods, while not possessing true adaptive immunity, show highly evolved systems of innate immunity, and are additionally protected from external injury (and exposure to pathogens) by their chitinous shells.

Reproductive immunology

This area of the immunology is devoted to the study of immunological aspects of the reproductive process including fetus acceptance. The term has also been used by fertility clinics to address fertility problems, recurrent miscarriages, premature deliveries, and dangerous complications such as pre-eclampsia.

Essence of immunology

- Branch of Biomedical science
- Immune system
- Immunity
- Viral immunology

Immune system

An **immune system** is a system of biological structures and processes within an organism that protects against disease. In order to function properly, an immune system must detect a wide variety of agents, from viruses to parasitic worms, and distinguish them from the organism's own healthy tissue.

Pathogens can rapidly evolve and adapt to avoid detection and destruction by the immune system. As a result, multiple defense mechanisms have also evolved to recognize and neutralize pathogens. Even simple unicellular organisms such as bacteria possess a rudimentary immune system, in the form of enzymes which protect against bacteriophage infections. Other basic immune mechanisms evolved

in ancient eukaryotes and remain in their modern descendants, such as plants and insects. These mechanisms include phagocytosis, antimicrobial peptides called defensins, and the complement system. Jawed vertebrates, including humans, have even more sophisticated defense mechanisms including the ability to adapt over time to recognize specific pathogens more efficiently. Adaptive (or acquired) immunity creates immunological memory after an initial response to a specific pathogen, leading to an enhanced response to subsequent encounters with that same pathogen. This process of acquired immunity is the basis of vaccination.

Disorders of the immune system can result in autoimmune diseases, inflammatory diseases and cancer. Immunodeficiency occur when the immune system is less active than normal, resulting in recurring and life-threatening infections. In humans, immunodeficiency can either be the result of a genetic disease, such as severe combined immunodeficiency, or acquired conditions such as HIV/AIDS or the use of immunosuppressive medication. In contrast, autoimmunityresult from a hyperactive immune system attacking normal tissues as if they were foreign organisms. Common autoimmune diseases include Hashimoto's thyroiditis, rheumatoid arthritis, diabetes mellitus type 1, and systemic lupus erythematosus. Immunology covers the study of all aspects of the immune system.

Layered defense

The immune system protects organisms from infection with layered defenses of increasing specificity. In simple terms, physical barriers prevent pathogens such as bacteria and viruses from entering the organism. If a pathogen breaches these barriers, the innate immune system provides an immediate, but non-specific response. Innate immune systems are found in all plants and animalsIf pathogens successfully evade the innate response, vertebrates possess a second layer of protection, the adaptive immune system, which is activated by the innate response. Here, the immune system adapts its response during an infection to improve its recognition of the pathogen. This improved response is then retained after the pathogen has been eliminated, in the form of an immunological memory, and allows the adaptive immune system to mount faster and stronger attacks each time this pathogen is encountered

Components of the immune system	
Innate immune system	**Adaptive immune system**
Response is non-specific	Pathogen and antigen specific response
Exposure leads to immediate maximal response	Lag time between exposure and maximal response
Cell-mediated and humoral components	Cell-mediated and humoral components
No immunological memory	Exposure leads to immunological memory
Found in nearly all forms of life	Found only in jawed vertebrates

Both innate and adaptive immunity depend on the ability of the immune system to distinguish between self and non-self molecules. In immunology, *self* molecules are those components of an organism's body that can be distinguished from foreign

substances by the immune system Conversely, *non-self* molecules are those recognized as foreign molecules. One class of non-self moleculesare called antigens (short for *anti*body *gen*erators) and are defined as substances that bind to specific immune receptors and elicit an immune response.

Surface barriers

Several barriers protect organisms from infection, including mechanical, chemical, and biological barriers. The waxy cuticle of many leaves, the exoskeleton of insects, the shells and membranes of externally deposited eggs, and skin are examples of mechanical barriers that are the first line of defense against infection However, as organisms cannot be completely sealed against their environments, other systems act to protect body openings such as the lungs, intestines, and the genitourinary tract. In the lungs, coughing and sneezing mechanically eject pathogens and other irritants from the respiratory tract. The flushing action of tears and urine also mechanically expels pathogens, while mucus secreted by the respiratory and gastrointestinal tract serves to trap and entangle microorganisms

Chemical barriers also protect against infection. The skin and respiratory tract secrete antimicrobial peptides such as the β-defensins. Enzymes such as lysozyme and phospholipase A2 in saliva, tears, and breast milk are also antibacterials. Vaginal secretions serve as a chemical barrier following menarche, when they become slightly acidic, while semen contains defensins and zinc to kill pathogens. In the stomach, gastric acid and proteases serve as powerful chemical defenses against ingested pathogens.

Within the genitourinary and gastrointestinal tracts, commensalflora serve as biological barriers by competing with pathogenic bacteria for food and space and, in some cases, by changing the conditions in their environment, such as pH or available iron This reduces the probability that pathogens will be able to reach sufficient numbers to cause illness. However, since most antibiotics non-specifically target bacteria and do not affect fungi, oral antibiotics can lead to an “overgrowth” of fungi and cause conditions such as a vaginal candidiasis (a yeast infection). There is good evidence that re-introduction of probiotic flora, such as pure cultures of the lactobacilli normally found in unpasteurized yogurt, helps restore a healthy balance of microbial populations in intestinal infections in children and encouraging preliminary data in studies on bacterial gastroenteritis, inflammatory bowel diseases, urinary tract infection and post-surgical infections.

Innate immune system

Microorganisms or toxins that successfully enter an organism will encounter the cells and mechanisms of the innate immune system. The innate response is usually triggered when microbes are identified by pattern recognition receptors, which recognize components that are conserved among broad groups of microorganisms, or when damaged, injured or stressed cells send out alarm signals, many of which (but not all) are recognized by the same receptors as those that recognize pathogens. Innate immune defenses are non-specific, meaning these systems respond to pathogens in a generic way. This system does not confer long-lasting immunity

against a pathogen. The innate immune system is the dominant system of host defense in most organisms.

Humoral and chemical barriers

Inflammation

Inflammation is one of the first responses of the immune system to infection. The symptoms of inflammation are redness, swelling, heat, and pain which are caused by increased blood flow into a tissue. Inflammation is produced by eicosanoids and cytokines, which are released by injured or infected cells. Eicosanoids include prostaglandins that produce fever and the dilation of blood vessels associated with inflammation, and leukotrienes that attract certain white blood cells (leukocytes). Common cytokines include interleukins that are responsible for communication between white blood cells; chemokines that promote chemotaxis; and interferons that have anti-viral effects, such as shutting down protein synthesis in the host cell Growth factors and cytotoxic factors may also be released. These cytokines and other chemicals recruit immune cells to the site of infection and promote healing of any damaged tissue following the removal of pathogens.

Complement system

The complement system is a biochemical cascade that attacks the surfaces of foreign cells. It contains over 20 different proteins and is named for its ability to "complement" the killing of pathogens by antibodies. Complement is the major humoral component of the innate immune response. Many species have complement systems, including non-mammals like plants, fish, and some invertebrates.

In humans, this response is activated by complement binding to antibodies that have attached to these microbes or the binding of complement proteins to carbohydrates on the surfaces of microbes. This recognition signal triggers a rapid killing response The speed of the response is a result of signal amplification that occurs following sequential proteolytic activation of complement molecules, which are also proteases. After complement proteins initially bind to the microbe, they activate their protease activity, which in turn activates other complement proteases, and so on. This produces a catalytic cascade that amplifies the initial signal by controlled positive feedback The cascade results in the production of peptides that attract immune cells, increase vascular permeability, and opsonize (coat) the surface of a pathogen, marking it for destruction. This deposition of complement can also kill cells directly by disrupting their plasma membrane.[33]

Cellular barriers

scanning electron microscope image of normal circulating human blood. One can see red blood cells, several knobby white blood cells including lymphocytes, a monocyte, a neutrophil, and many small disc-shaped platelets.

Leukocytes (white blood cells) act like independent, single-celled organisms and are the second arm of the innate immune system. The innate leukocytes include the

phagocytes (macrophages, neutrophils, and dendritic cells), mast cells, eosinophils, basophils, and natural killer cells. These cells identify and eliminate pathogens, either by attacking larger pathogens through contact or by engulfing and then killing microorganisms. Innate cells are also important mediators in the activation of the adaptive immune system

Phagocytosis is an important feature of cellular innate immunity performed by cells called 'phagocytes' that engulf, or eat, pathogens or particles. Phagocytes generally patrol the body searching for pathogens, but can be called to specific locations by cytokines. Once a pathogen has been engulfed by a phagocyte, it becomes trapped in an intracellular vesicle called a phagosome, which subsequently fuses with another vesicle called a lysosome to form a phagolysosome. The pathogen is killed by the activity of digestive enzymes or following a respiratory burst that releases free radicals into the phagolysosome. Phagocytosis evolved as a means of acquiring nutrients, but this role was extended in phagocytes to include engulfment of pathogens as a defense mechanism. Phagocytosis probably represents the oldest form of host defense, as phagocytes have been identified in both vertebrate and invertebrate animals

Neutrophils and macrophages are phagocytes that travel throughout the body in pursuit of invading pathogens. Neutrophils are normally found in the bloodstream and are the most abundant type of phagocyte, normally representing 50% to 60% of the total circulating leukocytes. During the acute phase of inflammation, particularly as a result of bacterial infection, neutrophils migrate toward the site of inflammation in a process called chemotaxis, and are usually the first cells to arrive at the scene of infection. Macrophages are versatile cells that reside within tissues and produce a wide array of chemicals including enzymes, complement proteins, and regulatory factors such as interleukin 1. Macrophages also act as scavengers, ridding the body of worn-out cells and other debris, and as antigen-presenting cells that activate the adaptive immune system.

Dendritic cells (DC) are phagocytes in tissues that are in contact with the external environment; therefore, they are located mainly in the skin, nose, lungs, stomach, and intestines. They are named for their resemblance to neuronaldendrites, as both have many spine-like projections, but dendritic cells are in no way connected to the nervous system. Dendritic cells serve as a link between the bodily tissues and the innate and adaptive immune systems, as they present antigen to T cells, one of the key cell types of the adaptive immune system.

Mast cells reside in connective tissues and mucous membranes, and regulate the inflammatory response. They are most often associated with allergy and anaphylaxis Basophils and eosinophils are related to neutrophils. They secrete chemical mediators that are involved in defending against parasites and play a role in allergic reactions, such as asthma Natural killer (NK cells) cells are leukocytes that attack and destroy tumor cells, or cells that have been infected by viruses.

Adaptive immune system

The adaptive immune system evolved in early vertebrates and allows for a stronger immune response as well as immunological memory, where each pathogen is "remembered" by a signature antigen. The adaptive immune response is antigen-specific and requires the recognition of specific “non-self” antigens during a process called antigen presentation. Antigen specificity allows for the generation of responses that are tailored to specific pathogens or pathogen-infected cells. The ability to mount these tailored responses is maintained in the body by "memory cells". Should a pathogen infect the body more than once, these specific memory cells are used to quickly eliminate it.

Lymphocytes

The cells of the adaptive immune system are special types of leukocytes, called lymphocytes. B cells and T cells are the major types of lymphocytes and are derived from hematopoietic stem cells in the bone marrow. B cells are involved in the humoral immune response, whereas T cells are involved in cell-mediated immune response.

Both B cells and T cells carry receptor molecules that recognize specific targets. T cells recognize a “non-self” target, such as a pathogen, only after antigens (small fragments of the pathogen) have been processed and presented in combination with a “self” receptor called a major histocompatibility complex (MHC) molecule. There are two major subtypes of T cells: the killer T cell and the helper T cell. Killer T cells only recognize antigens coupled to Class I MHC molecules, while helper T cells only recognize antigens coupled to Class II MHC molecules. These two mechanisms of antigen presentation reflect the different roles of the two types of T cell. A third, minor subtype are the γδ T cells that recognize intact antigens that are not bound to MHC receptors.

In contrast, the B cell antigen-specific receptor is an antibody molecule on the B cell surface, and recognizes whole pathogens without any need for antigen processing. Each lineage of B cell expresses a different antibody, so the complete set of B cell antigen receptors represent all the antibodies that the body can manufacture.

Killer T cells

Killer T cells directly attack other cells carrying foreign or abnormal antigens on their surfaces.

Killer T cell are a sub-group of T cells that kill cells that are infected with viruses (and other pathogens), or are otherwise damaged or dysfunctional. As with B cells, each type of T cell recognises a different antigen. Killer T cells are activated when their T cell receptor (TCR) binds to this specific antigen in a complex with the MHC Class I receptor of another cell. Recognition of this MHC:antigen complex is aided by a co-receptor on the T cell, called CD8. The T cell then travels throughout the body in search of cells where the MHC I receptors bear this antigen. When an activated T cell contacts such cells, it releases cytotoxins, such as perforin, which form pores in the target cell's plasma membrane, allowing ions, water and toxins to enter. The entry of another toxin called granulysin (a protease) induces the target cell to

undergo apoptosis. T cell killing of host cells is particularly important in preventing the replication of viruses. T cell activation is tightly controlled and generally requires a very strong MHC/antigen activation signal, or additional activation signals provided by "helper" T cells (see below).

[Helper T cells

Function of T helper cells: Antigen-presenting cells (APCs) present antigen on their Class II MHC molecules (MHC2). Helper T cells recognize these, with the help of their expression of CD4 co-receptor (CD4+). The activation of a resting helper T cell causes it to release cytokines and other stimulatory signals (green arrows) that stimulate the activity of macrophages, killer T cells and B cells, the latter producing antibodies. The stimulation of B cells and macrophages succeeds a proliferation of T helper cells.

Helper T cells regulate both the innate and adaptive immune responses and help determine which types of immune responses the body will make to a particular pathogen These cells have no cytotoxic activity and do not kill infected cells or clear pathogens directly. They instead control the immune response by directing other cells to perform these tasks.

Helper T cells express T cell receptors (TCR) that recognize antigen bound to Class II MHC molecules. The MHC:antigen complex is also recognized by the helper cell's CD4 co-receptor, which recruits molecules inside the T cell (e.g., Lck) that are responsible for the T cell's activation. Helper T cells have a weaker association with the MHC:antigen complex than observed for killer T cells, meaning many receptors (around 200–300) on the helper T cell must be bound by an MHC:antigen in order to activate the helper cell, while killer T cells can be activated by engagement of a single MHC:antigen molecule. Helper T cell activation also requires longer duration of engagement with an antigen-presenting cell. The activation of a resting helper T cell causes it to release cytokines that influence the activity of many cell types. Cytokine signals produced by helper T cells enhance the microbicidal function of macrophages and the activity of killer T cells. In addition, helper T cell activation causes an upregulation of molecules expressed on the T cell's surface, such as CD40 ligand (also called CD154), which provide extra stimulatory signals typically required to activate antibody-producing B cells.

γδ T cells

γδ T cells possess an alternative T cell receptor (TCR) as opposed to CD4+ and CD8+ (αβ) T cells and share the characteristics of helper T cells, cytotoxic T cells and NK cells. The conditions that produce responses from γδ T cells are not fully understood. Like other 'unconventional' T cell subsets bearing invariant TCRs, such as CD1d-restricted Natural Killer T cells, γδ T cells straddle the border between innate and adaptive immunity. On one hand, γδ T cells are a component of adaptive immunity as they rearrange TCR genes to produce receptor diversity and can also develop a memory phenotype. On the other hand, the various subsets are also part of the innate immune system, as restricted TCR or NK receptors may be used as pattern recognition receptors. For example, large numbers of human Vγ9/Vδ2 T cells

respond within hours to common molecules produced by microbes, and highly restricted Vδ1+ T cells in epithelia will respond to stressed epithelial cells.

An antibody is made up of two heavy chains and two light chains. The unique variable region allows an antibody to recognize its matching antigen

B lymphocytes and antibodies

A B cell identifies pathogens when antibodies on its surface bind to a specific foreign antigen. This antigen/antibody complex is taken up by the B cell and processed by proteolysis into peptides. The B cell then displays these antigenic peptides on its surface MHC class II molecules. This combination of MHC and antigen attracts a matching helper T cell, which releases lymphokines and activates the B cell. As the activated B cell then begins to divide, its offspring (plasma cells) secrete millions of copies of the antibody that recognizes this antigen. These antibodies circulate in blood plasma and lymph, bind to pathogens expressing the antigen and mark them for destruction by complement activation or for uptake and destruction by phagocytes. Antibodies can also neutralize challenges directly, by binding to bacterial toxins or by interfering with the receptors that viruses and bacteria use to infect cells.

Alternative adaptive immune system

Although the classical molecules of the adaptive immune system (e.g., antibodies and T cell receptors) exist only in jawed vertebrates, a distinct lymphocyte-derived molecule has been discovered in primitive jawless vertebrates, such as the lamprey and hagfish. These animals possess a large array of molecules called variable lymphocyte receptors (VLRs) that, like the antigen receptors of jawed vertebrates, are produced from only a small number (one or two) of genes. These molecules are believed to bind pathogenic antigens in a similar way to antibodies, and with the same degree of specificity.

Immunological memory

When B cells and T cells are activated and begin to replicate, some of their offspring will become long-lived memory cells. Throughout the lifetime of an animal, these memory cells will remember each specific pathogen encountered and can mount a strong response if the pathogen is detected again. This is "adaptive" because it occurs during the lifetime of an individual as an adaptation to infection with that pathogen and prepares the immune system for future challenges. Immunological memory can be in the form of either passive short-term memory or active long-term memory.

Passive memory

Newborn infants have no prior exposure to microbes and are particularly vulnerable to infection. Several layers of passive protection are provided by the mother. During pregnancy, a particular type of antibody, called IgG, is transported from mother to baby directly across the placenta, so human babies have high levels of antibodies

even at birth, with the same range of antigen specificities as their mother.[63]Breast milk or colostrum also contains antibodies that are transferred to the gut of the infant and protect against bacterial infections until the newborn can synthesize its own antibodies This is passive immunity because the fetus does not actually make any memory cells or antibodies—it only borrows them. This passive immunity is usually short-term, lasting from a few days up to several months. In medicine, protective passive immunity can also be transferred artificially from one individual to another via antibody-rich serum

The time-course of an immune response begins with the initial pathogen encounter, (or initial vaccination) and leads to the formation and maintenance of active immunological memory.

Active memory and immunization

Long-term *active* memory is acquired following infection by activation of B and T cells. Active immunity can also be generated artificially, through vaccination. The principle behind vaccination (also called immunization) is to introduce an antigen from a pathogen in order to stimulate the immune system and develop specific immunity against that particular pathogen without causing disease associated with that organism. This deliberate induction of an immune response is successful because it exploits the natural specificity of the immune system, as well as its inducibility. With infectious disease remaining one of the leading causes of death in the human population, vaccination represents the most effective manipulation of the immune system mankind has developed.

Most viral vaccines are based on live attenuated viruses, while many bacterial vaccines are based on acellular components of micro-organisms, including harmless toxin components. Since many antigens derived from acellular vaccines do not strongly induce the adaptive response, most bacterial vaccines are provided with additional adjuvants that activate the antigen-presenting cells of the innate immune system and maximize immunogenicity

Disorders of human immunity

The immune system is a remarkably effective structure that incorporates specificity, inducibility and adaptation. Failures of host defense do occur, however, and fall into three broad categories: immunodeficiencies, autoimmunity, and hypersensitivities.

Immunodeficiencies

Immunodeficiencies occur when one or more of the components of the immune system are inactive. The ability of the immune system to respond to pathogens is diminished in both the young and the elderly, with immune responses beginning to decline at around 50 years of age due to immunosenescence. In developed countries, obesity, alcoholism, and drug use are common causes of poor immune function However, malnutrition is the most common cause of immunodeficiency in developing countries. Diets lacking sufficient protein are associated with impaired cell-mediated immunity, complement activity, phagocyte function, IgA antibody concentrations,

and cytokine production. Additionally, the loss of the thymus at an early age through genetic mutation or surgical removal results in severe immunodeficiency and a high susceptibility to infection.

Immunodeficiencies can also be inherited or 'acquired'. Chronic granulomatous disease, where phagocytes have a reduced ability to destroy pathogens, is an example of an inherited, or congenital, immunodeficiency. AIDS and some types of cancer cause acquired immunodeficiency.

Autoimmunity

Overactive immune responses comprise the other end of immune dysfunction, particularly the autoimmune disorders. Here, the immune system fails to properly distinguish between self and non-self, and attacks part of the body. Under normal circumstances, many T cells and antibodies react with “self” peptides. One of the functions of specialized cells (located in the thymus and bone marrow) is to present young lymphocytes with self antigens produced throughout the body and to eliminate those cells that recognize self-antigens, preventing autoimmunity.

Hypersensitivity

Hypersensitivity is an immune response that damages the body's own tissues. They are divided into four classes (Type I – IV) based on the mechanisms involved and the time course of the hypersensitive reaction. Type I hypersensitivity is an immediate or anaphylactic reaction, often associated with allergy. Symptoms can range from mild discomfort to death. Type I hypersensitivity is mediated by IgE, which triggers degranulation of mast cells and basophils when cross-linked by antigen. Type II hypersensitivity occurs when antibodies bind to antigens on the patient's own cells, marking them for destruction. This is also called antibody-dependent (or cytotoxic) hypersensitivity, and is mediated by IgG and IgM antibodies.[] Immune complexes (aggregations of antigens, complement proteins, and IgG and IgM antibodies) deposited in various tissues trigger Type III hypersensitivity reactions. Type IV hypersensitivity (also known as cell-mediated or *delayed type hypersensitivity*) usually takes between two and three days to develop. Type IV reactions are involved in many autoimmune and infectious diseases, but may also involve *contact dermatitis* (poison ivy). These reactions are mediated by T cells, monocytes, and macrophages.

Other mechanisms

It is likely that a multicomponent, adaptive immune system arose with the first vertebrates, as invertebrates do not generate lymphocytes or an antibody-based humoral response. Many species, however, utilize mechanisms that appear to be precursors of these aspects of vertebrate immunity. Immune systems appear even in the structurally most simple forms of life, with bacteria using a unique defense mechanism, called the restriction modification system to protect themselves from viral pathogens, called bacteriophages. Prokaryotes also possess acquired immunity, through a system that uses CRISPR sequences to retain fragments of the genomes of

phage that they have come into contact with in the past, which allows them to block virus replication through a form of RNA interference.

Pattern recognition receptors are proteins used by nearly all organisms to identify molecules associated with pathogens. Antimicrobial peptides called defensins are an evolutionarily conserved component of the innate immune response found in all animals and plants, and represent the main form of invertebrate systemic immunity The complement system and phagocytic cells are also used by most forms of invertebrate life. Ribonucleases and the RNA interference pathway are conserved across all eukaryotes, and are thought to play a role in the immune response to viruses.

Unlike animals, plants lack phagocytic cells, but many plant immune responses involve systemic chemical signals that are sent through a plant. Individual plant cells respond to molecules associated with pathogens known as Pathogen-associated molecular patterns or PAMPs. When a part of a plant becomes infected, the plant produces a localized hypersensitive response, whereby cells at the site of infection undergo rapid apoptosis to prevent the spread of the disease to other parts of the plant. Systemic acquired resistance (SAR) is a type of defensive response used by plants that renders the entire plant resistant to a particular infectious agent. RNA silencing mechanisms are particularly important in this systemic response as they can block virus replication.

Tumor immunology

Macrophages have identified a cancer cell (the large, spiky mass). Upon fusing with the cancer cell, the macrophages (smaller white cells) will inject toxins that kill the tumor cell. Immunotherapy for the treatment of cancer is an active area of medical research.

Another important role of the immune system is to identify and eliminate tumors. The *transformed cells* of tumors express antigens that are not found on normal cells. To the immune system, these antigens appear foreign, and their presence causes immune cells to attack the transformed tumor cells. The antigens expressed by tumors have several sources; some are derived from oncogenic viruses like human papillomavirus, which causes cervical cancer, while others are the organism's own proteins that occur at low levels in normal cells but reach high levels in tumor cells. One example is an enzyme called tyrosinase that, when expressed at high levels, transforms certain skin cells (e.g. melanocytes) into tumors called melanomas. A third possible source of tumor antigens are proteins normally important for regulating cell growth and survival, that commonly mutate into cancer inducing molecules called oncogenes.

The main response of the immune system to tumors is to destroy the abnormal cells using killer T cells, sometimes with the assistance of helper T cells. Tumor antigens are presented on MHC class I molecules in a similar way to viral antigens. This allows killer T cells to recognize the tumor cell as abnormal. NK cells also kill tumorous cells in a similar way, especially if the tumor cells have fewer MHC class I

molecules on their surface than normal; this is a common phenomenon with tumors. Sometimes antibodies are generated against tumor cells allowing for their destruction by the complement system.

Clearly, some tumors evade the immune system and go on to become cancers. Tumor cells often have a reduced number of MHC class I molecules on their surface, thus avoiding detection by killer T cells. Some tumor cells also release products that inhibit the immune response; for example by secreting the cytokine TGF-β, which suppresses the activity of macrophages and lymphocytes. In addition, immunological tolerance may develop against tumor antigens, so the immune system no longer attacks the tumor cells.

Paradoxically, macrophages can promote tumor growth when tumor cells send out cytokines that attract macrophages, which then generate cytokines and growth factors that nurture tumor development. In addition, a combination of hypoxia in the tumor and a cytokine produced by macrophages induces tumor cells to decrease production of a protein that blocks metastasis and thereby assists spread of cancer cells.

Physiological regulation

Hormones can act as immunomodulators, altering the sensitivity of the immune system. For example, female sex hormones are known immunostimulators of both adaptiveand innate immune responses Some autoimmune diseases such as lupus erythematosus strike women preferentially, and their onset often coincides with puberty. By contrast, male sex hormones such as testosterone seem to be immunosuppressive Other hormones appear to regulate the immune system as well, most notably prolactin, growth hormone and vitamin D.

When a T-cell encounters a foreign pathogen, it extends a vitamin D receptor. This is essentially a signaling device that allows the T-cell to bind to the active form of vitamin D, the steroid hormone calcitriol. T-cells have a symbiotic relationship with vitamin D. Not only does the T-cell extend a vitamin D receptor, in essence asking to bind to the steroid hormone version of vitamin D, calcitriol, but the T-cell expresses the gene CYP27B1, which is the gene responsible for converting the pre-hormone version of vitamin D, calcidiol into the steroid hormone version, calcitriol. Only after binding to calcitriol can T-cells perform their intended function. Other immune system cells that are known to express CYP27B1 and thus activate vitamin D calcidiol, are dendritic cells, keratinocytes and macrophages.

It is conjectured that a progressive decline in hormone levels with age is partially responsible for weakened immune responses in aging individuals. Conversely, some hormones are regulated by the immune system, notably thyroid hormone activity. The age-related decline in immune function is also related to dropping vitamin D levels in the elderly. As people age, two things happen that negatively affect their vitamin D levels. First, they stay indoors more due to decreased activity levels. This means that they get less sun and therefore produce less cholecalciferol via UVB radiation. Second, as a person ages the skin becomes less adept at producing vitamin D.

The immune system is affected by sleep and rest, and sleep deprivation is detrimental to immune function. Complex feedback loops involving cytokines, such as interleukin-1 and tumor necrosis factor-α produced in response to infection, appear to also play a role in the regulation of non-rapid eye movement (REM) sleep. Thus the immune response to infection may result in changes to the sleep cycle, including an increase in slow-wave sleep relative to REM sleep.

Nutrition and diet

The function of the immune system, like most systems in the body, is dependent on proper nutrition. It has been long known that severe malnutrition leads to immunodeficiency. Overnutrition is also associated with diseases such as diabetes and obesity, which are known to affect immune function. More moderate malnutrition, as well as certain specific trace mineral and nutrient deficiencies, can also compromise the immune response.

Specific foods may also affect the immune system; for example, fresh fruits, vegetables, and foods rich in certain fatty acids may foster a healthy immune system while an excess of pro-inflammatory fatty acids can cause an imbalance in the immune system. Likewise, fetal undernourishment can cause a lifelong impairment of the immune system. In traditional medicine, some herbs are believed to stimulate the immune system, such as echinacea, licorice, ginseng, astragalus, sage, garlic, elderberry, and hyssop, as well as honey.

Manipulation in medicine

The immune response can be manipulated to suppress unwanted responses resulting from autoimmunity, allergy, and transplant rejection, and to stimulate protective responses against pathogens that largely elude the immune system (see immunization). Immunosuppressive drugs are used to control autoimmune disorders or inflammation when excessive tissue damage occurs, and to prevent transplant rejection after an organ transplant.

Anti-inflammatory drugs are often used to control the effects of inflammation. Glucocorticoids are the most powerful of these drugs; however, these drugs can have many undesirable side effects, such as central obesity, hyperglycemia, osteoporosis, and their use must be tightly controlled. Lower doses of anti-inflammatory drugs are often used in conjunction with cytotoxic or immunosuppressive drugs such as methotrexate or azathioprine. Cytotoxic drugs inhibit the immune response by killing dividing cells such as activated T cells. However, the killing is indiscriminate and other constantly dividing cells and their organs are affected, which causes toxic side effects. Immunosuppressive drugs such as ciclosporin prevent T cells from responding to signals correctly by inhibiting signal transduction pathways.

Larger drugs (>500 Da) can provoke a neutralizing immune response, particularly if the drugs are administered repeatedly, or in larger doses. This limits the effectiveness of drugs based on larger peptides and proteins (which are typically larger than 6000 Da). In some cases, the drug itself is not immunogenic, but may be

co-administered with an immunogenic compound, as is sometimes the case for Taxol. Computational methods have been developed to predict the immunogenicity of peptides and proteins, which are particularly useful in designing therapeutic antibodies, assessing likely virulence of mutations in viral coat particles, and validation of proposed peptide-based drug treatments. Early techniques relied mainly on the observation that hydrophilicamino acids are overrepresented in epitope regions than hydrophobic amino acids; however, more recent developments rely on machine learning techniques using databases of existing known epitopes, usually on well-studied virus proteins, as a training set. A publicly accessible database has been established for the cataloguing of epitopes from pathogens known to be recognizable by B cells. The emerging field of bioinformatics-based studies of immunogenicity is referred to as *immunoinformatics*. Immunoproteomics is a term used to describe the study of large sets of proteins (proteomics) involved in the immune response.

Manipulation by pathogens

The success of any pathogen depends on its ability to elude host immune responses. Therefore, pathogens evolved several methods that allow them to successfully infect a host, while evading detection or destruction by the immune system. Bacteria often overcome physical barriers by secreting enzymes that digest the barrier, for example, by using a type II secretion system. Alternatively, using a type III secretion system, they may insert a hollow tube into the host cell, providing a direct route for proteins to move from the pathogen to the host. These proteins are often used to shut down host defenses.

An evasion strategy used by several pathogens to avoid the innate immune system is to hide within the cells of their host (also called intracellularpathogenesis). Here, a pathogen spends most of its life-cycle inside host cells, where it is shielded from direct contact with immune cells, antibodies and complement. Some examples of intracellular pathogens include viruses, the food poisoningbacterium*Salmonella* and the eukaryotic parasites that cause malaria (*Plasmodium falciparum*) and leishmaniasis (*Leishmania spp.*). Other bacteria, such as *Mycobacterium tuberculosis*, live inside a protective capsule that prevents lysis by complement. Many pathogens secrete compounds that diminish or misdirect the host's immune response. Some bacteria form biofilms to protect themselves from the cells and proteins of the immune system. Such biofilms are present in many successful infections, e.g., the chronic *Pseudomonas aeruginosa* and *Burkholderiacenocepacia* infections characteristic of cystic fibrosis. Other bacteria generate surface proteins that bind to antibodies, rendering them ineffective; examples include *Streptococcus* (protein G), *Staphylococcus aureus* (protein A), and *Peptostreptococcusmagnus* (protein L)

The mechanisms used to evade the adaptive immune system are more complicated. The simplest approach is to rapidly change non-essential epitopes (amino acids and/or sugars) on the surface of the pathogen, while keeping essential epitopes concealed. This is called antigenic variation. An example is HIV, which mutates rapidly, so the proteins on its viral envelope that are essential for entry into its host target cell are constantly changing. These frequent changes in antigens may explain the failures of vaccines directed at this virus. The parasite *Trypanosomabrucei* uses

a similar strategy, constantly switching one type of surface protein for another, allowing it to stay one step ahead of the antibody response. Masking antigens with host molecules is another common strategy for avoiding detection by the immune system. In HIV, the envelope that covers the viron is formed from the outermost membrane of the host cell; such "self-cloaked" viruses make it difficult for the immune system to identify them as "non-self" structures.

Organs of the immune system

- Thymus
- Bones - White blood cells (leukocytes) are produced in bone marrow
- Spleen - Rich in B and T lymphocytes.

Tissues of the immune system

- Bone marrow

Cells of the immune system

- White blood cells (leukocytes)
  - *Granulocytes ,Neutrophil granulocytes (neutrophils), Eosinophil granulocytes (eosinophils), Basophil granulocytes, Lymphocytes*

· B cells

Plasma B cells, Memory B cells, B-1 cells, B-2 cells

· Natural killer cells (NK cells)

· T cells

Helper T cells, Cytotoxic T cells, Memory T cells, Regulatory T cells Natural Killer T cells, γδ T cells

- Cells of the innate immune system
  - Mast cells
  - Phagocytes
  - Macrophages

Immunological biomolecules

- Antibodies
- Antigen
- Superantigen
- Histamines
- Cytolysins

Immune system disorders

- Hypersensitivity, Allergy (immune system disorder) .Allergen

Autoimmunity, Immunodeficiency, Transplant rejection

Immunological treatments

- Immunosuppressive drug
- Vaccine
- Vaccination

Immunity (medical)

Immunity is a biological term that describes a state of having sufficient biological defenses to avoid infection, disease, or other unwanted biological invasion. In other words, it is nothing but the capability of the body to resist harmful microbes from entering the body. Immunity involves both specific and non-specific components. The non-specific components act either as barriers or as eliminators of wide range of pathogens irrespective of antigenic specificity. Other components of the immune system adapt themselves to each new disease encountered and are able to generate pathogen-specific immunity.

Innate immunity, or nonspecific, immunity is the natural resistance with which a person is born. It provides resistance through several physical, chemical, and cellular approaches. Microbes first encounter the epithelial layers, physical barriers that line our skin and mucous membranes. Subsequent general defenses include secreted chemical signals (cytokines), antimicrobial substances, fever, and phagocytic activity associated with the inflammatory response. The phagocytes express cell surface receptors that can bind and respond to common molecular patterns expressed on the surface of invading microbes. Through these approaches, innate immunity can prevent the colonization, entry, and spread of microbes.

Adaptive immunity is often sub-divided into two major types depending on how the immunity was introduced. **Naturally acquired immunity** occurs through contact with a disease causing agent, when the contact was not deliberate, whereas **artificially acquired immunity** develops only through deliberate actions such as vaccination. Both naturally and artificially acquired immunity can be further subdivided depending on whether immunity is induced in the host or passively transferred from a immune host. **Passive immunity** is acquired through transfer of antibodies or activated T-cells from an immune host, and is short lived -- usually lasting only a few months -- whereas **active immunity** is induced in the host itself by antigen, and lasts much longer, sometimes life-long. The diagram below summarizes these divisions of immunity.

A further subdivision of adaptive immunity is characterized by the cells involved; humoral immunity is the aspect of immunity that is mediated by secreted antibodies, whereas the protection provided by cell mediated immunity involves T-lymphocytes alone. Humoral immunity is active when the organism generates its own antibodies, and passive when antibodies are transferred between individuals. Similarly, cell mediated immunity is active when the organisms' own T-cells are stimulated and passive when T cells come from another organism.

The modern word “immunity” derives from the Latin *immunis*, meaning exemption from military service, tax payments or other public services.] The first written descriptions of the concept of immunity may have been made by the Athenian Thucydides who, in 430 BC, described that when the plague hit Athens *“the sick and the dying were tended by the pitying care of those who had recovered, because they knew the course of the disease and were themselves free from apprehensions.* ***For no one was ever attacked a second time, or not with a fatal result****”*.The term “immunes”, is also found in the epic poem “Pharsalia” written around 60 B.C. by the poet Marcus AnnaeusLucanus to describe a North African tribe’s resistance to snake venom.

The first clinical description of immunity which arose from a specific disease causing organism is probably *Kitab fi al-jadariwa-al-hasbah* (*A Treatise on Smallpox and Measles*, translated 1848) written by the Islamic physician Al-Razi in the 9th century. In the treatise, Al Razi describes the clinical presentation of smallpox and measles and goes on to indicate that that exposure to these specific agents confers lasting immunity (although he does not use this term). However, it was with Louis Pasteur’s Germ theory of disease that the fledgling science of immunology began to explain how bacteria caused disease, and how, following infection, the human body gained the ability to resist further infections.

Passive immunity

Passive immunity is the transfer of active immunity, in the form of readymade antibodies, from one individual to another. Passive immunity can occur naturally, when maternal antibodies are transferred to the fetus through the placenta, and can also be induced artificially, when high levels of human (or horse) antibodies specific for a pathogen or toxin are transferred to non-immune individuals. Passive immunization is used when there is a high risk of infection and insufficient time for the body to develop its own immune response, or to reduce the symptoms of ongoing or immunosuppressive diseases. Passive immunity provides immediate protection, but the body does not develop memory, therefore the patient is at risk of being infected by the same pathogen later.

Naturally acquired passive immunity

Maternal passive immunity is a type of naturally acquired passive immunity, and refers to antibody-mediated immunity conveyed to a fetus by its mother during pregnancy. Maternal antibodies (MatAb) are passed through the placenta to the fetus by an FcRn receptor on placental cells. This occurs around the third month of gestation IgG is the only antibody isotype that can pass through the placenta. Passive immunity is also provided through the transfer of IgA antibodies found in breast milk that are transferred to the gut of the infant, protecting against bacterial infections, until the newborn can synthesize its own antibodies.

Artificially acquired passive immunity

Artificially acquired passive immunity is a short-term immunization induced by the transfer of antibodies, which can be administered in several forms; as human or animal blood plasma, as pooled human immunoglobulin for intravenous (IVIG) or intramuscular (IG) use, and in the form of monoclonal antibodies (MAb). Passive transfer is used prophylactically in the case of immunodeficiency diseases, such as hypogammaglobulinemia. It is also used in the treatment of several types of acute infection, and to treat poisoning.Immunity derived from passive immunization lasts for only a short period of time, and there is also a potential

risk for hypersensitivity reactions, and serum sickness, especially from gamma globulin of non-human origin.

The artificial induction of passive immunity has been used for over a century to treat infectious disease, and prior to the advent of antibiotics, was often the only specific treatment for certain infections. Immunoglobulin therapy continued to be a first line therapy in the treatment of severe respiratory diseases until the 1930's, even after sulfonamide lot antibiotics were introduced.

Passive transfer of cell-mediated immunity

Passive or "adoptive transfer" of cell-mediated immunity, is conferred by the transfer of "sensitized" or activated T-cells from one individual into another. It is rarely used in humans because it requires histocompatible (matched) donors, which are often difficult to find. In unmatched donors this type of transfer carries severe risks of graft versus host disease.[7] It has, however, been used to treat certain diseases including some types of cancer and immunodeficiency. This type of transfer differs from a bone marrow transplant, in which (undifferentiated) hematopoietic stem cells are transferred.

Active immunity

The time course of an immune response. Due to the formation of immunological memory, reinfection at later time points leads to a rapid increase in antibody production and effector T cell activity. These later infections can be mild or even inapparent.

When B cells and T cells are activated by a pathogen, memory B-cells and T- cells develop. Throughout the lifetime of an animal these memory cells will "remember" each specific pathogen encountered, and are able to mount a strong response if the pathogen is detected again. This type of immunity is both *active* and *adaptive* because the body's immune system prepares itself for future challenges. Active immunity often involves both the cell-mediated and humoral aspects of immunity as well as input from the innate immune system. The *innate system* is present from birth and protects an individual from pathogens regardless of experiences, whereas adaptive immunity arises only after an infection or immunization and hence is "acquired" during life.

Naturally acquired active immunity

Naturally acquired active immunity occurs when a person is exposed to a live pathogen, and develops a primary immune response, which leads to immunological memory. This type of immunity is "natural" because it is not induced by deliberate exposure. Many disorders of immune system function can affect the formation of active immunity such as immunodeficiency (both acquired and congenital forms) and immunosuppression.

Artificially acquired active immunity

Artificially acquired active immunity can be induced by a vaccine, a substance that contains antigen. A vaccine stimulates a primary response against the antigen without causing symptoms of the disease.The term vaccination was coined by Edward Jenner and adapted by Louis Pasteur for his pioneering work in vaccination. The method Pasteur used entailed treating the infectious agents for those diseases so they lost the ability to cause serious disease. Pasteur adopted the name vaccine as a generic term in honor of Jenner's discovery, which Pasteur's work built upon.

In 1807, the Bavarians became the first group to require that their military recruits be vaccinated against smallpox, as the spread of smallpox was linked to combat. the practice of vaccination would increase with the spread of war.

There are four types of traditional vaccines:

- Inactivated vaccines are composed of micro-organisms that have been killed with chemicals and/or heat and are no longer infectious. Examples are vaccines against flu, cholera, plague, and hepatitis A. Most vaccines of this type are likely to require booster shots.
- Live, attenuated vaccines are composed of micro-organisms that have been cultivated under conditions which disable their ability to induce disease. These responses are more durable and do not generally require booster shots. Examples include yellow fever, measles, rubella, and mumps.
- Toxoids are inactivated toxic compounds from micro-organisms in cases where these (rather than the micro-organism itself) cause illness, used prior to an encounter with the toxin of the micro-organism. Examples of toxoid-based vaccines include tetanus and diphtheria.
- Subunit -vaccines are composed of small fragments of disease causing organisms. A characteristic example is the subunit vaccine against Hepatitis B virus.

Most vaccines are given by hypodermic injection as they are not absorbed reliably through the gut. Live attenuated polio and some typhoid and cholera vaccines are given orally in order to produce immunity based in the bowel.

PATHOGENESIS

A pathogen (Greek: πάθος*pathos*, "suffering, passion" and γενής*genēs* (-gen) "producer of") or **infectious agent** - in colloquial terms, a **germ** — is a microbe or microorganism such as a virus, bacterium, prion, or fungus that causes disease in its animal or planthost.[1][2] There are several substrates including *pathways* whereby pathogens can invade a host; the principal pathways have different episodic time frames, but soil contamination has the longest or most persistent potential for harboring a pathogen.

The body contains many natural orders of defense against some of the common pathogens (such as *Pneumocystis*) in the form of the human immune system and by some "helpful" bacteria present in the human body's normal flora. However, if the immune system or "good" bacteria is damaged in any way (such as by chemotherapy, human immunodeficiency virus (HIV), or antibiotics being taken to kill other pathogens), pathogenic bacteria that were being held at bay can proliferate and cause harm to the host. Such cases are called opportunistic infection.

Some pathogens (such as the bacterium *Yersinia pestis*, which may have caused the Black Plague, the *Variola* virus, and the Malaria protozoa) have been responsible for massive numbers of casualties and have had numerous effects on afflicted groups. Of particular note in modern times is HIV, which is known to have infected several million humans globally, along with the Influenza virus. Today, while many medical advances have been made to safeguard against infection by pathogens, through the use of vaccination, antibiotics, and fungicide, pathogens continue to threaten human life. Social advances such as food safety, hygiene, and water treatment have reduced the threat from some pathogens. Not all

pathogens are negative. In entomology, pathogens are one of the "Three P's" (predators, pathogens, and parasitoids) that serve as natural or introduced biological controls to suppress arthropodpest populations.

Types of pathogen

Viral

Pathogenic viruses are mainly those of the families of: Adenoviridae, bacteria Picornaviridae, Herpesviridae, Hepadnaviridae, Flaviviridae, Retroviridae, Orthomyxoviridae, Paramyxoviridae, Papovaviridae, Polyomavirus, Rhabdoviridae, Togaviridae. Some notable pathogenic viruses cause smallpox, influenza, mumps, measles, chickenpox, ebola, and rubella. Viruses typically range between 20-300 nanometers in length.

Bacterial

Although the vast majority of bacteria are harmless or beneficial to ones body, a few pathogenic bacteria can cause infectious diseases. The most common bacterial disease is tuberculosis, caused by the bacterium *Mycobacterium tuberculosis*, which affects just about 2 million people mostly in sub-Saharan Africa. Pathogenic bacteria contribute to other globally important diseases, such as pneumonia, which can be caused by bacteria such as *Streptococcus* and *Pseudomonas*, and foodborne illnesses, which can be caused by bacteria such as *Shigella*, *Campylobacter* and *Salmonella*. Pathogenic bacteria also cause infections such as tetanus, typhoid fever, diphtheria, syphilis and Hansen's disease. Bacteria can often be killed by antibiotics because the cell wall in the outside is destroyed and then the DNA. They typically range between 1 and 5 micrometers in length.

Fungal: Pathogenic fungi

Fungi comprise a eukaryotic kingdom of microbes that are usually saprophytes but can cause diseases in humans, animals and plants. Fungi are the most common cause of diseases in crops and other plants. Life threatening fungal infections in humans most often occur in immunocompromised patients or vulnerable people with a weakened immune system, although fungi are common problems in the immunocompetent population as the causative agents of skin, nail or yeast infections. Most antibiotics that function on bacterial pathogens cannot be used to treat fungal infections because fungi and their hosts both have eukaryotic cells. Most clinical fungicides belong to the azole group. The typical fungal spore size is 1-40 micrometer in length.

Other parasites

Human parasites Some eukaryotic organisms, such as protists and helminths, cause disease. One of the best known diseases caused by protists in the genus *Plasmodium* is malaria. These can range from: 3-200 micrometers in length.

Prionic

Prions are infectious pathogens that do not contain nucleic acids. Prions are abnormal proteins whose presence causes some diseases such as scrapie, bovine spongiform encephalopathy (mad cow disease) and Creutzfeldt–Jakob disease.[4] The discovery of prion as a new class of pathogen led Stanley B. Prusiner to receive the Nobel Prize in Physiology or Medicine in 1997.

Potency

Research into the basis of the ability of pathogens to cause disease provides evidence from multiple and diverse species of the existence of pathogenicity or virulence factors, encoded within the pathogens' genetic material, that facilitate the ability of microbes to cause disease. Microbiologists generally agree that it is not in interest of an infectious agent to kill its host because that would limit the organism's ability to multiply and spread to new hosts. Virulence factors usually serve some beneficial function in the microbe's life cycle, such as allowing spread in the body or attachment to host cells, and cause disease and death of the host only accidentally. Long term interaction of a pathogen with a population of hosts over many generations frequently results in adaptation of both the pathogen and host, leading to less disease. Thus especially deadly agents are often assumed to be recently introduced into the host population and have not yet become well adapted.

Transmission

Transmission of pathogens occurs through many different routes, including airborne, direct or indirect contact, sexual contact, through blood, breast milk, or other body fluids, and through the fecal-oral route. One of the primary pathways by which food or water become contaminated is from the release of untreated sewage into a drinking water supply or onto cropland, with the result that people who eat or drink contaminated sources become infected. In developing countries most sewage is discharged into the environment or on cropland; even in developed countries there are periodic system failures resulting in a sanitary sewer overflow.

Neutrophil Function: From Mechanisms to Disease

Neutrophils are the most abundant white blood cells in circulation, and patients with congenital neutrophil deficiencies suffer from severe infections that are often fatal, underscoring the importance of these cells in immune defense. In spite of neutrophils' relevance in immunity, research on these cells has been hampered by their experimentally intractable nature. Here, we present a survey of basic neutrophil biology, with an emphasis on examples that highlight the function of neutrophils not only as professional killers, but also as instructors of the immune system in the context of infection and inflammatory disease. We focus on emerging issues in the field of neutrophil biology, address questions in this area that remain unanswered, and critically examine the experimental basis for common assumptions found in neutrophil literature.

Reflex Principles of Immunological Homeostasis

The reasoning that neural reflexes maintain homeostasis in other body organs, and that the immune system is innervated, prompted a search for neural circuits that regulate innate and adaptive immunity. This elucidated the inflammatory reflex, a prototypical reflex circuit that maintains immunological homeostasis. Molecular products of infection or injury activate sensory neurons traveling to the brainstem in the vagus nerve. The arrival of these incoming signals generates action potentials that travel from the brainstem to the spleen and other organs. This culminates in T cell release of acetylcholine, which interacts with α7 nicotinic acetylcholine receptors (α7 nAChR) on immunocompetent cells to inhibit cytokine release in macrophages. Herein is reviewed the neurophysiological basis of reflexes that provide stability to the immune system, the neural- and receptor-dependent mechanisms, and the potential opportunities for developing novel therapeutic devices and drugs that target neural pathways to treat inflammatory diseases.

Tolerance of Infections

A host has two methods to defend against pathogens: It can clear the pathogens or reduce their impact on health in other ways. The first, resistance, is well studied. Study of the second, which ecologists call tolerance, is in its infancy. Tolerance measures the dose response curve of a host's health in reaction to a pathogen and can be studied in a simple quantitative manner. Such studies hold promise because they point to methods of treating infections that put evolutionary pressures on microbes different from antibiotics and vaccines. Studies of tolerance will provide an improved foundation to describe our interactions with all microbes: pathogenic, commensal, and mutualistic. One obvious mechanism affecting tolerance is the intensity of an immune response; an overly exuberant immune response can cause collateral damage through immune effectors and because of the energy allocated away from other physiological functions. There are potentially many other tolerance mechanisms, and here we systematically describe tolerance using a variety of animal systems.

Induced $CD4^+Foxp3^+$ Regulatory T Cells in Immune Tolerance

Regulatory T lymphocytes are essential to maintain homeostasis of the immune system, limiting the magnitude of effector responses and allowing the establishment of immunological tolerance. Two main types of regulatory T cells have been identified—natural and induced (or adaptive)—and both play significant roles in tuning down effector immune responses. Adaptive $CD4^+Foxp3^+$ regulatory T (iTreg) cells develop outside the thymus under a variety of conditions. These include not only antigen presentation under subimmunogenic or noninflammatory conditions, but also chronic inflammation and infections. We speculate that the different origin of iTreg cells (noninflammatory versus inflammatory) results in distinct properties, including their stability. iTreg cells are also generated during homeostasis of the gut and in cancer, although some cancers also favor expansion of natural regulatory T (nTreg) cells. Here we review how iTreg cells develop and how they participate in immunological tolerance, contrasting, when possible, iTreg cells with nTreg cells.

VLR-Based Adaptive Immunity

Lampreys and hagfish are primitive jawless vertebrates capable of mounting specific immune responses. Lampreys possess different types of lymphocytes, akin to T and B cells of jawed vertebrates, that clonally express somatically diversified antigen receptors termed variable lymphocyte receptors (VLRs), which are composed of tandem arrays of leucine-rich repeats. The VLRs appear to be diversified by a gene conversion mechanism involving lineage-specific cytosine deaminases. VLRA is expressed on the surface of T-like lymphocytes; B-like lymphocytes express and secrete VLRB as a multivalent protein. VLRC is expressed by a distinct lymphocyte lineage. VLRA-expressing cells appear to develop in a thymus-like tissue at the tip of gill filaments, and VLRB-expressing cells develop in hematopoietic tissues. Reciprocal expression patterns of evolutionarily conserved interleukins and chemokines possibly underlie cell-cell interactions during an immune response. The discovery of VLRs in agnathans illuminates the origins of adaptive immunity in early vertebrates.

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- Klaus D. Elgert - 2009 - 726 pages – Understanding immunology
- SulabhaPathak, UrmiPalan - 2005 - 411 pages – Essentials and fundamental of immunology
- Robert A. Meyers - 2007 - 435 pages – Immunology, from cell biology to disease
- J. David M. Edgar - 2006 - 202 pages – A core text with self assessment

Course Unit Name: Principles of Epidemiology

Course Description
This course of epidemiology explores its definition, its determinants, as well as its application. It also involves the most core epidemiological functions, describing the epidemiologic approach in public health, defining concepts of disease occurrence as well as chain of infection. The course also deals with understanding the concept of Immunology, branches of immunology, the importance of immunology, immune system, studying various disorders of the human immunity, organs of the immune system, cells in the innate immune system, Immunological Biomolecules and pathogenesis.

Course Objectives
· The Course introduces students to epidemiological knowledge that helps them to understand health related issues among the populations.
· It exposes them to measures used to control the chain of infection of diseases in case of its outbreak. Further still
· The course is intended to boast the student's capacity to track the cause of disease by use of methods like evaluation as one of the core epidemiological functions.
· To help students access a more firm understanding on the wider concept ofimmunology.
· To enable them learn measures to protect and increase their own immunity by eating balanced diets.
· To increase the students' capacity to identify illnesses that affect the humanimmunity.

Course Content
Introduction to Epidemiology
· Definition of Epidemiology
· Determinants of Epidemiology
· Health-related states or events
· Specified populations
· Application of Epidemiology

Core Epidemiology Functions
· Public Health Surveillance
· Field investigation
· Analytic studies
· Evaluation
· Linkages
· Policy development

The Epidemiologic Approach
· Defining a Case; Components of a case definition for outbreak investigation, criteria in case definition, modifying case definitions, variation definitions
· Using counts and rates
· Descriptive Epidemiology

· Analytic Epidemiology
· Experimental studies
· Observation studies
· Cohort study

Concepts of Disease Occurrence
· Causation
· Agent
· Host
· Environment
· Components causes and causal pies
· Natural History and Spectrum of disease

Chain of Infection
· Portal of exit
· Modes of transmission
· Portal of entry
· Host
· Implications for public health
· Epidemic disease occurrence
· Epidemic patterns
· Glossary

Mode of delivery Face to face lectures
Assessment
Course work 40%
Exams 60%
Total Mark 100%

PRINCIPLES OF EPIDEMIOLOGY

Epidemiology in Public Health

Recently, a news story described an inner-city neighborhood's concern about the rise in the number of children with asthma. Another story reported the revised recommendations for who should receive influenza vaccine this year. A third story discussed the extensive disease-monitoring strategies being implemented in a city recently affected by a massive hurricane. A fourth story described a finding published in a leading medical journal of an association in workers exposed to a particular chemical and an increased risk of cancer. Each of these news stories included interviews with public health officials or researchers who called themselves epidemiologists. Well, who are these epidemiologists, and what do they do? What is epidemiology? This lesson is intended to answer those questions by describing what epidemiology is, how it has evolved and how it is used today, and what some of the key methods and concepts are. The focus is on epidemiology in public health practice, that is, the kind of epidemiology that is done at health departments.

Objectives
By the end of this Module, you will be able to:
• *Define epidemiology*

• Summarize the historical evolution of epidemiology
• Name some of the key uses of epidemiology
• Identify the core epidemiology functions
• Describe primary applications of epidemiology in public health practice
• Specify the elements of a case definition and state the effect of changing the value of any of the elements
• List the key features and uses of descriptive epidemiology
• List the key features and uses of analytic epidemiology
• List the three components of the epidemiologic triad
• Describe the different modes of transmission of communicable disease in a population

Definition of Epidemiology

The word epidemiology comes from the Greek words *epi*, meaning on or upon, *demos*, meaning people, and *logos*, meaning the study of. In other words, the word epidemiology has its roots in the study of what befalls a population. Many definitions have been proposed, but the following definition captures the underlying principles and public health spirit of epidemiology:

*Epidemiology is the **study** of the **distribution** and **determinants** of **health-related states or events** in **specifiedpopulations**, and the **application** of this study to the control of health problems.*

Key terms in this definition reflect some of the important principles of epidemiology.

Study:

Epidemiology is a scientific discipline with sound methods of scientific inquiry at its foundation. Epidemiology is data-driven and relies on a systematic and unbiased approach to the collection, analysis, and interpretation of data. Basic epidemiologic methods tend to rely on careful observation and use of valid comparison groups to assess whether what was observed, such as the number of cases of disease in a particular area during a particular time period or the frequency of an exposure among persons with disease, differs from what might be expected. However, epidemiology also draws on methods from other scientific fields, including biostatistics and informatics, with biologic, economic, social, and behavioral sciences.

In fact, epidemiology is often described as the basic science of public health, and for good reason. First, epidemiology is a quantitative discipline that relies on a working knowledge of probability, statistics, and sound research methods. Second, epidemiology is a method of causal reasoning based on developing and testing hypotheses grounded in such scientific fields as biology, behavioral sciences, physics, and ergonomics to explain health-related behaviors, states, and events. However, epidemiology is not just a research activity but an integral component of public health, providing the foundation for directing practical and appropriate public health action based on this science and causal reasoning.

Distribution:

Epidemiology is concerned with the **frequency** and **pattern** of health events in a population:

Frequency refers not only to the number of health events such as the number of cases of meningitis or diabetes in a population, but also to the relationship of that number to the size of the population. The resulting rate allows epidemiologists to compare disease occurrence across different populations.
Pattern refers to the occurrence of health-related events by time, place, and person. Time patterns may be annual, seasonal, weekly, daily, hourly, weekday versus weekend, or any other breakdown of time that may influence disease or injury occurrence. Place patterns include geographic variation, urban/rural differences, and location of work sites or schools. Personal characteristics include demographic factors which may be related to risk of illness, injury, or disability such as age, sex, marital status, and socioeconomic status, as well as behaviors and environmental exposures. Characterizing health events by time, place, and person are activities of **descriptive epidemiology**, discussed in more detail later in this lesson.

Determinants:
Epidemiology is also used to search for **determinants**, which are the causes and other factors that influence the occurrence of disease and other health-related events. Epidemiologists assume that illness does not occur randomly in a population, but happens only when the right accumulation of risk factors or determinants exists in an individual. To search for these determinants, epidemiologists use analytic epidemiology or epidemiologic studies to provide the "Why" and "How" of such events. They assess whether groups with different rates of disease differ in their demographic characteristics, genetic or immunologic make-up, behaviors, environmental exposures, or other so-called potential risk factors. Ideally, the findings provide sufficient evidence to direct prompt and effective public health control and prevention measures.

Health-related states or events:
Epidemiology was originally focused exclusively on epidemics of communicable diseases but was subsequently expanded to address endemic communicable diseases and non-communicable infectious diseases. By the middle of the 20th Century, additional epidemiologic methods had been developed and applied to chronic diseases, injuries, birth defects, maternal-child health, occupational health, and environmental health. Then epidemiologists began to look at behaviors related to health and well-being, such as amount of exercise and seat belt use. Now, with the recent explosion in molecular methods, epidemiologists can make important strides in examining genetic markers of disease risk. Indeed, the term healthrelated states or events may be seen as anything that affects the well-being of a population. Nonetheless, many epidemiologists still use the term "disease" as shorthand for the wide range of health-related states and events that are studied.

Specified populations:
Although epidemiologists and direct health-care providers (clinicians) are both concerned with occurrence and control of disease, they differ greatly in how they view "the patient." The clinician is concerned about the health of an individual; the epidemiologist is concerned about the collective health of the people in a community or population. In other words, the clinician's "patient" is the individual; the epidemiologist's "patient" is the community. Therefore, the clinician and the epidemiologist have different responsibilities when faced with a person with illness.

For example, when a patient with diarrheal disease presents, both are interested in establishing the correct diagnosis. However, while the clinician usually focuses on treating and caring for the individual, the epidemiologist focuses on identifying the exposure or source that caused the illness; the number of other persons who may have been similarly exposed; the potential for further spread in the community; and interventions to prevent additional cases or recurrences.

Application:

Epidemiology is not just "the study of" health in a population; it also involves applying the knowledge gained by the studies to community-based practice. Like the practice of medicine, the practice of epidemiology is both a science and an art. To make the proper diagnosis and prescribe appropriate treatment for a patient, the clinician combines medical (scientific) knowledge with experience, clinical judgment, and understanding of the patient.Similarly, the epidemiologist uses the scientific methods of descriptive and analytic epidemiology as well as experience, epidemiologic judgment, and understanding of local conditions in "diagnosing" the health of a community and proposing appropriate, practical, and acceptable public health interventions to control and prevent disease in the community.

Summary:

Epidemiology is the study (scientific, systematic, data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (patient is community, individuals viewed collectively), and the application of (since epidemiology is a discipline within public health) this study to the control of health problems.

Core Epidemiologic Functions

In the mid-1980s, five major tasks of epidemiology in public health practice were identified: **public health surveillance, fieldinvestigation, analytic studies, evaluation, and linkages.** A sixth task, **policy development**, was recently added. These tasks are described below.

Public health surveillance:

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of health data to help guide public health decision making and action. Surveillance is equivalent to monitoring the pulse of the community. The purpose of public health surveillance, which is sometimes called "information for action,"18 is to portray the ongoing patterns of disease occurrence and disease potential so that investigation, control, and prevention measures can be applied efficiently and effectively. This is accomplished through the systematic collection and evaluation of morbidity and mortality reports and other relevant health information, and the dissemination of these data and their interpretation to those involved in disease control and public health decision making.

Morbidity and mortality reports are common sources of surveillance data for local and state health departments. These reports generally are submitted by health-care providers, infection control practitioners, or laboratories that are required to notify the health department of any patient with a reportable disease such as pertussis,

meningococcal meningitis, or AIDS. Other sources of health-related data that are used for surveillance include reports from investigations of individual cases and disease clusters, public health program data such as immunization coverage in a community, disease registries, and health surveys.

Most often, surveillance relies on simple systems to collect a limited amount of information about each case. Although not every case of disease is reported, health officials regularly review the case reports they do receive and look for patterns among them. These practices have proven invaluable in detecting problems, evaluating programs, and guiding public health action.

While public health surveillance traditionally has focused on communicable diseases, surveillance systems now exist that target injuries, chronic diseases, genetic and birth defects, occupational and potentially environmentally-related diseases, and health behaviors. Since September 11, 2001, a variety of systems that rely on electronic reporting have been developed, including those that report daily emergency department visits, sales of over-the-counter medicines, and worker absenteeism.19,20 Because epidemiologists are likely to be called upon to design and use these and other new surveillance systems, an epidemiologist's core competencies must include design of data collection instruments, data management, descriptive methods and graphing, interpretation of data, andscientific writing and presentation.

Field investigation:

As noted above, surveillance provides information for action. One of the first actions that results from a surveillance case report or report of a cluster is investigation by the public health department.

The investigation may be as limited as a phone call to the healthcare provider to confirm or clarify the circumstances of the reported case, or it may involve a field investigation requiring the coordinated efforts of dozens of people to characterize the extent of an epidemic and to identify its cause.

The objectives of such investigations also vary. Investigations often lead to the identification of additional unreported or unrecognized ill persons who might otherwise continue to spread infection to others. For example, one of the hallmarks of investigations of persons with sexually transmitted disease is the identification of sexual partners or contacts of patients. When interviewed, many of these contacts are found to be infected without knowing it, and are given treatment they did not realize they needed. Identification and treatment of these contacts prevents further spread. For some diseases, investigations may identify a source or vehicle of infection that can be controlled or eliminated.

For example, the investigation of a case of *Escherichia coli* O157:H7 infection usually focuses on trying to identify the vehicle, often ground beef but sometimes something more unusual such as fruit juice. By identifying the vehicle, investigators may be able to determine how many other persons might have already been exposed and how many continue to be at risk. When a commercial product turns out to be the culprit, public announcements and recalling the product may prevent many additional cases.

Occasionally, the objective of an investigation may simply be to learn more about the natural history, clinical spectrum, descriptive epidemiology, and risk factors of the disease before determining what disease intervention methods might be appropriate. Early investigations of the epidemic of SARS in 2003 were needed to establish a case definition based on the clinical presentation, and to characterize the populations at risk by time, place, and person. As more was learned about the epidemiology of the disease and communicability of the virus, appropriate recommendations regarding isolation and quarantine were issued.

Field investigations of the type described above are sometimes referred to as "shoe leather epidemiology," conjuring up images of dedicated, if haggard, epidemiologists beating the pavement in search of additional cases and clues regarding source and mode of transmission. This approach is commemorated in the symbol of the Epidemic Intelligence Service (EIS), CDC's training program for disease detectives — a shoe with a hole in the sole.

Analytic studies:

Surveillance and field investigations are usually sufficient to identify causes, modes of transmission, and appropriate control and prevention measures. But sometimes analytic studies employing more rigorous methods are needed. Often the methods are used in combination — with surveillance and field investigations providing clues or hypotheses about causes and modes of transmission, and analytic studies evaluating the credibility of those hypotheses.

Clusters or outbreaks of disease frequently are investigated initially with descriptive epidemiology. The descriptive approach involves the study of disease incidence and distribution by time, place, and person. It includes the calculation of rates and identification of parts of the population at higher risk than others. Occasionally, when the association between exposure and disease is quite strong, the investigation may stop when descriptive epidemiology is complete and control measures may be implemented immediately.

John Snow's 1854 investigation of cholera is an example. More frequently, descriptive studies, like case investigations, generate hypotheses that can be tested with analytic studies. While some field investigations are conducted in response to acute health problems such as outbreaks, many others are planned studies.

The hallmark of an analytic epidemiologic study is the use of a valid comparison group. Epidemiologists must be skilled in all aspects of such studies, including design, conduct, analysis, interpretation, and communication of findings.

- **Design** includes determining the appropriate research strategy and study design, writing justifications and protocols, calculating sample sizes, deciding on criteria for subject selection (e.g., developing case definitions), choosing an appropriate comparison group, and designing questionnaires.
- **Conduct** involves securing appropriate clearances and approvals, adhering to appropriate ethical principles, abstracting records, tracking down and interviewing subjects, collecting and handling specimens, and managing the data.
- **Analysis** begins with describing the characteristics of the subjects. It progresses to calculation of rates, creation of comparative tables (e.g., two-by-two tables), and

computation of measures of association (e.g., risk ratios or odds ratios), tests of significance (e.g., chi-square test), confidence intervals, and the like. Many epidemiologic studies require more advanced analytic techniques such as stratified analysis, regression, and modeling.

• Finally, **interpretation** involves putting the study findings into perspective, identifying the key take-home messages, and making sound recommendations. Doing so requires that the epidemiologist be knowledgeable about the subject matter and the strengths and weaknesses of the study.

Evaluation

Epidemiologists, who are accustomed to using systematic and quantitative approaches, have come to play an important role in evaluation of public health services and other activities. Evaluation is the process of determining, as systematically and objectively as possible, the relevance, effectiveness, efficiency, and impact of activities with respect to established goals.22

• **Effectiveness** refers to the ability of a program to produce the intended or expected results in the field; effectiveness differs from **efficacy**, which is the ability to produce results under ideal conditions.

• **Efficiency** refers to the ability of the program to produce the intended results with a minimum expenditure of time and resources.

The evaluation itself may focus on plans (formative evaluation), operations (process evaluation), impact (summative evaluation), or outcomes — or any combination of these. Evaluation of an immunization program, for example, might assess the efficiency of the operations, the proportion of the target population immunized, and the apparent impact of the program on the incidence of vaccine-preventable diseases. Similarly, evaluation of a surveillance system might address operations and attributes of the system, its ability to detect cases or outbreaks, and its usefulness.

Linkages:

Epidemiologists working in public health settings rarely act in isolation. In fact, field epidemiology is often said to be a “team sport.” During an investigation an epidemiologist usually participates as either a member or the leader of a multidisciplinary team. Other team members may be laboratorians, sanitarians, infection control personnel, nurses or other clinical staff, and, increasingly, computer information specialists.

Many outbreaks cross geographical and jurisdictional lines, so co-investigators may be from local, state, or federal levels of government, academic institutions, clinical facilities, or the private sector. To promote current and future collaboration, the epidemiologists need to maintain relationships with staff of other agencies and institutions. Mechanisms for sustaining such linkages include official memoranda of understanding, sharing of published or on-line information for public health audiences and outside partners, and informal networking that takes place at professional meetings.

Policy development:

The definition of epidemiology ends with the following phrase: “...and the application of this study to the control of health problems.” While some academically minded

epidemiologists have stated that epidemiologists should stick to research and not get involved in policy development or even make recommendations, public health epidemiologists do not have this luxury. Indeed, epidemiologists who understand a problem and the population in which it occurs are often in a uniquely qualified position to recommend appropriate interventions. As a result, epidemiologists working in public health regularly provide input, testimony, and recommendations regarding disease control strategies, reportable disease regulations, and health-care policy.

The Epidemiologic Approach

As with all scientific endeavors, the practice of epidemiology relies on a systematic approach. In very simple terms, the epidemiologist:

- **Counts** cases or health events, and describes them in terms of time, place, and person;
- **Divides** the number of cases by an appropriate denominator to calculate rates; and
- **Compares** these rates over time or for different groups of people.

Before counting cases, however, the epidemiologist must decide what a case is. This is done by developing a case definition. Then, using this case definition, the epidemiologist finds and collects information about the case-patients. The epidemiologist then performs descriptive epidemiology by characterizing the cases collectively according to time, place, and person. To calculate the disease rate, the epidemiologist divides the number of cases by the size of the population. Finally, to determine whether this rate is greater than what one would normally expect, and if so to identify factors contributing to this increase, the epidemiologist compares the rate from this population to the rate in an appropriate comparison group, using analytic epidemiology techniques. These epidemiologic actions are described in more detail below. Subsequent tasks, such as reporting the results and recommending how they can be used for public health action, are just as important, but are beyond the scope of this lesson.

Defining a case:

Before counting cases, the epidemiologist must decide what to count, that is, what to call a case. For that, the epidemiologist uses a **case definition**. A case definition is a set of standard criteria for classifying whether a person has a particular disease, syndrome, or other health condition. Some case definitions, particularly those used for national surveillance, have been developed and adopted as national standards that ensure comparability. Use of an agreedupon standard case definition ensures that every case is equivalent, regardless of when or where it occurred, or who identified it.

Furthermore, the number of cases or rate of disease identified in one time or place can be compared with the number or rate from another time or place. For example, with a standard case definition, health officials could compare the number of cases of listeriosis that occurred in Forsyth County, North Carolina in 2000 with the number that occurred there in 1999. Or they could compare the rate of listeriosis in Forsyth County in 2000 with the national rate in that same year. When everyone uses the same standard case definition and a difference is observed, the difference is likely to be real rather than the result of variation in how cases are classified.

Components of a case definition for outbreak investigations:
A case definition consists of clinical criteria and, sometimes, limitations on time, place, and person. The clinical criteria usually include confirmatory laboratory tests, if available, or combinations of symptoms (subjective complaints), signs (objective physical findings), and other findings. Case definitions used during outbreak investigations are more likely to specify limits on time, place, and/or person than those used for surveillance. Contrast the case definition used for surveillance of listeriosis with the case definition used during an investigation of a listeriosis outbreak in North Carolina in 2000.
Both the national surveillance case definition and the outbreak case definition require a clinically compatible illness and laboratory confirmation of *Listeria monocytogenes*from a normally sterile site, but the outbreak case definition adds restrictions on time and place, reflecting the scope of the outbreak.

Many case definitions, such as that shown for listeriosis, require laboratory confirmation. This is not always necessary, however; in fact, some diseases have no distinctive laboratory findings.
Kawasaki syndrome, for example, is a childhood illness with fever and rash that has no known cause and no specifically distinctive laboratory findings. Notice that its case definition (see box below) is based on the presence of fever, at least four of five specified clinical findings, and the lack of a more reasonable explanation.

Criteria in case definitions:
A case definition may have several sets of criteria, depending on how certain the diagnosis is. For example, during an investigation of a possible case or outbreak of measles, a person with a fever and rash might be classified as having a suspected, probable, or confirmed case of measles, depending on what evidence of measles is present. A case might be classified as suspected or probable while waiting for the laboratory results to become available. Once the laboratory provides the report, the case can be reclassified as either confirmed or “not a case,” depending on the laboratory results. In the midst of a large outbreak of a disease caused by a known agent, some cases may be permanently classified as suspected or probable because officials may feel that running laboratory tests on every patient with a consistent clinical picture and a history of exposure (e.g., chickenpox) is unnecessary and even wasteful. Case definitions should not rely on laboratory culture results alone, since organisms are sometimes present without causing disease.

Modifying case definitions:
Case definitions can also change over time as more information is obtained. The first case definition for SARS, based on clinical symptoms and either contact with a case or travel to an area with SARS transmission, was published in CDC’s Morbidity and Mortality Weekly Report (MMWR) on March 21, 2003 (see box below). Two weeks later it was modified slightly. On March 29, after a novel coronavirus was determined to be the causative agent, an interim surveillance case definition was published that included laboratory criteria for evidence of infection with the SARSassociated coronavirus. By June, the case definition had changed several more times. In

anticipation of a new wave of cases in 2004, a revised and much more complex case definition was published in December 2003.

Variation in case definitions:
Case definitions may also vary according to the purpose for classifying the occurrences of a disease. For example, health officials need to know as soon as possible if anyone has symptoms of plague or anthrax so that they can begin planning what actions to take. For such rare but potentially severe communicable diseases, for which it is important to identify every possible case, health officials use a sensitive case definition. A sensitive case definition is one that is broad or "loose," in the hope of capturing most or all of the true cases. For example, the case definition for a suspected case of rubella (German measles) is "any generalized rash illness of acute onset." This definition is quite broad, and would include not only all cases of rubella, but also measles, chickenpox, and rashes due to other causes such as drug allergies. So while the advantage of a sensitive case definition is that it includes most or all of the true cases, the disadvantage is that it sometimes includes other illnesses as well.

On the other hand, an investigator studying the causes of a disease outbreak usually wants to be certain that any person included in a study really had the disease. That investigator will prefer a specific or "strict" case definition. For instance, in an outbreak of *Salmonella* Agona infection, the investigators would be more likely to identify the source of the infection if they included only persons who were confirmed to have been infected with that organism, rather than including anyone with acute diarrhea, because some persons may have had diarrhea from a different cause. In this setting, the only disadvantages of a strict case definition are the requirement that everyone with symptoms be tested and an underestimation of the total number of cases if some people with salmonellosis are not tested.

Using counts and rates:
As noted, one of the basic tasks in public health is identifying and counting cases. These counts, usually derived from case reports submitted by health-care workers and laboratories to the health department, allow public health officials to determine the extent and patterns of disease occurrence by time, place, and person. They may also indicate clusters or outbreaks of disease in the community. Counts are also valuable for health planning. For example, a health official might use counts (i.e., numbers) to plan how many infection control isolation units or doses of vaccine may be needed. However, simple counts do not provide all the information a health department needs. For some purposes, the counts must be put into context, based on the population in which they arose. Rates are measures that relate the numbers of cases during a certain period of time (usually per year) to the size of the population in which they occurred.

Descriptive Epidemiology
As noted earlier, every novice newspaper reporter is taught that a story is incomplete if it does not describe the what, who, where, when, and why/how of a situation, whether it be a space shuttle launch or a house fire. Epidemiologists strive for similar comprehensiveness in characterizing an epidemiologic event, whether it be a pandemic of influenza or a local increase in allterrain vehicle crashes. However,

epidemiologists tend to use synonyms for the five W's listed above: case definition, person, place, time, and causes/risk factors/modes of transmission.

Descriptive epidemiology covers **time**, **place**, and **person**. Compiling and analyzing data by time, place, and person is desirable for several reasons.

- First, by looking at the data carefully, the epidemiologist becomes very familiar with the data. He or she can see what the data can or cannot reveal based on the variables available, its limitations (for example, the number of records with missing information for each important variable), and its eccentricities (for example, all cases range in age from 2 months to 6 years, plus one 17-yearold.).
- Second, the epidemiologist learns the extent and pattern of the public health problem being investigated — which months, which neighborhoods, and which groups of people have the most and least cases.
- Third, the epidemiologist creates a detailed description of the health of a population that can be easily communicated with tables, graphs, and maps.
- Fourth, the epidemiologist can identify areas or groups within the population that have high rates of disease. This information in turn provides important clues to the causes of the disease, and these clues can be turned into testable hypotheses.

Time:

The occurrence of disease changes over time. Some of these changes occur regularly, while others are unpredictable. Two diseases that occur during the same season each year include influenza (winter) and West Nile virus infection (August–September). In contrast, diseases such as hepatitis B and salmonellosis can occur at any time. For diseases that occur seasonally, health officials can anticipate their occurrence and implement control and prevention measures, such as an influenza vaccination campaign or mosquito spraying. For diseases that occur sporadically, investigators can conduct studies to identify the causes and modes of spread, and then develop appropriately targeted actions to control or prevent further occurrence of the disease. In either situation, displaying the patterns of disease occurrence by time is critical for monitoring disease occurrence in the community and for assessing whether the public health interventions made a difference.

Day of week and time of day. For some conditions, displaying data by day of the week or time of day may be informative. Analysis at these shorter time periods is particularly appropriate for conditions related to occupational or environmental exposures that tend to occur at regularly scheduled intervals. Farm tractor fatalities are displayed by days of the week.32 Note that the number of farm tractor fatalities on Sundays was about half the number on the other days. The pattern of farm tractor injuries by hour, as displayed in Figure 1.8 peaked at 11:00 a.m., dipped at noon, and peaked again at 4:00 p.m. These patterns may suggest hypotheses and possible explanations that could be evaluated with further study. The hourly number of survivors and rescuers presenting to local hospitals in New York following the attack on the World Trade Center on September 11, 2001.

Epidemic period. To show the time course of a disease outbreak or epidemic, epidemiologists use a graph called an epidemic curve. As with the other graphs presented so far, an epidemic curve's y-axis shows the number of cases, while the x-axis shows time as either date of symptom onset or date of diagnosis. Depending on

the incubation period (the length of time between exposure and onset of symptoms) and routes of transmission, the scale on the x-axis can be as broad as weeks (for a very prolonged epidemic) or as narrow as minutes (e.g., for food poisoning by chemicals that cause symptoms within minutes). Conventionally, the data are displayed as a histogram (which is similar to a bar chart but has no gaps between adjacent columns). Sometimes each case is displayed as a square. The shape and other features of an epidemic curve can suggest hypotheses about the time and source of exposure, the mode of transmission, and the causative agent.

Place:

Describing the occurrence of disease by place provides insight into the geographic extent of the problem and its geographic variation. Characterization by place refers not only to place of residence but to any geographic location relevant to disease occurrence. Such locations include place of diagnosis or report, birthplace, site of employment, school district, hospital unit, or recent travel destinations. The unit may be as large as a continent or country or as small as a street address, hospital wing, or operating room.

Sometimes place refers not to a specific location at all but to a place category such as urban or rural, domestic or foreign, and institutional or noninstitutional.

Analyzing data by place can identify communities at increased risk of disease. Even if the data cannot reveal why these people have an increased risk, it can help generate hypotheses to test with additional studies. For example, is a community at increased risk because of characteristics of the people in the community such as genetic susceptibility, lack of immunity, risky behaviors, or exposure to local toxins or contaminated food? Can the increased risk, particularly of a communicable disease, be attributed to characteristics of the causative agent such as a particularly virulent strain, hospitable breeding sites, or availability of the vector that transmits the organism to humans? Or can the increased risk be attributed to the environment that brings the agent and the host together, such as crowding in urban areas that increases the risk of disease transmission from person to person, or more homes being built in wooded areas close to deer that carry ticks infected with the organism that causes Lyme disease

Person:

Because personal characteristics may affect illness, organization and analysis of data by “person” may use inherent characteristics of people (for example, age, sex, race), biologic characteristics (immune status), acquired characteristics (marital status), activities (occupation, leisure activities, use of medications/tobacco/drugs), or the conditions under which they live (socioeconomic status, access to medical care). Age and sex are included in almost all data sets and are the two most commonly analyzed “person” characteristics. However, depending on the disease and the data available, analyses of other person variables are usually necessary. Usually epidemiologists begin the analysis of person data by looking at each variable separately. Sometimes, two variables such as age and sex can be examined simultaneously. Person data are usually displayed in tables or graphs.

Age. Age is probably the single most important “person” attribute, because almost every health-related event varies with age. A number of factors that also vary with

age include: susceptibility, opportunity for exposure, latency or incubation period of the disease, and physiologic response (which affects, among other things, disease development). When analyzing data by age, epidemiologists try to use age groups that are narrow enough to detect any age-related patterns that may be present in the data. For some diseases, particularly chronic diseases, 10-year age groups may be adequate. For other diseases, 10-year and even 5-year age groups conceal important variations in disease occurrence by age. Consider the graph of pertussis occurrence by standard 5-year age groups.

Ethnic and racial groups. Sometimes epidemiologists are interested in analyzing person data by biologic, cultural or social groupings such as race, nationality, religion, or social groups such as tribes and other geographically or socially isolated groups. Differences in racial, ethnic, or other group variables may reflect differences in susceptibility or exposure, or differences in other factors that influence the risk of disease, such as socioeconomic status and access to health care. Infant mortality rates for 2002 are shown by race and Hispanic origin of the mother.

Socioeconomic status. Socioeconomic status is difficult to quantify. It is made up of many variables such as occupation, family income, educational achievement or census track, living conditions, and social standing. The variables that are easiest to measure may not accurately reflect the overall concept.
Nevertheless, epidemiologists commonly use occupation, family income, and educational achievement, while recognizing that these variables do not measure socioeconomic status precisely. The frequency of many adverse health conditions increases with decreasing socioeconomic status. For example, tuberculosis is more common among persons in lower socioeconomic strata. Infant mortality and time lost from work due to disability are both associated with lower income.

These patterns may reflect more harmful exposures, lower resistance, and less access to health care. Or they may in part reflect an interdependent relationship that is impossible to untangle: Does low socioeconomic status contribute to disability, or does disability contribute to lower socioeconomic status, or both? What accounts for the disproportionate prevalence of diabetes and asthma in lower socioeconomic areas? A few adverse health conditions occur more frequently among persons of higher socioeconomic status. Gout was known as the “disease of kings” because of its association with consumption of rich foods. Other conditions associated with higher socioeconomic status include breast cancer, Kawasaki syndrome, chronic fatigue syndrome, and tennis elbow. Differences in exposure account for at least some if not most of the differences in the frequency of these conditions.

Analytic Epidemiology

As noted earlier, descriptive epidemiology can identify patterns among cases and in populations by time, place and person. From these observations, epidemiologists develop hypotheses about the causes of these patterns and about the factors that increase risk of disease. In other words, epidemiologists can use descriptive epidemiology to generate hypotheses, but only rarely to test those hypotheses. For that, epidemiologists must turn to analytic epidemiology.

The key feature of analytic epidemiology is a comparison group. Consider a large outbreak of hepatitis A that occurred in Pennsylvania in 2003.38 Investigators found almost all of the casepatients had eaten at a particular restaurant during the 2–6 weeks (i.e., the typical incubation period for hepatitis A) before onset of illness. While the investigators were able to narrow down their hypotheses to the restaurant and were able to exclude the food preparers and servers as the source, they did not know which particular food may have been contaminated. The investigators asked the case-patients which restaurant foods they had eaten, but that only indicated which foods were popular.

The investigators, therefore, also enrolled and interviewed a comparison or control group — a group of persons who had eaten at the restaurant during the same period but who did not get sick. Of 133 items on the restaurant's menu, the most striking difference between the case and control groups was in the proportion that ate salsa (94% of case-patients ate, compared with 39% of controls). Further investigation of the ingredients in the salsa implicated green onions as the source of infection. Shortly thereafter, the Food and Drug Administration issued an advisory to the public about green onions and risk of hepatitis A. This action was in direct response to the convincing results of the analytic epidemiology, which compared the exposure history of case-patients with that of an appropriate comparison group. When investigators find that persons with a particular characteristic are more likely than those without the characteristic to contract a disease, the characteristic is said to be associated with the disease. The characteristic may be a:

- Demographic factor such as age, race, or sex;
- Constitutional factor such as blood group or immune status;
- Behavior or act such as smoking or having eaten salsa; or
- Circumstance such as living near a toxic waste site.

Identifying factors associated with disease help health officials appropriately target public health prevention and control activities. It also guides additional research into the causes of disease.

Thus, analytic epidemiology is concerned with the search for causes and effects, or the why and the how. Epidemiologists use analytic epidemiology to quantify the association between exposures and outcomes and to test hypotheses about causal relationships. It has been said that epidemiology by itself can never prove that a particular exposure caused a particular outcome. Often, however, epidemiology provides sufficient evidence to take appropriate control and prevention measures.

Epidemiologic studies fall into two categories: **experimental** and **observational**.

Experimental studies:

In an experimental study, the investigator determines through a controlled process the exposure for each individual (clinical trial) or community (community trial), and then tracks the individuals or communities over time to detect the effects of the exposure. For example, in a clinical trial of a new vaccine, the investigator may randomly assign some of the participants to receive the new vaccine, while others receive a placebo shot. The investigator then tracks all participants, observes who gets the disease that the new vaccine is intended to prevent, and compares the two groups (new vaccine vs. placebo) to see whether the vaccine group has a lower rate of disease. Similarly, in a trial to prevent onset of diabete among high-risk individuals,

investigators randomly assigned enrollees to one of three groups — placebo, an anti-diabetes drug, or lifestyle intervention. At the end of the follow-up period, investigators found the lowest incidence of diabetes in the lifestyle intervention group, the next lowest in the anti-diabetic drug group, and the highest in the placebo group.

Observational studies:
In an observational study, the epidemiologist simply observes the exposure and disease status of each study participant. John Snow's studies of cholera in London were observational studies. The two most common types of observational studies are cohort studies and case-control studies; a third type is cross-sectional studies.

Cohort study. A cohort study is similar in concept to the experimental study. In a cohort study the epidemiologist records whether each study participant is exposed or not, and then tracks the participants to see if they develop the disease of interest. Note that this differs from an experimental study because, in a cohort study, the investigator observes rather than determines the participants' exposure status. After a period of time, the investigator compares the disease rate in the exposed group with
the disease rate in the unexposed group. The unexposed group serves as the comparison group, providing an estimate of the baseline or expected amount of disease occurrence in the community. If the disease rate is substantively different in the exposed group compared to the unexposed group, the exposure is said to be associated with illness.

The length of follow-up varies considerably. In an attempt to respond quickly to a public health concern such as an outbreak, public health departments tend to conduct relatively brief studies.
On the other hand, research and academic organizations are more likely to conduct studies of cancer, cardiovascular disease, and other chronic diseases which may last for years and even decades.
The Framingham study is a well-known cohort study that has followed over 5,000 residents of Framingham, Massachusetts, since the early 1950s to establish the rates and risk factors for heart disease. The Nurses Health Study and the Nurses Health Study II are cohort studies established in 1976 and 1989, respectively, that have followed over 100,000 nurses each and have provided useful information on oral contraceptives, diet, and lifestyle risk factors. These studies are sometimes called **follow-up** or **prospective** cohort studies, because participants are enrolled as the study beginsand are then followed prospectively over time to identifyoccurrence of the outcomes of interest.

An alternative type of cohort study is a **retrospective** cohort study. In this type of study both the exposure and the outcomes have already occurred. Just as in a prospective cohort study, the investigator calculates and compares rates of disease in the exposed and unexposed groups. Retrospective cohort studies are commonly used in investigations of disease in groups of easily identified people such as workers at a particular factory or attendees at a wedding. For example, a retrospective cohort study was used to determine the source of infection of cyclosporiasis, a parasitic disease that caused an outbreak among members of a residential facility in

Pennsylvania in 2004. The investigation indicated that consumption of snow peas was implicated as the vehicle of the cyclosporiasis outbreak.

Case-control study. In a case-control study, investigators start by enrolling a group of people with disease (at CDC such persons are called case-patients rather than cases, because case refers to occurrence of disease, not a person). As a comparison group, the investigator then enrolls a group of people without disease (controls). Investigators then compare previous exposures between the two groups. The control group provides an estimate of the baseline or expected amount of exposure in that population. If the amount of exposure among the case group is substantially higher than the amount you would expect based on the control group, then illness is said to be associated with that exposure.

The study of hepatitis A traced to green onions, described above, is an example of a case-control study. The key in a case-control study is to identify an appropriate control group, comparable to the case group in most respects, in order to provide a reasonable estimate of the baseline or expected exposure.

Cross-sectional study. In this third type of observational study, a sample of persons from a population is enrolled and their exposures and health outcomes are measured simultaneously. The cross-sectional study tends to assess the presence (prevalence) of the health outcome at that point of time without regard to duration. For example, in a cross-sectional study of diabetes, some of the enrollees with diabetes may have lived with their diabetes for many years, while others may have been recently diagnosed. From an analytic viewpoint the cross-sectional study is weaker than either a cohort or a case-control study because a crosssectional study usually cannot disentangle risk factors for occurrence of disease (incidence) from risk factors for survival with the disease. On the other hand, a cross-sectional study is a perfectly fine tool for descriptive epidemiology purposes. Crosssectional studies are used routinely to document the prevalence in a community of health behaviors (prevalence of smoking), health states (prevalence of vaccination against measles), and health outcomes, particularly chronic conditions (hypertension, diabetes).

In summary, the purpose of an analytic study in epidemiology is to identify and quantify the relationship between an exposure and a health outcome. The hallmark of such a study is the presence of at least two groups, one of which serves as a comparison group. In an experimental study, the investigator determines the exposure for the study subjects; in an observational study, the subjects are exposed under more natural conditions. In an observational cohort study, subjects are enrolled or grouped on the basis of their exposure, then are followed to document occurrence of disease. Differences in disease rates between the exposed and unexposed groups lead investigators to conclude that exposure is associated with disease. In an observational case-control study, subjects are enrolled according to whether they have the disease or not, then are questioned or tested to determine their prior exposure. Differences in exposure prevalence between the case and control groups allow investigators to conclude that the exposure is associated with the disease. Cross-sectional studies measure exposure and disease status at the same time, and are better suited to descriptive epidemiology than causation.

Concepts of Disease Occurrence

A critical premise of epidemiology is that disease and other healthevents do not occur randomly in a population, but are more likelyto occur in some members of the population than others because ofrisk factors that may not be distributed randomly in the population.As noted earlier, one important use of epidemiology is to identifythe factors that place some members at greater risk than others.

Causation:

A number of models of disease causation have been proposed. Among the simplest of these is the epidemiologic triad or triangle, the traditional model for infectious disease. The triad consists of an external **agent**, a susceptible **host**, and an **environment** that brings the host and agent together. In this model, disease results from the interaction between the agent and the susceptible host in an environment that supports transmission of the agent from a source to that host. Two ways of depicting this model are shown in Agent, host, and environmental factors interrelate in a variety of complex ways to produce disease. Different diseases require different balances and interactions of these three components. Development of appropriate, practical, and effective public health measures to control or prevent disease usually requires assessment of all three components and their interactions.

Agent originally referred to an infectious microorganism or pathogen: a virus, bacterium, parasite, or other microbe. Generally, the agent must be present for disease to occur; however, presence of that agent alone is not always sufficient to cause disease. A variety of factors influence whether exposure to an organism will result in disease, including the organism's pathogenicity (ability to cause disease) and dose. Over time, the concept of agent has been broadened to include chemical and physical causes of disease or injury. These include chemical contaminants (such as the L-tryptophan contaminant responsible for eosinophilia-myalgia syndrome), as well as physical forces (such as repetitive mechanical forces associated with carpal tunnel syndrome). While the epidemiologic triad serves as a useful model for many diseases, it has proven inadequate for cardiovascular disease, cancer, and other diseases that appear to have multiple contributing causes without a single necessary one.

Host refers to the human who can get the disease. A variety of factors intrinsic to the host, sometimes called risk factors, can influence an individual's exposure, susceptibility, or response to a causative agent. Opportunities for exposure are often influenced by behaviors such as sexual practices, hygiene, and other personal choices as well as by age and sex. Susceptibility and response to an agent are influenced by factors such as genetic composition, nutritional and immunologic status, anatomic structure, presence of disease or medications, and psychological makeup.

Environment refers to extrinsic factors that affect the agent and the opportunity for exposure. Environmental factors include physical factors such as geology and climate, biologic factors such as insects that transmit the agent, and socioeconomic factors such as crowding, sanitation, and the availability of health services.

Component causes and causal pies:

Because the agent-host-environment model did not work well for many non-infectious diseases, several other models that attempt to account for the multifactorial nature of causation have been proposed. One such model was proposed by Rothman in 1976, and has come to be known as the Causal Pies. An individual factor that contributes to cause disease is shown as a piece of a pie. After all the pieces of a pie fall into place, the pie is complete — and disease occurs. The individual factors are called **component causes**. The complete pie, which might be considered a causal pathway, is called a **sufficientcause**. A disease may have more than one sufficient cause, with each sufficient cause being composed of several component causes that may or may not overlap. A component that appears in every pie or pathway is called a **necessary cause***,* because without it, disease does not occur.

The component causes may include intrinsic host factors as well as the agent and the environmental factors of the agent-hostenvironment triad. A single component cause is rarely a sufficient cause by itself. For example, even exposure to a highly infectious agent such as measles virus does not invariably result in measles disease. Host susceptibility and other host factors also may play a role. At the other extreme, an agent that is usually harmless in healthy persons may cause devastating disease under different conditions.

*Pneumocystis carinii*is an organism that harmlessly colonizes the respiratory tract of some healthy persons, but can cause potentially lethal pneumonia in persons whose immune systems have been weakened by human immunodeficiency virus (HIV). Presence of *Pneumocystis carinii*organisms is therefore a necessary but not sufficient cause of pneumocystis pneumonia. As the model indicates, a particular disease may result from a variety of different sufficient causes or pathways. For example, lung cancer may result from a sufficient cause that includes smoking as a component cause. Smoking is not a sufficient cause by itself, however, because not all smokers develop lung cancer.

Neither is smoking a necessary cause, because a small fraction of lung cancer victims have never smoked. Suppose Component Cause B is smoking and Component Cause C is asbestos. Sufficient Cause I includes both smoking (B) and asbestos (C). Sufficient Cause II includes asbestos without smoking, and Sufficient Cause C includes smoking without asbestos. But because lung cancer can develop in persons who have never been exposed to either smoking or asbestos, a proper model for lung cancer would have to show at least one more Sufficient Cause Pie that does not include either component B or component C.

Note that public health action does not depend on the identification of every component cause. Disease prevention can be accomplished by blocking any single component of a sufficient cause, at least through that pathway. For example, elimination of smoking (component B) would prevent lung cancer from sufficient causes I and II, although some lung cancer would still occur through sufficient cause III.

Natural History and Spectrum of Disease

Natural history of disease refers to the progression of a disease process in an individual over time, in the absence of treatment. For example, untreated infection with HIV causes a spectrum of clinical problems beginning at the time of seroconversion (primary HIV) and terminating with AIDS and usually death. It is now recognized that it may take 10 years or more for AIDS to develop after seroconversion.43 Many, if not most, diseases have a characteristic natural history, although the time frame and specific manifestations of disease may vary from individual to individual and are influenced by preventive and therapeutic measures.

The process begins with the appropriate exposure to or accumulation of factors sufficient for the disease process to begin in a susceptible host. For an infectious disease, the exposure is a microorganism. For cancer, the exposure may be a factor that initiates the process, such as asbestos fibers or components in tobacco smoke (for lung cancer), or one that promotes the process, such as estrogen (for endometrial cancer). After the disease process has been triggered, pathological changes then occur without the individual being aware of them. This stage of subclinical disease, extending from the time of exposure to onset of disease symptoms, is usually called the **incubation period** for infectious diseases, and the **latency period** for chronic diseases. During this stage, disease is said to be asymptomatic (no symptoms) or inapparent. This period may be as brief as seconds for hypersensitivity and toxic reactions to as long as decades for certain chronic diseases. Even for a single disease, the characteristic incubation period has a range. For example, the typical incubation period for hepatitis A is as long as 7 weeks. The latency period for leukemia to become evident among survivors of the atomic bomb blast in Hiroshima ranged from 2 to 12 years, peaking at 6-7 years.44 Incubation periods of selected exposures and diseases varying from minutes to decades are displayed in

Although disease is not apparent during the incubation period, some pathologic changes may be detectable with laboratory, radiographic, or other screening methods. Most screening programs attempt to identify the disease process during this phase of its natural history, since intervention at this early stage is likely to be more effective than treatment given after the disease has progressed and become symptomatic. The onset of symptoms marks the transition from subclinical to clinical disease. Most diagnoses are made during the stage of clinical disease. In some people, however, the disease process may never progress to clinically apparent illness. In others, the disease process may result in illness that ranges from mild to severe or fatal. This range is called the **spectrum of disease**. Ultimately, the disease process ends either in recovery, disability or death.

For an infectious agent, **infectivity** refers to the proportion of exposed persons who become infected. **Pathogenicity** refers to the proportion of infected individuals who develop clinically apparent disease. **Virulence** refers to the proportion of clinically apparent cases that are severe or fatal. Because the spectrum of disease can include asymptomatic and mild cases, the cases of illness diagnosed by clinicians in the community often represent only the tip of the iceberg. Many additional cases may be too early to diagnose or may never progress to the clinical stage. Unfortunately, persons with inapparent or undiagnosed infections may nonetheless be able to transmit infection to others. Such persons who are infectious but have subclinical

disease are called **carriers**. Frequently, carriers are persons with incubating disease or inapparent infection. Persons with measles, hepatitis A, and several other diseases become infectious a few days before the onset of symptoms. However carriers may also be persons who appear to have recovered from their clinical illness but remain infectious, such as chronic carriers of hepatitis B virus, or persons who never exhibited symptoms. The challenge to public health workers is that these carriers, unaware that they are infected and infectious to others, are sometimes more likely to unwittingly spread infection than are people with obvious illness.

Chain of Infection

As described above, the traditional epidemiologic triad model holds that infectious diseases result from the interaction of agent, host, and environment. More specifically, transmission occurs when the agent leaves its **reservoir** or host through a **portal ofexit**, is conveyed by some **mode of transmission**, and enters through an appropriate **portal of entry** to infect a **susceptiblehost**. This sequence is sometimes called the chain of infection.

Portal of exit:

Portal of exit is the path by which a pathogen leaves its host. The portal of exit usually corresponds to the site where the pathogen is localized. For example, influenza viruses and *Mycobacteriumtuberculosis* exit the respiratory tract, schistosomes through urine, cholera vibrios in feces, *Sarcoptesscabiei*in scabies skin lesions, and enterovirus 70, a cause of hemorrhagic conjunctivitis, in conjunctival secretions. Some bloodborne agents can exit by crossing the placenta from mother to fetus (rubella, syphilis, toxoplasmosis), while others exit through cuts or needles in the skin (hepatitis B) or blood-sucking arthropods (malaria).

Modes of transmission:

An infectious agent may be transmitted from its natural reservoir to a susceptible host in different ways. There are different classifications for modes of transmission. Here is one classification:

- Direct (Direct contact and Droplet spread)
- Indirect (Airborne and VehicleborneVectorborne (mechanical or biologic))

In **direct transmission**, an infectious agent is transferred from a reservoir to a susceptible host by direct contact or droplet spread.

Direct contact occurs through skin-to-skin contact, kissing, and sexual intercourse. Direct contact also refers to contact with soil or vegetation harboring infectious organisms. Thus, infectious mononucleosis (“kissing disease”) and gonorrhea are spread from person to person by direct contact. Hookworm is spread by direct contact with contaminated soil.

Droplet spread *r*efers to spray with relatively large, short-range aerosols produced by sneezing, coughing, or even talking. Droplet spread is classified as direct because transmission is by direct spray over a few feet, before the droplets fall to the ground. Pertussis and meningococcal infection are examples of diseases transmitted from an infectious patient to a susceptible host by droplet spread.

Indirect transmission refers to the transfer of an infectious agent from a reservoir to a host by suspended air particles, inanimate objects (vehicles), or animate intermediaries (vectors).

Airborne transmission occurs when infectious agents are carried by dust or droplet nuclei suspended in air. Airborne dust includes material that has settled on surfaces and become resuspended by air currents as well as infectious particles blown from the soil by the wind. Droplet nuclei are dried residue of less than 5 microns in size. In contrast to droplets that fall to the ground within a few feet, droplet nuclei may remain suspended in the air for long periods of time and may be blown over great distances. Measles, for example, has occurred in children who came into a physician's office after a child with measles had left, because the measles virus remained suspended in the air.

Vehicles that may indirectly transmit an infectious agent include food, water, biologic products (blood), and fomites (inanimate objects such as handkerchiefs, bedding, or surgical scalpels). A vehicle may passively carry a pathogen — as food or water may carry hepatitis A virus. Alternatively, the vehicle may provide an environment in which the agent grows, multiplies, or produces toxin — as improperly canned foods provide an environment that supports production of botulinum toxin by *Clostridiumbotulinum*.

Vectors such as mosquitoes, fleas, and ticks may carry an infectious agent through purely mechanical means or may support growth or changes in the agent. Examples of mechanical transmission are flies carrying *Shigella*on their appendages and fleas carrying *Yersinia pestis*, the causative agent of plague, in their gut. In contrast, in biologic transmission, the causative agent of malaria or guinea worm disease undergoes maturation in an intermediate host before it can be transmitted to humans.

Portal of entry:

The portal of entry refers to the manner in which a pathogen enters a susceptible host. The portal of entry must provide access to tissues in which the pathogen can multiply or a toxin can act. Often, infectious agents use the same portal to enter a new host that they used to exit the source host. For example, influenza virus exits the respiratory tract of the source host and enters the respiratory tract of the new host. In contrast, many pathogens that cause gastroenteritis follow a so-called "fecal-oral" route because they exit the source host in feces, are carried on inadequately washed hands to a vehicle such as food, water, or utensil, and enter a new host through the mouth. Other portals of entry include the skin (hookworm), mucous membranes (syphilis), and blood (hepatitis B, human immunodeficiency virus).

Host:

The final link in the chain of infection is a susceptible host. Susceptibility of a host depends on genetic or constitutional factors, specific immunity, and nonspecific factors that affect an individual's ability to resist infection or to limit pathogenicity. An individual's genetic makeup may either increase or decrease susceptibility. For example, persons with sickle cell trait seem to be at least partially protected from a particular type of malaria. Specific immunity refers to protective antibodies that are directed against a specific agent. Such antibodies may develop in responsemto infection, vaccine, or toxoid (toxin that has been deactivated but retains its capacity to stimulate production of toxin antibodies) or may be acquired by transplacental

transfer from mother to fetus or by injection of antitoxin or immune globulin. Nonspecific factors that defend against infection include the skin, mucous membranes, gastric acidity, cilia in the respiratory tract, the cough reflex, and nonspecific immune response. Factors that may increase susceptibility to infection by disrupting host defenses include malnutrition, alcoholism, and disease or therapy that impairs the nonspecific immune response.

Implications for public health:

Knowledge of the portals of exit and entry and modes of transmission provides a basis for determining appropriate control measures. In general, control measures are usually directed against the segment in the infection chain that is most susceptible to intervention, unless practical issues dictate otherwise.

For some diseases, the most appropriate intervention may be directed at controlling or eliminating the agent at its source. A patient sick with a communicable disease may be treated with antibiotics to eliminate the infection. An asymptomatic but infected person may be treated both to clear the infection and to reduce the risk of transmission to others. In the community, soil may be decontaminated or covered to prevent escape of the agent.

Some interventions are directed at the mode of transmission:

Interruption of direct transmission may be accomplished by isolation of someone with infection, or counseling persons to avoid the specific type of contact associated with transmission. Vehicleborne transmission may be interrupted by elimination or decontamination of the vehicle. To prevent fecal-oral transmission, efforts often focus on rearranging the environment to reduce the risk of contamination in the future and on changing behaviors, such as promoting handwashing. For airborne diseases, strategies may be directed at modifying ventilation or air pressure, and filtering or treating the air. To interrupt vectorborne transmission, measures may be directed toward controlling the vector population, such as spraying to reduce the mosquito population.

Some strategies that protect portals of entry are simple and effective. For example, bed nets are used to protect sleeping persons from being bitten by mosquitoes that may transmit malaria. A dentist's mask and gloves are intended to protect the dentist from a patient's blood, secretions, and droplets, as well to protect the patient from the dentist. Wearing of long pants and sleeves and use of insect repellent are recommended to reduce the risk of Lyme disease and West Nile virus infection, which are transmitted by the bite of ticks and mosquitoes, respectively.

Some interventions aim to increase a host's defenses. Vaccinations promote development of specific antibodies that protect against infection. On the other hand, prophylactic use of antimalarial drugs, recommended for visitors to malaria-endemic areas, does not prevent exposure through mosquito bites, but does prevent infection from taking root.

Finally, some interventions attempt to prevent a pathogen from encountering a susceptible host. The concept of **herd immunity** suggests that if a high enough proportion of individuals in a population are resistant to an agent, then those few who are susceptible will be protected by the resistant majority, since the pathogen

will be unlikely to "find" those few susceptible individuals. The degree of herd immunity necessary to prevent or interrupt an outbreak varies by disease. In theory, herd immunity means that not everyone in a community needs to be resistant (immune) to prevent disease spread and occurrence of an outbreak. In practice, herd immunity has not prevented outbreaks of measles and rubella in populations with immunization levels as high as 85% to 90%. One problem is that, in highly immunized populations, the relatively few susceptible persons are often clustered in subgroups defined by socioeconomic or cultural factors. If the pathogen is introduced into one of these subgroups, an outbreak may occur.

Epidemic Disease Occurrence

Level of disease

The amount of a particular disease that is usually present in a community is referred to as the baseline or **endemic** level of the disease. This level is not necessarily the desired level, which may in fact be zero, but rather is the observed level. In the absence of intervention and assuming that the level is not high enough to deplete the pool of susceptible persons, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease. While some diseases are so rare in a given population that a single case warrants an epidemiologic investigation (e.g., rabies, plague, polio), other diseases occur more commonly so that only deviations from the norm warrant investigation.

Sporadic refers to a disease that occurs infrequently and irregularly.

Endemic refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area.

Hyperendemicrefers to persistent, high levels of disease occurrence. Occasionally, the amount of disease in a community rises above the expected level.

Epidemic refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.

Outbreak carries the same definition of epidemic, but is often used for a more limited geographic area. **Cluster** refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.

Pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. More specifically, an epidemic may result from:

- A recent increase in amount or virulence of the agent,
- The recent introduction of the agent into a setting where it has not been before,
- An enhanced mode of transmission so that more susceptible persons are exposed,
- A change in the susceptibility of the host response to the agent, and/or
- Factors that increase host exposure or involve introduction through new portals of entry.

The previous description of epidemics presumes only infectious agents, but non-infectious diseases such as diabetes and obesity exist in epidemic proportion.

Epidemic Patterns:

Epidemics can be classified according to their manner of spread through a population:

• Common-source
• Point
• Continuous
• Intermittent
• Propagated
• Mixed
• Other

A **common-source outbreak** is one in which a group of persons are all exposed to an infectious agent or a toxin from the same source. If the group is exposed over a relatively brief period, so that everyone who becomes ill does so within one incubation period, then the common-source outbreak is further classified as a **pointsourceoutbreak**. The epidemic of leukemia cases in Hiroshima following the atomic bomb blast and the epidemic of hepatitis A among patrons of the Pennsylvania restaurant who ate green onions each had a point source of exposure.38, 44 If the number of cases during an epidemic were plotted over time, the resulting graph, called an epidemic curve, would typically have a steep upslope and a more gradual downslope (a so-called “log-normal distribution”).

GLOSSARY

Active immunity see immunity, active.
active surveillance see surveillance, active.
age-adjusted mortality rate see mortality rate, age-adjusted.
agenta factor (e.g., a microorganism or chemical substance) or form of energy whose presence, excessive presence, or in the case of deficiency diseases, relative absence is essential for the occurrence of a disease or other adverse health outcome.
age-specific mortality rate see mortality rate, age-specific.
alternative hypothesis see hypothesis, alternative.
analytic epidemiology see epidemiology, analytic.
analytic study see study, analytic.
antibodyany of a variety of proteins in the blood that are produced in response to an antigen as an immune response.
antigenany substance (e.g., a toxin or the surface of a microorganism or transplanted organ) recognized as foreign by the human body and that stimulates the production of antibodies.
applied epidemiology see epidemiology, applied.
arbovirusany of a group of viruses that are transmitted between hosts by mosquitoes, ticks, and other arthropods.
arithmetic mean see mean, arithmetic.
arithmetic-scale line graph see line graph, arithmetic-scale.
arthropodan organism that has jointed appendages and segmented external skeleton (e.g., flies, mosquitoes, ticks, or mites).
associationthe statistical relation between two or more events, characteristics, or other variables.
asymmetricala type of distribution where the shape to the right and left of the central location is not the same. Often referred to as a skewed distribution; the mean, median, and mode of an asymmetrical distribution are not the same.
asymptomaticwithout symptoms.

attack rate a form of incidence that measures the proportion of persons in a population who experience an acute health event during a limited period (e.g., during an outbreak), calculated as the number of new cases of a health problem during an outbreak divided by the size of the population at the beginning of the period, usually expressed as a percentage or per 1,000 or 100,000 population (see also **incidence proportion**).
attack rate, secondary a measure of the frequency of new cases of a disease among the contacts of known patients.
attributable proportion see**proportion, attributable**.
attributable risk percent see **proportion, attributable**.
attributea risk factor that is an intrinsic characteristic of the individual person, animal, plant, or other type of organism under study (e.g., genetic susceptibility, age, sex, breed, weight).
axisone of the dimensions of a graph in a rectangular graph, the x-axis is the horizontal axis, and the y-axis is the vertical axis.

Bar chart a visual display in which each category of a variable is represented by a bar or column bar charts are used to illustrate variations in size among categories.
bar chart, 100% component a stacked bar chart in which all bars or columns are the same length, and the measured axis represents 0%–100%.
bar chart, deviation a bar chart displaying either positive or negative differences from a baseline.
bar chart, grouped a bar chart displaying quantities of two variables, represented by adjoining bars or columns (i.e., a group) of categories of one variable, separated by space between groups.
bar chart, stacked a bar chart displaying quantities of two variables, represented by subdivided bars or columns (the subdivisions representing the categories of one variable) separated by space between bars or columns.
biasa systematic deviation of results or inferences from the truth or processes leading to such systematic deviation; any systematic tendency in the collection, analysis, interpretation,
publication, or review of data that can lead to conclusions that are systematically different from the truth. In epidemiology, does not imply intentional deviation.
bias, information systematic difference in the collection of data regarding the participants in a study (e.g., about exposures in a case-control study, or about health outcomes in a cohort study) that leads to an incorrect result (e.g., risk ratio or odds ratio) or inference.
bias, selection systematic difference in the enrollment of participants in a study that leads to an incorrect result (e.g., risk ratio or odds ratio) or inference.
bimodalhaving two data peaks.
biologic transmission see **transmission, biologic**.
birth cohort see **cohort, birth**.
birth rate, crude the number of live births during a specified period divided by the mid-period population, usually expressed per 1,000 population.
box plot a visual display that summarizes data by using a "box and whiskers" format to indicate the minimum and maximum values (ends of the whiskers), interquartile range (length of the box), and median (line through the box).

Carrier a person or animal that harbors the infectious agent for a disease and can transmit it toothers, but does not demonstrate signs of the disease. A carrier can be asymptomatic (neverindicate signs of the disease) or can display signs of the disease only during the incubationperiod, convalescence, or postconvalescence. The period of being a carrier can be short (atransient carrier) or long (a chronic carrier).
casean instance of a particular disease, injury, or other health conditions that meets selected criteria (see also **case definition**). Using the term to describe the person rather than the health condition is discouraged (see also **case-patient**).
case-control study see **study, case-control**.
case definition a set of uniformly applied criteria for determining whether a person should be identified as having a particular disease, injury, or other health condition. In epidemiology, particularly for an outbreak investigation, a case definition specifies clinical criteria and details of time, place, and person.
case-fatality rate (also called **case-fatality ratio)** the proportion of persons with a particular condition (e.g., patients) who die from that condition. The denominator is the number of persons with the condition; the numerator is the number of cause-specific deaths among those persons.
case, index the first case or instance of a patient coming to the attention of health authorities.
case-patientin a case-control study, a person who has the disease, injury, or other health condition that meets the case definition (see also **case**).
case, source the case or instance of a patient responsible for transmitting infection to others; the instance of a patient who gives rise to an outbreak or epidemic.
cause, component a factor that contributes to a sufficient cause (see **cause, sufficient**).
cause of disease a factor (e.g., characteristic, behavior, or event) that directly influences the occurrence of a disease. Reducing such a factor among a population should reduce occurrence of the disease.
cause, necessary a factor that must be present for a disease or other health problem to occur.
cause-specific mortality rate see **mortality rate, cause-specific**.
cause, sufficient a factor or collection of factors whose presence is always followed by the occurrence of a particular health problem.
census the enumeration of an entire population, usually including details on residence, age, sex, occupation, racial/ethnic group, marital status, birth history, and relationship to the head of household.
central location (also called **central tendency)** a statistical measurement to quantify the middle or the center of a distribution. Of the multiple ways to define central tendency, the most common are the mean, median, and mode.
chain of infection the progression of an infectious agent that leaves its reservoir or host through a portal of exit, is conveyed by a mode of transmission, and then enters through an appropriate portal of entry to infect a susceptible host.
"chartjunk" unnecessary or confusing visual elements in charts, illustrations, or graphs. The term was first used by Edward Tufte in his book, *The Visual Display of Quantitative Information* (1983).
class interval the span of values of a continuous variable that are grouped into a single category (see **class**), usually to create a frequency distribution for that variable.
class limits the values at the upper and lower ends of a class interval.

clinical criteria the medical features (e.g., symptoms, medical examination findings, and laboratory results) that are used in a case definition.
clinical disease a disease that has been manifested by its symptoms and features.
clinical trial see **trial, clinical**.
cluster an aggregation of cases of a disease, injury, or other health condition (particularly cancer and birth defects) in a circumscribed area during a particular period without regard to whether the number of cases is more than expected (often the expected number is not known).
cohorta well-defined group of persons who have had a common experience or exposure and are then followed up, as in a cohort study or prospective study, to determine the incidence of new diseases or health events.
cohort, birth a group of persons born during a particular period or year.
cohort study see **study, cohort**.
common-source outbreak see **outbreak, common-source**.
community immunity see **immunity, herd**.
community trial see **trial, community**.
comparison group a group in an analytic study (e.g., a cohort or case-control study) with whom the primary group of interest (exposed group in a cohort study or case-patients in a case-control study) is compared. The comparison group provides an estimate of the background or expected incidence of disease (in a cohort study) or exposure (in a case-control study).
confidence interval a range of values for a measure (e.g., rate or odds ratio) constructed so that the range has a specified probability (often, but not necessarily, 95%) of including the true value of the measure.
confidence limits the end points (i.e., the minimum and maximum values) of a confidence.
confoundingthe distortion of the association between an exposure and a health outcome by a third variable that is related to both.
contactexposure to a source of an infection; a person who has been exposed.
contact, direct exposure or transmission of an agent from a source to a susceptible host through touching (e.g., from a human host by kissing, sexual intercourse, or skin-to-skin contact) or from touching an infected animal or contaminated soil or vegetation.
contagiouscapable of being transmitted from one person to another by contact or close
proximity.
contingency table a two-variable table of cross-tabulated data.
continuous variable see **variable, continuous**.
controlin a case-control study, a member of the group of persons without the health problem under study (see also **comparison group** and **study, case-control**).
crudewhen referring to a rate, an overall or summary rate for a population, without adjustment.
crude birth rate see **birth rate, crude**.
crude death rate see **mortality rate, crude**.
crude mortality rate see **mortality rate, crude**.
cumulative frequency in a frequency distribution, the number or proportion of observations with a particular value and any smaller value.

cumulative frequency curve a plot of the cumulative frequency rather than the actual frequency for each class interval of a variable. This type of graph is useful for identifying medians and quartiles and other percentiles.

Death-to-case ratio the number of deaths attributed to a particular disease, injury, or other healthcondition during a specified period, divided by the number of new cases of that disease, injury,or condition identified during the same period.
decision analysis application of quantitative methods to decision-making.
decision tree a branching chart that represents the logical sequence or pathway of a clinical or public health decision.
demographic information personal characteristics of a person or group (e.g., age, sex,
race/ethnicity, residence, and occupation) demographic information is used in descriptive epidemiology to characterize patients or populations.
dendrogramsee **phylogenetic tree**.
denominatorthe lower portion of a fraction; used in calculating a ratio, proportion, or rate. For a rate, the denominator is usually the midinterval population.
dependent variable see **variable, dependent**.
descriptive epidemiology see **epidemiology, descriptive**.
determinantany factor that brings about change in a health condition or in other defined
characteristics (see also **cause** and **risk factor**).
direct transmission see **transmission, direct**.
discrete variable (or **data**) see **variable (**or **data), discrete**.
distributionin epidemiology, the frequency and pattern of health-related characteristics and events in a population. In statistics, the frequency and pattern of the values or categories of a variable.
dose-responseassociation between an exposure and health outcome that varies in a consistently increasing or decreasing fashion as the amount of exposure (dose) increases.
dot plot a visual display of the specific data points of a variable.
droplet nuclei the residue of dried droplets of infectious agents that is easily inhaled and exhaled and can remain suspended in air for relatively long periods or be blown over great distances.
droplet spread the direct transmission of an infectious agent by means of the aerosols produced in sneezing, coughing, or talking that travel only a short distance before falling to the ground.

Effect the result of a cause.
effectivenessthe ability of an intervention or program to produce the intended or expected results in the field.
efficacythe ability of an intervention or program to produce the intended or expected results under ideal conditions.
efficiencythe ability of an intervention or program to produce the intended or expected results with a minimum expenditure of time and resources.
EIS Epidemic Intelligence Service; CDC's 2-year training program in applied epidemiology for public health professionals (http://www.cdc.gov/eis).

endemicthe constant presence of an agent or health condition within a given geographic area or population; can also refer to the usual prevalence of an agent or condition.
environmental factor an extrinsic factor (e.g., geology, climate, insects, sanitation, or health services) that affects an agent and the opportunity for exposure.
epidemicthe occurrence of more cases of disease, injury, or other health condition than expected in a given area or among a specific group of persons during a particular period. Usually, the cases are presumed to have a common cause or to be related to one another in some way (see also **outbreak**).
epidemic curve a histogram that displays the course of an outbreak or epidemic by plotting the number of cases according to time of onset.
epidemic period the time span of an outbreak or epidemic.
epidemiologic triad the traditional model of infectious disease causation having three components: an external agent, a susceptible host, and an environment that brings the host and agent together so that disease occurs.
epidemiologythe study of the distribution and determinants of health conditions or events among populations and the application of that study to control health problems.
epidemiology, analytic the aspect of epidemiology concerned with why and how a health problem occurs. Analytic epidemiology uses comparison groups to provide baseline or expected values so that associations between exposures and outcomes can be quantified and hypotheses about the cause of the problem can be tested (see also **study, analytic)**.
epidemiology, applied the application or practice of epidemiology to control and prevent health problems.
epidemiology, descriptive the aspect of epidemiology concerned with organizing and summarizing data regarding the persons affected (e.g., the characteristics of those who became ill), time (e.g., when they become ill), and place (e.g., where they might have been exposed to the cause of illness).
epidemiology, field applied epidemiology (i.e., the application or practice of epidemiology to control and prevent health problems), particularly when the epidemiologist(s) must travel to and work in the community in which the health problem is occurring or has occurred.
evaluationsystematic and objective examination of activities to determine their relevance,
effectiveness, and impact.
excess risk risk difference, calculated as the risk among the exposed group minus the risk among the unexposed group.
experimental study see **study, experimental**.
exposed group a group whose members have had contact with a suspected cause of, or possess a characteristic that is a suspected determinant of, a particular health problem.
exposurehaving come into contact with a cause of, or possessing a characteristic that is a
determinant of, a particular health problem.

False-negative a negative test result for a person who actually has the condition similarly, aperson who has the disease (perhaps mild or variant) but who does not fit the case definition, or apatient or outbreak not detected by a surveillance system.

false-positivea positive test result for a person who actually does not have the condition.
Similarly, a person who does not have the disease but who nonetheless fits the case definition, or a patient or outbreak erroneously identified by a surveillance system.
field epidemiology see **epidemiology, field**.
follow-up study see **study, cohort**.
fomitean inanimate object that can be the vehicle for transmission of an infectious agent (e.g., bedding, towels, or surgical instruments).
forest plot a graph that displays the point estimates and confidence intervals of individual studies included in a meta-analysis or systematic review as a series of parallel lines.
frequencythe amount or number of occurrences of an attribute or health outcome among a population.
frequency distribution a complete summary of the frequencies of the values or categories of a variable, often displayed in a two-column table with the individual values or categories in the left column and the number of observations in each category in the right column.
frequency polygon a graph of a frequency distribution in which values of the variable are plotted on the horizontal axis, and the number of observations are plotted on the vertical axis. Data points are plotted at the midpoints of the intervals and are connected with straight lines.

Geometric mean see **mean, geometric**.
grapha visual display of quantitative data arranged on a system of coordinates.

Health a state of complete physical, mental, and social well-being and not merely the absence ofdisease or other infirmity.
health indicator any of a variety of measures (e.g., mortality rate) that indicate the state of health of a given population.
health information system a combination of health statistics from different sources. Data from these systems are used to learn about health status, health care, provision and use of services, and the impact of services and programs on health.
healthy worker effect the observation that employed persons generally have lower mortality rates than the general population, because persons with severe, disabling disease (who have higher mortality rates) tend to be excluded from the workforce.
herd immunity see **immunity, herd**.
high-risk group a group of persons whose risk for a particular disease, injury, or other health condition is greater than that of the rest of their community or population.
HIPAA the Health Insurance Portability and Accountability Act, enacted in 1996, which addresses the privacy of a person's medical information as well as postemployment insurance and other health-related concerns.
histograma visual representation of the frequency distribution of a continuous variable. The class intervals of the variable are grouped on a linear scale on the horizontal axis, and the class frequencies are grouped on the vertical axis. Columns are drawn so that their bases equal the class intervals (i.e., so that columns of adjacent intervals touch), and their heights correspond to the class frequencies.
hosta person or other living organism that is susceptible to or harbors an infectious agent under natural conditions.

host factor an intrinsic factor (e.g., age, race/ethnicity, sex, or behaviors) that influences a person's exposure, susceptibility, or response to an agent.
hyperendemicthe constant presence at high incidence and prevalence of an agent or health condition within a given geographic area or population.
hypothesisa supposition, arrived at from observation or reflection, that leads to refutable predictions; any conjecture cast in a form that will allow it to be tested and refuted.
hypothesis, alternative the supposition that an exposure is associated with the health condition under study. The alternative is adopted if the null hypothesis (see **hypothesis, null**) proves implausible.
hypothesis, null the supposition that two (or more) groups do not differ in the measure of interest (e.g., incidence or proportion exposed); the supposition that an exposure is not associated with the health condition under study, so that the risk ratio or odds ratio equals 1. The null hypothesis is used in conjunction with statistical testing.

Immunity, active resistance developed in response to an antigen (i.e., an infecting agent orvaccine), usually characterized by the presence of antibody produced by the host.
immunity, herd the resistance to an infectious agent of an entire group or community (and, in particular, protection of susceptible persons) as a result of a substantial proportion of the population being immune to the agent. Herd immunity is based on having a substantial number of immune persons, thereby reducing the likelihood that an infected person will come in contact with a susceptible one among human populations, also called **community immunity**.
immunity, passive immunity conferred by an antibody produced in another host This type of immunity can be acquired naturally by an infant from its mother or artificially by administration of an antibody-containing preparation (e.g., antiserum or immune globulin).
incidencea measure of the frequency with which new cases of illness, injury, or other health condition occurs among a population during a specified period.
incidence proportion the fraction of persons with new cases of illness, injury, or other health condition during a specified period, calculated as the number of new cases divided by the size of the population at the start of the study period (see also **attack rate**).
incidence rate a measure of the frequency with which new cases of illness, injury, or other health condition occur, expressed explicitly per a time frame. Incidence rate is calculated as the number of new cases over a specified period divided either by the average population (usually mid-period) or by the cumulative person-time the population was at risk.
incubation period the time interval from exposure to an infectious agent to the onset of symptoms of an infectious disease.
independent variable see **variable, independent**.
index case see **case, index**.
indirect transmission see **transmission, indirect**.
individual data values or observations from each record (also called raw data).
infant mortality rate see **mortality rate, infant**.
infectioninvasion of the body tissues of a host by an infectious agent, whether or not it causes disease.

infectivitythe ability of an infectious agent to cause infection, measured as the proportion of persons exposed to an infectious agent who become infected.
information bias see bias, information.
interquartile range a measure of spread representing the middle 50% of the observations, calculated as the difference between the third quartile (75th percentile) and the first quartile (25th percentile).
isolationthe separation of infected persons to prevent transmission to susceptible ones. Isolation refers to separation of ill persons; **quarantine** refers to separation of potentially exposed but well persons.

Latency period the time from exposure to a causal agent to onset of symptoms of a (usuallynoninfectious) disease (see also **incubation period**).
life expectancy a statistical projection of the average number of years a person of a given age is expected to live, if current mortality rates continue to apply.
line graph, arithmetic-scale a graph that displays patterns or trends by plotting the frequency (e.g., number, proportion, or rate) of a characteristic or event during some variable, usually time.
The y-axis, measuring frequency, uses an arithmetic scale.
line graph, semilogarithmic-scale a graph that displays patterns or trends by plotting the frequency (e.g., number, proportion, or rate) of a characteristic or event during some variable, usually time. The y-axis, measuring frequency, uses a logarithmic scale.
line listing a type of epidemiologic database, organized similar to a spreadsheet with rows and columns in which information from cases or patients are listed each column represents a variable, and each row represents an individual case or patient.
logarithmic transformation conversion of nominal or ordinal data to logarithmic data. The purpose is to examine rate of change instead of amount of change only.

Map, area (shaded, choropleth) a visual display of the geographic pattern of a health problem,in which a marker is placed on a map to indicate where each affected person lives, works, ormight have been exposed.
mean (or average) commonly called the average; it is the most common measure of central tendency.
mean, arithmetic the measure of central location, commonly called the average, calculated by adding all the values in a group of measurements and dividing by the number of values in the group.
mean, geometric the mean, or average, of a set of data measured on a logarithmic scale.
measure of association a quantified relationship between exposure and a particular health problem (e.g., risk ratio, rate ratio, and odds ratio).
measure of central location a central value that best represents a distribution of data. Common measures of central location are the mean, median, and mode also called the measure of central tendency.
measure of dispersion see **measure of spread**.
measure of spread a measure of the distribution of observations out from its central value. Measures of spread used in epidemiology include the interquartile range, variance, and the standard deviation.
measurement scale the complete range of possible values for a measurement.
mechanical transmission see **transmission, mechanical**.

medianthe measure of central location that divides a set of data into two equal parts, above and below which lie an equal number of values (see also **measure of central location**).
medical surveillance see **surveillance, medical**.
midrangethe halfway point, or midpoint, in a set of observations. For the majority of data, the midrange is calculated by adding the smallest observation and the largest observation and dividing by two. The midrange is usually calculated as an intermediate step in determining other measures.
modethe most frequently occurring value in a set of observations (see also **measure of central**
location).
mode of transmission the manner in which an agent is transmitted from its reservoir to a susceptible host (see also **transmission**).
morbiditydisease; any departure, subjective or objective, from a state of physiological or psychological health and well-being.
mortalitydeath.
mortality rate a measure of the frequency of occurrence of death among a defined population during a specified time interval.
mortality rate, age-adjusted a mortality rate that has been statistically modified to eliminate the effect of different age distributions among different populations.
mortality rate, age-specific a mortality rate limited to a particular age group, calculated as the number of deaths among the age group divided by the number of persons in that age group, usually expressed per 100,000.
mortality rate, cause-specific the mortality rate from a specified cause, calculated as the number of deaths attributed to a specific cause during a specified time interval among a population divided by the size of the midinterval population.
mortality rate, crude a mortality rate from all causes of death for an entire population, without adjustment.
mortality rate, infant the mortality rate for children aged <1 year, calculated as the number of deaths reported among this age group during a given period divided by the number of live births reported during the same period, and expressed per 1,000 live births. Infant mortality rate is a universally accepted indicator of the health of a nation's population and the adequacy of its health-care system.
mortality rate, neonatal the mortality rate for children from age birth up to, but not including, 28 days. In calculating neonatal mortality rates, the numerator is the number of deaths among this age group during a given period, and the denominator is the number of live births reported during the same period. The neonatal mortality rate is usually expressed per 1,000 live births.
mortality rate, postneonatalthe mortality rate for children from age 28 days up to, but not including, 1 year. In calculating postneonatal mortality rates, the numerator is the number of deaths among this age group during a given period, and the denominator is the number of live births during the same period.. The postneonatal mortality rate is usually expressed per 1,000 live births.
mortality rate, race/ethnic-specific a mortality rate limited to a specified racial or ethnic group both numerator and denominator are limited to that group.
mortality rate, sex-specific a mortality rate among either males or females.

Natural history of disease the progression of a disease process in a person from the time itbegins to the time it resolves, in the absence of treatment.

NCHS The National Center for Health Statistics, the US governmental organization responsible for national vital statistics and multiple national health surveys. Organizationally, NCHS is a component of the Centers for Disease Control and Prevention, one of the agencies of the US Department of Health and Human Services.
NHANES The National Health and Nutrition Examination Survey, a representative survey of the civilian, noninstitutionalized US population conducted by the National Center for Health
Statistics, designed to (1) estimate the proportion of the US population and designated groups with selected disease and risk factors; (2) monitor trends in selected behaviors, exposures, and diseases; and (3) study the associations among diet, nutrition, and health.
necessary cause see **cause, necessary**.
neonatal mortality rate see **mortality rate, neonatal**.
nominal scale see **scale, nominal**.
normal curve the bell-shaped curve that results when a normal distribution is graphed.
normal distribution a distribution represented as a bell shape, symmetrical on both sides of the peak, which is simultaneously the mean, median, and mode, and with both tails extending to infinity.
notifiable disease a disease that, by law, must be reported to public health authorities upon diagnosis.
null hypothesis see **hypothesis, null**.
numeratorthe upper portion of a fraction (see also **denominator**).

Observational study see **study, observational**.
odds ratio a measure of association used in comparative studies, particularly case-control studies, that quantifies the association between an exposure and a health outcome; also called the cross-product ratio.
ordinal scale see **scale, ordinal**.
outbreakthe occurrence of more cases of disease, injury, or other health condition than expected in a given area or among a specific group of persons during a specific period. Usually, the cases are presumed to have a common cause or to be related to one another in some way. Sometimes distinguished from an epidemic as more localized, or the term less likely to evoke public panic (see also **epidemic**).
outbreak, common-source an outbreak that results from persons being exposed to the same harmful influence (e.g., an infectious agent or toxin). The exposure period can be brief or can extend over days, weeks, or longer, with the exposure being either intermittent or continuous.
outbreak, point-source a common source outbreak in which the exposure period is relatively brief so that all cases occur within one incubation period.
outbreak, propagated an outbreak that spreads from person to person rather than from a common source.
outcome(s)any or all of the possible results that can stem from exposure to a causal factor or from preventive or therapeutic interventions; all identified changes in health status that result from the handling of a health problem.
outliera value substantively or statistically different from all (or approximately all) of the other values in a distribution.

Pandemic an epidemic occurring over a widespread area (multiple countries or continents) and usually affecting a substantial proportion of the population.

***P* value** the probability of observing an association between two variables or a difference
between two or more groups as large or larger than that observed, if the null hypothesis were true. Used in statistical testing to evaluate the plausibility of the null hypothesis (i.e., whether the observed association or difference plausibly might have occurred by chance).

passive immunity see **immunity, passive**.

passive surveillance see**surveillance, passive**.

pathogenicitythe ability of an agent to cause disease after infection, measured as the proportion of persons infected by an agent who then experience clinical disease.

percentilea set of cut points used to divide a distribution or a set of ranked data into 100 parts of equal area with each interval between the points containing 1/100 or 1% of the observations. Forexample, the 5th percentile is a cut point with 5% of the observations below it and the remaining 95% above it.

period prevalence see **prevalence, period**.

person-time rate the incidence rate calculated as the number of new cases among a population divided by the cumulative person-time of that population, usually expressed as the number of events per persons per unit of time.

person-timethe amount of time each participant in a cohort study is observed and disease-free, often summed to provide the denominator for a person-time rate.

phylogenetic tree a branching chart that indicates the evolutionary lineage or genetic relatedness of organisms.

pie chart a circular graph of a frequency distribution in which each segment of the pie is proportional in size to the frequency of corresponding category.

pointprevalencesee**prevalence, point**.

point-source outbreak see **outbreak, point-source**.

populationthe total number of inhabitants of a geographic area or the total number of persons in a particular group (e.g., the number of persons engaged in a certain occupation).

population pyramid a graphical display of the age-sex distribution of a population, constructed with a horizontal histogram of the age distribution of males pointing to the left, and the corresponding horizontal histogram of age distribution of females pointing to the right.

portal of entry a pathway into the host that gives an agent access to tissue that will allow it to multiply or act.

portal of exit a pathway by which an agent can leave its host.

postneonatal mortality rate see **mortality rate, postneonatal**.

predictive value positive the proportion of cases identified by a test, reported by a surveillance system, or classified by a case definition that are true cases, calculated as the number of true positives divided by the number of true-positives plus false-positives.

prevalencethe number or proportion of cases or events or attributes among a given population.

prevalence rate the proportion of a population that has a particular disease, injury, other health condition, or attribute at a specified point in time (point prevalence) or during a specified period (period prevalence).

prevalence, period the amount of a particular disease, chronic condition, or type of injury present among a population at any time during a particular period.
prevalence, point the amount of a particular disease, chronic condition, or type of injury present among a population at a single point in time.
privacy rule a set of regulations based on the Health Insurance Portability and Accountability Act to protect the privacy of individually identifiable health information.
propagated outbreak see **outbreak, propagated**.
proportiona ratio in which the numerator is included in the denominator; the ratio of a part to the whole, expressed as a "decimal fraction" (e.g., 0 2), a fraction (1/5), or a percentage (20%).
proportion, attributable a measure of the impact of a causative factor on the public health; the proportion of a health state or event among exposed persons that can be attributed to the exposure also called attributable risk percent.
proportionate mortality the proportion of deaths among a population attributable to a particular cause during a selected period. Each cause of death is expressed as a percentage of all deaths, and the sum of the proportionate mortality for all causes must equal 100%. These proportions are not mortality rates because, in proportionate mortality, the denominator is all deaths instead of the population among whom the deaths occurred.
prospective study see **study, prospective**.

Quarantine the separation of well persons who have been exposed or are suspected to have beenexposed to a communicable disease, to monitor for illness and to prevent potential transmissionof infection to susceptible persons during the incubation period. Quarantine refers to separationof potentially exposed but well persons; **isolation** refers to separation of ill persons.

Race/ethnic-specific mortality rate see **mortality rate, race/ethnic-specific**.
random sample see **sample, random**.
rangein statistics, the difference between the largest and smallest values in a distribution; in common use, the span of values from smallest to largest.
ratean expression of the relative frequency with which an event occurs among a defined population per unit of time, calculated as the number of new cases or deaths during a specified period divided by either person-time or the average (midinterval) population. In epidemiology, it is often used more casually to refer to proportions that are not truly rates (e.g., attack rate or case-fatality rate).
rate ratio a measure of association that quantifies the relation between an exposure and a health outcome from an epidemiologic study, calculated as the ratio of incidence rates or mortality rates of two groups.
ratiothe relative size of two quantities, calculated by dividing one quantity by the other.
recordin a line listing, each row is a record or observation. A record represents data related to a single case.
relative risk a general term for measures of association calculated from the data in a two-by-two table, including risk ratio, rate ratio, and odds ratio (see **risk ratio**).
representative sample see **sample, representative**.
reservoirthe habitat in which an infectious agent normally lives, grows, and multiplies, which can include humans, animals, or the environment.

retrospective study see **study, retrospective**.
riskthe probability that an event will occur (e.g., that a person will be affected by, or die from, an illness, injury, or other health condition within a specified time or age span).
risk factor an aspect of personal behavior or lifestyle, an environmental exposure, or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, injury, or other health condition.
risk ratio a measure of association that quantifies the association between an exposure and a health outcome from an epidemiologic study, calculated as the ratio of incidence proportions of two groups.

Sample a selected subset of a population a sample can be random or nonrandom andrepresentative or nonrepresentative.
sample, random a sample of persons chosen in such a way that each one has the same (and known) probability of being selected.
sample, representative a sample whose characteristics correspond to those of the original or reference population.
scale, interval a measurement scale consisting of quantitative categories whose values are measured on a scale of equally spaced units, but without a true zero point (e.g., date of birth).
scale, nominal a measurement scale consisting of qualitative categories whose values have no inherent statistical order or rank (e.g., categories of race/ethnicity, religion, or country of birth).
scale, ordinal a measurement scale consisting of qualitative categories whose values have a distinct order but no numerical distance between their possible values (e.g., stage of cancer, I, II, III, or IV).
scale, ratio a measurement scale consisting of quantitative categories whose values are intervals with a true zero point (e.g., height in centimeters or duration of illness).
scatter diagram (or **scattergram**) a graphical display of the association between two variables in which a dot is plotted on the graph for each set of paired values for two continuous variables, with one variable plotted on the horizontal axis, and the other plotted on the vertical axis.
seasonalitychange in physiologic status or in the occurrence of a disease, chronic condition, or type of injury that conforms to a regular seasonal pattern.
secondary attack rate see **attack rate, secondary**.
secular trend see **trend, secular**.
selection bias see **bias, selection**.
semilogarithmic-scale line graph see **line graph, semilogarithmic-scale**
sensitivitythe ability of a test, case definition, or surveillance system to identify true cases; the proportion of people with a health condition (or the proportion of outbreaks) that are identified by a screening test or case definition (or surveillance system).
sentinel surveillance see**surveillance, sentinel**.
sex-specific mortality rate see **mortality rate, sex-specific**.
skeweda distribution that is not symmetrical.
source (of infection) the person, animal, object, or substance from which an infectious agent is transmitted to a host.
source case see **case, source**.

specificity the ability or a test, case definition, or surveillance system to exclude persons without the health condition of interest; the proportion of persons without a health condition that are correctly identified as such by a screening test, case definition, or surveillance system.
spectrum of illness the range of manifestations a disease process can take (e.g., from asymptomatic to mild clinical illness to severe illness and death).
sporadican event that occurs infrequently and irregularly.
spot map a visual display of the geographic pattern of a health problem, in which a marker is placed on a map to indicate where each affected person lives, works, or might have been exposed.
standard deviation a statistical summary of how dispersed the values of a variable are around its mean, calculated as the square root of the variance.
standard error (of the mean) the standard deviation of a theoretical distribution of sample means of a variable around the true population mean of that variable. Standard error is computed as the standard deviation of the variable divided by the square root of the sample size.
statistical inference generalizations developed from sample data, usually with calculated degrees of uncertainty.
statistical significance the measure of how likely it is that a set of study results could have occurred by chance alone. Statistical significance is based on an estimate of the probability of the observed or a greater degree of association between independent and dependent variables occurring under the null hypothesis (see also ***P* value**).
study, analytic a study, usually observational, in which groups are compared to identify and quantify associations, test hypotheses, and identify causes. Two common types are cohort studies and case-control studies.
study, case-control an observational analytic study that enrolls one group of persons with a certain disease, chronic condition, or type of injury (case-patients) and a group of persons without the health problem (control subjects) and compares differences in exposures, behaviors, and other characteristics to identify and quantify associations, test hypotheses, and identify causes.
study, cohort an observational analytic study in which enrollment is based on status of exposure to a certain factor or membership in a certain group. Populations are followed, and disease, death, or other health-related outcomes are documented and compared. Cohort studies can be either prospective or retrospective.
study, cross-sectional a study in which a sample of persons from a population are enrolled and their exposures and health outcomes are measured simultaneously; a survey.
study, experimental a study in which the investigator specifies the type of exposure for each person (clinical trial) or community (community trial) then follows the persons' or communities' health status to determine the effects of the exposure.
study, observational a study in which the investigator observes rather than influences exposure and disease among participants. Case-control and cohort studies are observational studies (see also **study, experimental**).
study, prospective an analytic study in which participants are enrolled before the health outcome of interest has occurred.
study, retrospective an analytic study in which participants are enrolled after the health outcome of interest has occurred. Case-control studies are inherently retrospective.

subclinicalwithout apparent symptoms.
surveillance, active public health surveillance in which the health agency solicits reports.
surveillance, medical monitoring of a person who might have been exposed to an infectious, chemical, radiologic, or other potentially causal agent, for the purpose of detecting early symptoms.
surveillance, passive public health surveillance in which data are sent to the health agency without prompting.
surveillance, sentinel a surveillance system that uses a prearranged sample of sources (e.g., physicians, hospitals, or clinics) who have agreed to report all cases of one or more notifiable diseases.
surveillance, syndromic(1) the monitoring of the frequency of illnesses with a specified set of clinical features among a given population without regard to the specific diagnoses, if any, that are assigned to them by clinicians. (2) A system for early detection of outbreaks whereby health department staff, assisted by automated acquisition of data routinely collected for other purposes and computer generation of statistical signals, monitor disease indicators, particularly those associated with possible terrorism-related biologic and chemical agents, continually or at least daily to detect outbreaks earlier than would otherwise be possible with traditional public health methods.
surveya systematic canvassing of persons to collect information, often from a representative sample of the population.
survival curve a line graph that begins with 100% of the study population and displays the percentage of the population still surviving at successive points in time. A survival curve can also be used to depict freedom from a health problem, complication, or another endpoint.
symmetricala type of distribution where the shapes to the right and left of the central location are the same. Normal, bell-shaped distributions are symmetrical; the mean, median, and mode are the same.
symptomany indication of disease noticed or felt by a patient.
syndromea combination of symptoms characteristic of a disease or health condition; sometimes refers to a health condition without a clear cause (e.g., chronic fatigue syndrome).
syndromic surveillance see**surveillance, syndromic**.

Table an arrangement of data in rows and columns. In epidemiology, the data are usually
summaries of the frequency of occurrence of an event or characteristic occurring among different groups.
trendmovement or change in frequency over time, usually upwards or downwards**.**
trend, secular changes occurring over a substantial period, generally years or decades.
trial, clinical an experimental study that uses data from individual persons. The investigator specifies the type of exposure for each study participant and then follows each person's health status to determine the effects of the exposure.
trial, community an experimental study that uses data from communities. The investigator specifies the type of exposure for each community and then follows the communities' health status to determine the effects of the exposure.

trial, randomized clinical a clinical trial in which persons are randomly assigned to exposure or treatment groups.
two-by-two table see **table, two-by-two.**

Validity the degree to which a measurement, questionnaire, test, or study or any other datacollectiontool measures what it is intended to measure.
variableany characteristic or attribute that can be measured and can have different values.
variable(or **data**), **discrete** a variable that is limited to a finite number of values; data for such a variable.
variable, continuous a variable that has the potential for having an infinite number of values along a continuum (e.g., height and weight).
variable, dependent in a statistical analysis, a variable whose values are a function of one or more other variables.
variable, independent an exposure, risk factor, or other characteristic being observed or measured that is hypothesized to influence an event or manifestation (the dependent variable).
variance a measure of the spread in a set of observations, calculated as the sum of the squares of deviations from the mean, divided by the number of observations minus 1 (see also **standarddeviation**).
vectora living intermediary that carries an agent from a reservoir to a susceptible host (see also **transmission, biologic** and **transmission, mechanical**) (e.g., mosquitoes, fleas, or ticks).
vehiclean inanimate object that can carry an agent from a reservoir to a susceptible host (e.g., food, water, blood products, and bedding) (see also **transmission, indirect**).
virulencethe ability of an infectious agent to cause severe disease, measured as the proportion of persons with the disease who become severely ill or die.
vital statistics systematically tabulated data about recorded births, marriages, divorces, and deaths.

X-axis the horizontal axis of a rectangular graph, usually displaying the independent variable(e.g., time).
Y-axis the vertical axis of a rectangular graph, usually displaying the dependent variable (e.g.,frequency — number, proportion, or rate).
years of potential life lost (YPLL) a measure of the impact of premature death on a population,
calculated as the sum of the differences between a predetermined minimally acceptable age (e.g., 65 years or current life expectancy) and the age at death for everyone who died earlier than that age.

Zoonosis an infectious disease that is transmissible from animals to humans.

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Course Name	Health Care Administration & Management

Course Description

The Course describes the definition of health care, the philosophy of health care, the political philosophy of health care. It further involves the ideas about the health care delivery systems, in-depth discussion about the Primary Health Care (PHC), understanding emergency health care, health insurance, meaning of first aid versus universal first aid.

Course Objectives

· To help students get exposed to the different health systems prevalent in their country.
· To equip students with capacities to analyze weakness and strengths of different health care systems.
· To help introduce students to new debates concerning health insurance to the country's citizens.
· To enable students learn the appropriate mechanisms through which health care can be well delivered.

Course Content

Introduction to Health Care Administration

· Definition of Health Care
· Philosophy of Health Care
· Ethics of health care
· Political philosophy of healthcare

Health Care delivery

· Meaning of health care delivery
· Primary health care
· Secondary health care
· Tertiary health care
· Health care industry
· Health care research
· Health care financing
· Health care administration and regulation
· Health care information technology

Primary Health Care (PHC)

· Aims of Primary Health Care
· Community health
· Goals and principles of Primary Health Care
· Approaches of PHC
· PHC and mental health

Emergency Health Care

· Defining an Emergency
· Types of Emergencies
· Systems of classifying emergencies
· Agencies involved in dealing with emergencies
· Summoning emergency services
· Key emergency principle

Health Insurance

· Meaning of Health Insurance

· Definition of health Insurance policy
· Health Plan Vs health insurance
· Factors affecting insurance prices
· Community health insurance in Uganda
· Standards of hospitals and clinics used by insurance companies
· How health insurance can work for Uganda

First Aid

· Meaning of First Aid
· Aims of first aid
· Several types of first aid
· Symbols of first aid
· Conditions that often require first aid
· First Aid resources
· Basic First Aid; What to do

Universal First Aid

· Definition of Universal First Aid
· The birth of Universal Health Care System
51
· Case studies of Universal first aid

Mode of delivery Face to face lectures

Assessment

Coursework 40%
Exams 60%
Total Mark 100%

HEALTH SERVICE ADMINSTRATION

Introduction to Health care system

Health care systems are designed to meet the health care needs of target populations. There are a wide variety of health care systems around the world. In some countries, the health care system has evolved and has not been planned, whereas in others a concerted effort has been made by governments, trade unions, charities, religious, or other co-ordinated bodies to deliver planned health care services targeted to the populations they serve. However, health care planning has often been evolutionary rather than revolutionary.

Goals

The goals for health systems, according to the *World Health Report 2000 - Health systems: improving performance* (WHO, 2000), are good health, responsiveness to the expectations of the population, and fair financial contribution. Duckett (2004) proposed a two dimensional approach to evaluation of health care systems: quality, efficiency and acceptability on one dimension and equity on another.

Providers
Health care provider

Health care providers are trained professional people working self-employed or as an employee in an organization, whether a for-profit company, a not-for profit company, a government entity, or a charity. Organisations employing people providing health care are also known as health care providers. Examples are doctors and nurses, dentists, medical laboratory staff, specialist therapists, psychologists, pharmacists, chiropractors, and optometrists.

Financing

There are generally five primary methods of funding health care systems:

1. direct or out-of-pocket payments,
2. general taxation,
3. social health insurance,
4. voluntary or private health insurance, and
5. donations or community health insurance.

Most countries' systems feature a mix of all five models. One study [5] based on data from the OECD concluded that all types of health care finance "are compatible with" an efficient health care system. The study also found no relationship between financing and cost control.

The term health insurance is generally used to describe a form of insurance that pays for medical expenses. It is sometimes used more broadly to include insurance covering disability or long-term nursing or custodial care needs. It may be provided through a government-sponsored social insurance program, or from private insurance companies. It may be purchased on a group basis (e.g., by a firm to cover its employees) or purchased by individual consumers. In each case, the covered groups or individuals pay premiums or taxes to help protect themselves from high or unexpected health care expenses. Similar benefits paying for medical expenses may also be provided through schemes organized by the government and funded through contributions from users.

By estimating the overall cost of health care expenses, a routine finance structure (such as a monthly premium or annual tax) can be developed, ensuring that money is available to pay for the health care benefits specified in the insurance agreement. The benefit is administered by a central organization, most often either a government agency or a private or not-for-profit entity operating a health plan.[6]

Many forms of commercial health insurance control their costs by restricting the benefits that are paid by through deductiblesco-paymentscoinsurance, policy exclusions, and total coverage limits and will severely restrict or refuse coverage of pre-existing conditions. Many government schemes also have co-payment schemes but exclusions are rare because of political pressure. The larger insurance schemes may also negotiate fees with providers.

Many forms of government insurance schemes control their costs by using the bargaining power of government to control costs in the health care delivery system. For example by negotiating drug prices directly with pharmaceutical companies, or

negotiating standard fees with the medical profession. Government schemes sometimes feature contributions related to earnings as part of a scheme to deliver universal health care, which may or may not also involve the use of commercial and non-commercial insurers. Essentially the more wealthy pay a little more into the scheme and to cover the needs of the relatively poor who therefore contribute a little less. There are usually caps on the contributions of the wealthy and minimum payments that must be made by the insured (often in the form of a minimum contribution, similar to a deductible in commercial insurance models).

Payment models

Primary care

There are three ways to pay general practitioners. There has been growing interest in blending elements of these systems.[7]

Fee-for-service

Fee-for-service arrangements pay general practitioners based on the service.[7] They are even more widely used for specialists working in ambulatory care.

There are two ways to set fee levels:

- By individual practitioners.
- Central negotiations (as in Japan, Germany, Canada and in France) or hybrid model (such as in Australia, France's sector 2, and New Zealand) where GPs can charge extra fees on top of standardized patient reimbursement rates.

Other

In *capitation payment systems*, GPs are paid for each patient on their "list", usually with adjustments for factors such as age and gender. According to OECD, "these systems are used in Italy (with some fees), throughout the United Kingdom (with some fees and allowances for specific services), Austria (with fees for specific services), Denmark (one third of income with remainder fee for service), Ireland (since 1989), the Netherlands (fee-for-service for privately insured patients and public employees) and Sweden (from 1994). Capitation payments have become more frequent in “managed care” environments in the United States."

According to OECD, "Capitation systems allow funders to control the overall level of primary health expenditures, and the allocation of funding among GPs is determined by patient registrations. However, under this approach, of GPs may register too many patients and under-serve them, select the better risks and refer on patients who could have been treated by the GP directly. Freedom of consumer choice over doctors, coupled with the principle of "money following the patient" may moderate some of these risks. Aside from selection, these problems are likely to be less marked than under salary-type arrangements."

In several OECD countries, general practitioners (GPs) are employed on *salaries* for the government. According to OECD, "Salary arrangements allow funders to control primary care costs directly; however, they may lead to under-provision of services (to ease workloads), excessive referrals to secondary providers and lack of attention to the preferences of patients." There has been movement away from this system.

Health informatics

Health informatics or medical informatics is the intersection of information science, medicine and health care. It deals with the resources, devices and methods required to optimize the acquisition, storage, retrieval and use of information in health and biomedicine. Health informatics tools include not only computers but also clinical guidelines, formal medical terminologies, and information and communication systems.

Management

Public health is concerned with threats to the overall health of a community based on population health analysis. The population in question can be as small as a handful of people or as large as all the inhabitants of several continents (for instance, in the case of a pandemic). Public health is typically divided into epidemiology, biostatistics and health services. Environmental, social, behavioral, and occupational health are also important subfields.

Vaccination policy refers to the policy a government adopts in relation to vaccination. Vaccinations are voluntary in some countries and mandatory in some countries. Some governments pay all or part of the costs of vaccinations for vaccines in a national vaccination schedule.

Today, most governments recognize the importance of public health programs in reducing the incidence of disease, disability, and the effects of aging, although public health generally receives significantly less government funding compared with medicine. In recent years, public health programs providing vaccinations have made incredible strides in promoting health, including the eradication of smallpox, a disease that plagued humanity for thousands of years.

An important public health issue facing the world currently is HIV/AIDS[8]. Another major public health concern is diabetes[9]. In 2006, according to the World Health Organization, at least 171 million people worldwide suffered from diabetes. Its incidence is increasing rapidly, and it is estimated that by the year 2030, this number will double. A controversial aspect of public health is the control of smoking[10].

Antibiotic resistance is another major concern, leading to the reemergence of diseases such as Tuberculosis.

Special health care systems

- Occupational safety and health
- School health services
- Military medicine

Cross-country comparisons

Direct comparisons of health statistics across nations are complex. The Commonwealth Fund, in its annual survey, "Mirror, Mirror on the Wall", compares the performance of the health care systems in Australia, New Zealand, the United Kingdom, Germany, Canada and the U.S. Its 2007 study found that, although the U.S. system is the most expensive, it consistently underperforms compared to the other countries.[11] A major difference between the U.S. and the other countries in the study is that the U.S. is the only country without universal health care. The OECD also collects comparative statistics, and has published brief country profiles.

Country	Life expectancy	Infant mortality rate	Physicians per 1000 people	Nurses per 1000 people	Per capita expenditure on health (USD)	Healthcare costs as a percent of GDP	% of government revenue spent on health	% of health costs paid by government
Australia	81.4	4.2	2.8	9.7	3,137	8.7	17.7	67.7
Canada	80.7	5.0	2.2	9.0	3,895	10.1	16.7	69.8
France	81.0	4.0	3.4	7.7	3,601	11.0	14.2	79.0
Germany	79.8	3.8	3.5	9.9	3,588	10.4	17.6	76.9
Japan	82.6	2.6	2.1	9.4	2,581	8.1	16.8	81.3
Norway	80.0	3.0	3.8	16.2	5,910	9.0	17.9	83.6
Sweden	81.0	2.5	3.6	10.8	3,323	9.1	13.6	81.7
UK	79.1	4.8	2.5	10.0	2,992	8.4	15.8	81.7
US	78.1	6.7	2.4	10.6	7,290	16.0	18.5	45.4

Efficiency and effectiveness of service are the focus of these profiles. Perhaps most efficient is Healthcare in Taiwan, costing 6 percent of GDP (~1/4 US cost), universal coverage by a government-run insurer with smart card IDs to fight fraud.

Beginning in 1979, military conflict destroyed the **health** system of **Afghanistan**. Most medical professionals left the country in the 1980s and 1990s, and all medical training programs ceased. In 2004 Afghanistan had one medical facility for every 27,000 people, and some centers were responsible for as many as 300,000 people. In 2004 international organizations provided a large share of medical care. An estimated one-quarter of the population had no access to health care. In 2003 there were 11 physicians and 18 nurses per 100,000 population, and the per capita health expenditure was US$28 embarked on a poverty reduction program that called for outlays in education, health, sanitation, and water. A poliovaccination campaign for 14 million children has been carried out, and a program to resettle some 2 million subsistence farmers is underway. In November 2004, the government launched a five-year program to expand primary health care. In January 2005, it began distributing antiretroviral drugs, hoping to reach up to 30,000 HIV-infected adults.

Finland

In Finland, public medical services at clinics and hospitals are run by the municipalities (local government) and are funded 78% by taxation, 20% by patients through access charges, and by others 2%. Patient access charges are subject to annual caps. For example GP visits are (11€ per visit with annual 33€ cap), hospital outpatient treatment (22€ per visit), a hospital stay, including food, medical care and medicines (26€ per 24 hours, or 12€ if in a psychiatric hospital). After a patient has spent 590€ per year on public medical services, all treatment and medications thereafter are free. Taxation funding is partly local and partly nationally based. Patients can claim re-imbursement of part of their prescription costs from KELA. Finland also has a much smaller private medical sector which accounts for about 14 percent of total health care spending. Only 8% of doctors choose to work in private practice, and some of these also choose to do some work in the public sector. Private sector patients can claim a contribution from KELA towards their private medical costs (including dentistry) if they choose to be treated in the more expensive private sector, or they can join private insurance funds. However, private sector health care is mainly in the primary care sector. There are virtually no private hospitals, the main hospitals being either municipally owned (funded from local taxes) or run by the teaching universities (funded jointly by the municipalities and the national government). In 2005, Finland spent 7.5% of GDP on health care, or US$2,824 per capita. Of that, approximately 78% was government expenditure.

Germany

Germany has a universal multi-payer system with two main types of health insurance: "State health insurance" (GesetzlicheKrankenversicherung) known as sickness funds and "Private" (Private Krankenversicherung). Compulsory insurance applies to those below a set income level and is provided through private non-profit "sickness funds" at common rates for all members, and is paid for with joint employer-employee contributions. Provider compensation rates are negotiated in complex corporatist social bargaining among specified autonomously organized interest groups (e.g. physicians' associations) at the level of federal states (Länder).

The sickness funds are mandated to provide a wide range of coverages and cannot refuse membership or otherwise discriminate on an actuarial basis. Small numbers of persons are covered by tax-funded government employee insurance or social welfare insurance. Persons with incomes above the prescribed compulsory insurance level may opt into the sickness fund system, which a majority do, or purchase private insurance. Private supplementary insurance to the sickness funds of various sorts is available. In 2005, Germany spent 10.7% of GDP on health care, or US$3,628 per capita. Of that, approximately 77% was government expenditure.

Ghana

In Ghana, most health care is provided by the government, but hospitals and clinics run by religious groups also play an important role. Some for-profit clinics exist, but they provide less than 2% of health services. Health care is very variable through the country. The major urban centres are well served, but rural areas often have no modern health care. Patients in these areas either rely on traditional medicine or travel great distances for care. In 2005, Ghana spent 6.2% of GDP on health care, or US$30 per capita. Of that, approximately 34% was government expenditure.[18]

Mali

Health in Mali, one of the world's poorest nations, is greatly affected by poverty, malnutrition, and inadequate hygiene and sanitation. Mali's health and development indicators rank among the worst in the world. In 2000 only 62–65 percent of the population was estimated to have access to safe drinking water and only 69 percent to sanitation services of some kind; only 8 percent was estimated to have access to modern sanitation facilities. Only 20 percent of the nation's villages and livestock watering holes had modern water facilities.

Mali is dependent on international development organizations and foreign missionary groups for much of its health care. In 2001 general government expenditures on health constituted 6.8 percent of total general government expenditures and 4.3 percent of gross domestic product (GDP), totaling only about US$4 per capita at an average exchange rate. Medical facilities in Mali are very limited, especially outside of Bamako, and medicines are in short supply. There were only 5 physicians per 100,000 inhabitants in the 1990s and 24 hospital beds per 100,000 in 1998. In 1999 only 36 percent of Malians were estimated to have access to health services within a five-kilometer

Health care in the Netherlands, has since January 2006 been provided by a system of compulsory insurance backed by a risk equalization program so that the insured are not penalized for their age or health status. This is meant to encourage competition between health care providers and insurers. Children under 18 are insured by the government, and special assistance is available to those with limited incomes. In 2005, the Netherlands spent 9.2% of GDP on health care, or US$3,560 per capita. Of that, approximately 65% was government expenditure.[18]

Health care provision in Nigeria is a concurrent responsibility of the three tiers of government in the country.[33] However, because Nigeria operates a mixed economy,

private providers of health care have a visible role to play in health care delivery. The federal government's role is mostly limited to coordinating the affairs of the universityteaching hospitals, while the state government manages the various general hospitals and the local government focus on dispensaries. The total expenditure on health care as % of GDP is 4.6, while the percentage of federal government expenditure on health care is about 1.5%.[34] A long run indicator of the ability of the country to provide food sustenance and avoid malnutrition is the rate of growth of per capita food production; from 1970-1990, the rate for Nigeria was 0.25%.[35] Though small, the positive rate of per capita may be due to Nigeria's importation of food products. Historically, health insurance in Nigeria can be applied to a few instances: free health care provided and financed for all citizens, health care provided by government through a special health insurance scheme for government employees and private firms entering contracts with private health care providers.[36] However, there are few people who fall within the three instances. In May 1999, the government created the National Health Insurance Scheme, the scheme encompasses government employees, the organized private sector and the informal sector. Legislative wise, the scheme also covers children under five, permanently disabled persons and prison inmates. In 2004, the administration of Obasanjo further gave more legislative powers to the scheme with positive amendments to the original 1999 legislative act.[37]

South Africa

In South Africa, parallel private and public systems exist. The public system serves the vast majority of the population, but is chronically underfunded and understaffed. The wealthiest 20% of the population uses the private system and are far better served. This division in substantial ways perpetuates racial inequalities created in the pre-apartheid segregation era and apartheid era of the 20th century. In 2005, South Africa spent 8.7% of GDP on health care, or US$437 per capita. Of that, approximately 42% was government expenditure.[18]

Sudan

Outside urban areas, little health care is available in Sudan, helping account for a relatively low average life expectancy of 57 years and an infant mortality rate of 69 deaths per 1,000 live births, low by standards in Middle Eastern but not African countries. For most of the period since independence in 1956, Sudan has experienced civil war, which has diverted resources to military use that otherwise might have gone into health care and training of professionals, many of whom have migrated in search of more gainful employment. In 1996 the World Health Organization estimated that there were only 9 doctors per 100,000 people, most of them in regions other than the South. Substantial percentages of the population lack access to safe water and sanitary facilities. Malnutrition is widespread outside the central Nile corridor because of population displacement from war and from recurrent droughts; these same factors together with a scarcity of medicines make diseases difficult to control. Child immunization against most major childhood diseases, however, had risen to approximately 60 percent by the late 1990s from very low rates in earlier decades. Spending on health care is quite low—only 1 percent of gross domestic product (GDP) in 1998 (latest data). The United Nations

placed the rate of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) infection in late 2003 at 2.3 percent for adults, quite low by regional standards. The United Nations suggested, however, that the rate could be as high as 7.2 percent. Between 400,000 and 1.3 million adults and children were living with HIV, and AIDS deaths numbered 23,000. As of late 2004, some 4 million persons in the South had been internally displaced and more than 2 million had died or been killed as a result of two decades of war. Comparable figures for Darfur were 1.6 million displaced and 70,000 dead since fighting began there in early 2003.[15]

trend. Physicians are poorly trained, modern medical techniques are rarely used, and medications are in short supply. In 2004 Niyazov dismissed 15,000 medical professionals, exacerbating the shortage of personnel. In some cases, professionals have been replaced by military conscripts. Private health care is rare, as the state maintains a near monopoly. Free public health care was abolished in 2004.

United States

The United States is alone among developed nations in not having a universal health care system. Healthcare in the U.S. does, however, have significant publicly funded components. Medicare covers the elderly and disabled with a historical work record, Medicaid is available for some, but not all of the poor, and the State Children's Health Insurance Program covers children of low-income families. The Veterans Health Administration directly provides health care to U.S. military veterans through a nationwide network of government hospitals; while active duty service members, retired service members and their dependents are eligible for benefits through TRICARE. Together, these tax-financed programs cover 27.8% of the population and make the government the largest health insurer in the nation.

Roughly two thirds of urban hospitals in the U.S. are non-profit hospitals and the balance evenly divided between for-profit hospitals and public hospitals. The urban public hospitals are often associated with medical schools. For example, the largest public hospital system in America is the New York City Health and Hospitals Corporation, which is associated with the New York University School of Medicine.

Although public hospitals constitute the greatest percentage of non-federal hospitals, care in the U.S. is generally provided by physicians in private practice and private hospitals. Just over 59% of Americans receive health insurance through an employer, although this number is declining and the employee's expected contribution to these plans varies widely and is increasing as costs escalate. A significant number of people cannot obtain health insurance through their employer or are unable to afford individual coverage. The U.S. Census Bureau estimated that 15.3% of the U.S. population, or 45.7 million people, were uninsured at some time in 2007. More than 38% of the uninsured are in households earning $50,000 or more per year. The census also states that 16.7% of the 39.6 million on Medicaid incorrectly reported they were uninsured. A few states have taken serious steps toward universal health care coverage, most notably Minnesota, Massachusetts and Connecticut, with recent examples being the Massachusetts 2006 Health Reform Statute and Connecticut's SustiNet plan to provide quality, affordable health care to

state residents. In 2005, the United States spent 15.2% of GDP on health care, or US$6,347 per capita. Of that, approximately 45% was government expenditure.

Consumer driven health care is a plan put forth by the National Center for Policy Analysis, a self-described conservative think tank. It refers to a method of financing health care being the combination of a savings plan with a health insurance policy that pays for the most catastrophic health care needs. As such it sits between fully comprehensive low or zero deductible/co-pay insurance policy and meeting all health insurance out of pocket. This type of arrangements relieves the insurance company for paying for all but the most catastrophic of medical expenses. This reduces the monthly premium paid by the insured but the consumer is then expected to put aside money into a Health Savings Accounts (HSAs), Health Reimbursement Arrangements (HRAs), or similar medical payment products, from which the majority of routine health care expenses and the first large slice of any catastrophic insurance claim would be used to pay health care providers and prescription medicines. The advantage of this system is that the consumer is expected to play a higher role in ensuring value for money. But this is but one option of many that have been discussed in the current debates in the U.S.Congress.

United Arab Emirates

Standards of health care are considered to be generally high in the United Arab Emirates, resulting from increased government spending during strong economic years. According to the UAE government, total expenditures on health care from 1996 to 2003 were US$436 million. According to the World Health Organization, in 2004 total expenditures on health care constituted 2.9 percent of gross domestic product (GDP), and the per capita expenditure for health care was US$497. Health care currently is free only for UAE citizens. Effective January 2006, all residents of Abu Dhabi are covered by a new comprehensive health insurance program; costs will be shared between employers and employees. The number of doctors per 100,000 (annual average, 1990–99) is 181. The UAE now has 40 public hospitals, compared with only seven in 1970. The Ministry of Health is undertaking a multimillion-dollar program to expand health facilities–hospitals, medical centers, and a trauma center–in the seven emirates. A state-of-the-art general hospital has opened in Abu Dhabi with a projected bed capacity of 143, a trauma unit, and the first home health care program in the UAE. To attract wealthy UAE nationals and expatriates who traditionally have traveled abroad for serious medical care, Dubai is developing Dubai Healthcare City, a hospital free zone that will offer international-standard advanced private health care and provide an academic medical training center; completion is scheduled for 2010.[15]

Zimbabwe

Zimbabwe now has one of the lowest life expectancies on Earth - 44 for men and 43 for women, down from 60 in 1990. The rapid drop has been ascribed mainly to the HIV/AIDS pandemic. Infant mortality has risen from 59 per thousand in the late 1990s to 123 per 1000 by 2004. The health system has more or less collapsed: By the end of November 2008, three of Zimbabwe's four major hospitals had shut down, along with the Zimbabwe Medical School and the fourth major hospital had two

wards and no operating theatres working. Due to hyperinflation, those hospitals still open are not able to obtain basic drugs and medicines. The ongoing political and economic crisis also contributed to the emigration of the doctors and people with medical knowledge. In August 2008, large areas of Zimbabwe were struck by the ongoing choleraepidemic.

Out-of-pocket expenses

Out-of-pocket expenses are direct outlays of cash which may or may not be later reimbursed.

In operating a vehicle, gasoline, parking fees and tolls are considered out-of-pocket expenses for the trip. Insurance, oil changes, and interest are not, because the outlay of cash covers expenses accrued over a longer period of time.

The services rendered and other in-kind expenses are not considered out-of-pocket expenses, nor are depreciation of capital goods or depletion.

Organizations often reimburse out-of-pocket expenses incurred on their behalf, especially expenses incurred by employees on their employers' behalf. In the United States, out-of-pocket expenses for such things as charity, medical bills, and education may be deductions on federal income taxes, according to IRS regulations.

To be **out of pocket** is to have expended personal resources, often unexpectedly or unfairly, at the end of some enterprise.

Since at least 1970, the phrase *out of pocket* has been occasionally used as a synonym for *out of contact*.[*citation needed*]

Health Financing

In the health care financing sector, this represents the share of the expenses that the patient or the family pay directly to the health care provider, without a third-party (insurer, or state). This usually means that the family has to bear the costs, without risk sharing or solidarity mechanisms involved, and without the possibility to spread the cost overtime.

National health insurance

National health insurance is health insurance that insures a national population for the costs of health care and usually is instituted as a program of healthcare reform. It may be administered by the public sector, the private sector, or a combination of both. Funding mechanisms vary with the particular program and country. National health insurance does not equate to government run or government financed health care, but is usually established by national legislation.

History

Germany has the world's oldest national health insurance, through the world's oldest universal health care system, with origins dating back to Otto von Bismarck's social legislation, which included the Health Insurance Bill of 1883, Accident Insurance Bill of 1884, and Old Age and Disability Insurance Bill of 1889. In Britain, the National Insurance Act 1911 marked the first steps there towards national health insurance, covering most employed persons and their financial dependents and all persons who had been continuous contributors to the scheme for at least five years whether they were working or not. This system of health insurance continued in force until the creation of the National Health Service in 1948 which extended health care security to all legal residents. Most other countries national health insurance systems were implemented in the period following the Second World War as a process of deliberate healthcare reform, intended to make health care affordable to all, in the spirit of Article 25 of the Universal Declaration of Human Rights of 1948 by nations which had adopted the declaration as signatories. The US did not ratify the social and economic rights sections, including Article 25's right to health.[1]

Types of programs

Health care systems, Single-payer health care, and Universal health care

National healthcare insurance programs differ both in how the money is collected, and in how the services are provided. In countries such as Canada, payment is made by the government directly from tax revenue. In the UK an additional contribution is collected for all workers, paid by employees and employers based on the level of salary paid. In both of these cases the collection is administered by government. In France a similar system of compulsory contributions is made, but the collection is administered by non-profit organisations set up for the purpose. This is known in the United States as single-payer health care. The provision of services may be either through health care providers that may be publicly or privately owned.

An alternative funding approach is where countries implement national health insurance by legislation requiring compulsory contributions to competing insurance funds. These funds (which may be run by public bodies, private for-profit companies, or private non-profit companies), must provide a minimum standard of coverage and are not allowed to discriminate between patients by charging different rates according to age, occupation, or previous health status. To protect the interest of both patients and insurance companies, the government establishes an equalization pool to spread risks between the various funds. The government may also contribute to the equalization pool as a form of health care subsidy. This is the model used in the Netherlands.

Other countries are largely funded by contributions by employers and employees to sickness funds. With these programs, funds do not come from the government, and neither from direct private payments. This system operates in countries such as Germany and Belgium. These countries have so-called social health insurance systems, characterized by the presence of sickness funds, which can be based on professional, regional, religious, or political affiliation. Usually characterization is a matter of degree: systems are mixes of these three sources of funds (private,

employer-employee contributions, and national/sub-national taxes). These funds are usually not for profit institutions run solely for the benefit of their members.

In addition to direct medical costs, some national insurance plans also provide compensation for loss of work due to ill-health, or may be part of wider social insurance plans covering things such as pensions, unemployment, occupational retraining, and financial support for students. National schemes have the advantage that the pool or pools tend to be very very large and reflective of the national population. Health care costs, which tend to be high at certain stages in life such as during pregnancy and childbirth and especially in the last few years of life can be paid into the pool over a lifetime and be higher when earnings capacity is greatest to meet costs incurred at times when earnings capacity is low or non existent. This differs from the private insurance schemes that operate in some countries which tend to price insurance year on year according to health risks such as age, family history, previous illnesses, and height/weight ratios. Thus some people tend to have to pay more for their health insurance when they are sick and/or are least able to afford it. These factors are not taken into consideration in NHI schemes. In private schemes in competitve insurance markets, these activities by insurance companies tend to act against the the basic principles of insurance which is group solidarity.

National health insurance schemes

- Health care in Ghana - National Health Insurance Scheme (NHIS)
- Health care in Colombia - Law 100 - National Health Insurance Scheme: Contributory Vs. Subsidized coverage (NHIS)
- Health care in Japan - People without insurance through employers can participate in a national health insurance program administered by local governments.
- Health care in South Korea
- Health care in Switzerland - A compulsory health insurance covers a range of treatments which are set out in detail in the Federal Act.
- Health care in Taiwan - National Health Insurance (NHI)
- Health care in Nigeria - National Health Insurance Scheme (NHIS)
- Health care in Canada

Health policy

Health care often accounts for one of the largest areas of spending for both governments and individuals all over the world, and as such it is surrounded by controversy. For example, it is now clear that medical debt is now a leading cause of bankruptcy in the United States.[1] Though there are many topics involved in health care politics, most can be categorized as either philosophical or economic. Philosophical debates center around questions about individual rights and government authority while economic topics include how to maximize the quality of health care and minimize costs.

Background

The modern concept of health care involves access to medical professionals from various fields as well as medical technologies such as medication and surgical techniques. One way that a person gains access to these goods and services is by paying for them. Many governments around the world have established universal health care, which attempts to provide the same level of access to every person in a country. Many citizens are against universal health care for a variety of reasons.

Philosophy

Right to Health Care

The United Nations' Universal Declaration of Human Rights (UDHR) asserts that medical care is a right of all people. Many religions also impose an obligation on their followers to care for those in less favourable circumstances, including the sick. Humanists too would assert the same obligation and the right has been enshrined in many other ways too.[2][3]

An opposing school of thought rejects this notion. They (laissez-faire capitalists for example) assert that providing health care funded by taxes is immoral because it is a form of legalized robbery, denying the right to dispose of one's own income at one's own will. They assert that doctors should not be servants of their patients but rather they should be regarded as traders, like everyone else in a free society."

Government Regulation

A second question concerns the effect government involvement would have. One concern is that the right to privacy between doctors and patients could be eroded if governments demand power to oversee health of citizens.

Another concern is that governments use legislation to control personal freedoms. For example, some Canadian provinces have outlawed private medical insurance from competing with the national social insurance systems for basic health care to ensure fair allocation of national resources irrespective of personal wealth. Laissez-faire supporters argue that this blocks a fundamental freedom to use one's own purchasing power at will.

Controlling the Industry

When a government controls the health care industry, it defines what health care is available, and how it is paid for, privately or with taxes. Public regulation, investor owned HMOs and medical insurance companies (which are not under the democratic control of health care users) may all determine what health care a person might get.

Universal health care requires government involvement and oversight.

Impact on quality of health care

One question that is often brought up is whether publicly-funded health care provides better or worse quality health care than market driven medicine. There are many arguments on both sides of the issue.

Arguments which see publicly-funded health care as improving the quality of health care:

- For those people who would otherwise go without care, any quality care is an improvement.
- Since people perceive universal health care as *free*, they are more likely to seek preventative care which makes them better off in the long run.
- A study of hospitals in Canada found that death rates are lower in private not-for-profit hospitals than in private for-profit hospitals.

Arguments which see publicly-funded health care as worsening the quality of health care:

- It slows down innovation and inhibits new technologies from being developed and utilized. This simply means that medical technologies are less likely to be researched and manufactured, and technologies that are available are less likely to be used.
- Free health care can lead to overuse of medical services, and hence raise overall cost.
- Publicly-funded medicine leads to greater inefficiencies and inequalities.
- It is alleged that uninsured citizens can simply pay for their health care. Even indigent citizens can still receive emergency care from alternative sources such as non-profit organizations. Some providers may be required to provide some emergency services regardless of insured status or ability to pay, as with the Emergency Medical Treatment and Active Labor Act in the United States.

Impact on medical professionals

Proponents of universal health care contend that universal health care reduces the amount of paperwork that medical professionals have to deal with, allowing them to concentrate on treating patients.

Impact on Medical Research

Those in favor of universal health care posit that removing profit as a motive will increase the rate of medical innovation. Those opposed argue that it will do the opposite, for the same reason.

Economic Impact

Universal health care affects economies differently than private health care.

Those in favor of universal health care contend that it reduces wastefulness in the delivery of health care by removing the middle man, the insurance companies, and thus reducing the amount of bureaucracy.

Those opposed to universal health care argue that socialized medicine suffers from the same financial problems as any other government planned economy. They argue that it requires governments to greatly increase taxes as costs rise year over year. Their claim is that universal health care essentially tries to do the economically impossible. Opponents of universal health care argue that government agencies are less efficient due to bureaucracy. However, supporters note that modern industrial countries with socialized medicine tend to spend much less on health care than similar countries lacking such systems.

In the United States, opponents of universal health care also claim that, before heavy regulation of the health care and insurance industries, doctor visits to the elderly, and free care or low cost care to impoverished patients were common, and that governments effectively regulated this form of charity out of existence. They suggest that universal health care plans will add more inefficiency to the medical system through additional bureaucratic oversight and paperwork, which will lead to fewer doctor patient visits.

Means

Many forms of universal health care have been proposed. These include mandatory health insurance requirements, complete capitalization of health care, and single payer systems among others.

Hyperbole

Hyperbole has become a dominant feature of health care politics in the United States. Some examples are these.

Publicly-funded health care

Publicly-funded health care is a form of health care financing designed to meet the cost of all or most health care needs from a publicly managed fund. Usually this is under some form of democratic accountability, the right of access to which are set down in rules applying to the whole population contributing to the fund or receiving benefits from it. The fund may be a not-for-profit trust which pays out for health care according to common rules established by the members or by some other democratic form. In some countries the fund is controlled directly by the government or by an agency of the government for the benefit of the entire population. This distinguishes it from other forms of private medical insurance, the rights of access to which are subject to contractual obligations between an insurer (or his sponsor) and an insurance company which seeks to make a profit by managing the flow of funds between funders and providers of health care services.

Financing

Publicly funded health care systems are usually financed in one of two ways: through taxation or via required national health insurance.

When taxation is the primary means of financing health care, everyone receives the same level f coverage regardless of their ability to pay, their level of taxation, or risk factors.

In compulsory insurance models, healthcare is financed through a "sickness fund", which can receive income from a number of places such as employees' salary deductions, employers' contributions, or top-ups from the state.

Varieties of public systems

Health care system

Most developed countries currently have partially or fully publicly funded health systems. For example, each country of the United Kingdom has a National Health Service (NHS). Other examples would be the Medicare systems in Canada and in Australia. In most countries of Europe, a system of social insurance based on the principle of social solidarity shields the citizen from bearing the burden of most health care expenditures at the time of consumption. The citizen contributes to these costs in taxation during his or her lifetime.

Among countries with significant public funding of health care there are many different approaches exist to the funding and provision of medical services. Systems may be funded from general government revenues (as in the United Kingdom and Canada), or through a government social security system (as in France, Belgium, Japan, and Germany) with a separate budget and hypothecated taxes. The proportion of the cost of care covered also differs: in Canada, all hospital care is paid for by the government, while in Japan patients must pay 10 to 30% of the cost of a hospital stay. Services provided by public systems vary. For example, the Belgian government pays the bulk of the fees for dental and eye care, while the Australian government covers only eye care.

Publicly funded medicine may be administered and provided by the government, as in the United Kingdom; in some systems, though, medicine is publicly funded but most health providers are private entities, as in Canada. The organization providing public health insurance is not necessarily a public administration, and its budget may be isolated from the main state budget. Some systems do not provide universal healthcare, or restrict coverage to public health facilities. Some countries, such as Germany, have multiple public insurance organizations linked by a common legal framework. Some, like Holland, allow private for-profit insurers to participate.

Innovations in health care can be very expensive. Population aging generally implies more health care, at a time when the taxed working population decreases.[*citation needed*]

Two-tier health care

Almost every major country that has a publicly funded health care system also has a parallel private system, generally catering to private insurance holders. While one goal of public systems is to provide equal service to all, this egalitarianism is often partial. Every nation either has parallel private providers or its citizens are free to travel to a nation that does, so there is effectively a two-tier healthcare system that reduces the equality of service.

From the inception of the NHS model (1948), public hospitals in the United Kingdom have included "amenity beds" which would typically be siderooms fitted more comfortably, and private wards in some hospitals where for a fee more amenities are provided. Patients using these beds are in an NHS hospital for surgical treatment, and operations are generally carried out in the same operating theatres as NHS work and by the same personnel but the hospital and the physician will receive funding from an insurance company. These amenity beds do not exist in all publicly funded systems, such as in Spain. From time to time, the NHS pays for private hospitals (*arranged hospitals*) to take on surgical cases under contract.

Policy discussion

Many countries are seeking the right balance of public and private insurance, public subsidies, and out-of-pocket payments.

Many OECD countries have implemented reforms to achieve policy goals of ensuring access to health-care, improving the quality of health care and health outcomes, allocating an appropriate level of public sector other resources to health care, whilst at the same time ensuring that services are provided in a cost-efficient and cost-effective manner (microeconomic efficiency). A range of measures, such as better payment methods, have improved the microeconomic incentives facing providers. However, introducing improved incentives through a more competitive environment among providers and insurers has proved difficult.

There are deaths from insufficient coverage, of both people and procedures, by private health insurance in the US. A 2009 Harvard study published in the American Journal of Public Health found more than 44,800 excess deaths annually in the United States due to Americans lacking health insurance, equivalent to one excess death ever 12 minutes. More broadly, the total number of people in the United States, whether insured or uninsured, who die because of lack of medical care were estimated in a 1997 analysis to be nearly 100,000 per year.

Healthcare reform

Healthcare reform is a general rubric used for discussing major health policy creation or changes—for the most part, governmental policy that affects healthcare delivery in a given place. Healthcare reform typically attempts to:

- Broaden the population that receives health care coverage through either public sector insurance programs or private sectorinsurance companies
- Expand the array of health care providers consumers may choose among
- Improve the access to health care specialists

- Improve the quality of health care
- Decrease the cost of health care

Universal health care.

Universal health care is health care coverage for all eligible residents of a political region and often covers medical, dental and mental health care. Typically, costs are borne in the majority by publicly-funded programs.

Universal health care systems vary according to the extent of government involvement in providing care and/or health insurance. In some countries, such as the UK, Spain, and the Nordic countries, the government has a high degree of involvement in the commissioning or delivery of health care services and access is based on residence rights not on the purchase of insurance. Others have a much more pluralistic delivery system based on obligatory health with contributory insurance rates related to salaries or income, and usually funded by employers and beneficiaries jointly. Sometimes the health funds are derived from a mixture of insurance premiums and government taxes. These insurance based systems tend to have a higher proportion of private medical providers obtaining reimbursement, often at heavily regulated rates, through mutual or publicly owned medical insurers. A few countries such as the Netherlands and Switzerland operate via privately owned but heavily regulated private insurers. Americans use the term "single-payer health care" to describe the pooling of health care funds into a single not-for-profit fund for a region or nation. The term is frequently ascribed to the Canadian health care system.

Universal health care is implemented in all industrialized countries, with the exception of the United States.[1] It is also provided in many developing countries.

History

Germany has the world's oldest universal health care system, with origins dating back to Otto von Bismarck's social legislation, which included the Health Insurance Bill of 1883, Accident Insurance Bill of 1884, and Old Age and Disability Insurance Bill of 1889. In Britain, the National Insurance Act 1911 marked the first steps there towards universal health care, covering most employed persons and their financial dependents and all persons who had been continuous contributors to the scheme for at least five years whether they were working or not. This system of health insurance continued in force until the creation of the National Health Service in 1948 which extended health care security to all legal residents. Most current universal health care systems were implemented in the period following the Second World War as a process of deliberate healthcare reform, intended to make health care available to all, in the spirit of Article 25 of the Universal Declaration of Human Rights of 1948, signed by every country doing so. The US did not ratify the social and economic rights sections, including Article 25's right to health.[2]

Implementation and Comparisons

Universal health care is a broad concept that has been implemented in several ways. The common denominator for all such programs is some form of government action aimed at extending access to health care as widely as possible and setting minimum standards. Most implement universal health care through legislation, regulation and taxation. Legislation and regulation direct what care must be provided, to whom, and on what basis. Usually some costs are borne by the patient at the time of consumption but the bulk of costs come from a combination of compulsory insurance and tax revenues. Some programs are paid for entirely out of tax revenues. In others tax revenues are used either to fund insurance for the very poor or for those needing long term chronic care. The UK government's National Audit Office in 2003 published an international comparison of ten different health care systems in ten developed countries, nine universal systems against one non-universal system (the U.S.), and their relative costs and key health outcomes. A wider international comparison of 16 countries, each with universal health care, was published by the World Health Organization in 2004 In some cases, government involvement also includes directly managing the health care system, but many countries use mixed public-private systems to deliver universal health care.

Medicare

In Australia, Medibank — as it was then known — was introduced, by the Whitlam Labor government on 1 July1975, through the Health Insurance Act 1973. The Australian Senate rejected the changes multiple times and they were passed only after a joint sitting after the 1974 double dissolution election. However, Medibank was supported by the subsequent FraserCoalition (Australia) government and became a key feature of Australia's public policy landscape. The exact structure of Medibank / Medicare, in terms of the size of the rebate to doctors and hospitals and the way it has administered, has varied over the years. The original Medibank program proposed a 1.35% levy (with low income exemptions) but these bills were rejected by the Senate, and so Medibank was funded from general taxation. In 1976, the Fraser Government introduced a 2.5% levy and split Medibank in two: a universal scheme called Medibank Public and a government-owned private health insurance company, Medibank Private.

During the 1980s, Medibank Public was renamed Medicare by the Hawke Labor government, which also changed the funding model, to an income tax surcharge, known as the Medicare Levy, which was set at 1.5%, with exemptions for low income earners. The Howard Coalition government introduced an additional levy of 1.0%, known as the Medicare Levy Surcharge, for those on high annual incomes ($70,000) and do not have adequate levels of private hospital coverage. This was part of an effort by the Coalition to encourage take-up of private health insurance. According to WHO, government funding covered 67.5% of Australia's health care expenditures in 2004; private sources covered the remaining 32.5% of expenditures.

Funding models

Universal health care in most countries has been achieved by a mixed model of funding. General taxation revenue is the primary source of funding, but in many countries it is supplemented by specific levies (which may be charged to the individual and/or an employer) or with the option of private payments (either direct or via optional insurance) for services beyond that covered by the public system.

Almost all European systems are financed through a mix of public and private contributions. The majority of universal health care systems are funded primarily by tax revenue (e.g. Portugal and Spain). Some nations, such as Germany, France and Japan employ a multi-payer system in which health care is funded by private and public contributions. However, much of the non-government funding is by defined contributions by employers and employees to regulated non-profit sickness funds. These contributions are compulsory and vary according to a person's salary, and are effectively a form of hypothecated taxation.

A distinction is also made between municipal and national healthcare funding. For example, one model is that the bulk of the healthcare is funded by the municipality, speciality healthcare is provided and possibly funded by a larger entity, such as a municipal co-operation board or the state, and the medications are paid by a state agency.

Universal health care systems are modestly redistributive. Progressivity of health care financing has limited implications for overall income inequality.[75]

Single-payer

The term single-payer health care is used in the United States to describe a funding mechanism meeting the costs of medical care from a single fund. Although the fund holder is usually the government, some forms of single-payer employ a public-private system.

Public

Some countries (notably the United Kingdom, Italy and Spain) have eliminated insurance entirely and choose to fund health care directly from taxation. Other countries with insurance-based systems effectively meet the cost of insuring those unable to insure themselves via social security arrangements funded from taxation, either by directly paying their medical bills or by paying for insurance premiums for those affected.

Compulsory insurance

This is usually enforced via legislation requiring residents to purchase insurance, though sometimes, in effect, the government provides the insurance. Sometimes there may be a choice of multiple public and private funds providing a standard service (e.g. as in Germany) or sometimes just a single public fund (as in Canada).

In some European countries where there is private insurance and universal health care, such as Germany, Belgium, and The Netherlands, the problem of adverse selection (see Private insurance below) is overcome using a risk compensation pool to equalize, as far as possible, the risks between funds. Thus a fund with a predominantly healthy, younger population has to pay into a compensation pool and a fund with an older and predominantly less healthy population would receive funds from the pool. In this way, sickness funds compete on price and there is no advantage to eliminate people with higher risks because they are compensated for by means of risk-adjusted capitation payments. Funds are not allowed to pick and choose their policyholders or deny coverage, but then mainly compete on price and service. In some countries the basic coverage level is set by the government and cannot be modified.

Ireland at one time had a "community rating" system through VHI, effectively a single-payer or common risk pool. The government later opened VHI to competition but without a compensation pool. This resulted in foreign insurance companies entering the Irish market and offering cheap health insurance to relatively healthy segments of the market which then made higher profits at VHI's expense. The government later re-introduced community rating through a pooling arrangement and at least one main major insurance company, BUPA, then withdrew from the Irish market.

In some countries with universal coverage, private insurance often excludes many health conditions which are expensive and which the state health care system can provide. For example in the UK, one of the largest private health care providers is BUPA which has the following list of general exclusions.

Dental/oral treatment (such as fillings, gum disease, jaw shrinkage, etc)†; pregnancy and childbirth†; temporary relief of symptoms†; convalescence, rehabilitation and general nursing care†; drugs and dressings for out-patient or take-home use†; screening and preventive treatment; birth control, conception, sexual problems and sex changes†; allergies or allergic disorders; chronic conditions†; eyesight†; physical aids and devices†; *deafness; cosmetic, reconstructive or weight loss treatment† ; ageing, menopause and puberty ; dialysis† ; complications from excluded or restricted conditions/ treatment ; HRT and bone densitometry†; learning difficulties, behavioural and developmental problems ; overseas treatment and repatriation ; AIDS/HIV† ; pre-existing or special conditions ; experimental drugs and treatment† ; sleep problems and disorders ; speech disorders†

all of which (except overseas repatriation) are available for free or very low cost from the NHS. († indicates that treatment may be provided in certain circumstances)

Where voluntary insurance (often private) is predominant, such as in the U.S., medical (health) insurance is subject to the well-known economic problem of adverse selection which may also be referred to as a market failure. Adverse selection in insurance markets occurs because those providing insurance have limited information with which to estimate the health risks on which they may need to pay future claims. In simple terms, those with poor health are more likely to apply for insurance and more likely to need treatments requiring high insurance company

payouts. Those with good health may find the cost of insurance too high for the perceived benefit, and some will remove themselves from the risk pool. This adverse selection concentrates the risk pool, thereby further raising costs. In practical terms, the potential for adverse selection means that private insurers have an economic incentive to use medical underwriting to 'weed out' high cost applicants in order to avoid adverse selection. Among the potential solutions posited by economists are single payer systems as well as other methods of ensuring that health insurance is universal, such as by requiring all citizens to purchase insurance and limiting the ability of insurance companies to deny insurance to individuals or vary price between individuals.

Mental health professional

A **mental health professional** is a person who offers services for the purpose of improving an individual's mental health or to treat mental illness. This broad category includes psychiatrists, clinical psychologists, clinical social workers, psychiatric nurses, mental health counselors as well as many other professionals. These professionals often deal with the same illnesses, disorders, conditions, and issues; however their scope of practice often differs. The most significant difference between mental health professionals are the laws regarding required education and training in the various groupings.

Professional distinctions

Comparison of American mental health professionals

Occupation	**Degree**	**Common Licenses**	**Prescription Privilege**	**Average Income** ($US)
Psychiatrist	MD/DO	Psychiatrist	Yes	$190,000
Clinical Psychologist	PhD/PsyD	Psychologist	Varies	$75,000
School Psychologist	Doctoral Level PhD/EdD Post-Master's Terminal Degree (not doctoral level) EdS Masters Level MA/MS	Certified School Psychology, National Certified School Psychologist	No	$78,000
Counselor/Psychotherapist (Doctorate)	PhD/EdD/DMFT	MFT/LPC	No	$65,000
Counselor/Psychotherapist (Masters)	MA/MS/MC	MFT/LPC/LPA/LMHC	No	$49,000
Clinical Social Worker	MSW/DSW/PhD plus two to three years of post-master's supervised clinical experience	LCSW/LICSW	No	$50,700
Social Worker (agency based master's level)	MSW/DSW/PhD	LMSW/GSW/LSW	No	$46,170
Social Worker (bachelor level)	BSW	RSW, SWA, Social Work Assistant	No	$29,170
Psychiatric Nurse	BSN/MSN/DNP/PhD	MHNP/NPP	Varies	$75,711
Physician assistant	MPAS/MHS/MMS/DScPA	PA/PA-C/APA-C/RPA/RPA-C	Yes	$80,356[2]
Expressive/Art Therapist	MA	ATR/MT-BC	No	$45,000

Treatment diversity

Mental health professionals exist to improve the mental health of individuals, couples, and families. Because mental health covers a wide range of elements, the scope of practice greatly varies between professionals. Some professionals may enhance relationships while others treat specific mental disorders and illness. Often, as with the case of psychiatrists and psychologists, the scope of practice may overlap.

Most qualified mental health professionals will refer a patient or client to another professional if the specific type of treatment needed is outside of their scope of practice. Additionally, many mental health professionals may sometimes work together using a variety of treatment options such as concurrent psychiatric medication and psychotherapy. Additionally, specific mental health professionals may be utilized based upon their cultural and religious background or experience.

Psychiatrist

Main articles: Psychiatrist and Psychiatry

Psychiatrists are physicians and one of the few professionals in the mental health industry who specialize and are certified in treating mental illness using the biomedical approach to mental disorders including the use of medications.

Psychiatrists may also go through significant training to conduct psychotherapy and cognitive behavioral therapy; however psychologists and clinical psychologists specialize in the research and clinical application of these techniques. The amount of training a psychiatrist holds in providing these types of therapies varies from program to program and also differs greatly based upon region.

Specialties of psychiatrists

As part of their evaluation of the patient, psychiatrists are one of only a few mental health professionals who may conduct physical examinations, order and interpret laboratory tests and EEGs, and may order brain imaging studies such as CT or CAT, MRI, and PET scanning. A medical professional must evaluate the patient for any medical problems or diseases that may be the cause of the mental illness.

Historically psychiatrists have been the only mental health professional with the power to prescribe medication to treat specific types of mental illness. However Physician Assistants, psychiatric nurses, and clinical psychologists have gained the ability to prescribe psychiatric medications in a few U.S. states.

Educational requirements for psychiatrists

Typically the requirements to become a psychiatrist are substantial but differ from country to country.

In the United Kingdom, the Republic of Ireland, and most Commonwealth countries, a would-be psychiatrist must first obtain Bachelor of Medicine and Bachelor of Surgery degrees. These degrees are most often abbreviated MB BS: MB ChB, MB BCh, MB BChir (Cambridge), BM BCh (Oxford), BM BS, or plain BM also occur. Following this, the individual in the UK will in future act as a "foundation programme trainee" for two additional years. The foundation programme allows new graduates to experience the different specialties of medicine, as well as learn important attributes and qualities of a doctor. Upon completion, a postgraduate student can apply for training to specialize in psychiatry. Following acceptance, this specialized training will last for about 6 years. After one year of training a written and clinical examination would be taken and after three years or so and experience in a range of subspecialties the Specialist Trainee would pass the examination for Membership of the Royal College of Psychiatrists: abbreviated as MRCPsych. In the past a few trained in internal medicine (qualifying as MRCP) or, more recently, general practice (MRCGP) before starting psychiatric training. After obtaining a Certificate of Specialist Training, the individual can apply for a consultant post and work independently as a psychiatrist or, more often, as part of a multi-disciplinary team.

In the United States and Canada one must first complete a Bachelor's degree. Students may typically decide any major of their choice, however they must enroll in specific courses, usually outlined in a pre-medical program.[10] One must then apply to and attend 4 years of medical school in order to earn their MD or DO and to complete their medical education. Following this, the individual must practice as a psychiatric resident for another four years. Psychiatry residents are required to complete at least four post-graduate months of internal medicine (pediatrics may be substituted for some or all of the internal medicine months for those planning to specialize in child and adolescent psychiatry) and two months of neurology, usually during the first year.[10] Occasionally, some prospective psychiatry residents will choose to do a transitional year internship in medicine or general surgery, in which case they may complete the two months of neurology later in their residency. After completing their training, psychiatrists take written and then oral board examinations.[10] The total amount of time required to qualify in the field of psychiatry in the United States is typically 4 to 5 years after obtaining the MD or DO.

Clinical psychologist

A clinical psychologist studies and applies psychology for the purpose of understanding, preventing, and relieving psychologically-based distress or dysfunction and to promote subjective well-being and personal development. In many countries it is a regulated profession that addresses moderate to more severe or chronic psychological problems, including diagnosable mental disorders. Clinical psychology includes a wide range of practices, such as research, psychological assessment, teaching, consultation, forensic testimony, and program development and administration. Central to clinical psychology is the practice of psychotherapy, which uses a wide range of techniques to change thoughts, feelings, or behaviors in service to enhancing subjective well-being, mental health, and life functioning. Unlike other mental health professionals, psychologists are trained to conduct

psychological assessment. Clinical psychologists can work with individuals, couples, children, older adults, families, small groups, and communities.

Specialties of clinical psychologists

Clinical psychologists who focus on treating mental health specialize in evaluating patients and providing psychotherapy. There are a wide variety of therapeutic techniques and perspectives that guide practitioners, although most fall into the major categories of Psychodynamic, Cognitive Behavioral, Existential-Humanistic, and Systems Therapy (e.g. family or couples therapy).

In addition to therapy, clinical psychologists are also trained to administer and interpret psychological personality tests such as the MMPI and the Rorschach inkblot test, and various standardized tests of intelligence, memory, and neuropsychological functioning. Common areas of specialization include: specific disorders (e.g. trauma or depression), neuropsychological disorders, child and adolescent, family and relationship counseling, health, sport, forensic, organization and business, and school psychology.

[Educational requirements for clinical psychologists

Clinical psychologists undergo many hours of postgraduate training—usually 4 to 6 years post-Bachelors—in order to gain demonstrable competence and experience. Today, in the U.S., about half of the licensed psychologists are being trained in the Scientist-Practitioner Model of Clinical Psychology (PhD)—a model that emphasizes both research and clinical practice and is usually housed in universities. The other half are being trained within a Practitioner-Scholar Model of Clinical Psychology (PsyD), which focuses on practice (similar to professional degrees for medicine and law).[11] A third training model called the Clinical Scientist Model emphasizes training in clinical psychology research. Outside of coursework, graduates of both programs generally are required to have had 2 to 3 years of supervised clinical experience, a certain amount of personal psychotherapy, and the completion of a dissertation (PhD programs usually require original quantitative empirical research, whereas the PsyD equivalent of dissertation research often consists of literature review and qualitative research, theoretical scholarship, program evaluation or development, critical literature analysis, or clinical application and analysis).

Counseling psychologist or psychotherapist

Counseling generally involves helping people with what might be considered "normal" or "moderate" psychological problems, such as the feelings of anxiety or sadness resulting from major life changes or events.[12][13] As such, counseling psychologists often help people adjust to or cope with their environment or major events, although many also work with more serious problems as well.

One may practice as a counseling psychologist with a PhD or EdD, and as a counseling psychotherapist with a Masters degree. Compared with clinical psychology, there are fewer counseling psychology graduate programs (which are commonly housed in departments of education), counselors tend to conduct more

vocational assessment and less projective or objective assessment, and they are more likely to work in public service or university clinics (rather than hospitals or private practice).[14] Despite these differences, there is considerable overlap between the two fields and distinctions between them continue to fade.

Certified Mental Health Professional

The Certified Mental Health Professional (CMHP) certification is designed to measure an individual's competency in performing the following job tasks. The job tasks are not presented in any particular order of importance.

1. Maintain confidentiality of records relating to clients' treatment.
2. Encourage clients to express their feelings, discuss what is happening in their lives, and help them to develop insight into themselves and their relationships.
3. Guide clients in the development of skills and strategies for dealing with their problems.
4. Prepare and maintain all required treatment records and reports.
5. Counsel clients and patients, individually and in group sessions, to assist in overcoming dependencies, adjusting to life, and making changes.
6. Collect information about clients through interviews, observations, and tests.
7. Act as the client's advocate in order to coordinate required services or to resolve emergency problems in crisis situations.
8. Develop and implement treatment plans based on clinical experience and knowledge.
9. Collaborate with other staff members to perform clinical assessments and develop treatment plans.
10. Evaluate client's physical or mental condition based on review of client information.

School psychologist

School psychologists' primary concern is with the academic, social, and emotional well-being of children within a scholastic environment. Unlike clinical psychologists, they receive much more training in education, child development and behavior, and the psychology of learning, often graduating with a post-Masters Educational Specialist Degree (EdS), EdD or Doctor of Philosophy (Ph D) degree. Besides offering individual and group therapy with children and their families, school psychologists also evaluate school programs, provide cognitive assessment, help design prevention programs (e.g. reducing drops outs), and work with teachers and administrators to help maximize teaching efficacy, both in the classroom and systemically.[15]

Social worker

Social workers in the area of mental health may assess, treat, develop treatment plans, provide case management and/or rights advocacy to individuals with mental health problems. They can work independently or within clinics/service agencies, usually in collaboration with other health care professionals.

In the US, they are often referred to as clinical social workers; each state specifies the responsibilities and limitations of this profession. State licensing boards and national certification boards require clinical social workers to have a masters or doctoral degree (MSW or DSW/PhD) from a university. The doctorate in social work requires submission of a major original contribution to the field in order to be awarded the degree.

In the UK, Approved Mental Health Professionals, who are usually social workers, have a legal role in the assessment and detention of eligible mentally disordered people under the Mental Health Act (1983).

In general, it is the social model, rather ,or in addition to, the dominant medical model, that is the underlying rationale for mental health social work, including a focus on social causation, labeling, critical theory and social constructivism. Many argue social workers need to work with medical and health colleagues to provide an effective service but they also need to be at the forefront of processes that include and empower services users.[16]

Psychiatric and mental health nurse

Psychiatric Nurses or Mental Health Nurse Practitioners work with people with a large variety of mental health problems, often at the time of highest distress, and usually within hospital settings. These professionals work in primary care facilities, outpatient mental health clinics, as well as in hospitals and community health centers. MHNPs evaluate and provide care for patients who have anything from psychiatric disorders, medical mental conditions, to substance abuse problems. They are licensed to provide emergency psychiatric services, assess the psychosocial and physical state of their patients, create treatment plans, and continually manage their care. They may also serve as consultants or as educators for families and staff; however, the MHNP has a greater focus on psychiatric diagnosis, including the differential diagnosis of medical disorders with psychiatric symptoms and on medication treatment for psychiatric disorders.

Educational requirements for psychiatric and mental health nurses

Psychiatric and mental health nurses receive specialist education to work in this area. In some countries it is required that a full general nurse training be completed prior to specializing as a psychiatric nurse. In other countries, such as the U.K., an individual completes a specific nurse training course that determines their area of work. As with other areas of nursing, it is becoming usual for psychiatric nurses to be educated to degree level and beyond.

In order to become a nurse practitioner in the U.S., at least six years of college education must be obtained. After earning the Bachelor's degree (usually in nursing, although there are Masters Entry Level Nursing graduate programs intended for individuals with a Bachelors degree outside of nursing) the test for licensure as a registered nurse (the NCLEX-RN) must be passed. Next, the candidate must complete a state-approved Masters Degree advanced nursing education program

which includes at least 600 clinical hours. Several schools are now also offering further education and awarding a DNP(Doctorate of Nurse Practice).

Individuals who choose a Masters Entry Level pathway will spend an extra year at the start of the program taking classes necessary to pass the NCLEX-RN. Some schools will issue a BSN, others will issue a certificate. The student then continues with the normal MSN program.[17][18][19][20]

Health law

Health Law is the federal, state, and local law, rules, regulations and other jurisprudence affecting the health care industry and their application to health care patients, providers and payors, and vendors to the health care industry, including without limitation the (1) relationships among providers, payors and vendors to the health care industry and its patients; and (2) delivery of health care services; all with an emphasis on operations, regulatory and transactional legal issues.[1]

Some areas of law it includes are:

- Contract law
- Medical malpractice
- Administrative law
- Public health law
- Consent

Basic terms

The terms "legislation" and "law" are used to refer generically to statutes, regulation and other legal instruments (e.g. ministerial decrees) that may be the forms of law used in a particular country.

In general, there are a wide range of regulatory strategies that might be used to ensure people's health and safety. Increasingly, regulators are taking an approach of "responsive regulation". This involves using mechanisms that are responsive to the context, conduct and culture of those being regulated, providing for a range of regulatory mechanisms to achieve the behaviour desired. Where appropriate, the aim is to use incentives before sanctions. However, when those being regulated do not respond accordingly, escalating sanctions can be invoked. These strategies may be broadly 3 classified into five groups:

1.voluntarism : voluntary compliance undertaken by an individual oorganization without any coercion;

2.self-regulation : for example, an organized group that regulates the behaviou of its own members through a voluntary code of practice;

3.economic instruments: for example, supply-side funding sanctions or incentives for health care providers, and/or demand-side measures that give more power to consumers;

4.meta-regulation: involving an external regulatory body to ensure that healt care providers implement safety and quality practices and programmes;

5.command and control mechanisms : involving enforcement by government

Health care

Surgery is one of the most invasive, difficult and expensive procedures in medicine. The International Red Cross and Red Crescent Movement is a well-known international relief movement.

Health care (often **healthcare** in American English), is the treatment and management of illness, and the preservation of health through services offered by the medical, dental, complementary and alternative medicine, pharmaceutical, clinical sciences (*in vitro* diagnostics), nursing, and allied health professions. Health care embraces all the goods and services designed to promote health, including "preventive, curative and palliative interventions, whether directed to individuals or to populations".[1]

Before the term *health care* became popular, English-speakers referred to *medicine* or to the *health sector* and spoke of the treatment and prevention of illness and disease. The social and political issue of access to healthcare in the US has led to public debate and confusing use of terms such as **health care** (medical management of illness or disease), health insurance (reimbursement of health care costs), and the public health (the collective state and range of health in a population). The public health is related most to economic development and wealth distribution, and health insurance is a business which both provides and restricts reimbursement for healthcare itself in the event of disease, or in access to of medical healthcare in individual health-seeking, -promoting or -maintaining behaviours.

Provision

A health-care provider is a person or organization that provides services and/or health-care personnel to deliver proper health care in a systematic way to any individual in need of health-care services. A health-care provider could be a government, the health-care industry, a health-care equipment company, an institution such as a hospital or medical laboratory. Health-care professionals may include physicians, dentists, support staff, nurses, therapists, psychologists, pharmaconomists, pharmacists, chiropractors, and optometrists.

Practicing health care without a license is generally a serious crime that could be punished by up to several years in prison.

Health-care industry

The delivery of modern health care depends on an expanding group of trained professionals coming together as an interdisciplinary team.[2][3]

The health-care industry incorporates several sectors that are dedicated to providing services and products dedicated to improving the health of individuals. According to market classifications of industry such as the Global Industry Classification Standard and the Industry Classification Benchmark the health-care industry includes health care equipment & services and pharmaceuticals, biotechnology & life sciences. The particular sectors associated with these groups are: biotechnology, diagnostic substances, drug delivery, drug manufacturers, hospitals, medical equipment and instruments, diagnostic laboratories, nursing homes, providers of health care plans and home health care.

According to government classifications of Industry, which are mostly based on the United Nations system, the International Standard Industrial Classification, health care generally consists of Hospital activities, Medical and dental practice activities, and other human health activities. The last class consists of all activities for human health not performed by hospitals or by medical doctors or dentists. This involves activities of, or under the supervision of, nurses, midwives, physiotherapists, scientific or diagnostic laboratiories, pathology clinics, ambulance, nursing home, or other para-medical practitioners in the field of optometry, hydrotherapy, medical massage, occupational therapy, speech therapy, chiropody, homeopathy, chiropractice, acupuncture, etc.

Research

Biomedical research (or experimental medicine), in general simply known as medical research, is the basic research, applied research, or translational research conducted to aid the body of knowledge in the field of medicine. Medical research can be divided into two general categories: the evaluation of new treatments for both safety and efficacy in what are termed clinical trials, and all other research that contributes to the development of new treatments. The latter is termed preclinical research if its goal is specifically to elaborate knowledge for the development of new therapeutic strategies. A new paradigm to biomedical research is being termed translational research, which focuses on iterative feedback loops between the basic and clinical research domains to accelerate knowledge translation from the bedside to the bench, and back again.

In terms of pharmaceutical R&D spending, Europe spends a little less that the United States (€22.50bn compared to €27.05bn in 2006) and there is less growth in European R&D spending.[6][7] Pharmaceuticals and other medical devices are the leading high technology exports of Europe and the United States. However, the United States dominates the biopharmaceutical field, accounting for the three quarters of the world's biotechnology revenues and 80% of world R&D spending in biotechnology.

World Health Organization

The World Health Organization (WHO) is a specialized United Nations agency which acts as a coordinator and researcher for public health around the world. Established on 7 April1948, and headquartered in Geneva, Switzerland, the agency inherited the mandate and resources of its predecessor, the Health Organization, which had been

an agency of the League of Nations. The WHO's constitution states that its mission "is the attainment by all peoples of the highest possible level of health." Its major task is to combat disease, especially key infectious diseases, and to promote the general health of the peoples of the world. Examples of its work include years of fighting smallpox. In 1979 the WHO declared that the disease had been eradicated - the first disease in history to be completely eliminated by deliberate human design. The WHO is nearing success in developing vaccines against malaria and schistosomiasis and aims to eradicate polio within the next few years. The organization has already endorsed the world's first official HIV/AIDS Toolkit for Zimbabwe from October 3, 2006, making it an international standard.[9]

The WHO is financed by contributions from member states and from donors. In recent years the WHO's work has involved more collaboration, currently around 80 such partnerships, with NGOs and the pharmaceutical industry, as well as with foundations such as the Bill and Melinda Gates Foundation and the Rockefeller Foundation. Voluntary contributions to the WHO from national and local governments, foundations and NGOs, other UN organizations, and the private sector (including pharmaceutical companies), now exceed that of assessed contributions (dues) from its 193 member nations.[10]

Economics

Health economics is a branch of economics concerned with issues related to scarcity in the allocation of health and health care. Broadly, health economists study the functioning of the health care system and the private and social causes of health-affecting behaviors such as smoking.

A seminal 1963 article by Kenneth Arrow, often credited with giving rise to the health economics as a discipline, drew conceptual distinctions between health and other goals. Factors that distinguish health economics from other areas include extensive government intervention, intractable uncertainty in several dimensions, asymmetric information, and externalities.[12] Governments tend to regulate the health care industry heavily and also tend to be the largest payer within the market. Uncertainty is intrinsic to health, both in patient outcomes and financial concerns. The knowledge gap that exists between a physician and a patient can prevent the patient from accurately describing his symptoms or enable the physician to prescribe unnecessary but profitable services; these imbalances lead to market failures resulting from asymmetric information. Externalities arise frequently when considering health and health care, notably in the context of infectious disease. For example, making an effort to avoid catching a cold, or practising safer sex, affects people other than the decision maker.

The scope of health economics is neatly encapsulated by Alan William's "plumbing diagram"[13] dividing the discipline into eight distinct topics:

- What influences health? (other than health care)
- What is health and what is its value
- The demand for health care
- The supply of health care

- Micro-economic evaluation at treatment level
- Market equilibrium
- Evaluation at whole system level; and,
- Planning, budgeting and monitoring mechanisms.

Consuming just under 10 percent of gross domestic product of most developed nations, health care can form an enormous part of a country's economy. In 2001, health care consumed 8.4 per cent of GDP across the OECDcountries[14] with the United States (13.9%), Switzerland (10.9%), and Germany (10.7%) being the top three.

The United States and Canada account for 48% of world pharmaceutical sales, while Europe, Japan, and all other nations account for 30%, 9%, and 13%, respectively.[7] United States accounts for the three quarters of the world's biotechnology revenues.

Systems

The United States is currently[*when?*] debating the adoption of a national "single-payer" health care system, and these debates are contributing to biased descriptions of health care systems in the media. One case argues that a single-payer universal health care system will save money through reduced bureaucratic administration costs.[15]Social health insurance is where a nation's entire population is eligible for health care coverage, and this coverage and the services provided are regulated. In almost every country, state or municipality with a government health care system a parallel private, and usually for-profit, system is allowed to operate. This is sometimes referred to as two-tier health care. The scale, extent, and funding of these private systems is variable.

A traditional view is that improvements in health result from advancements in medical science. The medical model of health focuses on the eradication of illness through diagnosis and effective treatment. In contrast, the social model of health places emphasis on changes that can be made in society and in people's own lifestyles to make the population healthier. It defines *illness* from the point of view of the individual's functioning within their society rather than by monitoring for changes in biological or physiological signs.[16]

The United States currently operates under a mixed market health care system. Government sources (federal, state, and local) account for 45% of U.S. health care expenditures.[17] Private sources account for the remainder of costs, with 38% of people receiving health coverage through their employers and 17% arising from other private payment such as private insurance and out-of-pocket co-pays. Opponents of government intervention into the market generally believe that such intervention distorts pricing as government agents would be operating outside of the corporate model and the principles of market discipline; they have less short and medium-term incentives than private agents to make purchases that can generate revenues and avoid bankruptcy. Health system reform in the United States usually focuses around three suggested systems, with proposals currently underway to integrate these systems in various ways to provide a number of health care options. First is single payer, a term meant to describe a single agency managing a single system, as found

in most modernized countries as well as some states and municipalities within the United States. Second are employer or individual insurance mandates, with which the state of Massachusetts has experimented. Finally, there is consumer-driven health, in which systems, consumers, and patients have more control of how they access care. This is argued to provide a greater incentive to find cost-saving health care approaches. Critics of consumer-driven health say that it would benefit the healthy but be insufficient for the chronically sick, much as the current system operates. Over the past thirty years, most of the nation's health care has moved from the second model operating with not-for-profit institutions to the third model operating with for-profit institutions; the greater problems with this approach have been the gradual deregulation of HMOs resulting in fewer of the promised choices for consumers, and the steady increase in consumer cost that has marginalized consumers and burdened states with excessive urgent health care costs that are avoided with consumers have adequate access to preventive health care.

A few states have taken serious steps toward universal health care coverage, most notably Minnesota, Massachusetts and Connecticut, with recent examples being the Massachusetts 2006 Health Reform Statute[18] and Connecticut's Susti Net plan to provide quality, affordable health care to state residents.[19]

Politics

The politics of health care depends largely on which country one is in. Current concerns in England, for instance, revolve around the use of private finance initiatives to build hospitals which it is argued costs taxpayers more in the long run.[20] In Germany and France, concerns are more based on the rising cost of drugs to the governments. In Brazil, an important political issue is the breach of intellectual property rights, or patents, for the domestic manufacture of antiretroviral drugs used in the treatment of HIV/AIDS.

The South African government, whose population sets the record for HIV infections, came under pressure for its refusal to admit there is any connection with AIDS[21] because of the cost it would have involved. In the United States 12% to 16% of the citizens are still unable to afford health insurance. State boards and the Department of Health regulate inpatient care to reduce the national health care deficit. To tackle the problems of the perpetually increasing number of uninsured, and costs associated with the US health care system, President Barack Obama says he favors the creation of a universal health care system. [22] However, New York Times opinion columnist Paul Krugman said that Obama's plan would not actually provide universal coverage.[23] (In contrast, Dennis Kucinich, an early candidate who did not get on the ballot, supported a single-payer system.) Factcheck.org alleges that Obama's predicted savings were exaggerated. [24] In contrast, the state of Oregon and the city of San Francisco are both examples of governments that adopted universal healthcare systems for strictly fiscal reasons.

Donation

A **donation** is a gift given by physical or legal persons, typically for charitable purposes and/or to benefit a cause. A donation may take various forms, including

cash, services, new or used goods including clothing, toys, food, vehicles, it also may consist of emergency, relief or humanitarian aid items, development aid support, and can also relate to medical care needs as i.e. blood or organs for transplant. Charitable gifts of goods or services are also called gifts in kind.

Legal aspects

Donations are gifts given without return consideration. This lack of return consideration means that, in common law, an agreement to make a donation is an "imperfect contract void for want of consideration." Only when the donation is actually made does it acquire legal status as a transfer or property. In civil law jurisdictions, on the contrary, donations are valid contracts, though they may require some extra formalities, such as being done in writing.In politics, the law of some countries may prohibit or restrict the extent to which politicians may accept gifts or donations of large sums of money, especially from business or special interest groups (see campaign finance).

In countries where there are limits imposed on the freedom of disposition of the testator, there are usually similar limits on donations.The person or institution giving a gift is called the **donor**, and the person or institution getting the gift is called the **donee**.

Donating in the name of others

It is possible to donate in the name of a third party, making a gift in honor or in memory of someone or something. Gifts in honor or memory of a third party are made for various reasons, such as holiday gifts, wedding gifts, in memory of somebody who has died, in memory of pets or in the name of groups or associations no longer existing. Memorial gifts are sometimes requested by the survivors (e.g. "in lieu of flowers, contributions may be made to ABC Charity"), usually directing donations to a charitable organization for which the deceased was a donor or volunteer, or for a cause befitting the deceased's priorities in life or manner of death. Memorial donations are also sometimes given by people if they cannot go to the ceremonies.

Globalization and Health

Globalization and Health is an open-access, peer-reviewed, online journal that provides an international forum for high quality original research, knowledge sharing and debate on the topic of globalization and its effects on health, both positive and negative. Globalization, namely the intensification of flows of people, goods, and services across borders, has a complex influence on health. The journal publishes material relevant to any aspect of globalization and health from a wide range of social and medical science disciplines (e.g. economics, sociology, epidemiology, demography, psychology, politics and international relations). The output of the journal is useful to a wide audience, including academics, policy-makers, health care practitioners, and public health professionals. The journal is affiliated with the London School of Economics

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Course Name: Reproductive Health Issues

Course Description

The Course introduces complex definitions of reproductive health, differentiating maternal health and reproductive health, critical understanding of health related SDGs. It further involves human rights related to constellation of reproductive rights, the lifecycle approach of reproductive health, conceptualization of family planning &its methods, family planning versus birth control, stages of pregnancy, physiological changes of pregnancy, breast feeding, pre-conception counseling, infertility, maternal health, and continuous debates on abortion.

Course Objectives

· To help students learn complex issues related to reproductive health.
· To provide them with practical skills of assessing the achievement of health related MDGs in their own country.
· To further introduce students to critical thinking about how best reproductive health rights especially for women can be raised.
· To strengthen the capacity of practitioners of public health to discover more knowledge in reproductive health and thus disseminate it to the public for health improvements for populations at risk.

Course Content

Introduction

· Definition of Reproductive Health
· What is sexual Health
· Child bearing and Health
· Health related MDGs
· Violence against Women

Human Rights

· Supporting the constellation of Reproductive Rights
· What are reproductive rights
· Reproductive rights and international development goals

The life cycle approach of reproductive health

· Critical messages for different life stages
· Reproductive and sexual health is a social concern
· Stepping up efforts to save mothers' lives
· Female reproductive health risk factors

Family Planning

· Meaning of Family Planning
· Differentiation between Family and Birth Control
· Overview: Types of Birth Control
· Brief description of different methods of Family planning methods
· Benefits of Family planning

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Birth Control

· Meaning of Birth Control
· Methods of birth control
· Methods in development; For females and for males
· Modern misconceptions against birth control
· Birth control education

Stages of Pregnancy

· Initiation
· Perinatal period
· Postnatal period
· Child birth
· Diagnosis
· Prenatal development and sonograph images

Physiological changes in Pregnancy

· Hormonal changes
· Musculoskeletal changes
· Physical changes
· Cardiovascular changes
· Respiratory changes
· Metabolic changes
· Weight gains

Breast Feeding

· Meaning of breast feeding
· Benefits of breast feeding for the infant
· Benefits for the mothers
· Breastfeeding difficulties
· Types of breastfeeding
· History of breastfeeding
· Breastfeeding in public

Pre-conception Counseling

· Meaning of pre-conception counseling
· Obstacles of pre-conception counseling
· What is involved in pre-conception counseling

Infertility

· Definition of infertility
· Primary Vs Secondary infertility
· Prevalence of infertility
· Causes of infertility
· Different approaches to infertility treatment

Maternal Health

· Meaning of Maternal Health
· Problems affecting Maternal Health in developing countries
· Proposed solutions

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Abortion

· Definition of abortion
· Types of abortion
· Abortion methods
· Health consideration
· Incidence of induced abortion.

Mode of delivery Face to face lectures

Assessment

Coursework 40%

Exams 60%

Total Mark 100%

REPRODUCTIVE HEALTH ISSUES

- Definitions of reproductive health
- Sexual health
- Childbearing and health
- Reproductive health and abortion
- Public Policy & Legislation
- Violence against Women
- Human and Reproductive Rights
- Critical messages for different life stages
- Stepping up Efforts to Save Mothers' Lives
- Female Reproductive Health Risk Factors
- Family planning
- Birth control

Introduction

In this module we are going to look at reproductive health where by we are basically going to focus on knowing what reproductive health and it's associated practices under which we will look at family planning, birth control, sexual health, child bearing health, Maternal mortality and infant Mortality, Public policy and legislation of reproductive health, violence against women, Reproductive rights and Sexual Concerns

Course Analysis

By the end of the module one should be in position to answer questions and attempt the course work question below
Reproductive health is a relevant aspect of development in modern societies today, with relevant examples and proper explanations, explain the benefits of reproductive health to the citizens and government of a developing country like yours.

According to The World Health Organisation (WHO), Reproductive health is defined as a state of physical, mental, and social well-being in all matters relating to the reproductive system at all stages of life. Reproductive health implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when, and how often to do so. Implicit in this are the right of men and women to be informed and to have access to safe, effective, affordable, and acceptable methods of family planning of their choice, and the right to appropriate health-care services that enable women to safely go through pregnancy and childbirth.

Reproductive health care is defined as the constellation of methods, techniques, and services that contribute to reproductive health and well-being by preventing and solving reproductive health problems. It also includes sexual health, the purpose of which is the enhancement of life and personal relations, and not merely counselling and care related to reproduction and sexually transmitted infections.
In support of this aim, WHO's reproductive health program has developed four broad programmatic goals:

* Experience healthy sexual development and maturation and have the capacity for equitable and responsible relationships and sexual fulfilment; * Achieve their desired number of children safely and healthily, when and if they decide to have them; * Avoid illness, disease, and disability related to sexuality and reproduction and receive appropriate care when needed; * Be free from violence and other harmful practices related to sexuality and reproduction.

Sexual health

An unofficial working definition for sexual health is that "Sexual health is a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity. Sexual health requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence. For sexual health to be attained and maintained, the sexual rights of all persons must be respected, protected and fulfilled." However, this is not an official WHO position, and should not be used or quoted as a WHO definition.

Childbearing and health

Early childbearing and other behaviours can have health risks for women and their infants. Waiting until a woman is at least 18 years old before trying to have children improves maternal and child health. If an additional child is desired, it is considered healthier for mother, as well as for the succeeding child, to wait at least 2 years after previous birth before attempting to conceive. After a miscarriage or abortion, it is healthier to wait at least 6 months.

The WHO estimates that each year, 358 000 women die due to complications related to pregnancy and childbirth; 99% of these deaths occur within the most disadvantaged population groups living in the poorest countries of the world. Most of these deaths can be avoided with improving women's access to quality care from a skilled birth attendant before, during and after pregnancy and childbearing International Conference on Population and Development (ICPD), 1994 The International Conference on Population and Development (ICPD) was held in Cairo, Egypt, from 5 to 13 September 1994. Delegations from 179 States took part in negotiations to finalize a Programme of Action on population and development for the next 20 years. Some 20,000 delegates from various governments, UN agencies, NGOs, and the media gathered for a discussion of a variety of population issues, including immigration, infant mortality, birth control, family planning, and the education of women.

In the ICPD Program of Action, 'Reproductive health' is defined as:

“a state of complete physical, mental and social well-being and...not merely the absence of disease or infirmity, in all matters relating to the reproductive system and its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. Implicit in this last condition are the right of men and women to be informed [about] and to have access to safe, effective, affordable and acceptable methods of family planning of their choice, as well as other methods of birth control which are not against the law,

and the right of access to appropriate health-care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant."

This definition of the term is also echoed in the United Nations Fourth World Conference on Women, or the so-called Beijing Declaration of 1995. However, the ICPD Program of Action, even though it received the support of a large majority of UN Member States, does not enjoy the status of an international legal instrument; it is therefore not legally binding.

The Program of Action endorses a new strategy which emphasizes the numerous linkages between population and development and focuses on meeting the needs of individual women and men rather than on achieving demographic targets The ICPD achieved consensus on four qualitative and quantitative goals for the international community, the final two of which have particular relevance for reproductive health:

- Reduction of maternal mortality: A reduction of maternal mortality rates and a narrowing of disparities in maternal mortality within countries and between geographical regions, socio-economic and ethnic groups.

- Access to reproductive and sexual health services including family planning: Family planning counselling, pre-natal care, safe delivery and post-natal care, prevention and appropriate treatment of infertility, prevention of abortion and the management of the consequences of abortion, treatment of reproductive tract infections, sexually transmitted diseases and other reproductive health conditions; and education, counselling, as appropriate, on human sexuality, reproductive health and responsible parenthood. Services regarding HIV/AIDS, breast cancer, infertility, delivery, hormone therapy, sex reassignment therapy, and abortion should be made available. Active discouragement of female genital mutilation (FGM).

Key to this new approach is empowering women and providing them with more choices through expanded access to education and health services and promoting skill development and employment. The Programme advocates making family planning universally available by 2015, or sooner, as part of a broadened approach to reproductive health and rights, provides estimates of the levels of national resources and international assistance that will be required, and calls on Governments to make these resources available.

Millennium Development Goals

Achieving universal access to reproductive health by 2015 is one of the two targets of Goal 5 - Improving Maternal Health - of the eight Millennium Development Goals. To monitor global progress towards the achievement of this target, the United Nations has agreed on the following indicators: 4

- 5.3: contraceptive prevalence rate

- 5.4: adolescent birth rate

- 5.5: antenatal care coverage

 5.6: unmet need for family planning

According to the MDG Progress Report, regional statistics on all four indicators have either improved or remained stable between the years 2000 and 2005. However, progress has been slow in most developing countries, particularly in Sub-Saharan Africa, which remains the region with the poorest indicators for reproductive health According to the WHO in 2005 an estimated 55% of women do not have sufficient antenatal care and 24% have no access to family planning services Uganda inclusive Violence against Women

Living with dignity includes freedom from physical and emotional violence and the fear of such violence in the home, workplace, church, and community. For this reason, the Unitarian Universalist Association calls for the end of violence against women and the spiritual, emotional, and physical damage that accompanies it. Join us as we do this important work.

Human Rights

Supporting the Constellation of Reproductive Rights

During the 1990s, a series of important United Nations conferences emphasized that the well-being of individuals, and respect for their human rights, should be central to all development strategies. Particular emphasis was given to reproductive rights as a cornerstone of development.

Reproductive rights were clarified and endorsed internationally in the Cairo Consensus that emerged from the 1994 International Conference on Population and Development. This constellation of rights, embracing fundamental human rights established by earlier treaties, was reaffirmed at the Beijing Conference and various international and regional agreements since, as well as in many national laws. They include the right to decide the number, timing and spacing of children, the right to voluntarily marry and establish a family, and the right to the highest attainable standard of health, among others.

What are reproductive rights?

Attaining the goals of sustainable, equitable development requires that individuals are able to exercise control over their sexual and reproductive lives. This includes the rights to:

 Reproductive health as a component of overall health, throughout the life cycle, for both men and women

 Reproductive decision-making, including voluntary choice in marriage, family formation and determination of the number, timing and spacing of one's children and the right to have access to the information and means needed to exercise voluntary choice

 Equality and equity for men and women, to enable individuals to make free and informed choices in all spheres of life, free from discrimination based on gender

 Sexual and reproductive security, including freedom from sexual violence and coercion, and the right to privacy.

Reproductive rights and international development goals
The importance of reproductive rights in terms of meeting international development goals has increasingly been recognized by the international community. In the September 2005 World Summit, the goal of universal access to reproductive health was endorsed at the highest level. Reproductive rights are recognized as valuable ends in themselves, and essential to the enjoyment of other fundamental rights. Special emphasis has been given to the reproductive rights of women and adolescent girls, and to the importance of sex education and reproductive health programmes.

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Reproductive Health
The Life Cycle Approach
Reproductive health is a lifetime concern for both women and men, from infancy to old age. UNFPA supports programming tailored to the different challenges they face at different times in life.

In many cultures, the discrimination against girls and women that begins in infancy can determine the trajectory of their lives. The important issues of education and appropriate health care arise in childhood and adolescence. These continue to be issues in the reproductive years, along with family planning, sexually transmitted diseases and reproductive tract infections, adequate nutrition and care in pregnancy, and the social status of women and concerns about cervical and breast cancer.

Male attitudes towards gender and sexual relations arise in boyhood, when they are often set for life. Men need early socialization in concepts of sexual responsibility and

ongoing education and support in order to experience full partnership in satisfying sexual relationships and family life.

Critical messages for different life stages
In its advocacy and programming, UNFPA has focused on key messages that can empower both women and men at different stages of their lives.

Girls and boys

 Inform and empower girls to delay pregnancy until they are physically and emotionally mature.

 Inspire and motivate boys and men to be sexually responsible partners and value daughters equally as sons.

 Encourage governments to take responsibility for the human catastrophe of orphans and other children who live in the streets.

Adolescents

 Reorient health education and services to meet the diverse needs of adolescents. Integrated reproductive health education and services for young people should include family planning information, and counselling on gender relations, STDs and HIV/AIDS, sexual abuse and reproductive health.

 Ensure that health care programmes and providers' attitudes allow for adolescents' access to the services and information they need.

 Support efforts to eradicate female genital cutting and other harmful practices, including early or forced marriage, sexual abuse, and trafficking of adolescents for forced labour, marriage or commercial sex.

 Socialize and motivate boys and young men to show respect and responsibility in sexual relations.

Adulthood

 Improve communication between men and women on issues of sexuality and reproductive health, and the understanding of their joint responsibilities, so that they are equal partners in public and private life.

 Enable women to exercise their right to control their own fertility and their right to make decisions concerning reproduction, free of coercion, discrimination and violence.

 Improve the quality and availability of reproductive health services and barriers to access.

 Make emergency obstetric care available to all women who experience complications in their pregnancies.

 Encourage men's responsibility for sexual and reproductive behaviour and increase male participation in family planning.

The older years

 Reorient and strengthen health care services to better meet the needs of older women.

 Support outreach by women's NGOs to help older women in the community to better understand the importance of girls' education, reproductive rights and sexual health so that they may become effective transmitters of this knowledge.

 Develop strategies to better meet needs of the elderly for food, water, shelter, social and legal services and health care.

Reproductive and sexual health is a societal concern
Reproductive and sexual health is a societal issue — not only the responsibility of the health sector. It is important to build partnerships with other public and private sectors, as well as with civil society.
Effective health service delivery can be achieved by:

 Partnerships with civil society

 Community involvement

 Integration of services

 Inclusion of health promotion activities

 Advocacy for sexual and reproductive health and rights

 Coordination across services, sectors, ministries

Communities can play an important role in building demand for appropriate reproductive health services. For instance, they can mobilize and build awareness at the local level about reproductive health issues. They can organize to pool resources in micro-insurance schemes. They can collectively exert more pressure for public health service improvements than individuals. Such efforts can be especially effective and timely as health reform and decentralization is underway in many countries. Innovative and participatory approaches are needed to ensure that reproductive health issues receive adequate attention during this transition. The UNFPA-supported Stronger Voices project is a good example
What can be defined as a reproductive health package is a system that occupies all the networks and stake holders involved within reproduction. A full sexual and reproductive health package includes:

 Family planning/birth spacing services

 Antenatal care, skilled attendance at delivery, and postnatal care

 Management of obstetric and neonatal complications and emergencies

 Prevention of abortion and management of complications resulting from unsafe abortion

 Prevention and treatment of reproductive tract infections and sexually transmitted infections including HIV/AIDS

Early diagnosis and treatment for breast and cervical cancer

 Promotion, education and support for exclusive breast feeding

 Prevention and appropriate treatment of sub-fertility and infertility

 Active discouragement of harmful practices such as female genital cutting

 Adolescent sexual and reproductive health

 Prevention and management of gender-based violence

Stepping up Efforts to Save Mothers' Lives

Every day, almost 1,000 women die in pregnancy or childbirth. Every ninety seconds, the loss of a mother shatters a family and threatens the well-being of surviving children. Evidence shows that infants whose mothers die are more likely to die before reaching their second birthday than infants whose mothers survive. And for every woman who dies, 20 or more experience serious complications.

Of the hundreds of thousands of women who die during pregnancy or childbirth each year, 90 per cent live in Africa and Asia. The majority of women are dying from severe bleeding, infections, eclampsia, obstructed labour and the consequences of unsafe abortions--all causes for which we have highly effective interventions.

Working for the survival of mothers is a human rights imperative. It also has enormous socio-economic ramifications – and is a crucial international development priority. Both the International Conference on Population and Development and Millennium Development Goals call for a 75 per cent reduction in maternal mortality between 1990 and 2015. This three-pronged strategy is key to the accomplishment of the goal:

 All women have access to contraception to avoid unintended pregnancies

All pregnant women have access to skilled care at the time of birth

All those with complications have timely access to quality emergency obstetric care

In 2008, UNFPA established the Maternal Health Thematic Fund to increase the capacity of national health systems to provide a broad range of quality maternal health services, reduce health inequities, and empower women to exercise their right to maternal health. The Campaign to End Fistula and the UNFPA-ICM Midwifery Programme are now integrated into this umbrella fund.

UNFPA has also teamed up with four partners, UNICEF, the World Bank, World Health Organization and UNAIDS, to accelerate progress in saving the lives of women and newborns. Collectively known as the 'The Health 4+' or 'H4+', the five agencies have pledged to support countries with the highest maternal mortality rates.
The H4+ joined the Every Woman Every Child effort in 2010 to support to the Global Strategy for Women's and Children's Health. The agencies have helped countries to make commitments to this global initiative, and with the UN's MDG Advocates and partners, are supporting a group of countries—that together accounts for almost 60 per cent of global maternal deaths—to mobilize the financial, technical and human resources needed to meet their commitments.

Female Reproductive Health Risk Factors Participating in these activities can impact your female reproductive health: Smoking Alcohol and Drugs Toxins Sexual History Smoking Smoking can have a serious impact on your female reproductive health by interfering with your body's ability to create oestrogen and thereby regulate ovulation. It can also cause your eggs to be more prone to genetic abnormalities, is associated with an increased risk of miscarriage, and has been linked to early onset of menopause. In addition to its impact on female reproductive health and fertility, smoking has been tied to increases in the likelihood of cervical cancer and pelvic infections. What to do? If you smoke, consider quitting. The impact of smoking is greater the longer you smoke and while not all of the female reproductive health damage is reversible, stopping now can prevent future damage. In addition to improving your female reproductive health, you can also improve other important aspects of your health, including heart and lung health. If you don't smoke, don't start

Alcohol and Drugs Moderation is the key with alcohol. In fact, many studies have shown that there is some benefit in the consumption of small amounts of alcohol for women. However, excessive consumption of alcohol and alcohol abuse can lead to female reproductive health problems including; irregular ovulation, amenorrhea (absence of menses), and the abnormal development of the endometrial lining. Illegal drugs, such as marijuana, heroin and cocaine, are universally damaging to female fertility and female reproductive health. Perhaps more difficult to manage are the risks that some legal and over-the-counter drugs may have on fertility and female reproductive health. For example, some prescription medications can interfere with ovulation. What to do? Don't use illegal drugs and moderate your alcohol consumption. Discuss any prescription drugs that you are taking with your doctor to determine if any may pose a female reproductive health problem in the future.
Toxins There is more information than ever available on the effects of "body burden", or the build up of certain environmental toxins, such as pesticides, fertilizers and solvents, in our bodies, as well as its impact on female reproductive health. While the extent to which toxin exposure contributes to infertility is still somewhat unclear, it should be considered as a preventable cause of female reproductive health

problems. Exposure to toxins has been linked to several female reproductive health problems such as, irregular periods, hormone changes, endometriosis and higher miscarriage rates in pregnant women. What to do? Try to limit your exposure to toxic materials as much as possible, particularly while trying to conceive. Take the proper precautions when using products containing or comprised of harmful toxins including the use of safety gloves, face masks and protective clothing to minimize direct exposure. Sexual History The best way to prevent female reproductive health problems related to sexual history is to practice safe sex – above and beyond preventing unwanted pregnancies. Many sexually transmitted infections (STDs) go untreated for long periods of time because the symptoms are sometimes not visible. This can pose a considerable threat to female reproductive health and future fertility. STDs, when left untreated, can lead to pelvic inflammatory disease, causing scarring or blocking of the fallopian tubes, and changes in the cervix.

Family planning is the planning of when to have children, and the use of birth control and other techniques to implement such plans. Other techniques commonly used include sexuality education, prevention and management of sexually transmitted infections pre-conception counselling and management, and infertility management.

Family planning is sometimes used in the wrong way also as a synonym for the use of birth control, though it often includes more. It is most usually applied to a female-male couple who wish to limit the number of children they have and/or to control the timing of pregnancy (also known as spacing children). Family planning may encompass sterilisation, as well as abortion.

Family planning services are defined as "educational, comprehensive medical or social activities which enable individuals, including minors, to determine freely the number and spacing of their children and to select the means by which this may be achieved."

Birth control

With assertions of overpopulation, there have been assertions that birth control is the answer. Birth control is techniques used to prevent unwanted pregnancy. There are a range of contraceptive methods, each with unique advantages and disadvantages. Any of the widely recognized methods of birth control is much more effective than no method. Behavioral methods that include intercourse, such as withdrawal and calendar based methods have little up front cost and are readily available, but are less effective in typical use than most other methods. Long-acting reversible contraceptive methods, such as IUD and implant are highly effective and convenient, requiring little user action. When cost of failure is included, IUDs and vasectomy are much less costly than other methods.

For families who want a sense of control over when to have children---a concept known as family planning---there are many options available, all differing slightly in price, effectiveness and comfort. Whatever method you choose, it's always a smart idea to talk to your doctor about your options and the pros and cons associated with each method.

Outer course

According to Planned Parenthood, "outer course" is defined as any sexual play that does not involve actual insertion of the penis into the vagina, thus preventing sperm from entering into the uterus. Outer course could include oral sex, stimulation by hand or body-to-body rubbing.

Types of Birth Control
Contraception is a term used for the prevention of pregnancy, and it is often referred to as birth control. There are several methods of contraception, some of which are created for women and others for men. Some methods are considered permanent while others are reversible. The majority of birth control methods fall into one of two categories: barrier or hormonal. There are also four other methods: sterilization (surgery), withdrawal, natural family planning and abstinence.
It is important to examine the different methods of birth control and other related considerations as you determine which method of contraception is best for you. It is important to remember that most birth control methods prevent pregnancy, but they do not prevent the transmission of sexually transmitted diseases. If you are sexually active and using a form of birth control, it is important to remember that all forms of birth control have a failure rate. You should take a pregnancy test if you are experiencing any pregnancy symptoms.

Below is a brief description of each type of contraception. Additional detailed information is available through links to each specific type of contraception.

Natural Family Planning
This method requires no drugs and allows the couple to enjoy normal sexual intercourse, but is more subject to error than other methods. With natural family planning, couples attempt to determine when the woman is ovulating, based on patterns with the menstrual cycle, and avoid having intercourse during those fertile times. Two common ways of determining ovulation are by examining the cervical mucus, which is clearer, slippery and more abundant when a woman is ovulating, and keeping track of the woman's basal body temperature. During ovulation, a woman's basal temperature will rise about .9 degrees Fahrenheit, according to the American Academy of Family Physicians.

Abstinence
Abstinence is the act of avoiding sex, whether sexual contact altogether or just intercourse. This method of family planning is the only one that is 100 percent effective in preventing pregnancy and protecting against sexually transmitted diseases (STDs). Abstinence can be difficult to maintain and allows for little spontaneity. As a means of contraception, abstinence is the voluntary refraining from sexual activity.

 Abstinence is the only contraceptive method that is 100% effective in the prevention of both pregnancy and the transmission of sexually transmitted diseases.

Fertility Awareness Method: Natural Family Planning (NFP):
Also known as natural family planning, fertility awareness is the act of abstaining from intercourse on a woman's fertile days, when she is most likely to become pregnant. To follow this method, women need to accurately and precisely chart their

fertility, either through basal body temperature changes or changes in cervical mucus, or by following the calendar.

 Fertility awareness method is also known as Natural Family Planning and it is commonly called NFP.

 NFP does not rely on devices or medications to prevent pregnancies.

 NFP is a contraceptive method that uses the natural functions of your body and your menstrual cycle to calculate ovulation. The most common features of NFP involve recording of your body temperature and changes in your cervical mucus each day.

 NFP requires periodic abstinence (approximately 7 to 10 days) during the ovulation period. Some women choose to use a barrier method or withdrawal during this time frame.

Birth Control Ring
The small, flexible birth control ring is placed in the vagina, where it releases a steady supply of progestin and oestrogen hormones. The ring stays in the vagina for 3 weeks, after which it is discarded. The ring is over 99 percent effective when used as prescribed. The ring may cause unwanted side effects such as nausea and weight gain.

Barrier Methods: Devices
Barrier or device methods of contraceptives are physical or chemical barriers designed to stop sperm from entering a woman's uterus.

Condoms
Condoms are thin latex coverings that form a barrier between sperm and the vagina. When used as indicated, condoms are 95 to 97 percent effective in preventing pregnancy and have the added bonus of protecting against STDs. Female and male varieties are available, and they come in a wide range of colours and styles.
Male Condom:

 The male condom is a tube of thin material (latex rubber) that is rolled over the erect penis prior to contact with the vagina.

The male condom is the most common barrier method.

Female Condom:

 The female condom is a seven-inch long pouch of polyurethane with two flexible rings and is inserted into the vagina prior to intercourse.

The female condom covers the cervix, vaginal canal, and the immediate area around the vagina.

Spermicide

Spermicides are creams, jellies or suppositories that stop sperm from moving. Spermicides can be conveniently purchased from drugstores and are easy to use, but they are not effective when used alone. Spermicides are most effective when used with another method of family planning, such as condoms.

Diaphragm:

The diaphragm is a soft rubber dome stretched over a flexible ring; the dome is filled with a spermicidal cream or jelly. The diaphragm is inserted into the vagina and placed over the cervix no more than 3 hours prior to intercourse.
Cervical Cap:

The cervical cap is a small cup made of latex rubber or plastic. The cervical cap is filled with a spermicidal cream or jelly and inserted into the vagina and placed over the cervix.

Contraceptive Sponge:
The contraceptive sponge is a soft saucer-shaped device made from polyurethane foam.

Hormonal Methods:
Whether administered as a pill, patch, shot, ring or implant, hormone medications contain manufactured forms of the hormones oestrogen and/or progesterone. Hormonal methods work in one of three ways: 1) preventing a woman's ovaries from releasing an egg each month; 2) causing the cervical mucus to thicken making it harder for sperm to reach and penetrate the egg; 3) thinning the lining of the uterus which reduces the likelihood that a fertilized egg will implant in the uterus wall. Hormonal contraceptives do NOT protect against the transmission of sexually transmitted diseases.

Birth Control Pills
Many types of birth control pills are on the market. Pills keep a woman's ovaries from releasing eggs, thus preventing fertilisation. The main function of this type of the birth control the pill is to suppress ovulation, or 13 the release of an egg. Most birth control pills also thicken the cervical mucus, which aids in preventing pregnancy by blocking sperm from entering the uterus and fertilising an egg that may develop despite the pill.

Birth control pills are 95 percent effective with standard use. The mini pill contains only progestin, while the combination pill contains both progestin and oestrogen. Women who take these forms of the pill must be sure to take it at the same time each day or risk getting pregnant. Birth control pills require a prescription from a doctor or healthcare provider.

Depo-Provera:
Depo-Provera is an injection given by your health care provider that prevents pregnancy for three months.
Lunelle:

Lunelle is an injection given by your health care provider that prevents pregnancy for one month.

NuvaRing/Vaginal Ring:
NuvaRing, or vaginal ring, is a flexible ring that is inserted into the vagina for three weeks, removed for one week, and then replaced with a new ring. The ring releases estrogen and progesterone into your body.
Ortho Evra Patch/Birth Control Patch:
The birth control patch is placed directly on the skin with the hormones built into the sticky side of the patch.
>Each week for the first three weeks a patch is placed on the hip, buttocks or upper arm.
>The fourth week you are free from the patch allowing for a menstrual period.
Intrauterine Device (IUD):
An intrauterine device (IUD) is a small copper or plastic device inserted into the uterus that creates a hostile environment for sperm. Some IUDs release small amounts of hormones. IUDs last from 5 to 12 years and are an effective method of birth control but should only be used by women in monogamous relationships who have already given birth.
The IUD does not stop the sperm from entering into the uterus, but rather it changes cervical mucus decreasing the probability of fertilization and it changes the lining of the uterus preventing implantation should fertilization occur.
Withdrawal
Neither withdrawal nor sterilisations prevent transmission of sexually transmitted diseases. Withdrawal involves the removal of the erect penis from the vagina prior to ejaculation.

Sterilisation
Men and women both have the option of undergoing minor surgical procedures in order to render themselves infertile. For men, this process is called a vasectomy, which prevents sperm from entering into the semen. For women, this process is called tubal ligation, and involves blocking or cutting the Fallopian tubes permanently to prevent sperm from fertilizing an egg. Both methods are considered permanent.

 Female:

oSterilisation involves the surgical closing of the fallopian tubes which carry the eggs from the ovaries to the uterus

oThis procedure is referred to as a tubal ligation

 Male:

oSterilisation involves the surgical closing of tubes that carry sperm

oThis procedure is referred to as a vasectomy

Birth control, also known as contraception, is designed to prevent pregnancy. Birth control methods may work in a number of different ways. These include

 Preventing sperm from getting to the eggs - condoms, diaphragms and intrauterine devices (IUDs) work this way

Keeping the woman's ovaries from releasing eggs that could be fertilized - birth control pills work this way

 Sterilisation, which permanently prevents a woman from getting pregnant or a man from being able to get a woman pregnant

Your choice of birth control should depend on several factors. These include your health, frequency of sexual activity, number of sexual partners and desire to have children in the future. Your health care provider can help you select the best form of birth control for you
Feature
What is the precise scope of the right to family planning? Perhaps the answer with the broadest global consensus comes from UNFPA, the United Nations Population Fund, whose family planning advocacy is supported by most of the UN's 192 member states. To promote human rights and women's equality, family planning services must "reject coercion" and "offer a wide selection of methods; reflect high standards of medical practice; [be] sensitive to cultural conditions; [and] provide sufficient information about proper use or possible side effects." However, "UNFPA does not support or promote abortion as a method of family planning."

Benefits
Voluntary family planning brings well-documented health benefits to individuals, families and communities. It reduces abortion as well as maternal, infant and child mortality rates. Specific methods have their own unique health advantages. Condoms, for example, help check the spread of HIV/AIDS and other sexually transmitted infections. The Lactational Amenorrhea Method gives mothers and babies the health benefits of breastfeeding. The availability of family planning in communities empowers women and children to improve their educational and economic status as well as their health.

Obstacles
Perhaps 200 million women on Earth want but cannot obtain family planning methods. Others lack proper instruction or access to their most preferred methods. In many places, gender-based violence sabotages women's own choices about family planning. Such violence makes women and children more vulnerable to further dangers like HIV/AIDS. In some countries, violence against women has included forced pregnancy prevention as a matter of government policy.
Controversies
While widely accepted and practiced, the right to family planning "has not been enshrined in a legally binding human rights treaty and...remains controversial" because of "fear of coercive family planning programmes; [the] idea that family planning promotes promiscuity; [the] abortion debate and status of the unborn child," according to the Human Rights Education Association.

BENEFITS OF FAMILY PLANNING

Financial Readiness

Planning when to add to your family can be delayed until you feel financially ready to raise a child. Although it's unlikely that you'd save the hundreds of thousands of dollars it costs to raise a child through age 17, you will be able to wait, for instance, until you have a stable job. In addition, family planning allows couples to space their children to lessen the financial burden of college.

Fertility Issues

Family planning will bring any fertility problems to light quickly if it is difficult to conceive once you are trying based on the woman's cycle. Twenty-five percent of couples will conceive on a first cycle and more than half have conceived after six months, according to amazingpregnancy.com. If you are not pregnant after a year of trying, it's a good idea to get evaluated by your health care provider.

Health Benefits

Pregnancies that occur too close together can be harmful to both the mother's and the baby's health, according to the World Health Organization, which records more than 500,000 maternal deaths throughout the world each year. While health care in the United States has significantly lowered maternal death, doctors still advise waiting between pregnancy. A study in "Conception" cited in "Business Week" reported that babies conceived within six months of their siblings births had a 41 percent greater chance of premature birth. Other problems cited included low birth weight and birth defects.

Choosing Your Family Size

Family planning allows you to choose the size of your family based on your financial situation as well as your age and patience level. While there are always surprises with multiples, deciding how many children to have in your family gives you control over your financial future and theirs.

Time Management

For many working families, a single income is not enough to sustain the financial burden. If both parents in a household work and will continue to do so, it's vital that the spare time each has is spent nurturing the growth of the children. This becomes increasingly more difficult as more children are added to the household

Higher Education

Higher education in terms of you and your partner is a vital consideration for family planning. Seeking a degree or certification takes time, energy and money. The advantage of planning your family according to these demands will enable you to complete your education in a timelier fashion with much less stress, worry and guilt.

Family Dynamic

Whether you want two children, no children or twenty, family planning will help you build the family dynamic of your wishes. Decide what is right for your family based on the specific needs of each member, whether that means trying for another child naturally, sterilization, adoption or a different choice.

Residential

Conscious family planning will aid you in your decision to purchase and/or sell a home in a particular area. Depending on the desired growth of your family, what kind of schools you want your children to attend and the cost of living, you will better be able to choose a home that will suit the needs of your complete family

ADULT ADOPTION

The overwhelming majority of adoptions in the World involve adults adopting infants or children. However, there are situations in which an adult might adopt another adult. If you are considering adult adoption, it's important to understand the process, as well as any state laws that may apply to your specific case.
Identification

In an adult adoption, an adult adopts a consenting individual who is over 18 years of age. As with the adoption of a child, an adult adoption severs the legal relationship between the adoptee and his biological parents, and the adopter becomes the adoptee's legal parent.

Function

According to the website Adoption, there are several possible reasons for adult adoptions. If you have no heirs but you have a close relationship with an unrelated adult, you might want to form a legal parent-child relationship with that adult to ensure that your family name is carried on and/or that she inherits your estate. If your adult biological child was adopted or in foster care when she was young, you might want to legally reclaim your relationship as her parent. If you have a close relationship with an adult who has physical or mental disabilities, you might want her to benefit from your family health plan or to inherit your estate so that she will have the financial means to care for herself after your death.

Process

Adult adoptions follow the same process as child adoptions. You first file an adoption petition in your jurisdiction. If the court determines that you meet the state standard, it sets a hearing date. At the hearing, the judge evaluates the parties involved, and if he approves the adoption, he sets a second hearing date in order to finalize the adoption. Once the adoption is final, a new birth certificate is issued for the adoptee listing the adopter as the legal parent and noting any name changes the adoptee might have made. After the adoption, the adoption is sealed according to state law, just as in a child adoption.

State Laws

Adult adoption is legal in many countries, provided there is no intent to defraud. However, adoption laws vary widely from state to state. According to Adoption, most states require that the adopting party be older than the adoptee. Some states only allow adoptions of adults with diminished capacity. Some require that an adoptee's spouse consent to the adoption or that the adoptee's birth parents be notified. Still others only require that the parties in question agree to the arrangement. Check with your state to see if you meet your state's standards for adult adoption.
Considerations

Homosexual couples sometimes consider adoption as a means to ensure that their partner benefits from their inheritance and their family insurance. However, because the adoption process is meant to create a parent-child relationship, courts might reject a petition for an adoption of a sexual partner. According to Adoption, gay couples often are better off securing their partner's future by consulting an attorney and creating a will.

Birth control

Birth control is a regimen of one or more actions, devices, sexual practices, or medications followed in order to deliberately prevent or reduce the likelihood of pregnancy or childbirth. There are three main routes to preventing or ending pregnancy: the prevention of fertilization of the ovum by sperm cells ("contraception"), the prevention of implantation of the blastocyst ("contragestion"), and the chemical or surgical induction of abortion of the developing embryo or, later, foetus. In common usage, term "contraception" is often used for both contraception and contragestion.

Birth control is commonly used as part of family planning.

The history of birth control began with the discovery of the connection between coitus and pregnancy. The oldest forms of birth control included coitus interruptus, pessaries, and the ingestion of herbs that were believed to be contraceptive or abortifacient. The earliest record of birth control use is an ancient Egyptian set of instructions on creating a contraceptive pessary.

Different methods of birth control have varying characteristics. Condoms, for example, are the only methods that provide significant protection from sexually transmitted diseases. Cultural and religious attitudes on birth control vary significantly.

Methods of birth control

Physical methods reproductive technology

Physical methods may work in a variety of ways, among them: physically preventing sperm from entering the female reproductive tract; hormonally preventing ovulation from occurring; making the woman's reproductive tract inhospitable to sperm; or surgically altering the male or female reproductive tract to induce sterility. Some methods use more than one mechanism. Physical methods vary in simplicity, convenience and efficacy.

Barrier methods

Barrier methods place a physical impediment to the movement of sperm into the female reproductive tract.

The most popular barrier method is the male condom, a latex or polyurethane sheath placed over the penis. The condom is also available in a female version, which is made of polyurethane. The female condom has a flexible ring at each end — one secures behind the pubic bone to hold the condom in place, while the other ring stays outside the vagina.

Cervical barriers are devices that are contained completely within the vagina. The contraceptive sponge has a depression to hold it in place over the cervix. The cervical cap is the smallest cervical barrier. Depending on the type of cap, it stays in place by

suction to the cervix or to the vaginal walls. The diaphragm fits into place behind the woman's pubic bone and has a firm but flexible ring, which helps it press against the vaginal walls.

Spermicide may be placed in the vagina before intercourse and creates a chemical barrier. Spermicide may be used alone, or in combination with a physical barrier.
Hormonal methods

There are variety of delivery methods for hormonal contraception. Forms of synthetic oestrogens and progestins (synthetic progestogens) combinations commonly used include the combined oral contraceptive pill ("The Pill"), the Patch, and the contraceptive vaginal ring ("NuvaRing"). A monthly injectable form, Lunelle, is not currently available for sale in the United States.
Other methods contain only a progestin (a synthetic progestogen). These include the progesterone only pill (the POP or 'minipill'), the injectablesDepo Provera (a depot formulation of medroxyprogesterone acetate given as an intramuscular injection every three months) and Noristerat (Norethindrone acetate given as an intramuscular injection every 8 weeks), and contraceptive implants. The progestin-only pill must be taken at more precisely remembered times each day than combined pills. The first contraceptive implant, the original 6-capsule Norplant, was removed from the market in the United States in 1999, though a newer single-rod implant called Implanon was approved for sale in the United States on July 17, 2006. The various progestin-only methods may cause irregular bleeding during use.

Ormeloxifene (Centchroman)
Ormeloxifene (Centchroman) is a selective estrogen receptor modulator, or SERM. It causes ovulation to occur asynchronously with the formation of the uterine lining, preventing implantation of a zygote. It has been widely available as a birth control method in India since the early 1990s, marketed under the trade name Saheli. Centchroman is legally available only in India.[

Emergency contraception
Some combined pills and POPs may be taken in high doses to prevent pregnancy after a birth control failure (such as a condom breaking) or after unprotected sex. Hormonal emergency contraception is also known as the "morning after pill," although it is licensed for use up to three days after intercourse.
Copper intrauterine devices may also be used as emergency contraception. For this use, they must be inserted within five days of the birth control failure or unprotected intercourse.

Emergency contraception appears to work by suppressing ovulation. However, because it might prevent a fertilized egg from implanting, some people[who?] consider it a form of abortion. The details of the possible methods of action are still being studied.

Intrauterine methods

An intrauterine device. These are contraceptive devices which are placed inside the uterus. They are usually shaped like a "T" — the arms of the T hold the device in

place. There are two main types of intrauterine contraceptives: those that contain copper (which has a spermicidal effect), and those that release a progestogen (in the US the term progestin is used).

Terms used for these devices differ between the United Kingdom and the United States. In the US, all devices which are placed in the uterus to prevent pregnancy are referred to as intrauterine devices (IUDs) or intrauterine contraceptive devices (IUCDs). In the UK, only copper-containing devices are called IUDs (or IUCDs), and hormonal intrauterine contraceptives are called Intra-Uterine System (IUS). This may be because there are ten types of copper IUDs available in the UK,[19] compared to only one in the US.

Sterilization

Surgical sterilization is available in the form of tubal ligation for women and vasectomy for men. Sterilization should be considered permanent. In women, the process may be referred to as "tying the tubes," but the Fallopian tubes may be tied, cut, clamped, or blocked. This serves to prevent sperm from joining the unfertilized egg. The non-surgical sterilization procedure, Essure, is an example of a procedure that blocks the tubes, wherein micro-inserts are placed into the fallopian tubes by a catheter passed from the vagina through the cervix and uterus.
Although tubal ligation should be considered a permanent procedure, it is possible to attempt a tubal ligation reversal to reconnect the Fallopian tubes. The rate of success depends on the type of tubal ligation procedure that was originally performed and damage done to the tubes as well as the woman's age.

Behavioral methods

Behavioral methods involve regulating the timing or methods of intercourse to prevent the introduction of sperm into the female reproductive tract, either altogether or when an egg may be present.

Fertility awareness

Symptoms-based methods of fertility awareness involve a woman's observation and charting of her body's fertility signs, to determine the fertile and infertile phases of her cycle. Charting may be done by hand or with the assistance of software. Most methods track one or more of the three primary fertility signs: changes in basal body temperature, in cervical mucus, and in cervical position. If a woman tracks both basal body temperature and another primary sign, the method is referred to as symptothermal. Other bodily cues such as mittelschmerz are considered secondary indicators.

Fertility monitors are computerized devices that determine fertility or infertility based on, for example, temperature or urinalysis tests. Calendar-based methods such as the rhythm method and Standard Days Method estimate the likelihood of fertility based on the length of past menstrual cycles. To avoid pregnancy with fertility awareness, unprotected sex is restricted to the least fertile period. During the most fertile period, barrier methods may be availed, or she may abstain from intercourse. The term natural family planning (NFP) is sometimes used to refer to any use of fertility awareness methods. However, this term specifically refers to the practices which are permitted by the Roman Catholic Church — breastfeeding infertility, and

periodic abstinence during fertile times. FA methods may be used by NFP users to identify these fertile times.

Coitus interruptus
Coitus interruptus (literally "interrupted sexual intercourse"), also known as the withdrawal method, is the practice of ending sexual intercourse ("pulling out") before ejaculation. The main risk of coitus interruptus is that the man may not perform the maneuver correctly, or may not perform the maneuver in a timely manner. Although concern has been raised about the risk of pregnancy from sperm in pre-ejaculate, several small studies have failed to find any viable sperm in the fluid.

Avoiding vaginal intercourse
The risk of pregnancy from non-vaginal sex, such as with anal sex, oral sex, or non-penetrative sex is virtually zero[citation needed]. A very small risk comes from the possibility of semen leaking onto the vulva (with anal sex) or coming into contact with an object, such as a hand, that later contacts the vulva.

Total abstinence
Different groups define the term sexual abstinence in different ways. When used in discussions of birth control, usually the avoidance of all sexual activity—total sexual abstinence—is the intended meaning. Sometimes people choose to be sexually abstinent to reduce their risk of pregnancy, and abstinence may be included in lists of birth control methods. Those who are sexually abstinent do not have unplanned pregnancies. Other sources instead classify abstinence as not being a form of birth control.

Abstinence as a long term method is not 100% effective in preventing pregnancy: not everyone who intends to be abstinent refrains from all sexual activity, and in many populations there is a significant risk of pregnancy from nonconsensual sex. As a public health measure, it is estimated that the protection provided by abstinence may be similar to that of condoms. Some authorities recommend that those using abstinence as a primary method have backup method(s) available (such as condoms or emergency contraceptive pills).

Lactational
Most breastfeeding women have a period of infertility after the birth of their child. The lactational amenorrhea method, or LAM, gives guidelines for determining the length of a woman's period of breastfeeding infertility.

Induced abortion
In some areas, women use abortion as a primary means to control birth. This practice is more common in Russia,[30] Turkey,[31] and Ukraine.[32] On the other hand, women from Canada[33], and other places[citation needed] generally do not use abortion as a primary form of birth control. Abortion is subject to ethical debate. Surgical abortion methods include suction-aspiration abortion (used in the first trimester) or dilation and evacuation (used in the second trimester). Medical abortion methods involve the use of medication which is swallowed or inserted vaginally to induce abortion. Medical abortion can be used if the length of gestation has not exceeded 8 weeks.

Some herbs are considered abortifacient, and some animal studies have found various herbs to be effective in inducing abortion in non-human animal species. Humans generally do not use herbs when other methods are available, due to the unknown efficacy and due to risks of toxicity..

Methods in development

For females

 Praneem is a polyherbal vaginal tablet being studied as a spermicide, and a microbicide active against HIV.

BufferGel is a spermicidal gel being studied as a microbicide active against HIV.

 Duet is a disposable diaphragm in development that will be pre-filled with BufferGel. It is designed to deliver microbicide to both the cervix and vagina. Unlike currently available diaphragms, the Duet will be manufactured in only one size and will not require a prescription, fitting, or a visit to a doctor.

 The SILCS diaphragm is a silicone barrier which is still in clinical testing. It has a finger cup molded on one end for easy removal. Like the Duet, the SILCS is novel in that it will only be available in one size.

 A vaginal ring is being developed that releases both estrogen and progesterone, and is effective for over 12 months.

Two types of progestogen-only vaginal rings are being developed. Progestogen-only products may be particularly useful for women who are breastfeeding. The rings may be used for four months at a time.

A progesterone-only contraceptive is being developed that would be sprayed onto the skin once a day.

 Quinacrine sterilization and the Adiana procedure are two permanent methods of birth control being developed

For males

: Male contraceptive

Other than condoms and withdrawal, there are currently no available methods of reversible contraception which males can use or control. Several methods are in research and development:

 As of 2007, a chemical called Adjudin is currently in Phase II human trials as a male oral contraceptive.[42]

 RISUG (Reversible Inhibition of Sperm Under Guidance), is an experimental injection into the vas deferens that coats the walls of the vas with a spermicidal substance. The method can potentially be reversed by washing out the vas deferens with a second injection.

 Experiments in vas-occlusive contraception involve an implant placed in the vasa deferentia.

 Experiments in heat-based contraception involve heating the testicles to a high temperature for a short period of time.

Misconceptions
Modern misconceptions and urban legends have given rise to a great many false claims:

 The suggestion that douching with any substance immediately following intercourse works as a contraceptive is untrue. While it may seem like a sensible idea to try to wash the ejaculate out of the vagina, it is not likely to be effective. Due to the nature of the fluids and the structure of the female reproductive tract, douching most likely actually spreads semen further towards the uterus. Some slight spermicidal effect may occur if the douche solution is particularly acidic, but overall it is not scientifically observed to be a reliably effective method. Douching is neither a contraceptive nor a preventative measure against STDs or other infections.

It is untrue that a female cannot become pregnant as a result of the first time she engages in sexual intercourse.

 While women are usually less fertile for the first few days of menstruation, it is a myth that a woman absolutely cannot get pregnant if she has sex during her period.

Having sex in a hot tub does not prevent pregnancy, but may contribute to vaginal infections.

 Although some sex positions may encourage pregnancy, no sexual positions prevent pregnancy. Having sex while standing up or with a woman on top will not keep the sperm from entering the uterus. The force of ejaculation, the contractions of the uterus caused by prostaglandins in the semen, as well as ability of sperm to swim overrides gravity.

 Urinating after sex does not prevent pregnancy and is not a form of birth control, although it is often advised anyway to help prevent urinary tract infections.

 Toothpaste cannot be used as an effective contraceptive.

Effectiveness
Effectiveness is measured by how many women become pregnant using a particular birth control method in the first year of use. Thus, if 100 women use a method that has a 12 percent first-year failure rate, then sometime during the first year of use, 12 of the women should become pregnant.

The most effective methods in typical use are those that do not depend upon regular user action. Surgical sterilization, Depo-Provera, implants, and intrauterine devices (IUDs) all have first-year failure rates of less than one percent for perfect use. In reality, however, perfect use may not be the case, but still, sterilization, implants,

and IUDs also have typical failure rates under one percent. The typical failure rate of Depo-Provera is disagreed upon, with figures ranging from less than one percent up to three percent.
Other methods may be highly effective if used consistently and correctly, but can have typical use first-year failure rates that are considerably higher due to incorrect or ineffective usage by the user. Hormonal contraceptive pills, patches or rings, fertility awareness methods, and the lactational amenorrhea method (LAM), if used strictly, have first-year (or for LAM, first-6-month) failure rates of less than 1%.

In one survey, typical use first-year failure rates of hormonal contraceptive pills (and by extrapolation, patches or rings) were as high as five percent per year. Fertility awareness methods as a whole have typical use first-year failure rates as high as 25 percent per year; however, as stated above, perfect use of these methods reduces the first-year failure rate to less than 1%.

Condoms and cervical barriers such as the diaphragm have similar typical use first-year failure rates (14 and 20 percent, respectively), but perfect usage of the condom is more effective (three percent first-year failure vs six percent) and condoms have the additional feature of helping to prevent the spread of sexually transmitted diseases such as the HIV virus. The withdrawal method, if used consistently and correctly, has a first-year failure rate of four percent. Due to the difficulty of consistently using withdrawal correctly, it has a typical use first-year failure rate of 19 percent, and is not recommended by some medical professionals.
Combining two birth control methods, can increase their effectiveness to 95% or more for less effective methods. Using condoms with another birth control method is also one of the recommended methods of reducing risk of getting sexually transmitted infections, including HIV. This approach is one of the Dual Protection Strategies.

Protection against sexually transmitted infections
Some methods of birth control also offer protection against sexually transmitted infections (STIs). The male latex condom offers some protection against some STIs with correct and consistent use, as does the female condom, although the latter has only been approved for vaginal sex. The female condom may offer greater protection against STIs that pass through skin to skin contact, as the outer ring covers more exposed skin than the male condom. Some of the methods involving avoiding vaginal intercourse can also reduce risk: latex or polyurethane barriers can be used during oral sex, and mutual or solo masturbation are very low-risk. The remaining methods of birth control do not offer significant protection against the sexual transmission of STIs.

Many STIs may also be transmitted non-sexually; this is one reason why abstinence from sexual behavior does not guarantee 100 percent protection against sexually transmitted infections. For example, HIV may be transmitted through contaminated needles which may be used in intravenous drug use, tattooing, body piercing, or injections. Health-care workers have acquired HIV through occupational exposure to accidental injuries with needles.[56]
Religious and cultural attitudes
Religious views on birth control

Religions vary widely in their views of the ethics of birth control. In Christianity, the Roman Catholic Church accepts only Natural Family Planning and only for serious reasons,[57] while Protestants maintain a wide range of views from allowing none to very lenient.[58] Views in Judaism range from the stricter Orthodox sect to the more relaxed Reform sect.[59] In Islam, contraceptives are allowed if they do not threaten health , although their use is discouraged by some. Hindus may use both natural and artificial contraceptives. A common Buddhist view of birth control is that preventing conception is ethically acceptable, while intervening after conception has occurred or may have occurred is not.

Birth control education

Many teenagers, most commonly in developed countries, receive some form of sex education in school. What information should be provided in such programs is hotly contested, especially in the United States and United Kingdom. Possible topics include reproductive anatomy, human sexual behavior, information on sexually transmitted diseases (STDs), social aspects of sexual interaction, negotiating skills intended to help teens follow through with a decision to remain abstinent or to use birth control during sex, and information on birth control methods.
One type of sex education program used in some more conservative areas of the United States is called abstinence-only education, and it promotes complete sexual abstinence until marriage.

The programs do not encourage birth control, often provide inaccurate information about contraceptives and sexuality, stress failure rates of condoms and other contraceptives, and teach strategies for avoiding sexually intimate situations. Advocates of abstinence-only education believe that the programs will result in decreased rates of teenage pregnancy and STD infection. In a non-random, Internet survey of 1,400 women who found and completed a 10-minute multiple-choice online questionnaire listed in one of several popular search engines, women who received sex education from schools providing primarily abstinence information, or contraception and abstinence information equally, reported fewer unplanned pregnancies than those who received primarily contraceptive information, who in turn reported fewer unplanned pregnancies than those who received no information. However, randomized controlled trials demonstrate that abstinence-only sex education programs increase the rates of pregnancy and STDs in the teenage population. Professional medical organizations, including the AMA, AAP, ACOG, APHA, APA, and Society for Adolescent Medicine, support comprehensive sex education (providing abstinence and contraceptive information) and oppose the sole use of abstinence-only sex education.

Pregnancy

Pregnancy (latin "graviditas") is the carrying of one or more offspring, known as a fetus or embryo, inside the uterus of a female. In a pregnancy, there can be multiple gestations, as in the case of twins or triplets. Human pregnancy is the most studied of all mammalian pregnancies. Obstetrics is the surgical field that studies and cares for high risk pregnancy. Midwifery is the non-surgical field that cares for pregnancy and pregnant women.

Childbirth usually occurs about 38 weeks after conception; i.e., approximately 40 weeks from the last normal menstrual period (LNMP) in humans. The World Health Organization defines normal term for delivery as between 37 weeks and 42 weeks. The calculation of this date involves the assumption of a regular 28-day menstrual cycle.

Terminology One scientific term for the state of pregnancy is gravid, and a pregnant female is sometimes referred to as a gravida. Neither word is used in common speech. Similarly, the term "parity" (abbreviated as "para") is used for the number of previous successful live births. Medically, a woman who has never been pregnant is referred to as a "nulligravida", and in subsequent pregnancies as multigravida or "multiparous". Hence, during a second pregnancy a woman would be described as "gravida 2, para 1" and upon live delivery as "gravida 2, para 2." An in-progress pregnancy, as well as abortions, miscarriages, or stillbirths account for parity values being less than the gravida number, whereas a multiple birth will increase the parity value. Women who have never carried a pregnancy achieving more than 20 weeks of gestation age are referred to as "nulliparous". The medical term for a woman who is pregnant for the first time is primigravida.

The term embryo is used to describe the developing offspring during the first 8 weeks following conception, and the term fetus is used from about 2 months of development until birth.
In many societies' medical or legal definitions, human pregnancy is somewhat arbitrarily divided into three trimester periods, as a means to simplify reference to the different stages of prenatal development. The first trimester carries the highest risk of miscarriage (natural death of embryo or fetus). During the second trimester, the development of the fetus can be more easily monitored and diagnosed. The beginning of the third trimester often approximates the point of viability, or the ability of the fetus to survive, with or without medical help, outside of the uterus.

Progression
Stages in prenatal development, with weeks and months numbered by gestation.
Initiation
Pregnancy occurs as the result of the female gamete or oocyte merging with the male gamete, spermatozoon, in a process referred to, in medicine, as "fertilization," or more commonly known as "conception." After the point of "fertilization," it is referred to as an egg. The fusion of male and female gametes usually occurs through the act of sexual intercourse, resulting in spontaneous pregnancy. However, the advent of artificial insemination and in vitro fertilisation have also made achieving pregnancy possible in cases where sexual intercourse does not result in fertilization (e.g., through choice or male/female infertility).
Perinatal period
Perinatal defines the period occurring "around the time of birth", specifically from 22 completed weeks (154 days) of gestation (the time when birth weight is normally 500 g) to 7 completed days after birth.

Legal regulations in different countries include gestation age beginning from 16 to 22 weeks (5 months) before birth.
Postnatal period

The postnatal period begins immediately after the birth of a child and then extends for about six weeks. During this period the mother's body returns to prepregnancy conditions as far as uterus size and hormone levels are concerned.

Duration

The expected date of delivery (EDD) is 40 weeks counting from the last menstrual period (LMP), and birth usually occurs between 37 and 42 weeks. The actual pregnancy duration is typically 38 weeks after conception. Though pregnancy begins at conception, it is more convenient to date from the first day of a woman's last menstrual period, or from the date of conception if known. Starting from one of these dates, the expected date of delivery can be calculated. Forty weeks is 9 months and 6 days, which forms the basis of Naegele's rule for estimating date of delivery. More accurate and sophisticated algorithms take into account other variables, such as whether this is the first or subsequent child (i.e., pregnant woman is a primip or a multip, respectively), ethnicity, parental age, length of menstrual cycle, and menstrual regularity.

Fewer than 5% of births occur on the due date; 50% of births are within a week of the due date, and almost 90% within 2 weeks. It is much more useful, therefore, to consider a range of due dates, rather than one specific day, with some online due date calculators providing this information.

Accurate dating of pregnancy is important, because it is used in calculating the results of various prenatal tests (for example, in the triple test). A decision may be made to induce labour if a fetus is perceived to be overdue. Furthermore, if LMP and ultrasound dating predict different respective due dates, with the latter being later, this might signify slowed fetal growth and therefore require closer review.

The Age of Viability has been receding relentlessly as medical revolution continues to unfold. Whereas it used to be 28 weeks, it has been brought back to as early as 23, or even 22 weeks in some countries. Unfortunately, there has been a profound increase in morbidity and mortality associated with the increased survival to the extent it has led some to question the ethics and morality of resuscitating at the edge of viability.

Childbirth

Childbirth is the process whereby an infant is born. It is considered by many to be the beginning of the infant's life, and age is defined relative to this event in most cultures. A woman is considered to be in labour when she begins experiencing regular uterine contractions, accompanied by changes of her cervix — primarily effacement and dilation. While childbirth is widely experienced as painful, some women do report painless labours, while others find that concentrating on the birth helps to quicken labour and lessen the sensations. Most births are successful vaginal births, but sometimes complications arise and a woman may undergo a cesarean section.

During the time immediately after birth, both the mother and the baby are hormonally cued to bond, the mother through the release of oxytocin, a hormone also released during breastfeeding.

Diagnosis

The beginning of pregnancy may be detected in a number of different ways, either by a pregnant woman without medical testing, or by using medical tests with or without the assistance of a medical professional.
Most pregnant women experience a number of symptoms, which can signify pregnancy. The symptoms can include nausea and vomiting, excessive tiredness and fatigue, craving for certain foods not normally considered a favorite, and frequent urination particularly during the night.

Pregnancy detection can be accomplished using one or more of various pregnancy tests, which detect hormones generated by the newly formed placenta. Clinical blood and urine tests can detect pregnancy 12 days after implantation which is as early as 6 to 8 days after fertilization. Blood pregnancy tests are more accurate than urine tests. Home pregnancy tests are personal urine tests, which normally cannot detect a pregnancy until at least 12 to 15 days after fertilization. Both clinical and home tests can only detect the state of pregnancy, and cannot detect the age of the embryo.

In the post-implantation phase, the blastocyst secretes a hormone named human chorionic gonadotropin, which in turn stimulates the corpus luteum in the woman's ovary to continue producing progesterone. This acts to maintain the lining of the uterus so that the embryo will continue to be nourished. The glands in the lining of the uterus will swell in response to the blastocyst, and capillaries will be stimulated to grow in that region. This allows the blastocyst to receive vital nutrients from the woman.

Despite all the signs, some women may not realize they are pregnant until they are quite far along in their pregnancy, in some cases not even until they begin labour. This can be caused by many factors, including irregular periods (quite common in teenagers), certain medications (not related to conceiving children), and obese women who disregard their weight gain. Others may be in denial of their situation.

Physiology

Pregnancy is typically broken into three periods, or trimesters, each of about three months. While there are no hard and fast rules, these distinctions are useful in describing the changes that take place over time.

First trimester

Traditionally, doctors have measured pregnancy from a number of convenient points, including the day of last menstruation, ovulation, fertilization, implantation and chemical detection. In medicine, pregnancy is often defined as beginning when the developing embryo becomes implanted into the endometrial lining of a woman's uterus. In some cases where complications may have arisen, the fertilized egg might implant itself in the fallopian tubes or the cervix, causing an ectopic pregnancy. Most pregnant women do not have any specific signs or symptoms of implantation, although it is not uncommon to experience minimal bleeding at implantation. Some women will also experience cramping during their first trimester. This is usually of no concern unless there is spotting or bleeding as well. After implantation the uterine endometrium is called the decidua. The placenta, which is formed partly

from the decidua and partly from outer layers of the embryo, is responsible for transport of nutrients and oxygen to, and removal of waste products from the fetus. The umbilical cord is the connecting cord from the embryo or fetus to the placenta.The developing embryo undergoes tremendous growth and changes during the process of fetal development.

Morning sickness occurs in about seventy percent of all pregnant women and typically improves after the first trimester.
In the first 12 weeks of pregnancy the nipples and areolas darken due to a temporary increase in hormones.
Most miscarriages occur during this period.

Second trimester
Months 4 through 6 of the pregnancy are called the second trimester. Most women feel more energized in this period, and begin to put on weight as the symptoms of morning sickness subside and eventually fade away.
In the 20th week the uterus, the muscular organ that holds the developing fetus, can expand up to 20 times its normal size during pregnancy. Although the fetus begins to move and takes a recognizable human shape during the first trimester, it is not until the second trimester that movement of the fetus, often referred to as "quickening", can be felt. This typically happens in the fourth month, more specifically in the 20th to 21st week, or by the 19th week if the woman has been pregnant before. However, it is not uncommon for some women not to feel the fetus move until much later. The placenta fully functions at this time and the fetus makes insulin and urinates. The reproductive organs distinguish the fetus as male or female.

Third trimester
Comparison of growth of the abdomen between 26 weeks and 40 weeks gestation.
Final weight gain takes place, which is the most weight gain throughout the pregnancy. The fetus will be growing the most rapidly during this stage, gaining up to 28g per day. The woman's belly will transform in shape as the belly drops due to the fetus turning in a downward position ready for birth. During the second trimester, the woman's belly would have been very upright, whereas in the third trimester it will drop down quite low, and the woman will be able to lift her belly up and down. The fetus begins to move regularly, and is felt by the woman. Fetal movement can become quite strong and be disruptive to the woman. The woman's navel will sometimes become convex, "popping" out, due to her expanding abdomen.

This period of her pregnancy can be uncomfortable, causing symptoms like weak bladder control and back-ache. Movement of the fetus becomes stronger and more frequent and via improved brain, eye, and muscle function the fetus is prepared for ex utero viability. The woman can feel the fetus "rolling" and it may cause pain or discomfort when it is near the woman's ribs and spine.
It is during this time that a baby born prematurely may survive. The use of modern medical intensive care technology has greatly increased the probability of premature babies surviving, and has pushed back the boundary of viability to much earlier dates than would be possible without assistance. In spite of these developments,

premature birth remains a major threat to the fetus, and may result in ill-health in later life, even if the baby survives.

Prenatal development and sonograph images

Prenatal development is divided into two primary biological stages. The first is the embryonic stage, which lasts for about two months. At this point, the fetal stage begins. At the beginning of the fetal stage, the risk of miscarriage decreases sharply, all major structures including hands, feet, head, brain, and other organs are present, and they continue to grow and develop. When the fetal stage commences, a fetus is typically about 30 mm (1.2 inches) in length, and the heart can be seen beating via sonograph; the fetus bends the head, and also makes general movements and startles that involve the whole body. Some fingerprint formation occurs from the beginning of the fetal stage.

Electrical brain activity is first detected between the 5th and 6th week of gestation, though this is still considered primitive neural activity rather than the beginning of conscious thought, something that develops much later in fetation. Synapses begin forming at 17 weeks, and at about week 28 begin multiply at a rapid pace which continues until 3–4 months after birth. It isn't until week 23 that the fetus can survive, albeit with major medical support, outside of the womb. It is not until then that the fetus possesses a sustainable human brain.

Embryo at 4 weeks after fertilization Relative size in 1st month (simplified illustration)	Fetus at 8 weeks after fertilization Relative size in 3rd month (simplified illustration)	Fetus at 18 weeks after fertilization Relative size in 5th month (simplified illustration)	Fetus at 38 weeks after fertilization Relative size in 9th month (simplified illustration)

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Course Name: Gender and women's health

Course Description

The Course focuses Gender related issues in public health. It involves women's realties which tends to be a problem, women who are beaten and even killed. Case studies of domestic violence, Honour killings and crimes against women, addressing sexual violence in humanitarian settings, women's health, women and the Strategic development goals (SDGs)

Course Objectives

- To help students analyze the vital gender aspects in public health such as equal access of health services by both women and men.
- To help them learn the major challenges women face in accessing health services.
- To provide them with instincts to become sensitive about reproductive health needs of the gender spectrum.

Course Content

Introduction Gender and Public Health

- World in the world today: an overview
- Some relevant statistics
- Women's realities: the problem
- Women who are beaten and killed

Domestic violence

- Domestic violence in Uganda
- Honour killings in Turkey
- Honour crimes in Iraq (A report by Amnesty International)

Addressing Sexual Violence in Humanitarian Settings

- Prevention
- Applicable responses to sexual violence
- Clinical management of rape

Women's Health

- Definition of Health World Health Organization (WHO)
- Views by United Nations Family Planning Association
- The case of widow "Cleansing"
- HIV/AIDS amongst women
- Women who are cut from a cultural point of view
- Sex workers in Uganda

Women and the Strategic Development Goals

- Overview of the SDGs
- The SDG's: a Commentary
- Challenges in achieving the SDGs

Introduction Gender and public health

This third topic of module 1, we introduce the subject of gender and health and review the status of women in our world today. In order to understand the

importance of gender equality for public health, we will demonstrate how much inequality exists in the world, inequality that can lead to disease and death. We shall see that while women in Africa are generally not regarded as having the same societal status as women in most countries, women all over the world have their own sets of problems to deal with. All of the stories told in this unit are factual and some of them have shocking consequences for women's health.
This unit provides introductory material for the later module on Population and Reproductive Health.

- **Women in the world today: an overview**

"Women do two-thirds of the world's work, receive 10 percent of the world's income and own 1 percent of the means of production."

Many of us in sub-Saharan African countries labour under the misapprehension that women in other countries are liberated, have equal opportunities with men, are economically independent, have access to good health care and education, and can make decisions and choices for themselves, especially in relation to family planning and reproductive health. As we shall see, this is not necessarily the case. While it is true that women in most of the so-called "developed" countries have what we could consider as more freedoms and opportunities than we in East Africa might have, women all over the world suffer from varying degrees of oppression and hardship. This topic of the module Foundations of Public health will attempt to give an overview of the state of women in the world today and try to document the most recent attempts to ensure that women are given as much liberty and opportunities as men appear to enjoy.
The overview that follows has been assembled by reading newspaper and magazine articles, reports from various state and NGO organizations, and news stories highlighted on television and the Internet over the past three to four years.

- **Some statistics**

More than 1 billion people in the world today live in absolute poverty (i.e. earn less than US$1 per day). Nearly 70 percent of them are women. Globally, women's wages average between 20 and 50 percent lower than men's.

At the end of the 20th century, 885 million of the world's adults (nearly one in four) are illiterate. Two-thirds of them are women. If present trends continue, this number will remain largely unchanged through 2010. Access to education varies according to income, race, ethnic origin, disability, and residence. But the single largest factor is gender. One out of three women in the world today cannot read or write. A large body of research has established a strong correlation between literacy and social development with the greatest social benefits accruing from the extension of basic education to girls and women.

In developing countries, populations with the lowest literacy rates have the poorest health status. The relationship between literacy and health is particularly strong when female literacy is studied. A survey of 106 developing countries shows that as the literacy level of women increases:

- Fertility rates decline because literate women tend to marry later and are more likely to use family planning;
- Infant mortality rates decline because mothers with even one year of schooling tend to take better care of their babies;
- Immunisation rates rise because literate mothers are more likely to seek medical care for their children.
- Women with even a few years of schooling are better agricultural workers, generate more income, and take better care of their families.
- Once low-income women increase their income, they use their new earnings to improve the education, health and nutrition of their families.

Given these statistics (which have been compiled from a number of diverse sources), we should immediately see that there is a problem. But what is it? Why are more than one half of the world's people treated differently? Why are development programmes not making a difference? Why are women still living under the rule of their men?

- **Women's realities: the problems**

According to the writer Kristen Sternberg (Georgia, USA), women all around the world face their own problems. If we take a look at news articles about women's issues worldwide: changes for Iranian women, the plight of Chinese women, and the difficulties faced by Latin American and Indian women, we shall see what kinds of problems women face in the 21st century. Sternberg points out that in the United States, during the past century, women gained many of their civil rights and today's females enjoy more legal, cultural, and societal freedoms than ever before. In the last half-century alone, many changes have taken place in many different countries, but, paradoxically, most of us are getting mixed messages about the role of women in our cultures today. Think about the contrasts set up by the images of successful business women and then about the pros and cons of beauty pageants.

Women in many other regions and cultures around the world plan and participate in meaningful activities to celebrate International Women's Day on March 8th each year. And it is true that we have seen some remarkable changes due to this kind of sensitisation, but there have been gains and losses toward equality with men since the 1980 in relation to the following: marriage and divorce rates; the size of family households, including percentages of families living in poverty; incidences of domestic violence; fertility rates, including information on preference for males and girl-child neglect; population policies, including the issues of contraception and abortion practices and maternal mortality; women athletes; beauty contests, cosmetic surgery, and eating disorders; global sex trade and rape; types of work, status of pay, migrant workers, percentages of workforce; education issues; ownership of property; poverty and credit for women; women's political power at all levels – all these (and more) issues mean that women's realities worldwide are problematic.

According to JuleykaLantigua (editor/writer from New York), as we celebrate Women's Day on March 8 every year, millions of women do not even notice because

they are struggling for survival, literally in many cases. One life and death issue is childbirth. The World Health Organization estimates that half a million women die and 8 million are disabled each year during pregnancy or childbirth. In Mozambique 1,500 of every 100,000 women die during pregnancy or childbirth. Millions of women do not have reproductive freedom. In China, women undergo forced abortions. In the 1990s, more than 100,000 women in developing countries were subject to chemical sterilization with pellets containing quinacrine. The World Health Organization says quinacrine may cause cancer.

In north-east Brazil, 43 percent of women resort to female sterilization as a contraceptive method. These women have to take drastic steps to exercise their reproductive rights because more reversible methods are not available to them. In some countries, like in Chile, abortion is illegal under all circumstances. And close to 80,000 women die each year from unsafe abortions, according to the World Health Organisation.

Poverty is a global women's issue. It has been estimated that women constitute 70 percent of the 1 billion people living in poverty in the world today. As more women are displaced by rampant poverty, the trafficking and prostitution of girls and women is escalating. Japan is now home to more than 100,000 Thai and Filipino sex workers. Activists estimate that there are at least 1 million women and girls working in Thailand's sex trade. Colombia's Department of National Security estimates that 50,000 Colombian women are dispersed throughout European and Asian sex markets.

And all over the world, women face terrible situations of domestic abuse and sexual violence. According to the World Health Organization, one in five women in the world is physically or sexually abused in her lifetime. Violence against women is as serious a cause of death and disability as cancer, and causes more ill health than traffic accidents and malaria combined, according to the World Bank.

In parts of the Islamic world, such as Kuwait, Afghanistan, and Saudi Arabia, women are regarded as second-class citizens. Religious texts are invoked to deny women equal rights and to enforce strict laws against divorce, adultery, education, and employment. An Islamic court in the United Arab Emirates recently ordered a pregnant Indonesian domestic worker to be stoned to death for adultery. In Afghanistan, even after the ‘liberation’ from the Taliban, school buildings for girls continue to be burned down. The singing of women in public, including on radio and television, has been banned. Women can sing within their own schools but to attempt to sing outside the walls is to risk one’s life in the hands of gunmen (BBC News, 04 July 2003).

Women in the industrialized world face many obstacles to equality, as well. A survey by the Foreign Press Centre, showed that 35 percent of Japanese women who responded felt that sexual harassment at work was one of the major problems they faced. Another 47 percent said they were subject to discriminatory treatment at work.

Women in the United States still earn, on average, 75 percent of men's pay,

according to the AFL-CIO. And the United States is one of very few countries that does not have a national policy mandating paid maternity leave.

- **Women who are beaten and killed**

During the lawlessness after the overthrow of Saddam Hussain's government, many cases of violence, including espousal violence, were not prosecuted. Nineteen-year-old "Fatima" was shot in the legs by her husband in front of her family and their neighbours on 21 May 2003. Married at the age of 12, she was treated as a servant and regularly beaten in her husband's family home. She told Amnesty International that she tried to run away to her own family, but her husband came and said she should go back. When she refused he became very angry and took a piece of wood to beat her. It broke, so he grew even angrier and took his gun and shot her. Despite the number of eyewitnesses and the seriousness of the crime, neither the family nor the hospital reported the case to the police and the husband was not arrested. The family said it was a matter to be solved within the tribe. Fatima returned to her father's house after she left hospital. Her husband expressed regret and offered her compensation, seeking reconciliation with her through the mediation of elders of her tribe. However, she refused to return to him, despite the pressures. (Amnesty International)

Domestic violence or battering is a pattern of behaviour used to establish power and control over another person through fear or intimidation, often including the threat or use of violence. In all cultures the perpetrators of abuse are most commonly male. Women are most commonly the victims of violence, although elder and child abuses are also prevalent. Here are some disturbing facts:

- At least one out of every three women has been beaten, coerced into sex, or otherwise abused in her lifetime. Usually, the abuser is a member of her own family or someone known to her.
- The World Health Organization has reported that up to 70% of female murder victims are killed by their male partners.
- In the USA, the Surgeon General has warned that domestic violence poses the single largest threat to all women: more than rape, muggings, and car accidents put together.
- The Council of Europe has stated that domestic violence is the major cause of death and disability for women aged 16 to 44 and accounts for more death and ill-health than cancer or traffic accidents.
- In the USA, women accounted for 85% of the victims of domestic violence in 1999.
- The Human Rights Commission of Pakistan reported more than 1000 women were the victims of "crimes of honour" in the country in 1999.
- In Rwanda, approximately 500,000 women were raped during the 1994 genocide and an estimated 5,000 pregnancies resulted from those rapes.
- In Bangladesh, women who are killed by their husbands account for 50% of all murders.
- The Papua New Guinea Law Reform Commission found that 67% of rural women and 56% of urban women have been victims of espousal abuse.

- It is estimated that over 120 million women have undergone some form of genital mutilation and at least two million girls per year are at risk of mutilation.
- Women and children make up some 80% of the world's millions of refugees and other displaced persons.
- Over 50% of women experienced some form of sexual violence during the conflict in Sierra Leone in 1999.
- Women and girls are also subjected to forced prostitution and trafficking with the complicity or participation of peacekeeping forces.
- More than 60 million women are estimated to be “missing” from the world today as a result of sex-selective abortions and female infanticide according to an estimate by Amartya Sen. Indian economist and philosopher. China's last census in the year 2000 revealed that the ratio of newborn girls to boys was 100:119. The biological norm is 100:103.
- “Crimes of honour” have been reported in some countries in the Middle East, Latin America, and South Asia but estimating the prevalence is very difficult as most incidents escape official scrutiny.
- South African rape statistics include 52,975 rapes reported in 2000, the age group 12 to 17 years was the most vulnerable, with 472 reported rapes per 100,000 in that group; among 18 to 49 year-olds there were 286 rapes per 100,000; and for girls under 12 years 131 per 100,000.
- It is estimated that in Russia 14,000 women were killed by their partners or relatives in 1999, yet the country still has no law specifically addressing domestic violence.
- Up to 200,000 women were estimated to have been forced to serve as “comfort women” in military brothels of the Japanese Imperial army during World War II.
- Over 2 million women report being beaten every year in the United States. This means that a woman is beaten every 15 seconds somewhere in the United States alone.

The Beijing Platform for Action adopted at the Fourth World Conference on Women (1995) categorizes violence against women as an obstacle to the achievement of the objectives of equality, development, and peace. It underlines that violence against women violates and impairs or nullifies the enjoyment by women of their human rights and fundamental freedoms. The Platform thus confirms the categorization of violence against women as a human rights issue and the resulting accountability of States to prevent, investigate, and punish acts of violence against women, whether perpetrated by the state or by private persons. The consideration of violence against women as a fundamental human rights violation critically enhances earlier approaches, such as criminal justice and public health approaches, to addressing all forms of violence against women.

The Platform provided an important impetus for data collection and research on violence against women. Specifically, it called attention to the lack of data on violence against women and exhorted governments to build national statistical capacity to collect such data and disseminate findings, and to encourage research into the causes and consequences of different forms of violence against women. It also urged governments to work with universities and other organizations from civil

society to develop policies and institutional reforms on violence against women.

The 1993 United Nations Declaration on the elimination of violence against women provides a very broad and inclusive framework for studying violence against women. According to this definition, “violence against women” means any act of gender-based violence that results in, or is likely to result in, physical, sexual, or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life. (General Assembly resolution 48/104 of 20 December 1993, Article 1). Specifically, the Declaration outlines a broad variety of acts and circumstances that are included in this definition:

Physical, sexual and psychological violence occurring in the family, including battering, sexual abuse of female children in the household, dowry-related violence, marital rape, female genital mutilation, and other traditional practices harmful to women, non- espousal violence and violence related to exploitation; physical, sexual and psychological violence occurring within the general community, including rape, sexual abuse, sexual harassment and intimidation occurring at work, in educational institutions and elsewhere, and trafficking in women and forced prostitution; physical, sexual and psychological violence perpetrated or condoned by the State, wherever it occurs.

The Declaration recognizes that some groups of women are particularly vulnerable to violence, such as: women belonging to minority groups, indigenous women, refugee women, migrant women, women living in rural or remote communities, destitute women, women in institutions or in detention, female children, women with disabilities, elderly women, and women in situations of armed conflict.

Given this state of affairs, it should be clear that inflicting suffering on another human being, whether within the walls of the family or otherwise, is a crime and should be punishable by law. And yet, most states do not wish to legislate for matter that have traditionally been considered private.

- **What Amnesty International says**

According to Amnesty International (2005 Global Annual Report on Human Rights), violence against women is endemic all over the world. Here in Africa, we tend to think of domestic violence as a “cultural” issue, that men somehow have the “right” to beat their wives. However, even in countries where traditional norms have almost entirely disappeared, women are subject to violence. Let us take a closer look at what Amnesty International reported about women in Afghanistan, Kenya, and Uganda.

Afghanistan is in the process of reconstruction after many years of conflict, but hundreds of thousands of women and girls continue to suffer abuse at the hands of their husbands, fathers, brothers, armed individuals, parallel legal systems, and institutions of the state itself such as the police and the justice system. There are reported increases in forced marriages; some women in difficult situations have even killed themselves to escape such a heinous situation, while others burn themselves

to death to draw attention to their plight. Husbands, brothers, and fathers are the main perpetrators of violence in the home, but the social control and the power that they exercise is reinforced by the authorities, whether of the state or from informal justice systems such as 'shuras' (arabic word for "consultation"; believed to be the method by which pre-Islamic Arabian tribes selected leaders and made major decisions) and 'jirgas' (tribal assembly of elders which takes decisions by consensus, particularly among the Pashtun in Afghanistan).

Looking at gender violence in East-Africa, Amnesty reports that violence against women in **Kenya** remains widespread despite efforts to increase public awareness by the authorities and civil society. Perpetrators of violence against women included both state officials and private individuals, according to the report, which was launched by Amnesty's Kenyan chapter in Nairobi in May 2005. The report notes women and girls are subjected to domestic violence, sexual assault, rape, incest, forced marriages, and female genital mutilation. Gang rape and sexual assault during robbery and car-jacking are also frequently reported. Between January and August 2004, the police had recorded 1,895 rape cases, but noted that many more had not been reported to the police. In 2003, there were 2,308 rapes reported to law enforcement agencies.

Amnesty noted that a Kenyan demographic health survey released in August that year had indicated that more than half the women had experienced violence since they were 15. The survey showed that husbands inflicted 60 percent of the beatings. Women's rights groups in Kenya have attributed the low rate of convictions in sexual offence cases to a lack of trained police officers to carry out investigations, difficulties in the preservation of forensic evidence in rape cases and a shortage of lawyers with specialised training to prosecute such cases. The report states that government institutions for supporting survivors of violence were inadequate and services such as shelters and counselling were lacking - adding that there was no access to post-exposure prophylaxis against sexually-transmitted diseases in rape cases. Kenyan authorities have now formed a special unit in the office of the Director of Public Prosecutions to handle sexual offences and set up a women-only police station in Nairobi to deal exclusively with rape, domestic violence, and child abuse cases. We note here that this initiative is an excellent one but it treats the symptoms rather than treating the disease. However, until the disease itself is cured, then we argue that assisting women to deal with the after effects of domestic and other violence is a viable option and one which could alleviate the suffering of many women in Kenya.

And closer to home, gender violence in **Uganda** is still a problem despite the Constitution. Violence against women does not only take place behind the closed door of the home: our girls in schools are also at risk. A report from a collaborative research project between the University of Sussex School of Education and African educationalists, documents the abuse of girls in a number of secondary schools in sub-Saharan countries. Researchers found that "schools are breeding grounds for potentially damaging gendered practices which remain with pupils into adult life. By not clamping down on sexual abuse and aggressive behaviour, schools send messages to pupils that violence is a "normal" feature of life. Powerful peer pressures encourage pubescent girls to make themselves attractive to boys and boys to get girlfriends, using coercion if necessary. Transactional sex –as a means for girls to

pay school fees, meet living expenses, or obtain gifts– seems common. Girls often see their bodies as an economic asset. Some may enter sexual relationships with older men out of choice, but poverty pushes other girls who have no other means of supporting themselves into dependent and potentially exploitative liaisons. Girls come to see their bodies as an economic asset." In such relationships, they have limited choices over the use of condoms.

The researchers (Fiona Leach, Vivian Fiscian, EsmeKadzamira, Eve Lemani, and Pamela Machakanja) found that sexual abuse by older pupils, teachers and "sugar daddies" is only one aspect of a wider problem of school-based violence, which includes excessive corporal punishment and bullying. There are high levels of apathy among officials, lack of information among pupils and parents and a reluctance to believe girls who make allegations. Interestingly, most teachers do not see boys' intimidating behaviour as a serious problem but as part of growing up, and they are generally unwilling to report other teachers' sexual misconduct. Not all parents, teachers, and girls disapprove of teachers or older men having sexual liaisons with schoolgirls, whether for economic or cultural reasons.

Almost every day when we read the daily newspapers, we read of a case of abuse of an under-age girl. Given this situation, we can recognize the fact that serious work needs to be done so that teachers, parents, and school-children themselves recognize that sexual abuse and harassment also constitutes gender violence. Our greatest challenge is to make schools safe environments for Africa's schoolgirls.

- **Domestic violence in Uganda**

Despite the chronic and widespread nature of the global phenomenon of domestic violence, there has been an astounding failure to prosecute this crime even in countries with greater institutional capacity. In Uganda, there are no specific laws that provide Ugandan women with any meaningful protection from domestic violence. Since the early 1990s, local NGOs have unsuccessfully lobbied the government to pass domestic violence legislation and legislation addressing domestic relations. According to women's rights activists, in many Ugandan communities, wife battery that does not result in serious injury is tolerated and is considered a normal part of marriage. As a result of the under-reporting of domestic violence and the paucity of official statistics, domestic violence rates are difficult to measure with absolute accuracy. However, it is generally agreed that domestic violence rates are high in Uganda. According to U.N. statistics, in 2000, 41 percent of Ugandan women had suffered domestic violence. A study that examined domestic violence among women attending the prenatal clinic in Mulago Hospital, the largest hospital in Uganda providing free medical services, found that 40.7 percent of women reported physical assaults in the year before conceiving. Police Superintendent Helen Alyek of the Child and Family Protection Unit at Nsambya Police Station told Human Rights Watch that complaints of domestic violence rose from 495 in 2001 to 1009 in 2002. Alyek attributed the rise primarily to training on women's rights, but also to increased levels of violence as a result of poverty.

As recently as August 2002, the U.N. Committee on the Elimination of Discrimination against Women (CEDAW Committee) expressed concern at the high

incidence of violence against women in Uganda, including domestic violence and marital rape, and the absence of legal measures to address such violence. In the absence of a domestic violence law, the police and courts rely on assorted, non-specific provisions in the Penal Code that cover assault and homicide. A prior judicial order of separation is necessary in order to charge a man with the rape of his wife and the law otherwise relies on the common law presumption of consent within marriage. Existing criminal laws do not provide adequate legal remedies and punishments are often very lenient, with the accused being warned or fined. In our interviews we found that battered women rarely report domestic violence cases due to their lack of confidence in the legal system, and, in the cases in which they do report, law enforcement officials rarely intervene to protect women. A wife who reports her husband to the police for beating her faces social stigmatization for exposing family matters to the public. Most notably, in March 2002, the then Vice-President SpeciozaKazibwe stated that she had been a victim of domestic violence. This deeply personal revelation, which should have helped in the destigmatization of the issue, was instead met by extremely negative press and "anti-women" rhetoric on the radio.

Individual women and NGO representatives depicted government institutions that directly handle cases of violence against women as ineffective and non-responsive to women's needs. The Coalition Against Gender Violence, composed of five professional women's NGOs and the Ministry of Gender, Labour and Social Development, reported: "Numerous challenges remain regarding reporting, follow up, arrest, trial and punishment of perpetrators [of gender violence]. These include the fact that officials in these different structures and often the victims themselves are inculcated in and have internalized the culture of gender inequality such that they are not cognizant of what constitutes gender violence." In an effort to enhance the police response, the government has established family protection units at police posts at the national level, gender desks at the district level, and has carried out gender sensitization of law enforcement agencies. However, NGOs report that while police are trained extensively on children's rights, training on women's rights is largely absent.

To date, the most significant pieces of pending legislation with regard to domestic relations are the Domestic Relations Bill (Draft) (Domestic Relations Bill), which seeks to consolidate the six different statutes that relate to marriage and divorce in Uganda, and the Sexual Offences (Miscellaneous Amendments) Bill (Sexual Offences Bill). There has been serious government opposition to their enactment because they address issues such as marital rape, women's ownership of marital property, and polygyny, and therefore have far-reaching cultural and religious ramifications. The CEDAW committee has expressed concern at the slow progress in eradicating both de jure and de facto discrimination and has strongly recommended the speedy enactment of the Domestic Relations Bill and the Sexual Offences Bill. With the exception of criminalizing marital rape, however, neither the Domestic Relations Bill nor the Sexual Offences Bill addresses other facets of domestic violence.

The fact that domestic violence is an issue in Uganda today demonstrates that women (who are for the most part the victims of domestic violence) are regarded as second-class citizens. The fact that most of the women who are abused do not report

their cases means that patriarchy is a deeply-rooted system that silences women because social structures (sometimes as a result of cultural beliefs and practices) are not conducive to women taking a stand and defending themselves.

- **Honour killings in Turkey**

Let us now turn our attention to another crime, a crime that shocks the world in its brutality: honour killings. According to a recent report by journalist SebnebArsu in the New York Times, a nationwide campaign in Turkey aims to end so-called honour killings, in which a woman is killed by her husband or a male relative for alleged behaviour that is perceived as a slight to the dignity and respectability of her family. Rights organizations in Turkey and abroad have long denounced the traditional practice as brutal and unfair to women. Shockingly, men who engage in these murders are not held accountable by the law. According to official records, 43 women in Turkey were victims of honour killings in 2004. But activists say the true number is far greater, with families reporting deaths as suicides or simply filing missing persons reports.

However, a new penal code, ratified in September 2004, eliminated “protection of family honour” as a mitigating circumstance in murder trials and introduced heavier penalties for honour killing convictions. Another recent law calls for the creation of a women's shelter in every large municipality in the country. The campaign entails promotional spots on at least 10 television stations and hundreds of radio stations nationally, plus messages on billboards and fliers. NiluferNarli, a sociologist from Kadir Has University in Istanbul, asserts: "Panels and conferences reach the elite, but you need television and movies to reach people in the street." Perhaps this could also be a strategy Uganda rights groups could use more effectively to sensitize on violence against women countrywide.

- **Honour crimes in Iraq**

The following report from Amnesty International is given in full. Read it carefully and note your reactions as you do so.

Honour Crimes in Iraq. A Report by Amnesty International

Most victims of "honour crimes" are women and girls who are considered to have shamed the women’s families by immoral behaviour. Often the grounds for such an accusation are flimsy and no more than rumour. "Honour crimes" are most often perpetrated by male members of the women’s families in the belief that such crimes restore their and the family’s honour.

In international human rights law, "honour crimes" are recognized as a form of violence against women in the family or community. The rights that they violate include the right to life and security of the person; freedom from torture and cruel, inhuman and degrading treatment; and the right to equality before the law and to equal protection of the law. They also deprive women of rights assured by the UN Women’s Convention, for example the rights to choose a marriage partner, to enter into marriage freely, to freedom from discrimination, and to be treated as a human

being with dignity and equal rights to men.

In recent years, reports by Kurdish women's organizations on violence against women in northern Iraq have gained international attention and been echoed in reports by international organizations. The Committee on the Elimination of Discrimination against Women, the UN expert body charged with monitoring implementation of the Convention on the Elimination of All Forms of Discrimination against Women, noted in 2000 that: "The Committee is... deeply concerned by the violence against women perpetrated through honour killings." The Committee urged the Iraqi government in particular "to condemn and eradicate honour killings and ensure that these crimes are prosecuted and punished in the same way as other homicides". Furthermore, the UN Special Rapporteur on violence against women referred to the practice of "honour killings" in Iraq in her report of January 2002 to the Commission on Human Rights.

The UN Commission on Human Rights has addressed "honour killings" in the context of the right to life and called on states to "investigate promptly and thoroughly all killings committed in the name of passion or in the name of honour...and to bring those responsible to justice before a competent, independent and impartial judiciary, and to ensure that such killings, including those committed by... private forces, are neither condoned nor sanctioned by government officials or personnel".

The organization, Kurdish Women AgainstHonour Killings (KWAHK), reported that between 1991 and 1998, hundreds of women had died in so-called "honour killings" in northern Iraq. The report listed more than 100 individual cases of women killed during the 1990s by their husbands, brothers, cousins, and other family members in northern Iraq. Among reasons given for the killings were that the women had committed adultery, refused to marry against her will, or left home in order to marry a man of her own choice.

Until legal reforms specifically to address "honour killings" were introduced by the Kurdish authorities in northern Iraq between 2000 and 2002, the perpetrators of such killings were either never tried or received generally lenient sentences.

In one well-documented case, a court in Dohuk, northern Iraq, accepted the "honourable motivation" of men who had killed a young woman as grounds for leniency in sentencing. Pela, unmarried and living with her family in Sweden, was killed on 24 June 1999 on a visit to the family home in Dohuk. Breen, Pela's younger sister, heard a shot upstairs. Her uncle, RezkarAtroshi, came out of the room holding a gun, and claimed that Pela had shot herself. Breen, initially made to leave the house, later managed to get back in. Running upstairs, she found her sister covered in blood but still alive. Pela said that her uncle had shot her. Her mother helped bring her downstairs to the living room. There she was shot in the head and killed by one of her uncles. On 9 October 1999 the Dohuk Criminal Court convicted Pela's father, AgidAtroshi, and her uncle Rezkar of the killing, but gave them each a suspended one-year prison sentence.

The court referred to a report from the autopsy that "the hymen was broken" and to

the defendants' "honourable motivation" in support of its decision. The Court of Cassation reviewed the verdict and on 22 February 2000 ruled that the one-year sentence be served. In January 2000, Pela's uncles Rezkar and DahaszAtroshi were arrested in Sweden. On 12 January 2001 the Stockholm City Court convicted both men of the murder and sentenced them to life imprisonment. The sentences were confirmed on appeal.

Mutilation is another form of "honour crime" used in northern Iraq as a punishment for people accused of a relationship considered to be illegitimate. In July 1996, KajalKhidr, 24 years old and pregnant, was accused of adultery, tortured and mutilated by six members of her husband's family near the town of Rania, Sulaimaniya governorate. They cut off part of her nose, and told her that she would be killed after the birth of her child. She received treatment at a hospital in Rania, and a further three months of hospital treatment in Sulaimaniya, where she was kept under police protection. She then spent a year in hiding before finding refuge with a women's organization in Sulaimaniya. With the help of local human rights activists, she fled to Syria in February 1999 and was recognized as a refugee by the UN High Commissioner for Refugees. In July 2000 she was resettled in a third country where she lives with her daughter. Two of the men who had tortured her were arrested by the Patriotic Union of Kurdistan (PUK) authorities, which controlled the area, but were released within 24 hours on the grounds that they had acted to safeguard the "honour" of the family. No charges were ever brought against them.

Dunya (not her real name) from the Rania region was forced to marry against her will in 1999. Before her marriage she had been in love with Ahmed (not his real name), her husband's nephew. In March 2002 her husband accused her of adultery with Ahmed, and the families decided to cut off Dunya's nose and one of Ahmed's ears. In September 2002 one of Ahmed's relatives was sentenced to four years' imprisonment for carrying out the mutilations, two years for each offence.

Between 2000 and 2002 the Kurdish authorities amended the law so that courts could no longer find "honourable motivation" a mitigating circumstance in "honour crimes" against women. However, despite these reforms, Kurdish women's organizations fear that more efforts are made to conceal "honour killings", in order to avoid the judicial consequences. The Women's Information and Cultural Centre (WICC) suspects that the bodies of victims of "honour killings" have been hidden, or mutilated to conceal their identities. The Centre has reported recent cases where women have died in suspicious circumstances, and relatives have claimed that the deaths were accidental. One man who had killed his daughter-in-law, Gulestan, in June 2001 in the Balisan area, told the Centre in August 2002:

"We killed this woman to end the problem. If we did not kill this woman, two families would have got into a fight and maybe 15 people would have died over this. We have tribal customs and we do not take such cases to court... If I did not kill her I may have been told many times that I did not keep my honour... If I did not kill her, whenever I will have a family problem, the issue will be mentioned again." He said that they had to act swiftly to prevent the authorities from protecting Gulestan. Although he was aware of the legal amendments regarding "honour killings", he did not expect the case to be brought to trial. An agreement, including the payment of

compensation, had been reached with Gulestan's family, and the local authorities appeared to be aware of the arrangement.

Women and girls living in hiding to escape "honour killings" have given videotaped interviews about their experiences. One of them, Nivan (not her real name), ran away in 2002 at the age of 16 to marry the man she loved, against the will of her family. Attempts to reconcile her family and her husband's family, involving religious leaders and local authorities, were unsuccessful. Her family was allegedly behind an attempt to kill her and her husband, and the killing of her husband three months later in mid-2003. Initially detained on suspicion of involvement in the killing, she was released after two months, and now lives with her child in hiding. "I have no future. My family will look for me to kill me. I can never return to my family," she said.

In recent years several organizations have been established in northern Iraq that offer support for women at risk of violence, including survivors of attempted "honour killings". One of these organizations is the Sulaimaniya-based Asuda Centre for Combating Violence against Women (Asuda Centre), which in August 2002 opened a shelter for women survivors of violence at a secret location. Asuda Centre's work to protect women who have experienced violence or those at risk includes negotiating with their families. Most organizations operating in northern Iraq and offering support for women who have escaped violence in the home consider a controlled return to the family to be the most likely means of arriving at a long term solution. To ensure a woman's safe return, the male head of the family is often required to sign an official undertaking to guarantee the woman's protection. However, an activist of the Sulaimaniya-based women's centre, Khanzad, told Amnesty International that there had been cases in which families had killed a woman after her arranged return.

Kurdish women's rights activists have reported that several women who have remained in a shelter for more than a year, because no settlement with their families could be reached, might only be able to find safety in the long term outside northern Iraq or even outside Iraq altogether.

Violence associated with "honour crimes" has never been confined to northern Iraq. The Iraqi author, FuadTekerly, who worked as a judge in Baghdad, took a stand against such crimes when he published a short story in 1972 about a man claiming that he killed his sister-in-law in order to protect his family honour. The story reveals that the woman was murdered because she had discovered her brother-in-law's adulterous relationship with a relative.

More recently, lawyers have spoken of their involvement in cases of "honour killings" in the 1980s and 1990s in central and southern Iraq. A lawyer from Baghdad reported a case in which she was involved in the mid-1990s. She was representing Azima (not her real name), a teenage girl from the Abu Ghraib neighbourhood in Baghdad, who had been arrested after running away from her family with her lover. After several months of negotiations, she was returned to her family, who promised to ensure her safety. However, a month later she was shot dead by her teenage brother. The brother was sentenced to six months' imprisonment for the killing.

Another lawyer reported details of more than a dozen cases of "honour killings" that have been tried at Basra Criminal Court over the past three decades. She told Amnesty International about the killing of a young single mother in Basra: "In the beginning of the 1980s I witnessed a case of ‘honour killing’. I was on my way to the Basra Criminal Court. About 10 metres away from me, I saw a young man talking to a woman holding a baby child. Suddenly he pulled out a pistol and fired at her. The woman fell to the ground. The man lifted her up and pulled the child from beneath her. Then he covered her body, took the child and walked into the court building".

The murdered woman had become pregnant as a result of a secret relationship. She had turned to the police for protection and had been kept at a police station until her child was about a year old, when she was told to leave. She was apparently on her way to court to seek further protection when her brother killed her. At his trial, he was given a suspended two-year prison sentence.

The same Basra-based lawyer also reported cases in which the perpetrators of "honour killings" received significantly higher sentences. She recalled a case in the early 1980s in Basra. A young woman was returned to her family shortly after her wedding by her husband, who claimed that she was not a virgin when they married. She was stabbed to death by a member of her family. However, the autopsy report revealed that her hymen was intact, and the perpetrator was sentenced to at least 10 years’ imprisonment. The lawyer had experience of negotiations with the families of women seeking protection from threats of "honour crimes", and of the killing of a young woman by a relative one year after a settlement ensuring her safety had been agreed with the family.

"Honour killings" have continued during and after the Iraq-Iran war, the Gulf war in 1990-91 and the 2003 US-led war on Iraq. There is insufficient information available to establish whether the incidence of "honour killings" has increased over the past decades of armed conflict in Iraq. However, during the months of lawlessness following the 2003 US-led invasion, the perpetrators of "honour killings" – like other criminals – were unlikely to be tried. The lack of a functioning judicial system during the months after the 2003 war contributed to an increase in the part played by tribal bodies in resolving conflicts, including in relation to "honour crimes". In one case at the beginning of 2004 in al-‘Amara, there was a settlement between two tribes over an "honour killing". A husband of two wives had killed his second and younger wife when he discovered she had been involved in a love affair while he was absent for several months. The tribal settlement did not provide any punishment for the killing of the woman, but required her family to compensate the husband.

Thus, while the authorities in the countries where honour killings are taking place are attempting to enact laws that would outlaw the practice, we see that traditional cultural values and beliefs are often working against legislation.

Addressing Sexual Violence in Humanitarian Settings

Sexual violence is common in humanitarian settings. It may become more acute in the wake of a natural disaster and occurs at every stage of a conflict. The victims are usually women and adolescents, who have often been separated from their families and communities and whose care-taking roles increase their vulnerability to exploitation and abuse. Breakdowns in law and order and in protective societal norms mean that most perpetrators abuse with impunity.

In many conflicts, women's bodies become battlegrounds, with rape used as a method of warfare to humiliate, dominate or disrupt social ties. In the aftermath of natural disasters, women and young people may be left unaccompanied -- out in the open or in temporary shelters -- at the same time that security lapses lead to increased lawlessness and chaos.

The impact of sexual violence, especially rape, can be devastating. Physical consequences include injuries, unwanted pregnancies, fistula and HIV. Widespread sexual violence is also endemic in many post-conflict situations, where it can perpetuate a cycle of anxiety and fear that impedes recovery. However, because reliable data about sexual violence in these situations is scarce, UNFPA is spearheading efforts to determine the scope of the problem in many different contexts.

Prevention

Sexual violence is not inevitable. Better policing, involving women in the design of humanitarian assistance, working with displaced communities to develop systems of protection, and ending impunity for perpetrators are just a few of the actions that can help to minimize sexual violence. Information campaigns and community education can help to raise awareness of the issue, stimulate community dialogue, reduce stigma, and encourage survivors to report incidents and seek care. Effective campaigns positively engage men and promote reflection about cultural attitudes and gender inequalities that perpetuate violence against women.

- In Colombia, UNFPA's advocacy on sexual violence issues resulted in improved policies for women, including a law on the prevention of sexual violence and legal enforcement for perpetrators of rape.
- In Afghanistan, UNFPA supported the Afghan National Police to set up a centre that specifically deals with family violence and female crime victims and which is staffed by Afghan policewomen.
- In the Democratic Republic of Congo, UNFPA has trained and financially supported police units for Women and Children Protection Sections, and has engaged community groups to educate peers on the existence of these special police units and their sensitivity to the particular needs of women and children.
- In Darfur, Sudan, UNFPA-supported sexual violence committees have worked with the African Union Civil Police to arrange escorts for women and girls during firewood collection, as well as to monitor IDP camps. UNFPA has also

successfully lobbied for an increased number of female Civil Police to be deployed to Darfur.
- In Liberia, UNFPA provided funding and support to the Ministry of Gender (MoG) which resulted in sexual violence being taken up within the highest levels of Government, as a core responsibility of the MoG.
- In the occupied Palestinian territories, UNFPA trained and supported gender focal points in several ministries and government-run institutions, and provided technical support to civil society organizations to institutionalize gender and human rights principles.
- At the global level, UNFPA has developed an exhibition of portraits from around the world focusing on actors and actions that help to prevent sexual violence in conflict and post-conflict situations

Response

UNFPA's country offices promote a multi-sectoral, holistic approach to addressing sexual violence in humanitarian settings. Using a survivor-centred and survivor-driven approach, UNFPA provides a wide range of services to encourage social reintegration of survivors, including counseling and assistance with livelihoods. It trains police officers, lawyers and judges to ensure safe and ethical care for survivors, and works with all levels of medical professionals to foster appropriate and timely responses.

Medical treatment is critical for someone who has been sexually assaulted. Survivors need antibiotics to prevent infection and may require treatment for abrasions, tears, or traumatic fistula, a devastating but operable injury that may occur as a result of sexual assault.

In addition to physical injury, women and girls who are raped may be at risk of unwanted pregnancy or sexually transmitted infection. If provided in time, emergency contraception can prevent an unwanted pregnancy, and post-exposure prophylaxis can prevent the transmission of HIV and other sexually transmitted infections.

Much of UNFPA's work to address the issue of gender-based violence in humanitarian contexts is in the field of health response, and training other first responders (such as police and community or women's advocates) to more effectively care for sexual violence survivors. For example:

- In countries such as Central African Republic, Uganda and Nepal, UNFPA has trained health-service providers, security forces and key decision makers to effectively address sexual violence.

- In Afghanistan, where survivors of violence can often barely receive health services, UNFPA has worked through national actors to mainstream gender and human rights issues into the health service sector and successfully advocated to integrate violence against women issues into the national training curriculum for health service providers.

- In Sudan, UNFPA's work with the Government resulted in sexual violence survivors being able to directly access health services without first having to visit the police.

At the global level, in late 2007 UNFPA partnered with UNICEF to lead two regional "Caring for Survivors" workshops, in Timor-Leste and Jordan. The training focuses on building knowledge and skills in various aspects related to how responders communicate and interact with sexual violence survivors in conflict-affected settings. At the heart of this process is the emphasis on understanding and demonstrating a survivor-centred attitude, and using survivor-centred communication skills.

Clinical management of rape

Since 2005, UNFPA and UNHCR have partnered to conduct trainings for health care providers working in refugee, internally-displaced person and other humanitarian settings on the clinical management of rape survivors. The two-day curriculum includes modules on taking a survivor's history, collecting forensic evidence, examining a survivor and prescribing treatment, including emergency contraception, treatment of sexually transmitted infections and post-exposure prophylaxis to prevent the transmission of HIV. To date, UNFPA has conducted four regional training-of-trainers workshops in Geneva, Johannesburg, Nairobi and Cairo. Of those who have been trained as trainers, many are now actively engaged in training health providers in Nepal, Haiti, Liberia, Sudan, Zimbabwe and Cote d'Ivoire (among other countries). In addition, national trainings were conducted in over 10 countries, reaching nearly 500 heath-care providers.

Overall coordination

In late September 2005, as part of the humanitarian reform process, UNFPA was tasked with coordinating gender-based violence issues in humanitarian settings. Proper coordination of this complicated issue, which often engages a wide range of UN and other actors, is vital to ensuring that survivors receive adequate care, and that prevention efforts are varied, wide-reaching and appropriate. As a development agency with growing experience in humanitarian settings, UNFPA continues to forge new partnerships and to increase its human resources and technical capacities to scale up its coordination efforts.

- UNFPA has been led the roll-out and operationalisation of the IASC Guidelines for Gender-Based Violence Interventions in Humanitarian Settings to ensure coordinated, cross-cluster action to prevent and respond to sexual violence.
- UNFPA has been working with partners to document 'good practices' in coordinating efforts to end gender-based violence across a range of humanitarian contexts.
- In January 2007 UNFPA helped mobilize a coalition of 12 UN entities to create UN Action against Sexual Violence in Conflict -- a global forum that encourages country and regional intra-UN partnerships for action.

UNFPA is partnering with Ghent University in Belgium to train senior-level sexual violence field actors to improve their knowledge, understanding and communication

skills to coordinate multi-sectoral response to sexual violence in humanitarian settings

- **Women's health**

The **World Health Organization (WHO)** released its World Health Report 2005, simultaneously in Geneva and New Delhi, on World Health Day (6 April), to coincide with its theme 'Make Every Mother And Child Count'. According to the WHO, 10.6 million children die before age five, and half a million women die in childbirth every year because they have no access to life-saving care. The Report states that the death toll can be sharply reduced through wider use of key interventions and a "continuum of care" approach for mother and child that begins before pregnancy and extends through childbirth and into the baby's childhood.

About 530 000 women a year die in pregnancy or childbirth, more than three million babies are stillborn, more than four million newborns die within the first days or weeks of life. The report estimates that out of a total of 136 million births a year worldwide, less than two thirds of women in less developed countries and only one third in the least developed countries have their babies delivered by a skilled attendant - a fact which can make the difference between life and death, if there are complications. Almost 90% of all deaths among children under five years of age are attributable to just six conditions. These are: acute neonatal conditions, mainly pre term birth, birth asphyxia and infections, which account for 37% of the total; lower respiratory infections, mostly pneumonia (19%); diarrhoea (18%); malaria (8%); measles (4%); and HIV/AIDS (3%). Most of these deaths are avoidable through existing interventions that are simple, affordable and effective. They include oral rehydration therapy, antibiotics, antimalarial drugs and insecticide-treated bed nets, vitamin A and other micro nutrients, promotion of breastfeeding, immunization, and skilled care during pregnancy and childbirth.

India adds 16 million people every year to its population, just two million less than the entire population of Australia. Given the dangers of pregnancy and childbirth, India’s maternal mortality rates are among the highest in the world today.

- 60 per cent of the women are anaemic.
- More women than men die before the age of 35.
- Maternal deaths in India account for almost 25 percent of the world's childbirth-related deaths.
- More than half of Indian women are illiterate though it has the second largest education system in the world after China.
- Maternal mortality rate in India is 100 times more than in the developed world.

India's women remain significantly more malnourished than men. Bias against women and girls is reflected in the demographic ratio of 933 females for every 1,000 males. The country's maternal mortality rates are very high, particularly in rural areas, ranging from 440 to 580 deaths per 100,000 live births. India made modest increases in primary education enrolment rates in the 1990s. Today, it has 108 million children aged 6 -10 attending primary school. Yet more than half of Indian

women are still illiterate; about 40 million primary school-age children are not in school (mostly girls and those from the poorest and socially-excluded households); and only about one-third of an age group completes the constitutionally prescribed eight years of education.

According to the **United Nations Family Planning Association**, projections of the world's population should spur more urgent action to stop the spread of HIV/AIDS and help more women and men determine freely the size of their families. According to its just released World Population Prospects: The 2004 Revision, the number of people in the world is expected to rise by 2.6 billion, from today's 6.5 billion to 9.1 billion in 2050. The report's 2002 edition had projected a population of 8.9 billion in 2050. Almost all growth will take place in developing regions, where population is expected to rise from today's 5.3 billion to 7.8 billion, according to World Population Prospects. By contrast, developed countries' population will remain mostly unchanged, at 1.2 billion. "We must take more urgent action to promote access to reproductive health, including family planning, and fight HIV/AIDS to save millions of lives from AIDS and maternal death, as well as to reduce poverty in developing countries," said Thoraya Ahmed Obaid, UNFPA's Executive Director. Post Beijing, it is important to promote women's rights to protect their welfare and health, especially reproductive health. Developing countries suffer most of the world's deaths from AIDS and lose most of the half million women who die each year from childbirth-related causes.

- **The case of widow "cleansing"**

According to Sharon LaFraniere in the New York Times, in several African nations including Malawi, Zambia, and Kenya, a husband's funeral has long concluded with a final ritual: sex between the widow and one of her husband's relatives, to break the bond with his spirit and, it is said, save her and the rest of the village from insanity or disease. She reports that widows have long tolerated it, and traditional leaders have endorsed it, as an unchallenged tradition of rural African life.

Now HIV/AIDS is changing that. Political and tribal leaders are starting to speak out publicly against so-called sexual cleansing, condemning it as one reason the disease has spread to 25 million sub-Saharan Africans, killing 2.3 million last year alone. Pushing for change is the region's fledgling women's rights movement, which contends that lack of control over their sex lives is a major reason 60% of those infected in sub-Saharan Africa are women.

Many women are taught from childhood not to challenge tribal leaders or the prerogatives of men, the fear of flouting tradition often outweighing even the fear of AIDS. In Zambia, where 20% of adults are now infected with the virus, the National AIDS Council calls the practice very common. President Levy Mwanawasa has declared that forcing new widows into sex or marriage with their husband's relatives should be discouraged, and the nation's tribal chiefs have decided not to enforce either tradition. But a survey by Women and Law in Southern Africa found that in at least one-third of the country's provinces, sexual "cleansing" of widows persists.

- **HIV/AIDS**

The UNAIDS report on the HIV/AIDS pandemic highlights the growing rates of infection among women worldwide. Women now account for nearly 50% of all individuals living with HIV/AIDS worldwide. However, in Africa, the situation is more ominous. Almost 57% of all individuals living with HIV/AIDS in Africa are women. For Africans ages 15-24 living with HIV/AIDS, women account for 76% of all infections. In South Africa, Zambia and Zimbabwe, young women ages 15-24 have rates of infection that are between three and six times that of their male peers. According to Chinua Akukwe, professorial lecturer in Global Health at George Washington University, “the key question is whether African leaders are ready to make hard choices that would slow down the rate of infection among women. For the African woman at the receiving end of HIV/AIDS, the solution lies principally in changing societal beliefs and practices within her family, community, country, and the continent. The solution to gender inequities lies in the capacity of African governments to confront societal beliefs and practices that wittingly or unwittingly put women at risk of physical, emotional and mental harm.” The HIV/AIDS epidemic in Africa is exposing deadly consequences of gender inequities. As the toll of HIV/AIDS mounts in Africa and the epidemic gradually assumes a feminine connotation, every policy maker in Africa needs to work toward the end of all practices that prevent African women from becoming full partners in the titanic struggle ahead.

- **Women who are cut**

In this section we examine a subject that is extremely sensitive from a cultural point of view. While every attempt has been made to be non-judgemental, the evidence collected may prove disturbing reading.
According to the WHO, there is a practice that is predominantly prevalent in Africa but which has created uproar among many nations because of its severe health risks for the women, both physically and psychologically. It is used often as a symbol of subjugation for women in patriarchal societies. Once known as Female circumcision, health officials working for the rights of women are now calling this procedure Female Genital Mutilation [FGM] or Female Genital Cutting [FGC]. According to the WHO, FGC is the partial removal of the female genitalia. It is a procedure used primarily for religious or cultural practices. There have been no therapeutic benefits recorded for FGM. Worldwide, about 130 million women have experienced some form of genital mutilation. Women's activists groups are horrified by the health consequences as a result of this practice, and are working to ban it.

According to the World Health Organisation, there are six different types of female genital mutilation currently practiced. They are divided into Types I -- IV, and there are two additional methods.

1. One of these two methods involves scraping (angurya cutting) or cutting (gishiri cutting) the vaginal area.

2. The other unclassified method involves applying corrosive substances or herbs in or around the vagina to induce bleeding or to constrict the vaginal walls, making the vagina tighter and narrower.
3. Type I FGM, or clitoridectomy, is the removal of the clitoral hood. The clitoris may or may not be removed along with it. In Islamic cultures, this process is known as a "sunna circumcision." The significance of the word "sunna" refers to tradition and the prophet Muhammed.
4. Type II FGM, or an excision, is the removal of the clitoris along with either partial or full removal of the labia minora.
5. Type III FGM is called infibulation, or pharaonic circumcision. This is a clitoridectomy, an excision, and the removal of a part or all of the external genitalia, which is then sewn over part of the vagina, narrowing the opening. This allows only a small hole for urine and menstrual blood to pass through.
6. Type IV FGM is the process of pricking, piercing, incising, stretching, or cauterization (burning) of the clitoris, labia and surrounding tissue. In a man, FGM can be equivalent to cutting of part of or the entirety of a man's penis.

In Africa, where most FGM cases occur, Amnesty International reports 15 percent of the procedures to be an infibulation. However, 85 percent of FGMs in Africa will be either a clitoridectomy or an excision. This statistic reflects about an annual rate of two million young girls that will expect to undergo this procedure. Many cultures where FGM is practised believe that a woman is only initiated into her womanhood when she experiences the knife, razor or glass shard to her genitalia. Gender identity as a woman is important for many tribal societies, who perform elaborate rituals that are central to the girl's coming of age.

The late Kenyan President Jomo Kenyatta has been quoted supporting FGM for reasons that abolishing the practice "[would] destroy the tribal system" that has been upheld for so long in the Kikuyu tribes from the rural Kenyan areas. Amnesty International claims that the people of Sierra Leone feel socially and politically cohesive when their cultures carry on FGM rituals for all their women in the Bundo and Sande societies. In other cases, FGM is believed to reduce the woman's desire for sex, thus reducing her tendency to become promiscuous. This is a way for men to subjugate and reduce a woman's basic freedoms.

In certain cultures, men are convinced that a woman will definitely stray if she is not cut. As a result, many women in patriarchal societies will attempt to deaden a woman's sexual appetite. Additionally some people hold the preposterous belief that FGM is essential for a woman's hygiene, cleanliness and health. In some communities, a woman who has not been cut is considered unclean and is not allowed to share food or drink with her community.

Other superstitious societies believe that if a woman's clitoris comes in contact with a man's penis, the man will die. Others believe that an uncut woman's baby will die during childbirth. However, the most common reason for FGM is that it regulates woman's sexual desire and "hysteria." Contrary to all these beliefs, medical proof has revealed FGM to be debilitating and dangerous to a woman's health. During the procedure, intense pain, shock and haemorrhage can occur. FGMs are usually carried out without sterile medical instruments.

Some girls or women can expect to be cut by a glass shard or a dull knife. Using the same piece of cutting apparatus on multiple women increases the risk of HIV/AIDS. Lack of proper sterilization procedures and unprofessional work carried out by tribal members will create such situations for women. Besides extreme pain and discomfort, chronic side effects include reoccurring vaginal infections, spontaneous bleeding, abscesses, keloids and small benign tumors can occur after a clitoridectomy. Infibulations come with many serious side effects. Women suffer from long term chronic urinary tract infections, which can damage the bladder, urethra and kidneys. Furthermore, menstrual flow is blocked, which infects the reproductive system. Pelvic infections, endometriosis, infertility, scar tissue buildups, keloids and cysts can arise. Sexual intercourse is also painful. Women have to be "reopened" in many cases. This involves a gradual and painful reopening of her vaginal area, and many will experience another knife or cutting device to reopen the vagina.

Again, the lack of medical skill in many rural tribes and communities can create health risks during the reopening process. Penetration is extremely painful, and the fluids that flow from the unhealed wounds also increase the risk of spreading HIV during sex.

Childbirth is likewise excruciating. Build-ups of scar tissue can tear, and additionally, the mother has to be cut even more so that the baby can pass through the birth canal. If there is no attendant at hand to make these incisions, the perineum can tear, or there can be problems with obstructed labour. Sadly enough, many women are often closed up again to make their vaginal walls tight for their husband's sexual pleasure.

Repeated cutting and restitching of the genital area builds up rough scar tissue in the genital area, exacerbating the pain, and making intercourse and childbirth excruciating for a woman. Many international health organizations are working together to ban these practices. They are attempting to modify and compromise cultures which uphold FGM as an important and valued ritual. They even encourage a symbolic ceremony, such as holding a knife next to the genitals, pricking the clitoris, cutting pubic hair, or light and minimal scarification of the genital/ upper thigh area. However, while much progress has been made in recent years, much help is still needed in educating people about the effects of FGM.

This extract (which was taken from different reports of the WHO and AI) has attempted to document the health problems associated with FGC. It has not addressed the cultural ramifications of this and other practices. We ask you to think about the challenges posed to women's health through cultural practices.
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- **Sex workers in Uganda**

Let us now look at the issue of women as sex workers.

In 1949, the United Nations adopted a resolution in favour of the decriminalization of prostitution for individual prostitutes, which has been ratified by fifty countries (not by the United States). Many European countries including France and the

United Kingdom decriminalize prostitution per se, leaving all related activities criminal such as soliciting, advertising, etc. In 1973 the National Organization for Women passed a resolution supporting the decriminalisation of prostitution.

Whether you are in favour of the decriminalization of prostitution or not, it remains a problem in East Africa just as it is all over the world. The fact that in **Uganda** most of the prostitutes are women, means that they are more at risk from the violent behaviour of their clients. Women who sell sex in Uganda today are also putting themselves at risk of contracting HIV and other sexually-transmitted diseases. The fact that in many rural areas of the country today, a man can buy sex from a 12 year old girl for between 500 - 800 shillings is a shocking fact. Young girls who sell sex are almost certainly unable to negotiate safe sex and are, therefore, cutting off their chances of education since, unfortunately, few schools are willing to allow pregnant girls to attend class. This in itself is discrimination. And the police who regularly arrest the prostitutes in Kampala and herd them down to the Central Police Station for a night in the cells, themselves often take advantage of the girls' profession. Given the fact that many women and girls who sell sex are among the extreme poor, other options for gainful employment often are limited.

A study conducted in a town along the Kampala-Masaka highway in 2002 revealed that the women who sell sex (for various reasons) mostly sell sex to local men. In a culture where the senga prepares a girl for a monogamous marriage it is interesting to see how morality and norms refer to women only. As we have already seen, men are generally not expected to be virgins on their wedding night. Many of the women involved in the study had themselves dropped out of school early, had few other skills, and were under tremendous pressure to feed, clothe, and educate their children. Commercial sex seemed to be their only option. The study also pointed out that few of the local men consent to use condoms. Thus, the women were caught between wanting to make some money and leaving themselves open to sexually-transmitted diseases. And yet, few of the women in the study were ready to give up their line of work because they had more or less regular incomes. All this makes it extremely difficult to root out prostitution, and because so few men practise safe sex, we are likely to see the further spread of HIV infections among the girls who are increasingly being drawn into this trade because they are seen as clean and healthy. How long they remain so is questionable.

- **Women and the Strategic Development Goals**

Let us repeat some hard facts of the world today:

- More than 1,2 billion people around the world still live with less than one dollar per day and women are the worst hit by poverty.
- In the developing world, the risk of a woman dying during childbirth is one in 48.
- 113 million children (the majority female) do not attend school.
- Deadly diseases have destroyed a generation of development achievements.
- Two thirds of illiterate people around the world are women.
- Women and children make up 80 per cent of refugees.
- More than 1.2 billion people still have no access to drinking water.

- 11 million children die at birth each year.
- Too many developing countries spend more in debt servicing than in social services.

The eight Strategic Development Goals (SDGs), established in the Strategic Declaration, were approved by 191 Heads of State and Presidents at the General Assembly of the United Nations in the year 2000. They pledged to adopt new measures and join efforts in the fight against poverty, illiteracy, hunger, lack of education, gender inequality, infant and maternal mortality, disease and environmental degradation.

According to Ana Elena Obando of WHRnet (Women's Human Rights Net), numerous women's rights advocates, such as Joanna Kerr, wonder whether women's organizations should be drawn completely into the SDGs given their need to focus backlash against reproductive rights, the prevalence of violence against women, the increase in militarism and fundamentalisms, as well as the poverty generated by neoliberal economic strategies. The SDGs, Kerr says, might be a good political tool for the World Bank or the UN agencies to promote gender equality through public policy, but not necessarily the most effective for women's groups seeking social transformation through many other means.

Under similar scrutiny, the SDGs have been subject to a series of critiques by the international women's movement, namely: The World Bank, the World Trade Organization and the national and international private sector are driving a free-market economy under neo-liberal policies which threaten the very essence of the Strategic Development Goals. There is no recognition in the Declaration or in the Goals of the global neo-liberal context and its potential affects on the implementation of the SDGs.

- **The SDG's: a commentary**

Privatisation, other reforms and deregulation through Free Trade Agreements are undermining the role of the States, leaving their citizens with a shrinking institutional space in which to demand accountability concerning the advancement of the SDGs. *Peggy Antrobus*, an academic from the Caribbean, wonders how governments are going to finance health and basic education when they are being pressured to reduce public spending sources.

Activists such as *Aruna Rao* from India point out that the SDGs are a technical overview of a series of very complex topics under a paternalistic approach which does not strengthen women's capacity to hold public and private governance and services accountable.

Another common critique is that the SDGs reduce the resolutions, platforms, programs and declarations of the United Nations Conferences of the eighties to eight objectives which exclude concepts, indicators and issues -such as gender-based violence and political participation- that are key to the advancement of women's human rights.

The indicators and goals of the SDGs are not adequate and, moreover, the indicators are quantifiable, which precludes measuring women's equality or empowerment, for instance.

Goal 3, which specifically calls for the promotion of gender equality and women's empowerment, does not recognize that gender equality is not just an objective by itself but also key to achieving the other seven Development Goals. Additionally, this objective should be measured at least with four indicators such as the percentage of women in parliament, levels of education and literacy as well as wage gaps. However, the UNDP report guide reduces it to just one indicator focused on education.

The SDGs exclude sexual and reproductive rights, as Peggy Antrobus argues. This exclusion is an indicator of the politization of the process and the participation of international religious and economic fundamentalist groups and movements with an agenda that supposedly seeks to advance the rights of all human beings.

The SDGs do not include issues such as war and peace, although it is widely known that the problems women face during and after an armed conflict are one of the major challenges to advance development.

The SDGs do not take into account women's diversity: women with disabilities, indigenous women, and others who generally belong to the poorest groups and have less access to health, education, and other services.

Finally, the SDGs do not integrate the principle that human rights are indivisible, integral, and interrelated. Economic empowerment without reproductive rights or education without the elimination of sexual harassment and violence against women does not allow for the full exercise of human rights or women's full citizenship. It is not possible, for example, to think about promoting education for women if at the same time they cannot access water because this service has been privatized. It's impossible to analyze poverty without taking into account women's political participation and violence against women.

The international women's movement has also identified a number of challenges such as

- Strengthening the women's movement in order to propose strategies, mechanisms and plans to hold governments accountable locally and corporations accountable at the international level.
- Continuing to pressure them to implement the commitments made at the Conferences in the nineties, commitments which have not been included in the SDGs and are central to achieve gender equality and the other development objectives.
- Lobbying for Goal 3- "to promote gender equality and empower women" to include women as agents of change, decision-makers and policy beneficiaries.
- Urgently incorporating into the MGGs the relationship between the unequal distribution of wealth and poverty. We know that poverty is fabricated in order to make it seem like an independent variable, isolated from structural,

economic and social causes, and that poverty indicators are selective and have been oversimplified.

- Integrating gender-specific actions into policies aimed at fulfilling the SDGs through the identification of operational and analytical examples of how a gender perspective can be mainstreamed into the policies; or the identification of tools that promote accountability in the implementation strategies; or awareness of the multidimensionality of Goal 3 in order to measure it through the reduction of poverty, economic security, the environment, and not only through education.
- Showing that the selection of the SDGs already exists in other Conferences, including Beijing, and that the efforts to achieve the Goals should take into account the rights, concepts, goals and objectives of those Conferences if they are to achieve gender equality.
- Ensuring that each of the SDGs can be disaggregated by gender and contains quantitative as well as qualitative gender-sensitive indicators in order to monitor their progress. Statistics are a political tool and a prerequisite for planning and monitoring national programs and policies.
- Training of those responsible for national planning on gender and development and providing them with tools for the development of gender budgets and the equitable distribution of public resources. At the same time, an accountability mechanism must be created to ensure that these people will effectively incorporate gender dimensions into national actions.

Perhaps the most important challenge is pointing out that without political will and global financial support, none of the other aspects will be possible and the SDGs will be mere words on paper.

There has been an on-line discussion which discusses among other things some of the opportunities that the SDGs provide to the women's movement.

According to some, the Strategic Declaration contains a strong language on human rights, equality and democracy, as well as a commitment to implement CEDAW; it also surges from global consensus and a common index of progress. It is an opportunity for high-level global politics under a development framework with goals and time-bound commitments.

Given that governments already have international legal obligations under human rights treaties concerning gender equality and UN monitoring and supervision mechanisms, these can be used in accordance with the SDGs. Examples of this are the official reports and shadow reports which are submitted to CEDAW and the recommendations from the Committee to be cross-used with the SDGs.

More than 40 countries have submitted reports related to the SDGs. The women's movement has the opportunity to include specific goals and indicators in each country, which are not already present in the reports and which are considered key for the advancement of gender equality.

The plans of action and platforms that stemmed from the Conferences of the nineties provide a framework to in which to advance the SDGs.

The SDGs present a strategic opportunity to open a dialogue between governments, donors and with civil society which could allow for further analysis of the barriers of women's unequal status in society which serves to hinder the achievement of the Development Goals.

The unequal human development in the world is easily visible in the advances of certain areas of the world and the stagnation or retrogression in others. Equality among nations, as well as between women and men, requires a global and local pact of the different powers in every sphere of human activity.

Even in those cases where issues related to human rights, sustainable development and social development prevail, advocacy for women's rights must go beyond the United Nations. The increasing number of international financial institutions (World Trade Organization, IMF and the World Bank) and the agenda which they forward determines global policy, and the goals and objectives of any development policy including the SDGs will not be achieved if neo-liberal policies continue increasing the gender gaps. Given the publicity with which the SDGs were promoted when they were formulated, it is now a more sober human population who is faced with their limited success only.

Having painted a rather general picture of the state of some of the world's women, let us now look at the initiatives that have been made to eliminate discrimination and ensure that women's rights are safeguarded.

Beijing ++

Given the state of affairs we have outlined above, it is not surprising to find that institutional and non-institutional bodies and organs are working to achieve a more equal world. In June 2000, there was a conference at the United Nations, New York, continuing on 5 years from a similar conference in Beijing, 1995. (The formal name of the conference was "Women: 2000: Gender Equality, Development and Peace for the Twenty-First Century.")

Years before, in 1985, there was a conference in Nairobi, Kenya, to formulate strategies for advancing women's rights. This was followed by a "Plan of Action" defined in 1995, in Beijing. It has been recognized and agreed for a while that successful development also involves gender equality. The goals of this conference then was to reflect on the promised provisions of equality, development and peace for all women everywhere. Leading up to, and during the conference, many organizations had numerous issues to bring to the fore, including:

- Women's reproductive rights
- Abduction of girls
- Child soldiers and armed conflict
- Poverty and Economy
- Education and Training
- Health
- Violence

- Decision Making
- Institutional Mechanisms
- Human Rights
- Media
- Environment
- The Girl-child

According to a UN report, the international community had fallen far short of its commitments to empower women and achieve gender equality, and that only eight out of 188 member states had certain global agreements for this. It was also pointed out at this UN session that women continued to be deprived of basic and fundamental rights because of measures imposed in certain countries. In fact, some were even opposed to moving forward on such important issues, such as the Vatican, Nicaragua, Sudan, and Libya and sometimes Iraq and various other nations on particular issues such as reproductive rights, even freedom of expression (Libya and the Vatican opposed this). The Vatican, Iran and some other delegations even wanted to delete references to sexual and reproductive rights and health in the Current Challenges section of the review document.

The Fourth World Conference on Women, held in Beijing in September 1995, culminated with the adoption of the Beijing Declaration and Platform for Action (BPFA) which we have already mentioned and will discuss further in unit 5. This Declaration describes and seeks to improve the situation of women around the world. It outlines and analyses twelve principal areas of concern:

- women and poverty;
- education and training;
- women and health;
- violence against women;
- women and armed conflict;
- women and the economy;
- women in power and decision-making;
- institutional mechanisms for the advancement of women;
- human rights of women;
- women and the media;
- women and the environment;
- and the girl-child.It outlines a series of measures, which governments, civil societies, and international organizations including bi-laterals and multi-laterals should adopt and practice in order to eliminate causes of discrimination against women in all societies, and to progress toward equality.

The most recent high-profile meeting was the 49th session of the Commission on the Status of Women (CSW) held in New York in February and March 2005. At the New York meeting, governments reaffirmed their commitment to the Beijing Declaration and Platform for Action. In addition to official country delegations, the CSW brought together NGOs and women's rights activists from around the world, all showing a strong display of solidarity. Uganda was, of course, represented at that meeting. Ten

resolutions were adopted in New York, resolutions that reflect concern about various special areas today:

1. HIV/AIDS,
2. women in Afghanistan,
3. women in Palestine,
4. indigenous women,
5. women and natural disasters,
6. United Nations International Research and Training Institute for the Advancement of Women (INSTRAW),
7. economic advancement of women,
8. trafficking,
9. and a proposal to consider in 2006 the appointment of a Special Rapporteur on laws that discriminate against women.

According to an official report from a women's rights organization: "There was concern lest the focus on SDGs dilute the resources and energies going into the implementation of the BPFA. The 49th session of the CSW emphasized that the full and effective implementation of the BPFA is essential to achieving international development goals, including those contained in the Strategic Declaration."

While we have only taken a brief glance at the institutional and international efforts to eliminate all forms of discrimination against women, we should immediately see that gender realities are much more complex than some of the conferences care to admit. If we labour under the misapprehension that women's empowerment means women in gainful employment, then we have a lot of work to do because economic gains do not always go hand-in-hand with social and non-economic health gains.

At the end of this part of the topic, you should be well aware of the dangers of inequality for the health status not only of the women but also of the nations to which they belong. The complex realities that affect women's health are then issues of public health**.**

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AFRICA POPULATION INSTITUTE COURSE WORKS

IMMUNOLOGY AND PHARMACOLOGY

PAPER CODES: **APDPH 201**

1. a) Immunology in biomedical terms covers the study of all aspects of the immune systems in all organisms, to what extent is immunology physiological?

b) With examples discuss the different types of immunology you know?

2. a) As a student of public health why do study immunology?

b) Discuss the different type of immunology you know?

3. a) Discuss the various measures taken to boost immune system of the special groups. Hint: Pregnant mothers, Babies, HIV positive persons and the eldery people.
b) Mention and write the differences between Natural acquired immunity and artificial acquired immunity?

PRINCIPLES OF EPIDEMIOLOGY

PAPER CODES: **APDPH 202**

1. a) Epidemiology is the study of scientific discipline with sound scientific methods in inquiring its foundation. To what extend is epidemiology quantitative?

b) Name and define different scientific key terms that should not be neglected when defining epidemiology.

2. a) As a student of public health how has the study of epidemiology affected and changed your character and the community you live in.

b) Discuss the factors that have leads to reduced life expectancy in your country?

3. a) What are some of the key factors that has resulted to high mortality rate in your country.

b) What should be the possible measure to reduce high mortality rate in developing countries.

c) To what extent is low population growth as a result of high mortality rate?

HEALTH CARE/SERVICE ADMINISTRATION

PAPER CODES: **APDPH 203**

1. a) Discuss the health care philosophy

b) What are some of the factors that influence different health care groups and individuals in your country

c) Why is it recommended to have professional ethics in our society as health care personnel?

2. a) Mention some of the do's and don'ts' in health care fraternity

b) What is the difference between primary health care and community health care?

c) What is the purpose of primary healthcare?

3. a) Discuss the advantages and disadvantages of life assurance.
   b) Mention some principle of a good first aider
   c) Discuss different types of first Aid you know

REPRODUCTIVE HEALTH ISSUES

PAPER CODES: **APDPH 204**

1. a) Discuss some of the problems and challenges affecting women in developing countries
   b) What should be the possible solution to the above problems and challenges?

2. a) Discuss the causes and solution of high maternal mortality in your country
b) The causes of high maternal mortality rate in developing country has been as a result of cultural factors. Discuss.
3. a) Name and discuss some of the factors that bring about behavioural change the communities you live in?
   b) What are the possible causes of sexually transmitted diseases and what could be the possible solution to the problem above?

GENDER IN PUBLIC HEALTH

PAPER CODES: **APDPH 205**

1. a) Discuss the importance of counselling
   b) What are major causes of gender inequality?

2. a) What should be done to improve the status of women in developing countries?
   b) What are causes of domestic violence among women and children?

3. a) In developing countries cultural practices between men and women are not very strong as before with examples, discuss.
   b) Why should there be gender equality between men and women?