Community Medicine

This is a review file containing only the important points regarding the community medicine, it is for revision and should not be used alone.
Good luck….

احب اتقدم بالشكر الجزيل لكل من شارك في هذا العمل

amal alqarni
duaa abdulfattah
aroob althuthail
ruba barnawi
maha alghamdi
haneen alsubki
jawaher alkhayyal
wejdan alzaid
lama alfawzan

faisal alabbad
mohammed khoja
motasem alhassni
basel alanazi
meshal aleiaidi
moayed ahmed
abdulmohsen alghannam
moataz altokhais
mohammed alyousef

Team leaders: Mohammed Ghandour & Ghadah almuhana

436 TEAMS

Introduction to community medicine

Community medicine

- A branch of medicine that is concerned with the health of the members of a community, municipality or region.
- It's often considered synonymous with preventive and social medicine, public health, and community health.
- All these shares common ground, i.e. prevention of disease and promotion of health

Preventive medicine

- Focus on the health of individuals, communities and defined population
- It's goal is to protect, promote, and maintain health, well-being and to prevent disease, disability, and health

Public health

Public health and general preventive medicine focus on promoting health preventing disease and managing the health of communities and defined populations. These practitioners combine population based -public health skills with knowledge of primary, secondary and tertiary prevention. Public health is a combination of scientific discipline (e.g. Epidemiology biostatistics, demography) And skills and strategies (e.g. epidemiological investigation, planning and management)

Three core of public health functions

1. Assessment:
   Assessment & monitoring of the health of communities and populations
2. Policy development:
   Development of policies to solve local and national health problems
3. Assurance:
   To assure access to appropriate and cost-effective care

The 10 essential public health services

1. Monitor health status to identify community health problems
2. Diagnose and investigate health problems and health hazards in the community
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships to identify and solve health problems
5. Develop policies and plans that support individual and community health efforts
6. Enforce laws and regulations that protect health and ensure safety
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable
8. Assure a competent public health and personal health care workforce
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services
10. Research for new insights and innovative solutions to health problems

Sub-specialties of public health

- Epidemiology
- Biostatistics
- Demography
- Communicable disease

Who is responsible for conducting Community health services?

1. Ministry of Health
2. Public health institutes/school/university/hospitals
3. Other governmental agencies
4. Community participation

Terminology in public health

Defining Health:

"a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity " WHO

Multi-factorial:

It is believed that diseases occur due to the interaction of biological, social, environmental, psychological, genetic and economic factors, thus the cause of diseases is multi-factorial

Defining disease:

•Simplest definition: "Any deviation from normal functioning or state of complete physical and mental well-being"

•Disease is better explained on a spectrum: i.e. carrier state, subclinical, clinical, severe...etc.

Distinguishing disease from illness and sickness:

-Illness:

"the individual's perception and behavior in response to the presence of disease, and the disease's impact on the psychological environment"

-Sickness:

"A state of social dysfunction; the role that one assumes when he/she is ill"

Risk Factor:

A risk factor is an attribute or determinant that is significantly associated with the development of a disease. We are interested in risk factors because if we can change theme the occurrence of the disease will decrease.

Risk Group:

A group of the population that have certain characteristics that make them at greater risk for developing a certain disease compared to the rest of the population.

Targeting these groups in the prevention and control of diseases is known as "The risk approach"

Epidemiology:

The study of the Distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health, this encompasses studying disease frequency, its distribution and determinants

Disease frequency:

The frequency of disease, disability or mortality are often expressed in the form of measurements

These could be:

•Number of health events

•Proportions (e.g. prevalence)

•Rates (e.g. incidence, mortality rate, birth rate)

•Ratio (e.g. maternal mortality ratio)

Comparing these measurements between populations can give clues about disease etiology

What is meant by Distribution?

-Diseases occur in patterns in communities.

-It is important to study the distribution patterns in different subgroups in the population to get clues about causative (or risk) factors.

Distribution of the patterns is studied by person, place and time.

Determinants of Health:

These are a range of personal, social, economic and environmental factors that determine the health status of individuals or populations.

Personal or proximal determinants of health include: Age, sex, genetic factors and life style factors.

Basic terminology related to studying communicable diseases:

- **Infection:**
  The entry and development or multiplication of an infectious agent in the body of man or animals.
  Infections do not always cause illness.
  Levels of infection:
  1-Colonization 2-Subclinical (unapparent) 3-Latent infection 4-Clinical (manifest)
- **Reservoir:**
  The reservoir (host) of an infective agent is the habitat in which an infectious agent normally lives, grows, and multiplies in.
- **Incubation period:**
  The time interval from exposure to an infectious agent to the onset of symptoms of an infectious disease.

Difference between the terms "Communicable Disease" and "Infectious Disease":

- **Communicable disease:**
  A disease due to a specific infectious agent or its toxic products capable of being directly or indirectly transmitted from man to man, animal to animal, or from the environment (through air, dust, soil, water, food, etc.) to man or animal.
- **Infectious disease:**
  A clinically manifest disease of man or animals resulting from an infection.

Contagious disease:

A disease that is transmitted through contact.

Communicable period:

The time during which an infectious agent may be transmitted directly or indirectly from an infected person to another person or animal.

Contamination:

The presence of an infectious agent on a body surface; also, on or in clothes, beddings, toys, surgical instruments or dressings, or other inanimate articles or substances including water, milk and food.

Infestation:

The lodgment, development and reproduction of arthropods on the surface of the body or in the clothing.

Endemic, Epidemic, Pandemic, Outbreak:

• Endemic:

The constant presence of usual prevalence of a disease in a given geographic area or population group.

• Epidemic:

The sudden increase in the number of cases for a certain disease above what is normally expected in that population.

• Pandemic:

When an epidemic spread over several countries usually affecting a large number of people or around the world.

• Outbreak:

It is an epidemic that occurs in a limited geographic area (e.g. an institution, a home facility, a neighborhood, a village...). i.e. a localized epidemic

Sporadic

The cases occur irregularly, haphazardly from time to time, and generally infrequently cases are so few and separated widely in space and time that they show little or no connection with each other, nor a recognizable common source of infection.

Zoonotic disease (zoonosis):

An infection or infectious disease transmissible under natural conditions from vertebrate animals to man, such as (brucellosis and rabies)

Nosocomial infection:

An infection originating in a patient while in a hospital or other health care facility.

Difference between sterilization and disinfection:

Disinfection:

Thermal or chemical destruction of pathogen and other types of microorganisms

Sterilization:

A validated process used to render a product free of all forms of viable microorganisms including bacterial spores.

Carrier:

A person or animal that harbors the infectious agent for a disease and can transmit it to others but does not demonstrate signs of the disease.

Virulence:

The ability of an infectious agent to cause severe disease, measured as the proportion of persons with the disease who become severely ill or die.

Point source epidemic:

Where exposure to disease agent is brief and essentially simultaneous.

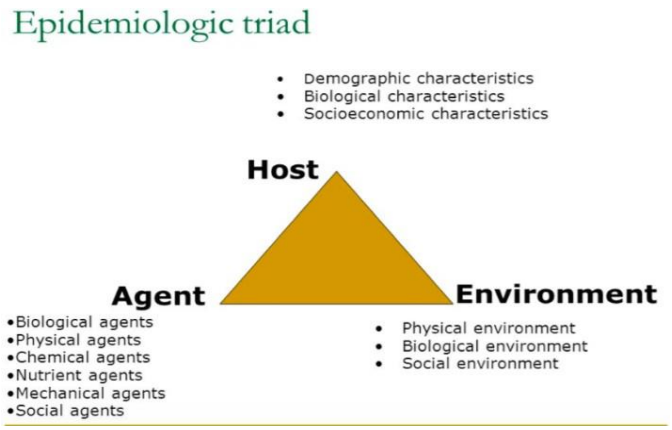
	Morbidity	Mortality
Definition	Morbidity refers to the state of being diseased or unhealthy within a population.	Mortality is the term used for the number of people who died within a population.
Demographic reference	Morbidity refers to an incidence of ill health in a population.	Mortality refers to the incidence of death or the number of deaths in a population.
Types of data	Data is collected according to the disease type, gender age, area.	The mortality rate can be distinguished into crude death rate; perinatal mortality rate; the maternal mortality rate; infant mortality rate; child mortality rate; standardized mortality rate; and age-specific mortality rate.
indicators	• Incidence & Prevalence • Notification Rates • Attendance Rates at hospitals, etc • Admission, readmission and discharge rates • Duration of hospital stay • Spells of sickness	• Crude Death Rate • Expectation of Life • Infant Mortality Rate • Child Mortality Rate • Under-5 proportionate mortality rate • Maternal Mortality Rate • Proportional Mortality Rate • Disease-specific Mortality Rate

Natural history of disease

Theories of Disease Causation

Germ theory:

It states that every human disease is caused by a microbe or germ, which is specific for that disease and one must be able to isolate the microbe from the diseased human being. Once you remove the microbe from this person, he will be cured.



In addition to HOST, AGENT and ENVIRONMENT, one more factor TIME factor is added.

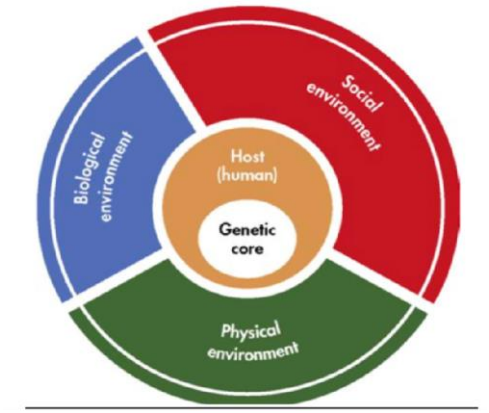
TIME accounts for incubation periods, life expectancy of the host or pathogen, duration of the course of illness.

The Theory of "Web of Causation"

- The various factors (e.g. hypercholesterolemia, smoking, hypertension) are like an interacting web of a spider.
- **Each factor** has its own relative importance in **causing** the final departure from the state of health, as well as **interacts** with others, **modifying** the effect of each other.
- Ideally suited in the study of **chronic disease**, where the agent is often not known and disease is the outcome of interaction of multiple factors.
- This model of disease causation considers all predisposing factors of any type and their complex interrelationship with each other.

Wheel theory

- As medical knowledge advanced, an additional aspect of interest that came into play is the comparative role of "genetic" and the "environmental" (i.e. extrinsic factors outside the host) factors in causation of disease.
- The "triad" as well as the "web" theory does not adequately cover up this differential.
  To explain such relative contribution of genetic and environmental factors, the "wheel" theory has been postulated.
- The core of the epidemiological wheel is Genetic.



According to the type of the disease the wheel cycle will change the size depending on the largest contribution of such component in developing a disease.

Natural History of Disease

Definition

- Natural history of disease refers to the **progress** of a **disease process** in an individual **over time**, in the absence of intervention. We do the prevention according to the history of the disease.
- The process begins with *exposure to* or accumulation of factors capable of causing disease without medical intervention, the process ends with:

1. Recovery
2. Disability.
3. Death.

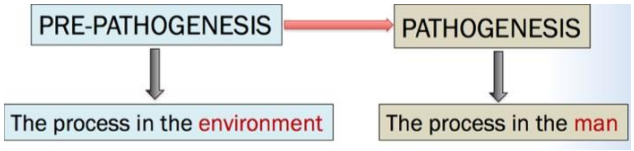
Why it is important?

- It is one of the major elements of descriptive epidemiology.
- Understanding the progress of disease process and its pathogenetic chain of events is must for the application of preventive measures.

Which Design is the Best?

- The natural history of disease is best established by cohort studies.
- As these studies are costly, understanding of the natural history of disease is largely based on other epidemiological studies, such as cross-sectional and retrospective studies, undertaken in different population settings.
- What the **physician** sees in the hospital is just an "episode" in the natural history of disease. The **epidemiologist**, by studying the natural history of disease in the community setting is in a unique position to *fill the gaps in the knowledge* about the natural history of disease

Schematic Diagram of The Natural history of disease in a patient



Pre-pathogenesis

- This refers to the period preliminary to the onset of disease in man.
- The disease agent has not yet entered man, but the factors which favor its interaction with the human host are already existing in the environment.
- This situation is frequently referred to as “man exposed to the risk of disease”.

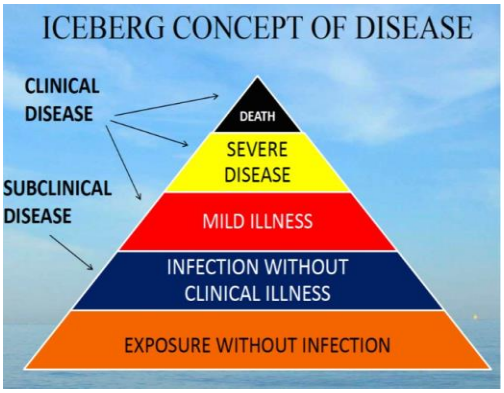
pathogenesis

- This phase begins with entry of the disease “agent” in the susceptible human host.
- After the entry, agent multiplies and induces tissue and physiological changes, the disease progresses through the period of **incubation** and later through the period of **early** and **late** pathogenesis.
- The outcome of the disease may be recovery, disability or death.
- In chronic diseases, the early pathogenesis phase is less dramatic and is also called as pre-symptomatic phase.
- During pre-symptomatic stage, there is no manifest disease. The pathological changes are essentially below the level of the “clinical horizon”.
- The **clinical stage** begins when recognizable signs or symptoms appear.
- By the time signs and symptoms appear, the disease phase is already well advance into the late pathogenesis.

Spectrum of disease and Iceberg Phenomenon

Spectrum of disease:

- It is a graphic representation of variations in the manifestations of disease.
- At the one end of disease spectrum are sub-clinical infections which are not ordinarily identified, and at the other end are fatal illnesses.
- In the middle of spectrum lie illnesses ranging in severity from mild to severe.
- These different manifestations are the result of individuals' different states of immunity and receptivity.



Spectrum of disease presents challenges to the clinician and to the public health worker. WHY? Because of the clinical spectrum, 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 remain asymptomatic. For the public health worker, the challenge is that persons with undiagnosed infections may be able to transmit them to others.

Prevention of the disease

- Prevention is the process of intercepting or opposing the "cause" of a disease and thereby the disease process.
- Why is it important? 1-Individual benefit: increases the survival rates and productivity of the person. 2-Economical benefit: preventing the disease is less costly than treating the complications of (referring the patient to more than one clinic).

Successful prevention depends on

1. Knowledge of causation
2. Dynamics of transmission
3. Identification of risk factors and risk groups
4. Availability of prophylactic or early detection and treatment measures
5. Organization to apply these measures
6. Continuous evaluation

Levels of Prevention

- Primordial prevention
- Primary prevention
- Secondary prevention
- Tertiary prevention

primordial prevention

- It is the prevention of the emergence or development of risk factors in population groups in which they HAVE NOT yet appeared.
    - *For example*, many adult health problems (e.g., obesity and hypertension) have their early origin in childhood, so efforts are directed towards encouraging children to adopt healthy lifestyles (e.g., physical exercise, healthy dietary habits etc.) so the prevalence of HTN and obesity will reduce when they get older.

- The main intervention in primordial prevention is through individual and mass education.

Primary Prevention

- It can be defined as "action taken prior to the onset of disease, which removes the possibility that a disease will ever occur".
- It signifies intervention in the pre-pathogenesis phase of a disease.

Two types of strategies	
Population (mass) strategy	High risk strategy
• directed at whole population irrespective of the individual risk levels. • directed towards socio-economic, behavioral and lifestyle changes	• Includes identification of "High risk groups" in the population and bring preventive care to these risk group. • e.g., People having the family history of Hypertension, allergic disease, Diabetes.

Secondary prevention

- Defined as **"action which stop the progress of a disease at its initial stage and prevents complications".**
- It is applied in the early pathogenesis stage of disease.
- It **reduces** the prevalence of the disease by shortening its duration.
- It may also **protect others in the community** from acquiring the infection and thus provide, a once, secondary prevention for the infected individuals and primary prevention for their potential contacts.
- The specific interventions used is:
  1-Early diagnosis and treatment.
  2-Early detection of health impairment is defined as " the ***detection of disturbances of homoeostatic and compensatory mechanism while biochemical, morphological and functional changes are still reversible*****.**
  E.g., screening for disease for breast cancer (using mammography) and cervical cancer (using pap smear).

Tertiary prevention has two types of approaches	
Disability Limitation	Rehabilitation
These include all measures to prevent the occurrence of further complications, impairments, disabilities and handicaps or even death.	It is defined as the combined and coordinated use of medical, social, educational and occupational measures for training and retraining the individual to the highest possible level of functional ability.
• Complete rest, morphine, oxygen and streptokinase is given to a patient of Acute MI, to prevent death or complications like arrhythmias / CHF. • Application of plaster cast to a patient who has suffered Colle's fracture, is done to prevent complications and further disability like mal-union or non-union	• Establishing schools for blinds • Provision of aids for the handicapped • Reconstructive surgery in leprosy • Muscle re-education and graded exercises in neurological disorders Vocational Rehabilitation: restoration of the capability to earn a livelihood

As a summary:

Level of prevention	Phase of disease	Target
Primordial	Underlying condition leading to causation	Total population and selected groups
primary	Specific causal factors	Total population, selected groups and healthy individuals
Secondary	Early stage of disease	Patient
Tertiary	late stage of disease	Patient

Determinant of health

Health-disease spectrum: As long as we are alive, there is some degree of health.

- Positive health
- Better health
- Freedom from sickness
- Unrecognized sickness
- Mild sickness
- Severe sickness
- Death

Health is relative to:

1- Where on the spectrum of health this patient is?
2- Health dimensions.
3- Local conditions and health standard.

Ex: A newborn baby in India weighs 2.8 kg on an average compared to 3.5 kg in the developed countries, and yet compares favorably in health.

Health dimension:

- physical
- mental
- social
- emotional
- spiritual
- vocational

Term	Health	Disease	Illness	Ecology of health
Definition	"A state of complete physical, mental and social well-being and not merely an absence of disease or infirmity "+ " socially and economically productive life "	"A condition in which body health is impaired."	"A phenomenon in which one or more natural functions of the body are so disturbed that the affected individual cannot meet the natural requirements of everyday life"	Human ecosystem includes –Natural environment –Man-made environment (physical, chemical, biological, psychological) and they must be in equilibrium. importance: planning of prevention of disease, and control of disease

Some environmental factors may affect the health such as:

1-Urbanization هجرة الناس الى المدن
2-Industrialization التطور الصناعي
3-Deforestation قطع الأشجار من الغابات
4-Dams and Canals … Ex (Malaria, Schistosomiasis and Bhopal gas tragedy)

Wellbeing components:

Standards of living مستوى المعيشة: DEALING WITH NUMBERS .

- The scale of our expenditure, the goods we consume, and the services we enjoy.
- comparison can be made using the per capita GNP (gross national product)

Objective (Standards of living / level of living)	Income + human right	Occupation + food consumption	Housing + clothing	Sanitation + social security	Health + Recreation	Nutrition And education
Subjective (Opinion) / quality of life	health	Happiness	education	Freedom of action	Justice + social and intellectual attainments	Freedom of expression

Measures of quality of life: know the indicators for each measure.

	Physical quality of life index (PQLI)	Human development index
Indicators used in calculating the index	• Infant mortality • Life expectancy at 1 year • Literacy	• Life expectancy at birth (longevity) • Mean years of schooling (knowledge) • Expected years of schooling (knowledge) • GNI, gross national income, per capita (income/ decent standard of living)
scale	From 0 to 100 , where 0 is the worst.	From 0 to 1 . • Values from 0 to + 1 – HDI India is 0.554 (Rank 136 out of 186 countries) [2012] - HDI for KSA 0.847 Rank 38 (2018) •Human poverty index [HPI] is complementary to HDI
It measures	The result of social, economic, and political policies.	It measures\reflects achievements in the most basic human capabilities

Human poverty index:

It measures 3 dimensions:

- Long and healthy life
- Knowledge
- Decent standard of living

Calculation of each dimension index:

$$= \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}$$

Cultural competence:

Culture is the blended patterns of human behavior that include "language, thoughts, communications, actions, customs, beliefs, values, and institutions of racial, ethnic, religious, or social groups." *Cultural competence* is "a set of congruent behaviors, attitudes, and policies that come together in a system, agency, or among professionals that enables effective work in cross-cultural situations.

Determinants of health:

- Biological: genetic predisposition
- Behavioral and socio-cultural: cultural (eg: marrying cousins) and behavior patterns, lifelong habits developed from socialization (eg: smoking), lifestyle (eg: lack of physical activity, lack of sleep)
- Environment: internal, external (macro-environment: things you're exposed to after conception.)
- Socio-economic: this determinant encompasses
  - Economic status: per capita GNP الدولة دخل /Is it considered a high income or a low-income country?
  - Education
  - Occupation
  - Political system
- Health services: services for treatment of disease, prevention of illness and promotion of health. To be effective, the health services must:
  - reach the social periphery,
  - equitably distributed
  - accessible at a cost the country and community can afford
  - socially acceptable
- Aging
- Gender
- Other: information technology, health related systems like agriculture and food

Term	Health disparity	Health Equity	Health inequality	Health inequity	Health literacy
Definition	A type of difference in health that is closely linked with social or economic disadvantage. Especially people who experienced social or economic obstacles to health. These obstacles stem from characteristics historically linked to discrimination or exclusion such as race or ethnicity, religion, socioeconomic status, gender, mental health, sexual orientation, or geographic location. Other characteristics include cognitive, sensory, or physical disability.	When all people have "the opportunity to attain their full health potential' and no one is 'disadvantaged from achieving this potential because of their social position or other socially determined circumstance.	Differences, variations, and disparities in the health achievements of individuals and groups of people.	A difference or disparity in health outcomes that is systematic, avoidable, and unjust	Whether a person can obtain, process, and understand basic health information and services that are needed to make suitable health decisions. Health literacy includes the ability to understand instructions on prescription drug bottles, appointment cards, medical education brochures, doctor's directions, and consent forms. It also includes the ability to navigate complex health care systems. Health literacy is not simply the ability to read. It requires a complex group of reading, listening, analytical, and decision-making skills and the ability to apply these skills to health situations

Index of disparity:

A regression-based measure that is used by scientists and retains the inherent order of categories like education or income but incorporates the population weights of the categories. The size of each category is considered by placing the groups on an axis that reflects the cumulative proportion of the population represented by the ordered groups. The index of disparity can be absolute (slope referred to as Slope Index of Inequality) or relative (slope referred to as Relative Index of Inequality)

Poverty:

When a person or group of people lack human needs because they cannot afford them. Human needs include clean water, nutrition, health care, education, clothing, and shelter

Social determinants of health:

The complex, integrated, and overlapping social structures and economic systems that are responsible for most health inequities.

Socioeconomic gradient in health:

This term refers to the stepwise fashion health outcomes improve as socioeconomic position improves. This gradient can be measured by a person's income, occupation, or the highest level of education he or she has.

Socioeconomic status:

A composite measure that typically incorporates economic, social, and work status.

- Economic status is measured by => income.
- Social status is measured by => education
- work status is measured by => occupation.

The right to heath:

WHO Constitution introduction affirms that it is one of the fundamental rights of every human being to enjoy "the highest attainable standard of health".

The right to health is the economic, social and cultural right to a universal minimum standard of health to which all individuals are entitled.

Health for all:

Health for All is a programming goal of the World Health Organization (WHO), which envisions securing the health and wellbeing of people around the world that has been popularized since the 1970s. It is the basis for the World Health Organization's primary health care strategy to promote health, human dignity, and enhanced quality of life.

Health indicators

What is health indicators?					
Is an **indication** of a given situation.		Variables that help to measure change.		When change cannot be measured directly they help us to measure it	
Uses of Health Indicators					
Measure health status in a community.	Compare health status between countries or over time.	Assessment of healtl care needs.	Allocation of resources according to needs.	Monitoring and evaluation of health services.	
Characteristics of a good indicator:					
Valid – measures what it is supposed to measure. (accurate, measures what claims to be measured for example: to measure tall we use meter.)	**Reliable(مهم) –** provides same information under different observations, conditions (repeated)	**Sensitive –** sensitive to changes in the situation (measure changes, if there is something changed it will detect positive findings)	**Specific –** reflects changes only in that situation (it will remove negative findings of sensitive changes)	**Relevant:** relevant to the community needs & problems. (use of something which is in need)	**Feasible**: the ability to obtain data when needed (simple not complicated)
Types of Health Indicators (we will concentrate in two indicators: mortality and morbidity)					
Mortality indicators (crude mortality rate, cause-specific mortality rate, age specific mortality rate) (mortem death, death indicators)	**Morbidity indicator** (incidence, prevalence) (sick)	**Disability indicators** (DALY, QALY,)	**Nutritional status indicators** (anthropometric measurements,)	**Health care delivery indicators** (doctor-population ratio, population-bed ratio,)	**Utilization rates** (bed turnover ratio, vaccine coverage ratio,)
Social and mental health indicators (tobacco use, substance Abuse, responsible sexual behavior, mental health)	**Environmental indicators** (Environmental Quality)	**Socioeconomic indicators** (rate of population increase, dependency ratio, literacy rate.)	**Health policy indicators** (GNP spent on healthcare,)	**Indicators of quality of life**	**Other indicators** (health for all, MDG, SDG)

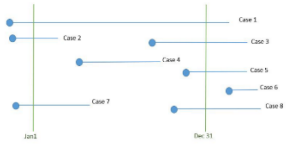
MORBIDITY INDICATORS					
1-Incidence rate	2- Prevalence	3- Attendance to out-patient clinics or health centers	4- Admission – re-admission – discharge rate	5- Length of hospital stay	6- Spells of sickness or absence from school or work
MORTALITY INDICATORS					
1- Crude death rate	2- Age specific mortality rate	3- Infant mortality rate	4- Perinatal mortality rate	5- Neonatal mortality rate	6-Post-neonatal mortality rate
7- Mortality rate of children below 5 years of age	8- Maternal mortality rate and ratio	9- Cause specific mortality rate	10- Proportionate mortality rate	11- Life expectancy	12-sillbirths
13- adult mortility rate					
DISABILITY INDICATORS					
1- Event-type indicators	2- Number of days of restricted activities	3- Number of days confined to bed	4- Number of days lost from work	5- Person-type indicators	6- Limitation of mobility
7- Confined to bed	8- Confined to house	9- Getting around with aids Limitatior of activities	10- Limitation of basic activities (toilet – bathing)	11- Limitation of major activities (house work or work)	
HEALTHCARE DELIVERY INDICATORS					

1- Doctors – population ratio	2- Nurses – population ratio	3- Bed – Population ratio	4- Center or sub-center – population ratio	5- Midwives – female in the fertile age group ratio)		
HEALTHCARE UTILIZATION INDICATORS						
1-Percentage of children attending for immunization	2- Percentage of children attending for routine check-up	3- Percentage of pregnant female attending for ante-natal care	4- Percentage of pregnant female attended by a trained birth attendant	5- Percentage of female attending family planning clinics	6- Bed occupancy rate	7- Bed turn over ratio
NUTRITION INDICATORS						
1- Specific nutritional	indicators 2- Percentage of the population who have low weight for age - height for age – weight for height	3- Percentage of infants born with a low birth weight	4- Percentage of the population who have low HB level	5- Percentage of children with clinical signs of malnutrition	6-Percentage of those whose protein and caloric intake below the required	
7- Percentage of those who have 2 meals or fewer per day	8-Increases in prices as a percentage increase in minimal wages	9-Percentage of expenditure on food from total income	10- Mortality indicators	11- MMR – IMR – children		
SOCIOECONOMIC INDICATORS						
1-Rate of population (GNP)	growth 2- Per-capita gross national production	3- Percentage of unemployed	4- Percentage of literacy	5- Average family size	6- Crowding index	
7- Dependency ratio)						
SOCIAL AND MENTAL INDICATORS						
1-suicide	2-homicide	3-delinquency	4- Alcohol and substance abuse	5- rape	6- child abuse	
7- wife abuse	8- neglected or abandoned youth					
ENVIRONMENTAL INDICATORS						
1-Percentage of the population with	2- safe water supply inside dwellings	3- sanitary refuse and sewage disposal	4- living nearby a source of pollution			

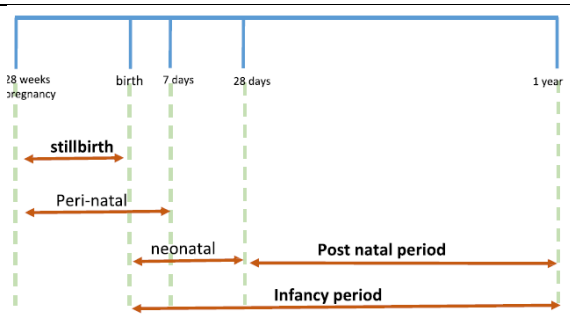
Morbidity rates

Incidence: • It measures the new cases.

• Incidence rate =	**(No. of new cases in the population during a specific period of time / Population at risk in the population during same period of time.) X 10^n** Incidence of cancer: population at risk we **remove the number of patient who have cancer already.**
	Example • In 1426 the number of colon cancer cases reported to the cancer registry in Riyadh region was 200. The midyear population of Riyadh region was four million. **Calculate the incidence of colon cancer in Riyadh?** Incidence rate = (No. of new cases in the population during a specific period of time/Population at risk in the population during same period of time) X 10^n

	= 200/4,000,000 X 1000 (If the fraction is too small we multiply by 100000 instead of 1000) = 0.05 /1000 population (But don't forget to write /10 to the power	
	Attack rate Acute recurrent diseases e.g. ARTI, food poisoning.	AR= (No. of episodes during specified period/ Population at risk during same) x 10^n
Prevalence		
: Point prevalence: (Ex. I survey now and calculate all who have diabetes	(Total cases (old + new) at fixed point of time in place/ total population at risk in the same place and time) x 10^n	
	Example MOH conducted a survey for RVF among workers in slaughterhouses in Makkah. 224 seropositive workers were identified among 6000 workers. **Calculate the prevalence of RVF?** Prevalence= Total cases (old + new) at fixed point of time in place/Total population at risk in the same place and time) x 10^n =224 / 6,000 X 1,000 = 37 per 1,000	
Period prevalence	$\frac{\text{No. of existing cases (old+new) of a specified disease during a given period of time interval}}{\text{Estimated mid-interval population at risk}}$ X100 Period prevalence: to observe a period, we sum recurrence with cured divided by population then, we multiply it by 1000. **not included in the exam.**	
	Incidence: 3, 4, 5, 8 Point prevalence jan1: 1, 2, 7 Point prevalence dec 31: 1, 3, 5, 8 Period prevalence: 1, 2, 3, 4, 5, 7, 8	

Mortality Rates	
Death rate= No. of deaths in one year/ Mid-year population	
Crude Death Rate (CDR) crude death rate: It is the total number of death over mid-year population Ex. Death rate in Saudi Arabia in 2018-2019 we calculate all of deaths whatever the cause over mid-year population.	
Crude Death Rate =	(Total number of deaths in a certain year and locality/ Estimated mid − year population (Same year and locality)) X 1000
Specific mortality rate	
Cause-specific mortality rate	(Deaths of a specific cause in a given year and locality/ Estimated mid − year population in same year and locality) X 100,000
	Example Specific death rate due to tuberculosis = (No. of deaths of TB in a certain year and locality/ Estimated mid − year population in same year and locality) X 100,000
Age-specific mortality rates	Age specific death rate= Number of persons dying in a certain age and a certain year and area/ Total number in the same age group in the same year and same area) *x*1000
	Examples: neonatal, post-neonatal, infant and under 5-years mortality rates.
Adult mortality rate (per 1000 population)	Adulthood: between 15- 60 years of age Adult mortality rate = (Number of persons dying between 15 – 60 in a certain year and area/ Total number of population between 15 - 60 in the same year and same area) *x*1000

Maternal mortality ratio (MMR) (per 100 000 live births). (مهم)	The number of maternal deaths per 100 000 live births during a specified time period, usually 1 year. Maternal death is the death of a woman while pregnant or within 42 days after termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.				
	Maternal mortality ratio = (Number of Maternal deaths assigned to causes related to pregnancy in a given year and locality/ Number of live births in the same year and locality) ×100.000				
Period of Infancy					
Infant mortality rate (per 1 000 live births). (مهم)	Infant mortality rate is the probability of a child born in a specific year or period dying before reaching the age of one.				
	Infant mortality rate = (Total number of deaths from zero up to less than one year during a year and in a given locality/ Total number of live births in the same year and locality) *x*1000				
Neonatal mortality rate (per 1 000 Neonatal livebirths)	Neonatal mortality rate = (Total(neonatal) number of deaths from zero up to less than 28 days during a year and in a given locality/ Total number of live births in the same year and locality) *x*1000				
Post-Neonatal mortality rate (per 1 000 live births)	Post- Neonatal mortalityrate = (Total number of deaths from 28 days up to less than one year during a year and in a given locality/ Total number of live births in the same year and locality) *x*1000				
Stillbirth rate (per 1000 total births)	Stillbirths: are defined as third trimester fetal deaths (> or = 1000 grams or > or = 28 weeks of gestation). Total births : Total births is defined as the sum of live births and still births. Third trimester from 28 weeks of gestation till termination of pregnancy, if death happen it is called stillbirth (fetal death).				
	Still birth rate = (Number of stillbirths during a year and in a given locality/ Total births (live births + stillbirths) in the same year and locality) *x*1000				
Perinatal Mortality Rate. (متعلق بالحمل والولادة	It the best indicator of Maternal and Child Health services It is expressed as the sum number of stillbirths and early neonatal deaths (less than 7 days of life) per 1000 total births (stillbirths plus live births).				
	M.R. = (No.of stillbirths + No.of early neonatal deaths in certain year and locality Perinatal/ Total births (Still and livebirths) in the same year and locality)x 1000				
Under-five mortality rate (per 1000 live births)	Under-five mortality rate is the probability of a child born in a specific year or period dying before reaching the age of five				
	(Total number of deaths among children under 5 - years of age during a year and in a given locality/ Total number of live births in the same year and locality) X1000				
Proportionate mortality ratio	$Proportionate\ mortality = \frac{Deaths\ due\ to\ a\ particular\ cause}{Deaths\ from\ all\ causes} \times 100$				
Case fatality rate (Death to case ratio)	Case fatality rate= (Total number of deaths from a certain disease in a year and in a given locality/ Total number of cases having the same disease in the same year and locality) *x*100 EX. malaria deaths/cases of malaria multiplied by 100				
Survival Rate (SR)	**It reflects severity and virulence of diseases**				
	Survival rate: Is the proportion of survivors in a group (e.g. of patients),	Is used to ‘describe	Quite useful in cancer studies	Can be used as a ‘yardstick for the	Survival period is usually

	studied and followed over a period of time (e.g. over a period of 5 years)	prognosis' in certain disease conditions		assessment of standards of therapy'	calculated from date of diagnosis or start of treatment
	= Total no. of patients alive after 5 years / Total no. of patients diagnosed/treated ×100				
Standardized (adjusted) death rates					
Removes confounding effect			Direct comparison		

Global demography concepts and population pyramid summary

- **Demographics**: It is the scientific study of human populations; it encompasses three domains:
  1. Change in population size.
  2. Composition of a population.
  3. Distribution of a population in space.
- **Sources of population data:**

1. Census data
2. Ministry of health
3. World Health Organization Statistics Gives the latest estimate
4. United Nations
5. World Bank Statistics

- health of people in a community depends on the dynamic **interaction** between **size of the population** and the **space** they occupy.

Population size, distribution and composition are determined by:

1-Fertility: The actual bearing of children, is determined by:

1) Age at marriage
2) Duration of married life
3) Spacing of children
4) Education
5) Economic status
6) Religion
7) Nutrition
8) Family planning

Measures of fertility:

1)Crude Birth Rate= $\frac{\text{Number of live births in a year in a specific locality X 1000}}{\text{estimated mid-year population size in that same year and locality}}$

2)General Fertility Rate= $\frac{\text{Number of live births in a year in a specific locality X 1000}}{\text{Mid-year female population age 15-49 (reproductive age) in that same year and same locality}}$

3) General *Marital* Fertility Rate= $\frac{\text{Number of live births in a year in a specific locality X 1000}}{\text{Mid-year female married population age 15-49 in that same year and same locality}}$

4) Age-specific Fertility Rate:
number of live births in a year to 1000 women in any specified age-group=

$$\frac{\text{Number of live births among a specific age group X 1000}}{\text{Mid-year female population in that age group in that same year and same locality}}$$

5) Total Fertility Rate: (rate per woman) the average number of children a woman would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group.

$$=\frac{\text{Sum of age specific fertility rates (rate per woman)}}{1000}$$

or Sum of age specific fertility rate (rate per 1000 women), If using a 5-year period, then: ΣAge specific fertility rate x 5.

2- Migration:

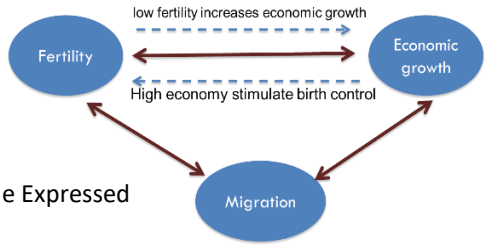
- Migration is towards high-income countries, except for refugees mostly migrate to low-income countries.
- Median age of migrants is 39 years
- Mostly women

Why is migration important to follow?

- It helps predict how the population will be shaped
- Migration usually goes from low income to more industrialized countries (more economic opportunity)
- Younger and healthier people migrate to more industrialized areas to work
- Migration affects economic growth and is affected by economic growth

Relations ship:

- Younger and healthier people migrate to more industrialized areas to work
- Migration affects economic growth and is affected by economic growth



3-Mortality

1) Mortality rate: Number of deaths in a given population in a specific period of time Expressed as per 100 population or per 1000 population.

MR= $\frac{\text{\# of deaths in a given period of time x 100 (or 1000)}}{\text{Total population in the same given period of time in that same population}}$

2)Crude death rate: Number of deaths in a given population in a specific period of time over the mid-year population of that same time period

CDR= $\frac{\text{\# of deaths in a given period of time x 1000}}{\text{mid-year population in the same given period of time in that same population}}$

4- social mobility

5 -marriage

5 stages of demographic transitions

1.Stage 1: (High Stationary)→ high birth rate ,and high death rate.

2.Stage 2: (Early expanding) →**Birth** rates remain the **same**, **Death** rates **begin to decline.**

3.Stage 3: (Late Expanding) →

- Death rates further decline
- Birth rates begin to fall
- Birth rates > death rates => population growth

4.Stage 4: (Low stationary)

- Low birth rate
- Low death rate
- Population becomes stationary; Zero population growth.

5.Stage 5: (Late Expanding)

- Birth rates very low
- Death rates very low
- Birth rates < death rates
- Population decline

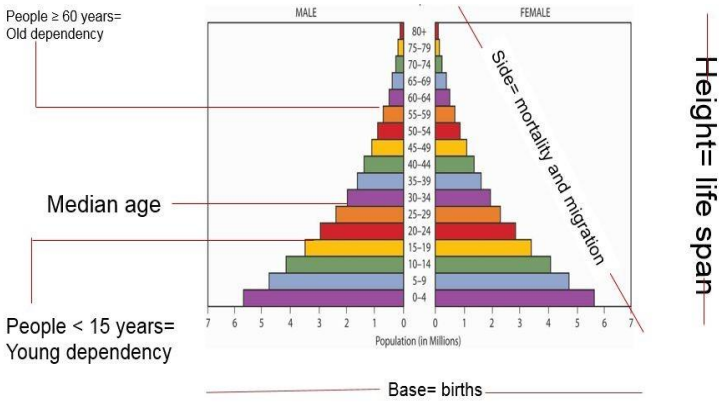
- Limitations of Demographic Transition Model is that Migration is not considered.
- How do we measure population growth? Crude birth rate – Crude death rate

Population pyramid

- This shows the age structure in a certain population
- By looking at the shape, you will be able to get an idea about:
  - Proportion age groups in a population
  - Male to female ratio

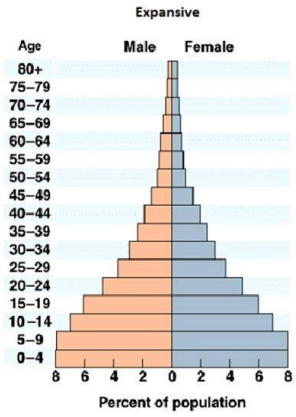
Population pyramid components

- **Base:** wide => high birth rate, narrow => low birth rate
- **Apex:** old population (retired population)
- **Height:** life span
- **Side:** change in population size due to death or



Types of population pyramids:

1. Expansive 2. Stationary 3. Constrictive

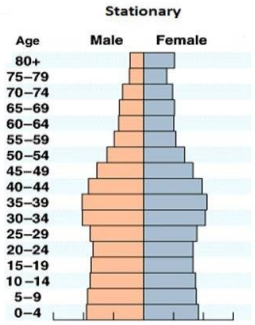


1- Expansive population pyramid:

Expansive or expanding pyramid usually presents itself in the form of triangular shape with concaved edges

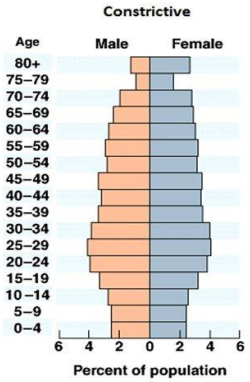
- High population growth due to:
  - High birth rate
  - Shorter life expectancy
  - high death rate
- Usually associated with lower standard of living

2-Stationary population pyramid



- It is showing unchanging pattern of fertility and mortality
- Age groups almost equal, but it is expected to see smaller figures at the oldest age groups

3-Constrictive population pyramid



- Narrow base
- Apex wider

It is more common when immigrants are factored out Indicated:

- High level of education
- Use of birth control
- Good health care system

Population density

Total population in a certain region divided by the surface area of that same region

National population dynamics and demographic transitions

Important population distribution measures

- **Dependency ratio (x 100)**

The proportion of persons above 65 years of age and children below 15 years of age are considered to be dependant on the economically productive age group (15-64 years) here you have to specify with age group either 65 years or below 15

- **Total dependency ratio (x 100)**

The ratio of the combined age groups 0-14 years plus 65 years and above to the 15-65 years age group is referred to as the total dependency

- **Population density**

Total population in a certain region divided by the surface area of that same region .

How does a population grow?

1. Natural increase

Difference between birth rates and death rates

2. Net migration

The difference between migrants coming into the country (immigrants) and leaving the country (emigrants)

Migration

Saudi Arabia ranks the second worldwide in hosting migrants.

5 Stages for Demographic Transition

- **Stage 1: (High Stationary)**
  - High birth rate
  - High death rate
- **Stage 2: (Early expanding)**
  - Birth rates remain the same
  - Death rates begin to decline
  - e.g. many of the countries in developing world
- **Stage 3: (Late Expanding)** KSA is here
  - Death rates further decline
  - Birth rates begin to fall
  - Birth rates > death rates => population growth
- **Stage 4: (Low stationary)**
  - Low birth rate
  - Low death rate
  - Population becomes stationary; Zero population growth
  - Many developed countries
- **Stage 5: (Declining)**
  - Birth rates very low
  - Death rates very low
  - Birth rates < death rates
  - Population decline
  - e.g. Germany and Hungary

Trend in Saudi Arabia 1974-2010

- Reduction in birth rates (slow reduction)
- Increase in the expatriate population in the later third of this period
- Sex ratio (higher males) => expatriate workforce

Demographic transition stage in KSA

- Reduction in mortality rates
- Slowly reducing (but still high) fertility rate

Net result? Growing population

Demographic transitional stage: late expanding

Demographic transition stage in KSA

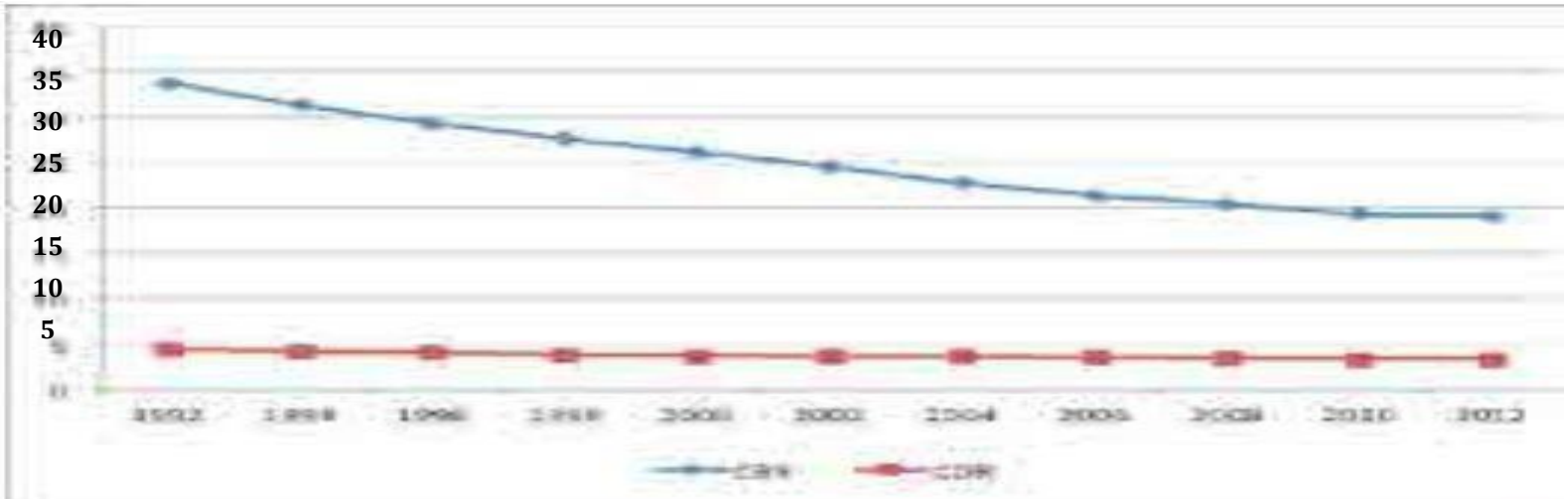


Fig. 1. Demographic Transition in Saudi Arabia showing crude birth rate (CBR) and crude death rate (CDR).

❖ it's showing us that the crude birth rate (CBR) and crude death rate (CDR) changed overtime in Saudi Arabia.

- The crude birth rate has been decreasing as well as the crude death rate.
- But net result there is a population growth why?
  - There is still a space between the crude birth and death rate
- The largest population growth was in 1992 since the difference between the crude birth rate and death rate is high 35-5=30%
- While in 2012 there was less population growth but still a growth 20-5=15%
- Annual growth rate (AGR) is not the population size so even if the AGR is declining overtime doesn't mean that the population not growing, it just means that the speed of growing is slower.
- The importance of Annual growth rate is giving us prediction of how many years will take a population to be doubled and that's needed for the policies and decision maker as for people in 2030 vision, to consider which services should be available

❖ How the growth of the population is still increasing (more explanation)

In 1992 the annual growth rate = 35(CBR)-5(CDR)=30%
And let's suppose that the population in this year was 10 million
And they increased 30% out of their population= 3 million in one year the net population 10+3=13 million
In 2012 the annual growth rate = 20(CBR)-5(CDR)=15%
And for example, the population was 20 million
And in one year is increasing 15% with net population of 23 million
Final statement the population still growing
As far as the birth rate is higher than the death rate there will be a growing population
If the annual rate reach 0 this mean, there is no more growing in the population

Screening

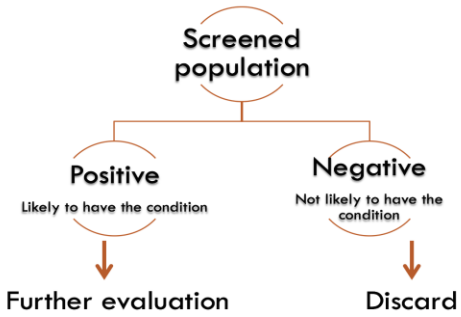
Definition of screening Objectives

Screening: actively searching for unrecognized disease or defect by means of rapidly applied tools in apparently healthy individuals not seeking medical care

Tools and examples of screening

- Test consisting a series of questions
- Instrument to measure a parameter
- Medical examination
- Radiological test
- Laboratory test

E.g.: colon cancer screening, mammogram.



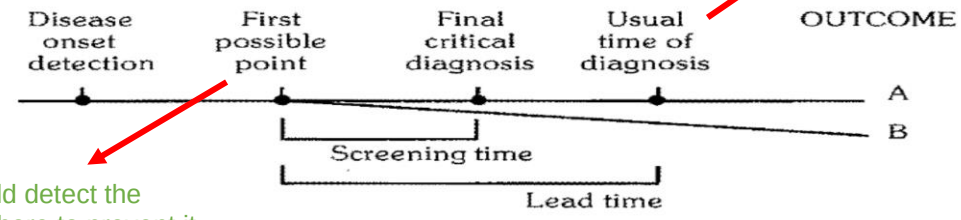
Concept of Screening

Natural history of disease	Preventive measure	Example
Person at risk	Primary prevention	Giving advice to a middle-aged obese man to reduce the risk of developing elderly onset diabetes.
Asymptomatical sick	Secondary prevention	Blood sugar levels of a middle-aged obese man that feels well.
Symptomatically sick	Terciary prevention	Follow up care for a person who is taking oral hypoglycaemics.

1- the most important to detect asymptomatic people
2- screening here is pointless, damage already done

here there is symptoms or complications

Concept of Lead Time



we should detect the disease here to prevent it

Difference between screening, case finding, periodic examination and diagnosis

Screening	The search for unrecognized disease or defect by means of rapidly applied tools in apparently healthy individuals not seeking medical care.
Periodic examination	Seeking of medical care at intervals to evaluate health status and to detect any health problem without the presence of any complaint. In periodic examination, different systems are looked at and a series of investigations are applied. example, anyone who's above 40 should measure blood glucose level
Case finding	The use of a clinical, laboratory or non laboratory test to detect disease in individuals seeking health care for other reasons. The aim of identifying diabetes among pregnant women is an example of case finding.
Diagnosis	A procedure to confirm or prove the existence of a disease or abnormality among those seeking medical care with a specific complaint. Achieved by obtaining medical history, clinical examination and the application of laboratory or non laboratory tests.

Types of screening programs :

1.**Mass screening:**

Applied to the whole population or population subgroups as adults, school children, industrial's workers irrespective of their risk.

2.High risk or selective screening:

Applied to a selective population subgroup who are at a high risk. Among high risk population, the disease is more likely to be prevalent and the screening will result in a better yield.

Uses of screening programs:

No.	Use of screening program	Definition	Example

1	Case detection	•**Prescriptive screening** •Identification of unrecognized disease or defect that doesn't arise from patient's request	Neonatal screening
2	Control of diseases	•**Prospective screening** •Prevention of the transmission of the disease to healthy community members	Screening of immigrants from infectious diseases such as tuberculosis and syphilis
3	Research purposes	•Initial screening is conducted to estimate the prevalence of a disease and subsequent screening will provide data on the incidence	Screening of chronic diseases whose natural history is not fully known (e.g. cancer)

Criteria of screening is related to:

A. The disease

The disease to be screened should fulfil the following criteria before it is considered suitable for screening:

1. The condition sought should be an important health (in general, prevalence should be high)
2. There should be a recognizable latent or early asymptomatic stage
3. The natural history of the condition, including development from latent to declared disease, should be adequately understood (so that we can know at what stage the process ceases to be reversible)
4. There is a test that can detect the disease prior to the onset of signs and symptoms
5. Facilities should be available for confirmation of the diagnosis.
6. There is an effective treatment 7. There is good evidence that early detection and treatment reduces morbidity and mortality
8. the expected benefits (e.g., the number of lives saved) of early detection exceed the risk and costs
9. Agreed-on policy whom to treat as a patient

B. The Screening Test the tool

1. Feasibility: Simple, inexpensive, capable of wide application

2. **Acceptability:** Acceptable by the people to whom it is intending to be applied
(example of socially unacceptable tests: pap smear, PR for prostatic cancer)

3**. Reliability (precision):** Consistent results on repeated application on the same individual under same circumstances

4. **Validity (accuracy):** Ability to distinguish between those who have and those who don't have the disease as confirmed by a gold standard.

Screening and diagnostic test:

Difference between screening and diagnostic test (very important)

No.	Screening test	Diagnostic test
1	Done on apparently healthy main and big difference	Done on those with indications or sick
2	Applied to groups	Applied to single patients, all diseases are considered

3	Test results are arbitrary and final	Diagnosis is not final but modified in light of new evidence, diagnosis is the sum of all evidence
4	Based on one criterion or cut-off point	Based on evaluation of a number of symptoms, signs (e.g., diabetes) and laboratory findings
5	Less accurate	More accurate
6	Less expensive	More expensive
7	Not a basis for treatment	Used as a basis for treatment
8	The initiative comes from the investigator or agency providing care	The initiative comes from a patient with a complaint
9	Results are not conclusive	Results are conclusive and final

They may trick you in the exam so be careful:

- Healthy individual who is not seeking medical advice = Screening teats
- Sick patient =Diagnostic test
-

Example of screening programs:

- Blood pressure for hypertension
- Fasting blood sugar level for diabetes
- Pap smear for cervical cancer

Validity of screening test:

Validity of the test reflects its "accuracy" compared to a gold standard.

1.Sensitivity: ability of the test to detect correctly those who truly have the condition (true positive) **(truly sick patients)**

- It is called as true positive rate.
- **True Positive Rate**
- Percentage of patients who have a disease that tested positive.
- Sensitivity= True positive/$T_{Disease}$ × 100
- T disease = total number of those who have the disease

2. Specificity: ability of the test to detect correctly those who truly do not have the condition (true negative) **(truly not sick)**

- It is called the true negative rate.
- **True Negative Rate**
- Percentage of patients who do not have the disease who tested negative.
- Specificity= True Negative/ $T_{Non\text{-}Disease}$ × 100
- T non-disease = total number of those who don't have the disease

True positive result is desirable

- ❑ It is money well spent
- ❑ Bringing subjects with the condition into care

- ❑ Subjects who incurred the hazards of screening and confirmation of the diagnosis will benefit from therapeutic intervention

True negative result is desirable

- ❑ Reassurance that they are free from the condition

3. False Positive Rate

Percentage of patients who have a positive test result but do not have the disease.

4. False Negative Rate

Percentage of patients who have negative test results but have the disease.

False positive result	**False negative result**
is referred to as adverse effect or errors of screening is not desirable	is not desirable
is a waste of resources; incurring the cost of the screening and the confirmation of the diagnosis	gives a false reassurance that they are free from the condition
leads to unnecessary exposure of subjects to the hazards of the tests	
causes emotional strain of being a probable case	

5. Positive predictive value

- Percentage of the time that a positive test correctly identifies people who have the disease.
- Positive Predictive Value= True Positive/ $T_{\text{Test Positive}} \times 100$

*here we talk about the Tests not Patients

6. Negative predictive value

- Percentage of time that a negative test correctly identifies people without the disease.
- Negative Predictive Value= True Negative/ $T_{\text{Test Negative}} \times 100$

Meaning of positive predictive value

- Reflects the diagnostic **power** of the test.
- The predictive accuracy depends upon sensitivity, specificity and disease **prevalence**
- **Low value** is a waste of resources; very few of those who tested positive will be found to have the condition
- **High value** is desirable in screening program; detecting and bringing into care subjects with the condition at a pre-clinical stage
- Predictive value positive increases considerably with the increase in the prevalence of the condition among the screened population
- In condition with relatively lower prevalence among the general population but higher prevalence among high risk population, it is recommended to avoid mass screening and to opt for “selective screening” of high risk population

	Disease (number)	**Non-Disease (number)**	**Total (number)**
Positive **(number)**	**A** (True Positive)	**B** (False Positive)	$T_{\text{Test Positive}}$
Negative **(number)**	**C** (False Negative)	**D** (True Negative)	$T_{\text{Test Negative}}$
	T_{Disease}	$T_{\text{Non-Disease}}$	**Total**

Test	**Breast cancer**		**Total**
	Positive	Negative	
Positive	900	1980	2880
Negative	100	97020	97120
Total	1000	99000	100000

Example:

•**Sensitivity= A/(A+C) × 100**

(900/1000)x 100 = 90.00%

•**Specificity= D/(D+B) × 100**

(97020/99000) x 100 = 98.00%

•**False Positive Rate= B /(B+D) × 100**

(1980/99000) x100= 2%

•**False Negative Rate= C /(A+C) × 100**

(100/1000) x100= 10%

•**Positive Predictive Value=** A/(A+B) × 100

(900/2880) x 100 = 31.3%

Out of those who are positive by the test only 31.3% are found to have breast cancer

•**Negative Predictive Value=** D/(D+C) × 100

(97020/97120) x 100 = 99.9%

Out of those who are negative by the test, 99.9% are found to be free from the cancer

Interpretations of sensitivity and specificity:

•sensitivity: Breast cancer screening test was capable to identify correctly 90% of the those who have the cancer

•A sensitive test will result in few false negative

•Test with high sensitivity is preferable in screening

•specificity: Breast cancer screening test was capable to identify correctly 98% of the those who don't have the condition

•A specific test will result in few false positive

•Test with high specificity is preferable for diagnosis

•Yield of the test reflects the number of correctly unrecognized subjects with the condition who have been identified and brought into care

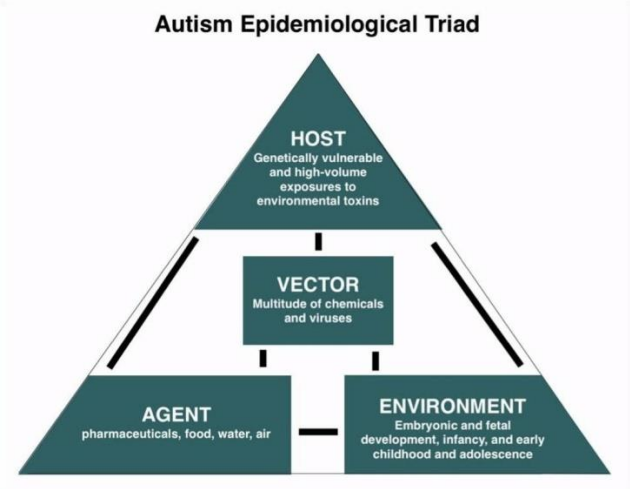
•Yield of the test is measured by its predictive value

Communicable Disease

What is a Communicable Disease?

It is an illness caused by an infectious agent or its toxic product that is transmitted from an infected person, animal or inanimate source to a susceptible host.

Epidemologic Triad



The Chain Of Infection:

Agent- Transmission- Susceptible Host Reservoir

- It is the habitat where the infective agent survives grows and multiplies in such a manner that it can be transmitted to a susceptible host.
- does all reservoirs have obvious infection?

No, it could be a carrier state so there is no symptoms.

The Reservoir

Reservoir of infection can be:

–Human => case or carrier

Carrier=person with unapparent infection that transmit the disease to others

–Animal => case or carrier

–Environmental reservoir:

- Water => e.g. legionnaire's disease
- Soil => e.g. Botulism, Tetanus
- Plants
- food

–Combination of these types

The Agent

Mechanism of disease production (pathogenesis)
Invasiveness: ability of the organisms to invade the tissues and multiply
Toxigenicity: ability of the organism to produce toxins
types of toxins:
1-**Exotoxins**: (released by living organisms): Heat labile; highly immunogenic and converted to antigen or toxoid by formalin, heat and acid.e.g. gram-ve E-Coli
2-**Endotoxins**: (released after disintegration of the organism): Heat stable, poorly immunogenic and not converted to toxoid.
Pathogenicity: The power of an infectious agent to produce disease.
Virulence: Ability to produce severe pathological reaction. Measured by the ratio of clinical to subclinical disease and case fatality rate.
Dose of infection (inoculum): high probability of severe disease with higher dose of Infection.

Viability of the organism (resistance): Ability of the organism to live outside the body.
Spore formation: Maintain viability for a long period in unfavorable environmental Conditions.
Antigenic power of the organism: Ability to stimulate the immune system to produce antibodies or antitoxin with subsequent immunity. Measured by the second attack frequency.
Ease of communicability is measured by the secondary attack rate, which is the number of secondary cases, occurring within the range of incubation period following exposure to a primary case expressed as a percentage of susceptible.

The Mode of Transmission

why it is important to know the mode of transmission? to apply prevention and control measures at this stage also it could be a part of education ..as a physician's we should educate patients about it

1. Direct Transmission	2. Indirect Transmission
• Direct contact – Skin-to-skin – e.g. STDs HIV • Droplet spread –spray with droplet over a few feet – e.g. pertussis,TB	• Airborne. Hardest to control – droplet nuclei or dust suspended in air e.g. chicken pox • Vehicle – food, water, biological products, fomites. • biological vehicles: saliva, feces, blood. • Vector –insects –may support growth or change to the agent

The Portal of Entry and Exit

• Portal of entry: it is the path by which the infectious agent enters that host
• Portal of exit: is the path by which the infectious agent exits the infected host
• These could be:
• Skin => Direct contact; e.g. scabies, fungal, staph
• Mucous membrane => e.g. HBV, STDs
• Respiratory tract => rhinovirus, EBV
• GIT => E-coli, enteric virus, HAV
• GUT => gonorrhoea, syphilis.
• Blood => HIV, HCV, HBV, malaria

The Host

A host is a person or other living animal, that affords living conditions suitable for the growth of an infectious agent.
Susceptibility to infection is universal but susceptibility to disease depends on:
1 Immunity. 2-Dietary and nutritional factors. 3-Genetic factors.

INCUBATION PERIOD

It is the period between the entry of the organism and the appearance of the first symptom of the disease.
Knowledge of the incubation period is important for:
• Surveillance and quarantine in some diseases
• Application of preventive measures to abort or modify the attack.
• Identification of the source of infection.

Immunity

Types of Immunity Natural Acquired:

Natural	**Acquired**

•physical first line of defense that we have Natural resistance of the body offered by skin, mucous membranes, gastric acidity, respiratory cilia.	•Passive: acquired through transferred antibodies from mother to infant (natural) or by administration of immunoglobulin or anti-sera (artificial)..not produce antibodies. •Active: post infection immunity (natural) or following vaccination (artificial) .. the body produce antibodies.

Prerequisites for transmission of a communicable disease

The six pre-requisites for the transmission of communicable diseases are:

1. Presence of reservoir for infection.
2. Presence of microbiological agent.
3. Portal of exit through which the microbiological agent leaves the reservoir.
4. Mode of transmission.
5. Portal of entry (inlet) through which the microbiological enters the host.
6. Presence of susceptible host.

(Prevention and Control Measures Applied to Break Different Stages of the Infection Chain)

Measures That Directed to the Agent

•Sterilization
•Disinfection
•Proper treatment of infected individuals to kill the agent at its source

Measures Directed to the Reservoir

• Cases: Case finding, reporting to the local health authority in order to apply the appropriate control measures for contact and the environment, isolation (strict isolation or discharge/body fluid isolation) for the whole period of communicability and treatment, surveillance for the longest incubation period.
• surveillance: look for people who have the disease. How can I do it? There is two ways:

1- active surveillance: I go test, examine & investigate.
2- passive surveillance:reporting the cases to the ministry of health. يعني يا إن الوزارة ترسل فريق للفحوصات(active (أو تستنى الحالات تتسجل عندها (passive(-in the outbreak cases it is better to do active surveillance.

•Carriers: Identification of carriers in the community, treatment and exclusion from work till the organism is eliminated especially if food handlers or working with children. Its cost effectiveness depends on the proportion of carrier in the community as well as the sensitivity of their occupation.الزواج قبل ما فحص مثل it is important to control the transmission of an infection between individuals & not producing offspring and children have the disease.

•Animal reservoir: Adequate animal husbandry, immunization of animals (if vaccine is available), treatment of infected animals and killing if treatment is not feasible.

Measures Directed towards Breaking Transmission:

• Isolation if indicated => to interrupt direct transmission
• Decontaminating of fomites => vehicle transmission
• Promote handwashing => prevent feco-oral transmission
• Modify ventilation and air pressure Ex:AC in institutions => prevent airborne transmission
• Control vector population => control vector-borne transmission
•Environment: sanitation of water, food, proper sewage handling

Measures Directed towards Protecting Portal of Entry

•Using bed-nets
•Wearing masks and gowns to prevent entry of infected body secretions or droplets through skin or mucous membranes
• Covering skin and using insect repellents in case of في الغابات

Measures Directed to the Host
•Health education
• Adequate personal hygiene
• Sound nutrition
• Immunization
• Chemoprophylaxis

What is the Benefit of Complete Immunization in the Community?
Complete immunization coverage can help prevent the agent from reaching a susceptible host.

Herd immunity
• State of immunity within the community
•If a high proportion of individuals in the community are resistant to an agent, then susceptible people will also be protected by the resistant majority
•The level of susceptibility increases as new infants are born, an epidemic will develop after accumulation of susceptible
• It could be produced artificially by immunization, or naturally after infection.

Some Definitions
Control:
Activities conducted to bring a disease or a health problem at a very low level till it becomes no longer a public health problem
Elimination:
Termination of all modes of transmission to a reduction of the incidence of the disease to the zero in a confined or specific geographic locality as a result of deliberate efforts yet, continued intervention methods are required .. decrease number if incidence of disease to a very low level but not necessarily meaning that it does not exist in the environment anymore.
Eradication:
Termination of all modes of transmission of infection by extermination of infectious agent.

Principles of immunization

Immunity
The ability of the human body to tolerate the presence of material indigenous to the body ("self"), and to eliminate foreign ("non-self") material.
Immunity to a microbe is usually indicated by the **presence of antibody** to that organism.
Immunity is generally **specific** to a single organism or group of closely related organisms.

Types of acquired immunity:

1- **Active immunity:**
- Immunity develops as a result of infection or by specific immunization.
- Stimulation of the immune system to produce antigen-specific humoral (antibody) and cellular immunity.
- Takes time to develop.
- usually lasts for many years, often for a lifetime

2- **Passive immunity:**
- Transfer of antibody produced by one human or other animal to another.
- Provides protection against some infections, but this protection is temporary..
- E.g. from mother to infant (transplacental)

Advantages of active immunity compared to passive immunity:
- Long-lasting protection
- Severe reactions are rare.
- Higher protective efficacy
- Less expensive.

Types of active immunity :

Humoral immunity:
- From B-cells (B-lymphocyte)
- they do not provide protection against more than one antigen

Cellular immunity:
- From mainly T-cells (T-lymphocyte)
- Responsible for immunity against many diseases such as Tuberculosis and Brucellosis

Ways for acquiring active immunity

1.Following clinical infection

once persons recover from infectious diseases, they will have lifelong immunity to that diseaseo E.g. chickenpox, rubella and measles

2.Following immunization with an antigen

Other type of immunity :

Herd immunity (Community immunity)

When vaccination of a portion of population (or herd) provides protection to unprotected individuals.

Classification of Vaccines

Vaccine

Immuno-biological substance designed to produce specific protection against a given disease.

Vaccination is the most effective medical strategy to control infectious diseases.

Vaccine may be prepared from:
- Live modified organisms
- Inactivated or killed organisms
- Extracted cellular fractions
- Toxoid
- Combination of these

1-Live attenuated Vaccines

-Prepared from live or wild organisms (modified in laboratory)

-These organisms lost their capacity to induce full disease but retain their immunogenicity.Stimulate the immune response

-To produce an immune response, live attenuated vaccines must replicate (grow) in the vaccinated person - Contraindications for administering live vaccine:

- Immunocompromised persons (leukemia, lymphoma or cancer)o Persons with immune deficiency disease.
- Pregnancy

-Live attenuated vaccines produce immunity in most recipients with one dose, except those administered orally.
-A small percentage of recipients do not respond to the first dose and a second dose is recommended to provide a very high level of immunity in the population.
-Live attenuated vaccines are fragile and can be damaged or destroyed by heat and light. They must be handled and stored carefully.

Examples:

- Viral vaccines
- Measles, mumps, rubella, varicella, zoster, yellow fever, rotavirus, and influenza (intranasal).
- Oral polio vaccine (OPV)
- Bacterial vaccines
- Bacille Calmette-Guérin (BCG)
- Oral typhoid

2-Inactivated or Killed Vaccines

- Produced by growing the bacterium or virus in culture media, then inactivating it with heat and/ or chemicals (usually formalin).
- Not alive and cannot replicate.
- Cannot cause disease from infection, even in an immunodeficient person.
- Always require multiple doses.
- A protective immune response develops after the second or third dose.
- Some inactivated vaccines may require periodic supplemental doses to increase, or "**boost,**" antibody titers.
- Usually administered by **subcutaneous** or **intramuscular** route Not given orally because it can't cross the mucosal barrier
- More stable than live vaccine. Transport cost much less than the live vaccine

Contraindication:

- Severe local or general reaction to a previous dose.

Example:

- Polio, Hepatitis A, Rabies, Pertussis , Typhoid, Cholera, Plague

3-Subunit Vaccines

Vaccine made of single or multiple **antigenic components** of a microorganism that can stimulate a specific immune response sufficient to protect from the relevant pathogen infection or from the clinical manifestation of the disease.

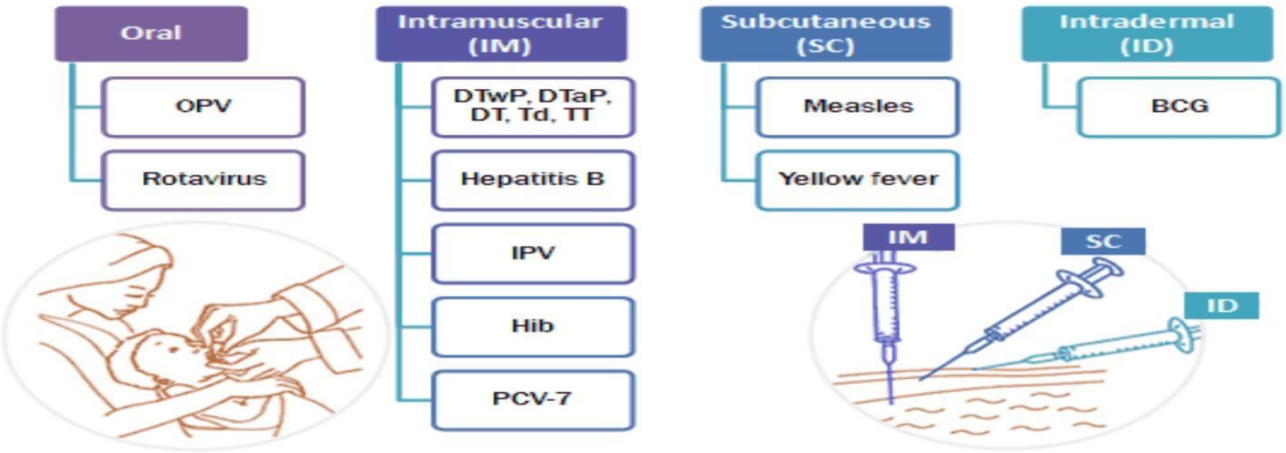
- Toxoids Protein vaccines
- Recombinant protein vaccines
- Polysaccharide-based vaccines
- Combinations

Toxoids	• Certain organisms produce exotoxins, e.g., diphtheria and tetanus bacilli. • The toxins produced by these organisms are **detoxicated** and used in the preparation of vaccines. • In general, toxoid preparations are highly efficacious and safe immunizing agents. ★
Protein vaccines	• Purified proteins • Pertussis vaccines currently available contain from two to four different proteins purified from B. pertussis and are able to confer protection against whooping cough comparable to that obtained with the whole cell vaccine. • The influenza vaccine
Polysaccharidebased vaccines	• Stimulation of an antibody response against the surface polysaccharide of pathogenic bacteria is a strategy for the development of vaccines against capsulated bacteria. • a limitation of polysaccharide-based vaccine is that the immune responses they elicit are often serotype specific. • Examples: S. pneumoniae, Hib (haemophilus influenza type B), and Salmonella
Combinations	• more than one kind of immunizing agent • **The aims of combined vaccines are to:** 1. Simplify administration 2. Reduce costs 3. Minimize the number of contacts of the patient with the health system, 4. Reducing the storage cost • Usually **does not** increase the risk of adverse reactions **Examples:** • DPT (Diphtheria-pertussis-tetanus) • MMR (Measles, mumps and rubella) • DPTP (DPT plus inactivated polio) • DPT-Hep B-Hib (Diphtheria, pertussis, tetanus, hepatitis Band haemophilus influenza type B).

Route of administration of Vaccines

This is a critical factor for success of the immunization

Oral administration	Intramuscular (IM) injection	Subcutaneous (SC) injection	Intradermal (ID) injection
makes immunization easier by eliminating the need for a needle and syringe.	Administers the vaccine into the muscle mass Vaccines containing adjuvants(ex.Aluminium) should be injected IM to reduce adverse local effects.	above the muscle and below the skin.	in the topmost layer of the skin. BCG is the only vaccine with this route of administration. Intradermal injection of **BCG** vaccine reduces the risk of neurovascular injury.



The "Cold Chain"

a system of storage and transport of vaccines at low temperature from the manufacturer to the actual vaccination site.

it's Important to avoid the "vaccine failure"

The success of national immunization programme is highly dependent on supply chain system for delivery of vaccines and equipment, with a functional system that meets **6 rights** of supply chain (The right vaccine in the right quantity at the right place at the right time in the right condition (no temperature breaks in cold chain) and at the right cost

immunization Schedules

The immunization schedule is different in each country depending on the (epidemic and pandemic infections). For example BCG vaccine is mandatory in Saudi arabia and other developing countries, while it's not in united states and other western countries.

BCG	–	Birth – 2 weeks
OPV	–	Birth; 6 weeks, 10 weeks and 14 weeks; 16–18 months, 5 years
DPT	–	6 weeks, 10 weeks and 14 weeks; 16–18 months and 5 years
Hepatitis B	–	Birth, 6 weeks and 14 weeks *or* 6 weeks, 10 weeks and 14 weeks
Hib Conjugate	–	6 weeks, 10 weeks and 14 weeks
Measles	–	9 months, 16–24 months
MMR	–	15 months Not before one year
Typhoid	–	2 years, 5 years, 8 years, 12 years
TT/Td	–	10 years, 16 years
TT	–	2 doses one month apart for pregnant women, or booster dose if previously immunized.

Vaccines that can be given after discussion with parents

Varicella	–	15 months (or after 1 year)
Hepatitis A	–	high-risk selected infants, 18 months, and 6 months later
Pneumococcal conjugate vaccine	–	6 weeks
Influenza vaccine	–	6 months of age to high risk selected infants anually

Examples of Currently Used Vaccines

Vaccine	Type	Mode of administration
Measles	Live attenuated	Subcutaneous
Rubella	Live attenuated	Subcutaneous
Mumps	Live attenuated	Intramuscular
Diphtheria	Toxoid	Intramuscular
Pertussis	whole -cell pertussis vaccines and acellular pertussis vaccines	Intramuscular

Emerging infectious diseases

Definitions

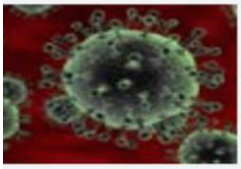
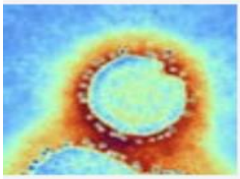
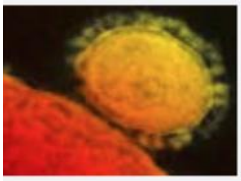
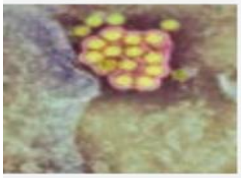
- **Emerging infectious diseases:** something new e.g: corona, ebola virus
- Diseases that are recognized in the human host for the first time
- **Re-emerging diseases:** reappearing e.g: TB
- Diseases that historically have infected humans, but continue to appear in new locations or in drug-resistant forms, or that reappear after apparent control or elimination

(the doctor discussed these tables in detail)

Table 1. Some major factors that underlie disease emergence and reemergence [2,5].

The Microbial Agent	The Human Host	The Human Environment
Genetic adaptation and change	Human susceptibility to infection	Climate and weather
Polymicrobial diseases	Human demographics and behavior	Changing ecosystems
	International trade and travel	Economic development and land use
	Intent to harm (bioterrorism)	Technology and industry
	Occupational exposures	Poverty and social inequality
	Inappropriate use of antibiotics	Lack of public health services
		Animal populations
		War and famine
		Lack of political will

Important zoonotic emerging infectious diseases reported to WHO, January to November 2013

	Emerging infection	Countries	Summary of cases	Control measures
	Avian influenza A/H5N1	Cambodia, Egypt, China, Indonesia, Bangladesh, Vietnam	20 cases including 11 deaths reported in Cambodia Sporadic reports of cases (11 in total) from other countries	Rapid response teams deployed Enhanced surveillance measures Public health education campaigns
	Avian influenza A/H7N9	China	139 laboratory confirmed cases with 45 deaths (March-November 2013). Linked to live bird markets with no sustained human to human transmission	Temporary closure of live bird markets in some affected areas Culling of live birds in wholesale markets in some affected areas
	Middle East respiratory syndrome corona virus	Saudi Arabia, Oman, France, Italy, Jordan, Qatar, Tunisia, United Arab Emirates, UK	150 laboratory confirmed cases and 64 deaths (September 2012-November 2013). Most case occurred in Saudi Arabia with cases in other countries in single figures. Limited human to human spread	Increase surveillance of sudden acute respiratory illness across WHO member states Elderly and chronically ill people asked to limit visit to the Hajj this year
	Yellow fever	Chad, Ethiopia, Cameroon, Democratic Republic of Congo	Small numbers of laboratory confirmed cases have been notified across several African countries	Increased surveillance activity and mass vaccination campaigns carried out in affected countries

Why are they matter of concern?

Heavy global burden, mainly when they become epidemics or pandemics.

They generally have a high mortality rate and spread across countries very rapidly causing panic and fear.

It is estimated that more than 15 million people all over the planet lose their life's directly because of infectious disease, and millions more due to the complications of chronic ones

Key messages

- Most emerging infectious diseases occur where animals meet humans
- The world's increased demand for meat has been one cause of disrupted ecosystems and increased the potential for emerging infections

- Since 2005 there has been a change of emphasis from control to prevention or minimisation at the source, but more must be done to show its cost effectiveness
- One Health brings together researchers and workers from health, agriculture, environment, and commerce to tackle the problem from all angles It is hoped that this approach will improve human health and reduce economic costs by preventing emerging infections at their source

What is Middle East respiratory syndrome coronavirus (MERS-CoV)?

- Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (Middle East respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012
- Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS).
- Approximately 35% of reported patients with MERS have died high mortality
- Human-to-human infections in health care settings, dromedary camels are a major reservoir host for MERS-CoV and an animal source of MERS infection in humans.
- The virus does not seem to pass easily from person to person unless there is close contact, such as occurs when providing unprotected care to a patient.
- Health care associated outbreaks have occurred in several countries, with the largest outbreaks seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea.

History of origin cases and clusters:

First identified in Saudi Arabia in June: : Jeddah, hospitalized with pneumonia,ARDS, acute kidney injury.....Died. MERS-CoV was isolated from his sputum.

The maximum cases found in SA .

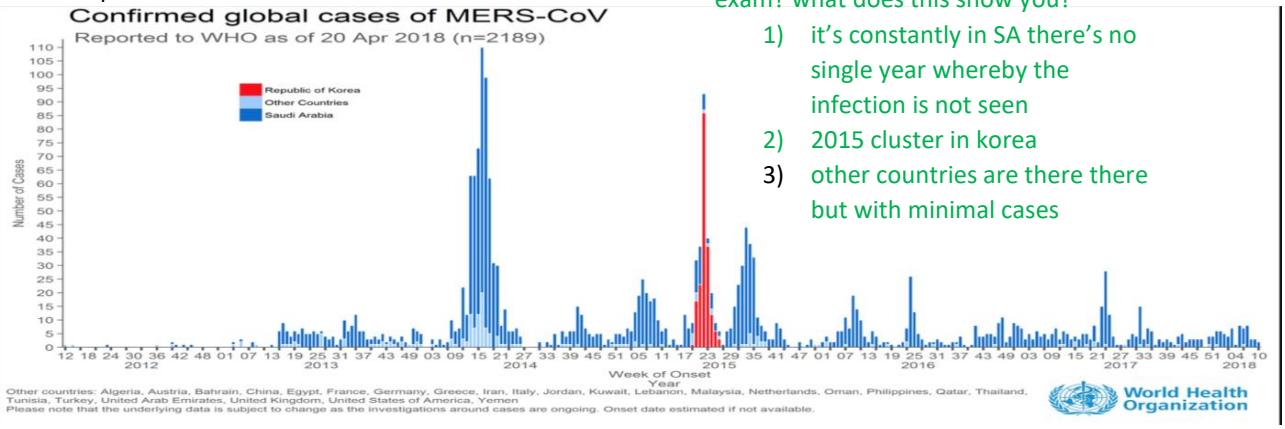
- September 2012: Qatar A patient with acute kidney injury, ARDS I.
- He had recently traveled to Saudi Arabia.

April 2012: Jorden

- 11 pneumonia cases (8 HCWs) health care workers
- One patient: pneumonia and pericarditis
- Other: pneumonia and DIC

how to read this if it comes in your exam? what does this show you?

1) it's constantly in SA there's no single year whereby the infection is not seen
2) 2015 cluster in korea
3) other countries are there there but with minimal cases



Who are risk?

- comorbidities (cancer, DT, obesity..etc)
- Populations in close contact with dromedaries (e.g. farmers, abattoir workers, shepherds, dromedary owners)
- health care workers caring for MERS-CoV patients
- Healthy adults infected with MERS-CoV tend to have mild subclinical or asymptomatic infections.

- To date, limited human-to-human transmission has occurred between close contacts of confirmed cases in household settings.
- The case clusters in the UK, Tunisia, Italy, and in HCWs in Saudia Arabia and France strongly suggest that human to human transmission occurs.
- MERS-CoV does not yet have pandemic potential.

Recommendation: Who are risk?

- Anyone visiting farms, markets, barns, or other places where dromedary camels and other animals are present should practice general hygiene measures, including regular hand washing before and after touching animals, and should avoid contact with sick animals.
- Consumption of raw or undercooked animal products, including milk and meat, carries a high risk of infection from a variety of organisms that might cause disease in humans.
- Animal products that are processed appropriately through cooking or pasteurization are safe for consumption, but should also be handled with care to avoid cross contamination with uncooked foods.
- Camel meat and camel milk are nutritious products that can continue to be consumed after pasteurization, cooking, or other heat treatments.

Case definitions:

- Limited data
- Fever, chills/rigors, headache, non-productive cough, dyspnea, and myalgia.
- Sore throat, coryza, sputum production, dizziness, nausea, and vomiting, diarrhea, and abdominal pain.

there is no particular symptoms, so how to support the Dx? by history. occupation wise, living wise.

Who needs to be monitored? (Patient Under Investigation):

- Fever AND pneumonia or ARDS AND EITHER:
- HX. of travel within 14d
- Close contact with a symptomatic traveler within 14d
- A member of a cluster of patients with severe acute respiratory illness? MERS

Case definitions:

- Confirmed case:
- Laboratory confirmation
- Probable case: a PUI with absent or inconclusive laboratory results for MERS-CoV infection who is a close contact of a laboratory-confirmed MERS-CoV case.

    - Includes anyone who provided care for the patient, including a HCWs or family member or another individual who had other similarly close physical contact, and anyone who lived with or visited a case while the case was symptomatic. we need to have them screened as well

Clinical manifestations:

- Incubation period:
    - days in S.Arabia very short
- 9-12 days: France
- 2-14 d
- WHO, CDC: MERS-CoV be considered in individuals with a syndrome of MERS who returned from travel to the Arabian countries within the past 14 days.

Laboratory findings:

- Leukopenia
- Lymphopenia
- Thrombocytopenia
- Virus isolation should be done from lower respiratory tract urine, feces, serum.
- Nasopharyngeal and oropharyngeal swab specimen

Whom to test?

- A person with an acute respiratory infection, which may include history of fever and cough and evidence of pulmonary parenchymal disease (pneumonia, ARDS) based upon clinical or radiographic evidence of consolidation, who requires admission to hospital.
- The disease is in a cluster that occurs within a 14-day period, without regard to place of residence or history of travel.
- Cluster: workplace, household, ...
- HCW who has been working in an environment where patients with severe acute respiratory infections are being cared.
- HX. Of travel to the Middle East within 14 days before onset of illness.
- Person with acute respiratory illness of any severity who, within 14 days before onset of illness, was in close physical contact with a confirmed or probable case of MERS-CoV infection while that patient was ill.

Treatment:

- No vaccine or specific treatment is currently available.
- Treatment is **supportive** and based on the patient's clinical condition.
- No antiviral agents are recommended for the treatment of MERS-CoV infection.

Prevention:

- There is no licensed vaccine for MERS-CoV.
- Infection control: standard, contact, and airborne precautions for the management of hospitalized patients.

Influenzas

General information:

Definition:

- Seasonal influenza is an acute respiratory infection caused by influenza viruses which circulate in all parts of the world.
- 4 types: A, B, C and D.

Influenza A and B viruses circulate and cause seasonal epidemics of disease

Subtypes:

- **Influenza A viruses** (Type A Influenza Cannot be Eradicated)
  A(H1N1) ……. A(H1N1) pdm09…. pandemic in 2009
  A(H3N2) influenza viruses.
  Only influenza type A viruses are known to have caused pandemics.
- **Influenza B viruses** are not classified into subtypes but can be broken down into lineages. Currently circulating influenza type B viruses belong to either B/Yamagata or B/Victoria lineage.
- **Influenza C virus** is detected less frequently and usually causes mild infections, thus does not present public health importance.
- **Influenza D viruses** primarily affect cattle and are not known to infect or cause illness in people.

Epidemiology:

- All age groups can be affected
- Pregnant women
- Children under 59 months
- Elderly,
- Individuals with chronic medical conditions (such as chronic cardiac, pulmonary, renal, metabolic, neurodevelopmental, liver or hematologic diseases)
- HIV/AIDS, receiving chemotherapy or steroids, or malignancy

- Health care workers are at high risk acquiring influenza virus infection due to increased exposure to the patients and risk further spread particularly to vulnerable individuals.

Transmission:

- Crowded areas including schools and nursing homes.
- When an infected person coughs or sneezes, droplets containing viruses (infectious droplets) are dispersed into the air and can spread up to one meter, and infect persons in close proximity who breathe these droplets in.
- The virus can also be spread by hands contaminated with influenza viruses.
- To prevent transmission, people should cover their mouth and nose with a tissue when coughing and wash their hands regularly.
- **Seasonal epidemics** occur mainly during winter, while in tropical regions, • influenza may occur throughout the year, causing outbreaks more irregularly.
- **Incubation period** 2 days but ranges 1- 4 days.

Avian Influenza

- Avian influenza is an infectious disease of birds caused by type A strains of the influenza virus.
- These viruses occur naturally among wild aquatic birds worldwide and can infect domestic poultry and other bird and animal species. The disease,
  - Fifteen subtypes of influenza virus are known to infect birds, thus providing an extensive reservoir of influenza viruses potentially circulating in bird populations.
  - H5N1; the strain of avian flu known as has been behind outbreaks of deadly avian flu.
  - Avian influenza transmitted by birds usually through feces or saliva.
  - Avian influenza is not usually passed on to humans, although it has been contracted by people who have handled infected birds or touched surfaces contaminated by the birds.
  - Migratory water birds, especially wild ducks. They may do not show clinical disease. The virus colonizes the intestinal tract and is spread in . . They act as a reservoir for the infection of other species the feces
  - Pigs can be infected by bird influenza (as well as by the form of § influenza that affects humans) and can pass on the flu to humans.

Swine Flu

- Swine influenza (swine flu) is a respiratory disease of pigs caused by type A influenza virus that regularly cause outbreaks of influenza in pigs.
- Like human influenza viruses, there are different subtypes and strains § of swine influenza viruses. The main swine influenza viruses circulating in U.S. pigs in recent years are: H1N1 influenza virus, H3N2 virus, H1N2 virus.
- Influenza in swine was first recognized as an epizootic disease in 1918.
- Swine influenza virus was first isolated from humans in 1974. Serologic evidence of infections with a swine influenza virus in humans has also been obtained. Viruses of swine may be a potential source of epidemic disease for humans.

Symptoms and Signs

- Systemic: fever
- Nasopharynx: Runny nose; sore throat
- Respiratory: Coughing
- Gastric: Nausea; Vomiting
- Intestinal: Diarrhea
- Psychological: Lethargy; Lack of appetite

Seasonal flu/ Pandemic flu

- **Epidemic (seasonal) influenza** which occurs annually and is § attributable to minor changes in genes that encode proteins on the surface of circulating influenza viruses. These are known as interpandemic epidemics.

- **Pandemic influenza** which occurs when more significant changes in § the influenza A virus arises when human virus strains acquire genes from influenza viruses of other animal species. When this happens, everyone in the world is susceptible to the new virus, and a worldwide epidemic or pandemic can result.

Infection Control

1-Clean

2-cover

3-Contact

Vaccination :

1-Flu shot (Inactivated vaccine Killed virus)

2-Nasal spray flu vaccine (Live attenuated virus vaccine (LAIV))

Treatment

Treatment with oseltamivir or zanamivir is recommended for all people with suspected or confirmed influenza who require hospitalization.

T.B

Transmission of M. tuberculosis:

- Spread by droplet nuclei.
- Expelled when person with infectious TB coughs, sneezes, speaks, or sings.
- Close contacts at highest risk of becoming infected.
- Transmission occurs from person with infectious. TB disease (not latent TB infection).

Probability TB Will Be Transmitted:

- Infectiousness of person with TB.
- Environment in which exposure occurred.
- Duration of exposure.
- Virulence of the organism.

Conditions That Increase the Risk of Progression to TB Disease:

- HIV infection.
- Substance abuse.
- Recent infection.
- Diabetes mellitus.
- Other immunosuppressive therapy.

Common Sites of TB Disease:

- Lungs (first organ gets affected by TB) (especially Apices of the lung).
- Pleura.
- Central nervous system.
- Lymphatic system.
- Disseminated (miliary TB) (when it spreads everywhere, it is hard to be removed).
- TB can affect any parts of the body.

Persons at Higher Risk for Exposure to or Infection with TB:

- Close contacts of persons known or suspected to have TB.
- Residents and employees of high-risk congregate settings.
- Health care workers (HCWs) who serve high-risk Clients.
- Medically underserved, low-income populations.
- Children exposed to adults in high-risk categories.
- Persons who inject illicit drugs.

Latent TB Infection (LTBI) (Goal = prevent future active disease):

- has TB infection, but No Disease, not sick and not INFECTIOUS.
- May develop TB disease if they do not receive treatment.

TB Infection (Goal = treat to cure, prevent transmission):
SICK, INFECTIOUS if PULMONARY and NOT INFECTIOUS if not PULMONARY.

Diagnosis of Latent TB Infection:

- person has a positive TB test result and a medical evaluation does not indicate TB disease.
- If a patient's skin test is positive yet he/she isn't presented with any symptoms, then we have to make sure if the patient is vaccinated or has latent TB infection.

Overall, about 5 to 10% of infected persons who do not receive treatment for latent TB infection will develop TB disease at some time in their live.

Testing for TB Disease and Infection:

1. **Tuberculin Skin Test**:

Factors that May Affect the Skin Test Reaction:
False-positive:
Nontuberculous mycobacteria BCG vaccination.
False-negative:

- Recent TB infection.
- Very young age (< 6 months old).
- Live-virus vaccination.

2. **Chest Radiograph**:

Cannot confirm diagnosis of TB

3. **Sputum Specimen Collection**.

4. **Medical History** (diagnosis can be made 90% depending on the history):

- Symptoms of disease
- History of TB exposure, infection, or disease
- Demographic risk factors for TB

Symptoms of Pulmonary TB:

- Productive, prolonged cough (duration of >3 weeks).
- Chest pain.
- Hemoptysis.

Systemic Symptoms of TB:

- Fever.
- Chills.
- Night sweats.
- Appetite loss.
- Weight loss.
- Easy fatigability.

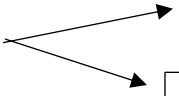
Treatment of TB Infection:

1. **Directly Observed Therapy (DOTs):**

- Health care worker watches patient swallow each dose of medication.
- Consider DOT for all patients.
- DOT can lead to reductions in relapse and acquired drug resistance.
- Use DOT with other measures to promote adherence.

2. **Treatment of TB for HIV-Negative Persons**

- Isoniazid.
- Rifampin.
- Pyrazinamide.
- Ethambutol or streptomycin.



Extrapulmonary TB
In most cases, treat with same regimens used for pulmonary TB

Bone and Joint TB, Miliary TB, or TB Meningitis in Children

Treat for a minimum of 12 months

3. **Multidrug-Resistant TB (MDR TB)**

- Presents difficult treatment problems.
- Treatment must be individualized.
- Clinicians unfamiliar with treatment of MDR TB should seek expert consultation.
- Always use DOT to ensure adherence.

Community TB Control:

1. **Preventing and Controlling TB**

Three priority strategies:

- Identify and treat all persons with TB disease.
- Identify contacts to persons with infectious TB; evaluate and offer therapy.
- Test high-risk groups for LTBI; offer therapy as appropriate.

-The current WHO recommended tuberculosis control strategy is BCG vaccination.

2. **Health care providers should work with health department in the following areas:**

- Overall planning and policy development.
- Identification of persons with clinically active TB.
- Management of persons with disease or TB suspects.
- Laboratory and diagnostic services.
- Data collection and analysis.
- Training and education.

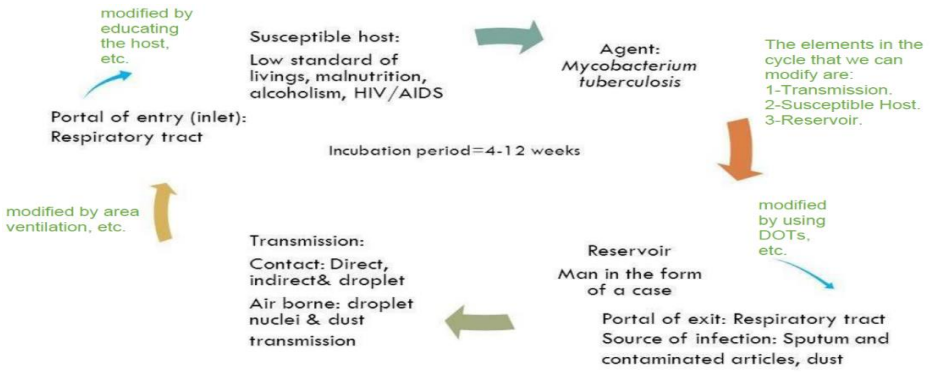
3. **Data Collection and Analysis**

- TB reporting required in every state
- All new cases and suspected cases promptly reported to health department
- All drug susceptibility results sent to health department

4. **Training and Education**

- TB control programs should
- Provide training for program staff
- Provide leadership in TB education to the community
- Ensure community leaders, clinicians, and policymakers are knowledgeable about TB
- Educate the public

Cycle of infection of pulmonary T.B



World Health Organization

www.who.int/tb

TUBERCULOSIS & DIABETES

THE DUAL EPIDEMIC OF TB AND DIABETES

DEADLY LINKAGES

- People with a weak immune system, as a result of chronic diseases such as diabetes, are at a higher risk of progressing from latent to active tuberculosis.
- Diabetes triples a person's risk of developing TB. About 15% of TB cases globally may be linked to diabetes
- TB can temporarily cause impaired glucose tolerance which is a risk factor for developing diabetes
- The likelihood that a person with TB will die or relapse is significantly higher if the person also has diabetes.
- A large proportion of people with diabetes as well as TB are not diagnosed, or are diagnosed too late.

KEY ACTIONS

- Early detection can help improve care and treatment outcomes of both diseases. All people with TB should be systematically screened for diabetes. Systematic screening for TB in people with diabetes should be considered in settings with high TB prevalence.
- WHO-recommended treatments should be rigorously implemented for people with TB/diabetes.
- It is important that proper care for diabetes is provided to minimize the risk of TB.
- Diabetes prevention on population level also helps prevent TB.
- A joint response is needed to ensure coordinated clinical management and address common health system bottlenecks and social determinants

World Health Organization

www.who.int/tb
www.who.int/tobacco

TUBERCULOSIS & TOBACCO

A strong association

- **Smoking substantially increases the risk of tuberculosis (TB) and death from TB**
- **More than 20% of global TB incidence may be attributable to smoking**
- **Controlling the tobacco epidemic will help control the TB epidemic**
- **Smoking is a risk factor for TB, independent of alcohol use and other socioeconomic risk factors**
- **Smoking increases the risk of TB disease by more than two-and-a-half times**
- **The WHO monograph on TB and tobacco describes other linkages and evidence**

HIV/AIDS

What is AIDS?

Acquired Immuno-Deficiency Syndrome (AIDS) is a severe life-threatening clinical condition,
This syndrome represents the late stage of infection with the Human Immuno-Deficiency Virus (HIV), which often results in progressive damage of the immune and other organ systems, especially the central nervous system (CNS).

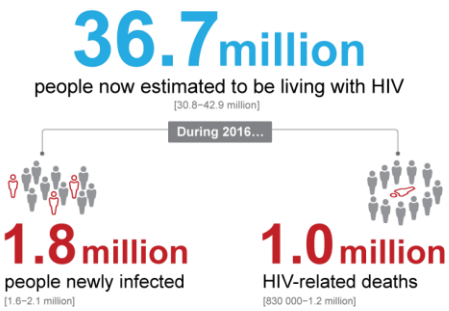
HIV/AIDS Pandemic: overall features

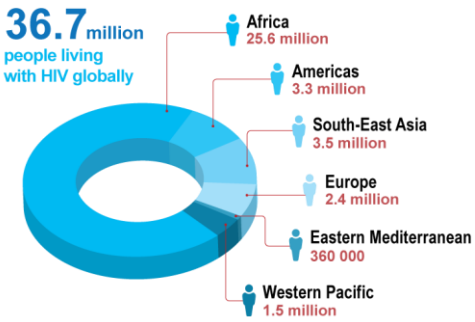
- Pandemic: all continents, all nations
- HIV has been isolated from ALL body fluids
- There are only three modes of transmission (Sexual 90%, Body fluids 5%, Mother-to-child 4%), body fluids it has higher transmission efficiency, however the sexual transmission is the predominant rout of transmission of HIV\AIDs.
- Incubation & communicability: long
- Asymptomatic infected (incubating carriers) are capable of transmission of the infection
- Impacts of infection: health, social, productivity, life expectancy, economic, overall development

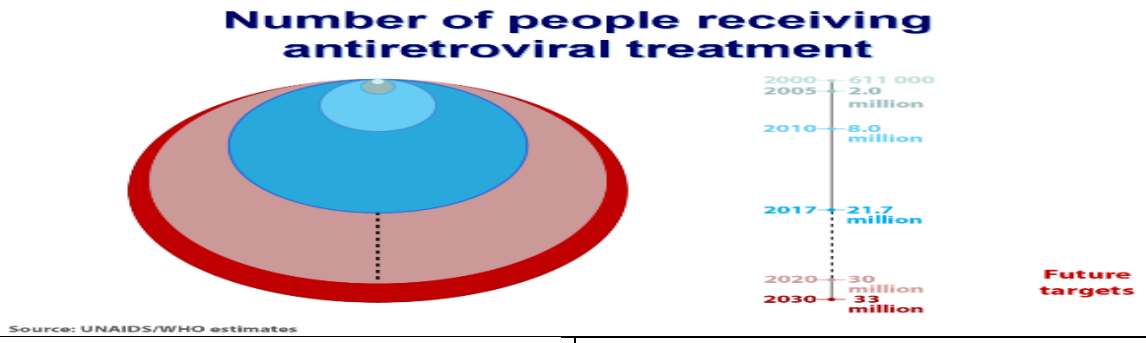
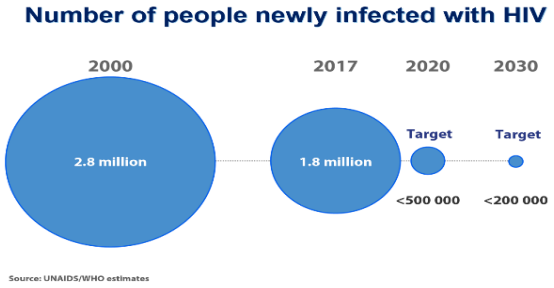
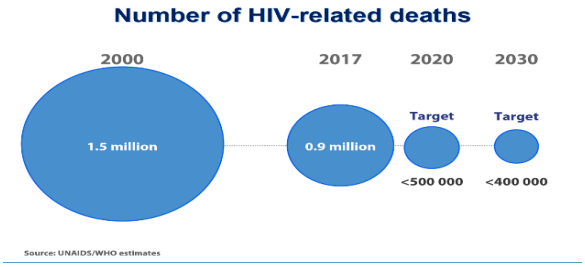
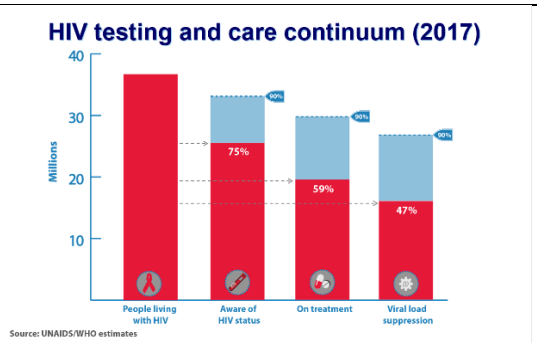
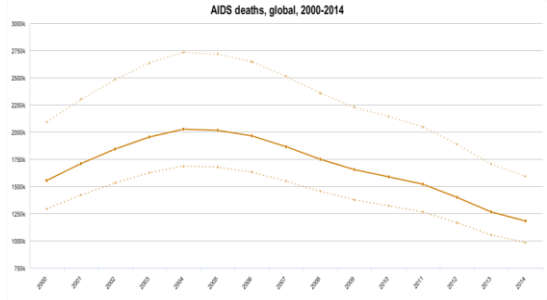
HIV/AIDS Infection cycle

- **Agent:** HIV retrovirus
- **Reservoir:** humans (cases, carriers)
- **Communicability increases with:** STI, TB, addiction, repeated contaminated injections / transfusions, sexual promiscuity (frequency, multiple partners)
- **Portal(s) of outlet:** semen, vaginal secretions, blood, skin… all the fluids of the body have shown HIV even saliva ... The other partner must have broken epithelium to get the virus.

Epidemiology

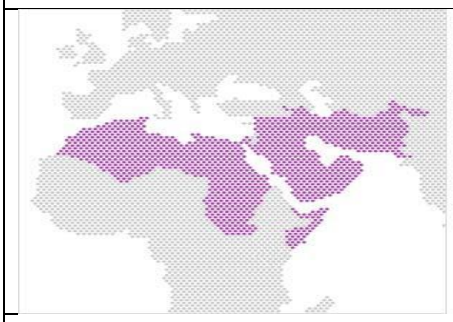
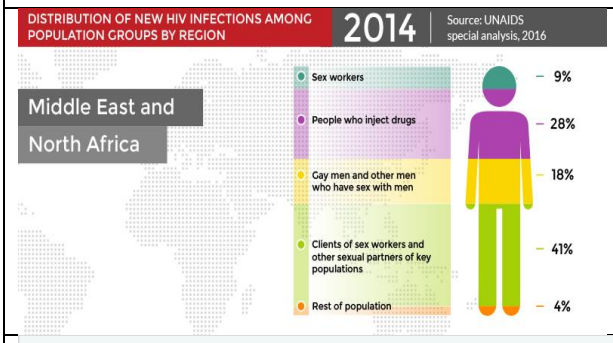
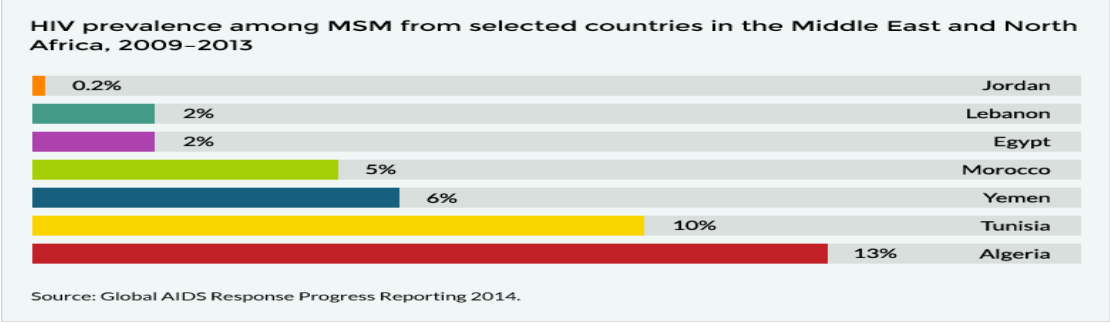




Graphs	Comments
	
	The number of newly affected people with HIV will decrease because they are going to increase the anti-retroviral treatment access and delivery … so, they are hoping and aiming that all HIV infected people will have access to treatment by 2030
	The death of HIV decline, but the rates of infection increase, that mean increase the burden of health care cost
	Here the dilemma is that the people who infected with HIV they do not know about their condition. Why? Because they do not have access to the testing and treatment & anti-retroviral is one of the expensive treatments in the world. So, there are saying that they are hoping to increase the awareness of HIV status by 90% and that will increase number of people who receive the treatment also the viral load suppression will increase.
	There is a decrease in the last years because of the awareness regarding the prevention. Also because of reporting and vaccination.

HIV/AIDS Pandemic: EMR features

- **Generalized epidemic** (> 1 %): in Djibouti, Sudan, some parts of Somalia
- **Concentrated epidemic** (> 5 %): among IDU in Iran, Libya, Pakistan
- **Age-gender distribution:** predominantly affecting adult (91 %) males (71 %)
- Modes of transmissions: mainly heterosexual (77 %); IDU (11 %); blood transfusion (5 %), mother to child (2 %)

Graphs	Comments
 	
 DISTRIBUTION OF NEW HIV INFECTIONS, BY COUNTRY, MIDDLE EAST AND NORTH AFRICA, 2016 Source: UNAIDS 2017 estimates.	
	So, its more common in the clients of sex workers then in people who inject drugs.
	

HIV / AIDS Prevention & Control

- **Globally**: UNAIDS (includes 10 UN agencies); IHRA (International Harm Reduction Association)
- **Nationally:** MoH- National AIDS Program (NAP),
- **Multi-sectoral:** National AIDS Committee (NAC) including: health, education, higher education, information, Islamic Affairs, Sports & Youth Welfare, planning, finance, labor, defense, interior
- **Non-governmental (civil service) organizations**

Prevention in the EMR

- Lebanon, efforts to prevent the mother-to-child transmission of HIV have been undermined by a lack of testing services in combination with expensive referral systems, fears around testing, as well as a lack of awareness and stigma
- HIV testing has been offered to women attending antinatal clinics in Oman since 2010 and has an acceptance rate of 99%. Along with the United Arab Emirates and Morocco, Oman has one of the highest testing coverages for pregnant women in the region.
- Iran's harm reduction programs have been recognized as good practice in preventing the transmission of HIV among people who inject drugs
- the government launched a campaign distributing clean needles and syringes in pharmacies across the country
- In Morocco, in 2012, a preventing mother-to-child transmission (PMTCT) program. It includes efforts to engage private health providers to offer HIV testing and counselling (HTC) and HIV awareness for pregnant women. basic health facilities had been established to provide HTC services for pregnant women
- The most effective method to prevent sexual transmission in Mediterranean region are mutual fidelity and condom use.

Barriers to HIV prevention programs in the Middle East and North Africa

- Cultural and social barriers
- Political barriers
- Legal barriers

General recommendations for HIV/AIDS prevention

- **Primary:** Health education efforts HIV\AIDs (which help in reducing the incidence), preventing transmission
- **Secondary:** health education, counseling, health care, support (avoid stigmatization this is the main thing that we are struggling in the middle east, discrimination), protect society (public health measures)
- **Tertiary:** care for the terminally ill, managing complications and associated conditions
- **Vulnerable groups:** youngsters & women (in general) but IDU, prisoners, TB & STI patients, homosexuals, prostitutes (in specific)
- **Other groups:** migrant workers, refugees and displaced persons, transport workers, & tourists

- **Preventions of sexual transmission:**

1. **Global recommendations:**
   abstinence, condom use
2. **EMR Recommendations:**
   fostering religion, health education (curricula, information, skills, behavior) dealing with the problem as a social/health issue, use of mass media (advertisements, plays, dialogues)

- **Prevention of blood transmission:**

1. Safety measures & screening at every stage
2. Voluntary un-paid donors only

3. Transfusion, only when needed
4. Careful history-taking and physical examination

- **Prevention of perinatal transmission:**

1. Pre-marital counseling
2. Infected women are advised not to conceive
3. Use of AZT (reduces transmission risk by 2/3)
4. In general, breast feeding should be continued
5. Case-management: compulsory notification

Malaria

What is malaria?
Malaria is a life-threatening disease caused by Plasmodium parasites (causative agent) that are transmitted to people through the bites of infected mosquitoes (vector: anopheles mosquitoes) and it's responsible for approximately 1-3 million deaths per year.

Epidemiology			
In 2016, there were 216 million cases and 445,000 deaths caused by malaria worldwide.	Between 2000 and 2015, malaria incidence fell by 37% globally.	During the same period, malaria mortality rates decreased worldwide by 60% among all age groups, and by 65% among children under 5.	In 2014, 13 countries reported zero cases of the disease and 6 countries reported fewer than 10 cases.

Malaria in Saudi Arabia		
Areas at the **southern region** are at risk of malaria transmission, specifically **Asir and Jizan**. The Dominant Malaria Species in Saudi Arabia is **P. Falciparum.** humidity is perfect for the growth of the vector	Saudi Arabia achieved a decrease in malaria cases and case incidence rates of **≥75%.**	Malaria outbreak in 1998. Since then, only a few cases were reported.
	In 2012, only 82 cases of malaria were reported.	The proportion of imported malaria has increased from 23% to 99% of total detected cases.

Malaria	**Host:**	**Human**	**Vector:**	**Anopheles Mosquitoes**
	Agent:	**Plasmodium parasite**	**Environment:**	Humidity, stagnant water, mosquitoes rate, cases rate,

Plasmodium Parasites				
Plasmodium falciparum	P. vivax	P. ovale	P. malariae	P. knowlesi
P. falciparum and P. vivax pose the greatest threat. In Saudi Arabia most commonly is falciparum.				
Transmitted				
Through the bites of infected female Anopheles mosquitoes (vector).				
Other modes of transmission:				
From mother to unborn child. Technical transmission from mother to baby.			Blood transfusion	

Imported Malaria:	**via asymptomatic travelers from malaria endemic areas, sustains a threat for possible resurgence of local transmission: Workers, immigrants, pilgrims.**

Clinical features:		
Paroxysmal fever	**Cold stage:**	lassitude, headache, nausea, chills. (¼ -1 h) skin cold then hot.
	Hot stage:	skin hot and dry (2 -6 h).
	Sweating stage:	fever subsides, sweating (2 -4 h)
Early Symptoms: Fever, Headache,and Chills. **If not treated** early might progress to **Severe illness**, Severe anemia, Respiratory Distress, Cerebral malaria,and Multiorgan failure.		

Risk factors		
No or little immunity against the disease in areas with high transmission.	Young children, who have not yet developed partial immunity to malaria.	Pregnant women, whose immunity is decreased by pregnancy.
Environmental: rain seasons.	People with low immunity such as HIV patients.	Poverty.
Travelers or migrants coming from areas with little or no malaria transmission, who lack immunity.		

Immunity against malaria (protection)
Genetic Factors: Biologic characteristics present from birth can protect against certain types of malaria: **(having the sickle cell trait)**
Acquired Immunity: newborns in endemic areas will be protected during the first few months by maternal antibodies
Repeated attacks of malaria

Diagnosis	
Microscopy: thin film, thick film	Rapid diagnostic test (RDT)
Serology: two weeks after infection, past infection in epidemiological studies.	

Community Diagnosis				
Pre-eradication: spleen rate, parasite rate	Eradication: microscopic diagnosis	Parasite incidence·	Blood examination rate	Vector indices
Human blood index	Sporozoite rate	Mosquito density	Man biting rate	Inoculation rate

Treatment				
Choice of treatment line depends on:				
Type of plasmodium species and stages of malaria parasites.	Clinical status of patient: Uncomplicated or Severe, or pregnancy.	· Drug sensitivity of the infected parasite (area)	Previous exposure to anti-malarial drugs.	
Artemisinin combination therapy (ACT): (3days) Monotherapy is not recommended for malaria treatment to prevent drug resistance.				
For uncomplicated malaria:				
First line:	(ARTESUNATE + SP); alternative (ARTESUNATE + MEFLOQUINE)			
Second Line:	(ARTEMETHER + LUMEFANTRINE)			
Third Line:	(oral QUININE + DOXYCYCLINE)			
A single dose of Primaquine is added to the first day as a gametocidal medication.				
Primaquine is contraindicated in:				
G6PG deficiency	pregnancy	children < 6m	lactating mothers for babies	hypersensitivity
Treatment failure. Failure to resolve or recurrence of fever or parasitemia:				
Early (1-3 days of treatment)			Late: (4days – 6 weeks after treatment)	
Causes:				
1-Poor adherence to treatment		2-Low or incomplete dose	3-Abnormal individual pharmacokinetics	4-Drug resistance
Antimalarial drug resistance: The ability of the parasite to survive and/or multiply despite the administration and absorption of medication. **Reasons:**				
1-Exposure of the parasite to insufficient amount of the drug				
2-Low dose prescribed	3-Lesser amount dispensed	4-Incomplete treatment	5-Vomiting	6-Low absorption

WHO efforts in malaria control: (Global Technical Strategy for Malaria 2016–2030)		
1.Ensure universal access to malaria prevention, diagnosis and treatment.	2.Accelerate efforts towards elimination and attainment of malaria-free status.	3.Transform malaria surveillance into a core intervention.

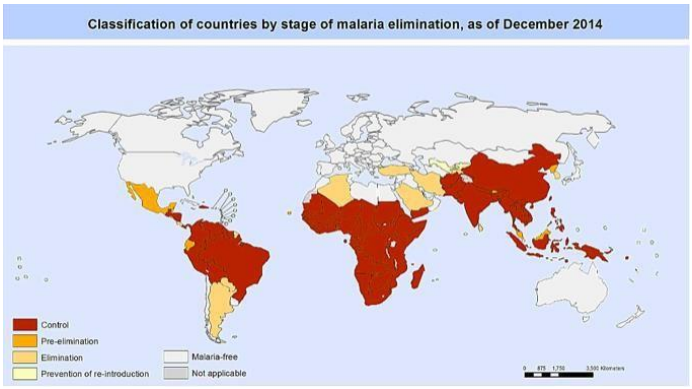
Control of malaria: Vector eradication is the BEST way to prevent malaria The main way to reduce malaria transmission at a community is vector control by apply the following:		
1-Decrease human-mosquito contact: (Primary prevention)		
Insecticide-treated mosquito nets (ITNs)	For all at-risk persons	Provision of free LLINs (long-lasting insecticidal net)
Everyone sleeps under a LLIN every night.		
2-Destruction of adult mosquitoes: (primary)		
Indoor spraying with residual insecticides	At least 80% of houses in targeted areas are sprayed	Protection depends on type of insecticide.
3-Destruction of mosquito larvae: (primary): Larviciding of water surfaces, intermittent irrigation, biological control		
4-Environmental control (secondary): Environmental sanitation, water management, drainage		
5-Source reduction (secondary): Environmental sanitation, water management, drainage		
6-Chemoprophylaxis (secondary):		
To travelers, travelers to Malaria Endemic areas receive prophylactic chemotherapy Before, during and after traveling.		
Pregnant women	Infants in endemic areas	Seasonal chemoprevention

7-Vaccination (secondary): Still under trial
8-Social participation (secondary): Health education, community participation

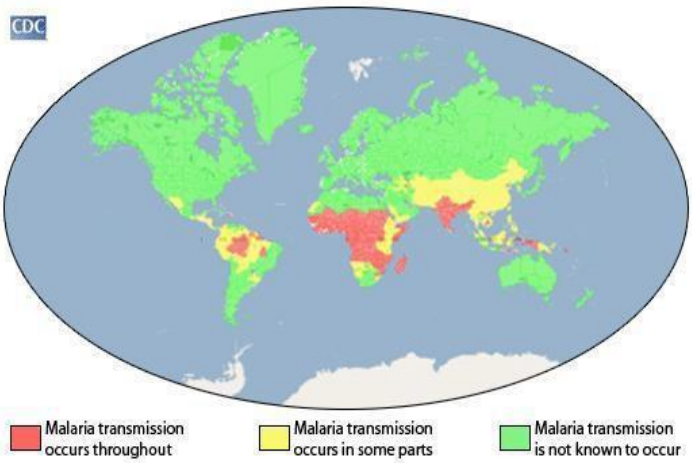
Risk factors in Saudi Arabia:	
Heavy rainfall season.	Army personnel and employees working at the Southern borders.
Travelers to countries with active malaria transmission.	Pilgrimage from regions with active malaria transmission.

Prevention and control of malaria in KSA: **The current elimination strategy in Saudi Arabia focuses mainly on:**	
1. Targeting high risk areas for sustained preventative measures such as (Long lasting insecticide treated nets, Indoor residual spraying).	2. Management of infection through rapid confirmed diagnosis and treatment.
3.Individual case follow up and reactive surveillance with appropriate treatment and vector control.	4.Active case detection at borders with screening and treatment.

Malaria and Hajj season:	
Measures applied before inlet of Pilgrims:	
Spray health care facilities pilgrim's camps with residual insecticides.	**Surveillance at Hajj Entry ports** (suspected cases/ necessary measures).
Measures applied during Hajj season:	
Epidemiology investigation malaria cases (proper diagnosis/treatment).	Secure malaria drugs and treatment policy for all health care facilities.



- Density of infection
- Darker color indicates more cases of malaria
- red > control: large number of cases
- Pre-elimination: less cases near to elimination
- مناطق استوائية the weather such as humidity and pond: mosquitoes will have proper weather to multiply
- Most cases of malaria are in : south America, south Africa and south Asia.
- elimination: they don't have cases
- Saudi Arabia is in the elimination phase, meaning we don't have high amount of cases,



- Green color doesn't mean the incidence rate, it talks about transmission. How many transmissions happen from the vector?
- Saudi Arabia is green, meaning that there is no transmission. that doesn't mean we don't have cases because we do have cases, but most of the cases come from abroad
- yellow have medium transmission.
- in the whole world falciparum and vivax both of them are common.

Hajj

Factors affecting pilgrims in the gathering of Hajj

1. Population factors
2. Environmental factors
3. Other factors.

Population factors:

- Different prevailing local infectious diseases
- Varying immunity.
- High proportion of elderly & chronically ill people.

Environmental factors:

- Weather, mostly dry and dusty.
- Huge crowd size, high population density, all time everywhere,
- Extended outdoor ritual event.
- Continuous mobility with physical effort.

Other factors:

- Food related
- transport & storage
- Waste, Human secretions & excreta
- Inappropriate / wrong behaviors
- Insects & disease vectors
- Animal slaughtering associated with Hajj→ Waste and Injuries.

Health Risks associated with Hajj:

1-communicalbe diseases:

- respiratory infections
- GIT infections
- **meningitis**
- blood borne diseases.

2-Non- communicable diseases:

- heat injury
- Complications to NCD
- accidents

risks to population:

- Individuals can efficiently transmit communicable diseases to many others;
  - Other pilgrims
  - Local population
  - When return to their home population.
- Opportunity for terrorism / violence.
- Put more strain on the infrastructure.

communicalbe diseases

- Diseases endemic in the host country
- Diseases endemic in the home countries
- International travel
- Increase with mix of populations

Types of Communicable diseases

- Respiratory infections
- Gastrointestinal infections
- Meningitis
- Blood-borne diseases

respiratory Infections

- E.g.: Coryza (cold),TB, seasonal influenza and bronchitis.
- They are transmitted through the droplets of coughing, sneezing or speaking.
- Overcrowding

- Direct contact with infected patients
- Sharing of personal tools
- Decreased personal hygiene

Prevention and Reduction of Spread:

- **Face-masks**
- Coughing/sneezing etiquette
- Hand washing
- No touching of eyes, nose or hands without proper hand washing.
- Vaccination against seasonal influenza
- WHO and ministry of health in KSA did a collaboration to start a surveillance program about MERS-Cov at Al Hajj to detect outbreaks.

Treatment

- Supportive treatment
- Rest, drinking fluids
- Antipyretics and painkillers.
- See a doctor on the onset of acute symptoms

EE

T.B

- Airborne transmission through the droplets of coughing, sneezing or speaking.
- Saudi Ministry of Health calls upon tuberculosis patients to put their Hajj off for later years.

Gastrointestinal Infections

Many pilgrims are prone to food poisoning especially by salmonella.

Symptoms:

- Diarrhea, constipation, nausea and vomiting, headache, fever and abdominal pain.

Causes

- Consumption of uncooked food (eggs), meet or improper storage of food (cream)
- Consumption of unwashed fruits or vegetables
- Consumption of unpasteurized milk
- Negligence of hand washing

Prevention:

- Proper hand washing
- Washing fruits and vegetables,
- proper cooking and storing of food
- Drinking pure water and pasteurized milk.
- restricting the entry of Hajjis coming from affected countries was the most effective action taken under the international health regulations (IHR) in Saudi Arabia to prevent Ebola virus diseases (EVD) outbreak during the Hajj season of 2014.

Blood born disease

- e.g.: Hepatitis B, C and HIV.

Causes: Head shaving using non-sterile blades or re-used

- licensed barber facilities at the Hajj premises to shave their heads
- The Saudi MoH encourages all pilgrims to receive the full series of hepatitis B vaccination prior to travel to Hajj

Meningococcal meningitides

- A bacterial disease caused by one of the most virulent human pathogens.
- **caused by:** Neisseria meningitides**,** Different serogroups the most important are: (A,B,C,W135,Y,X & Z).
- **Reservoir**: Humans (carriers)
- **Transmission**: droplet infection
- **I.P**: 2-10 days
- **High priority importance**
  - Can cause devastating epidemics.
  - Health system
  - Preventive med, Hajj program.
  - Highly public health concer

Case Definition

Adults & children >1yr	Children < 1yr
• Sudden onset, • Fever, headache, stiff neck • consciousness deterioration. • Meningial signs; Kerning..Brudziniski Skin rash.. petichial	• Fever, bulging fontanels, fits, skin rash • Vomiting, stiff neck, lethargy, feeding refusal

Confirmation

- Laboratory identified organism (microscopy)
- +ve CSF smear
- Culture (CSF / blood)

Preventive Measures: Towards Patient

1- Immediate reporting: on suspicion /and then with culture results

2- Isolation: Respiratory isolation ,for 24hrs after start of chemotherapy.

Preventive Measures: Towards Contacts

- **Identify contacts;** direct & indirect
- **Vaccination** (the unvaccinated)
- **Chemoprophylaxis;** For intimate contacts.
- Close **surveillance**

Vaccination

- Adults and children over the age of 2 years must be given 1 dose of the **quadrivalent** (ACYW135) vaccine;
- Certificate of vaccination issued not more than 3 years previously and **not less than 10 days** before arrival in Saudi Arabia

Chemoprophylaxis

- Chemoprophylaxis for arriving pilgrims from the African meningitis belt Local Hajjes & workers before departing Makkah.
- External Hajjes before departure (optional)
- Intimate contacts.
- Ciprofloxacin for adults (single dose 500mg PO).
- Rifampicin for children (5-10 mg/Kg bd /2 days).
- Ceftriaxone for pregnant ladies (single dose 250 mg i.m).

Non-communicable disease :

1-Heat injury

Heat stroke	Heat Exhaustion
• When core body temperature exceeds 40C with confusion and dry skin. • Headache and dizziness, dehydration, and skin redness. • **Extremely serious condition,** if not treated can lead to heart dysfunctions, nervous system dysfunction, renal failure and end with death.	• A **less serious** condition than sun stroke. • Extreme fatigue in hot weather • **Signs and symptoms:** cold and wet skin, excessive sweating, low heart beat, fast breathing, thirst, dizziness, nausea, fatigue, loss of consciousness.
Treatment: • Mechanical cooling (cold compressions, cold water, cool place,.....) • Resuscitation	

2-Complecation of chronic disease

Diabetes

- Hypertension
- Heart disease
- Kidney disease
- Epilepsy
- Asthma

Diabetes

- **Risks:** Hypo/hyperglycemia, foot ulcers
- **Precautions:**
  - Wrist bracelet or identification card.
  - Carrying glucometer, enough amount of diabetic medications, keeping insulin in proper temperature
  - Wearing socks, avoiding walking barefoot
  - Doctor's consultation
- **Symptoms of hypoglycemia:** severe fatigue, sudden hunger, blurring, excessive sweating
- **management**: Rest, snack...

Cardiovascular diseases

- Doctor's visit before going to hajj.
- Taking medications, and compliance.
- Avoid/ decrease mental and physical stress

General advice for chronic disease patients

- Doctor's visit before going to hajj
- Taking enough amount of medications
- Taking special precautions depending on diseases

3-Accedent:

1. **Fire**:

Solutions:

- Permanent fiberglass structures for tents
- Cooking in the tents is also prohibited.
- Evacuation plans.

2. **Trauma**
   - Major cause of injury and death during Hajj.
   - Motor vehicle crashes/ crowd crushes
   - Round pillars were replaced with wide, elliptical columns
   - Wider, multilevel bridge
   - Personal cars are prohibited from entering holy cites
   - Busses and train (almashae'er)

General health guidelines for pilgrims	
Before hajj	**During hajj**
• Necessary vaccinations • Doctor's visit before • Taking sufficient medications • Carrying a detailed report of medical condition and Personal tools	• Hygiene and general cleanliness • Shaving and hair cutting • Protection against food poisoning during Hajj

Health regulations for Hajj and Umrah

Regulations to obtain an entry visa for Hajj and Umrah

- Health education
- Food material
- Diseases surveillance
- **Hajj vaccinations:**

  1- Yellow Fever
  2- Meningococcal Meningitis
  3- Poliomyelitis
  4- Seasonal Influenza

Yellow fever vaccine

International health regulations (IHR 2005) obliged all travelers from countries or areas at risk of yellow fever to present valid vaccination certificate

- At least 10 days and at most 10 years before arrival at the border
- No certificate, individual will be placed under strict surveillance for 6 days from the date of vaccination or the last date of potential exposure to infection, whichever is earlier

Meningococcal Meningitis

Required from:

a) Visitors from all countries:

Umrah or pilgrimage (Hajj) or for seasonal work

submit a certificate of vaccination with the quadrivalent (ACYW135) vaccine against meningitis issued no more than 3 years and no less than 10 days before arrival in Saudi Arabia.

b) Visitors from African Countries: In addition to vaccination

ciprofloxacin tablets (500 mg) chemoprophylaxis will be administered at **port of entry** to lower the rate of carriers.

C) Interior pilgrims and the Hajj workers:

- All **citizens** and residents of **Madina and Makka** who were not vaccinated in the last 3 years
- All citizens and residents undertaking the **Hajj**
- All **Hajj workers** who have not been vaccinated in the past 3 years
- Any individual working at **entry points** during Hajj season

Poliomyelitis

countries reporting imported polio or vaccine-derived poliovirus (past 12m)	**polio-endemic countries**
• Visitors <15 years of age • Vaccination certificate (IPV, OPV) at least 6 weeks before visa application • Will receive 1 dose OPV at entry to SA • Eg: Kenya, Yemen	• All visitors • Vaccination certificate (OPV, IPV) 6 weeks before visa application • Will receive 1 dose OPV at entry to SA • Eg: Afghanistan, Nigeria

Seasonal Influenza

Recommended for:

- International pilgrims before arrival to KSA especially high risk people: pregnant women, children under 5 years, the elderly, and individuals with underlying health conditions such as HIV/AIDS, asthma, and chronic heart or lung diseases
- Internal pilgrims, particularly those at high risk described
- All health-care workers in the Hajj premises

Health Education

- Health authorities in countries of origin are required to provide information to pilgrims on:
- Infectious diseases symptoms, methods of transmission, complications, and means of prevention
  - Hand washing
  - Face mask

Food Material

- Hajj and Umrah performers are not allowed to bring fresh food into Saudi Arabia.
- Only properly canned or sealed food or food stored in containers with easy access for inspection is allowed in small quantities, sufficient for one person for the duration of his or her trip

Disease surveillance

Notifiable disease (immediately reported)

- Preliminary reporting includes; name, age, sex, nationality, dates of arrival, onset, isolation & positivity, Vaccination status , Serogroup.
- Suspected cases early preventive measures
- Confirmed cases (confirm by telephone call)) to MOH and HESN

Types of Surveillance During Hajj

• Surveillance at entry points

• Targeted infectious diseases
  - Influenza
  - Meningitis
  - Hemorrhagic Fevers • Cholera
  - Plague
  - Food poisoning
  - Others : (according to global situation...)

Hepatitis

Viral Hepatitis

- Infection of the liver caused by any type of viruses.
- Past > Hepatitis A virus (HAV) and hepatitis B virus (HBV) were the only known aetiological agents of viral hepatitis
- Present > Hepatitis viruses C, D, E and G have also been identified and are recognized as aetiological agents of viral hepatitis
- Other causative viruseѕ cytomegalovirus (CMV), Epstein- Barr virus, yellow fever virus and rubella virus (less common , but may cause hepatitis in immune compromise people)

WHO Global Hepatitis Report 2017:

- Viral hepatitis caused 1.34 million deaths in 2015
- Most viral hepatitis deaths in 2015 were due to chronic liver disease (liver cirrhosis) and primary liver cancer (hepatocellular carcinoma)
- Globally, in 2015,
  - 257 million people were living with chronic HBV infection
  - 71 million people with chronic HCV infection.

Hepatitis A

- Acute infectious disease caused by hepatitis A virus (HAV).
- **Symptoms**
  - Nonspecific symptoms (Fever*, chills, headache, fatigue, generalized weakness and pains)
  - Followed by (anorexia, nausea, vomiting, dark urine and jaundice**).

* fever is mainly with HAV, rare with HBV HCV

** jaundice is very imp. symptoms for hepatitis bc it is more specific

- **Mode of transmission**
  - Fecal–oral rout

Global Burden of HAV

endemic in most developing countries, WHO estimates that worldwide, hepatitis A caused approximately 11 000 deaths in 2015 (accounting for 0.8% of the mortality from viral hepatitis).

we divide areas into 3 parts:

1- high level of infection (non-develop countries) .2- intermediate (between non-develop and developed countries) = have higher infection rate. 3- developed countries = low infection

Prevalence of HAV in USA

Hepatitis A rates in the United States have declined by more than 95% since hepatitis A vaccine first became available in 1995.

Epidemiological determinants of HAV

Agent Factors	
Agent	● The hepatitis A virus, is an enterovirus ● It multiplies only in hepatocytes. ● Faecal shedding of the virus is at its highest during the later part of the incubation period and early acute phase of illness.
RESERVOIR OF INFECTION	The human cases are the only reservoir of infection.
PERIOD OF INFECTIVITY	The risk of transmitting HAV is greatest from 2 weeks before to 1 week after the onset of jaundice.
INFECTIVE MATERIAL	Mainly man's faeces.
Host Factors	
AGE	● Infection with HAV is more frequent among children than in adults. However, people from all ages may be infected if susceptible.
SEX	● Both sexes are equally susceptible
IMMUNITY	● Immunity after attack probably lasts for life.
Environmental Factors	Poor sanitation and overcrowding favour the spread of infection, giving rise to water-borne and food-borne epidemics.

Incubation Period of HAV

- 14-28 days
- The length of the incubation period is proportional to the dose of the virus ingested.

Clinical spectrum

Prevention and Control	
Control of reservoir	Control of reservoir is difficult because of: ● Faecal shedding of the virus is at its height during the incubation period and early phase of illness ● The occurrence of large number of subclinical cases Strict isolation of cases is not a useful control measure (bc infection may occur before symptoms appear)
Control of transmission	The best means of reducing the spread of infection is by ● Promoting simple measures of personal and community hygiene ● Hand washing before eating and after toilet ● The sanitary disposal of excreta which will prevent contamination of water, food and milk ● Proper disposal of sewage within communities.
Control of susceptible population	● Targeted protection of high-risk groups e.g. travellers to areas of intermediate or high endemicity. ● Universal Vaccine (for infants too).* ● Human immunoglobulin.

Vaccines

Types of hepatitis A vaccines:

Formaldehyde inactivated Vaccines	Live attenuated Vaccines
• Safe after the age of 12 months • The complete vaccinations schedule consists of 2 dose administration into the deltoid muscle • The interval between the firs(primary) dose and the secondary(booster) dose is commonly 6-12 months (18-36 months) • It can be administered simultaneously with other vaccines • Following 2 doses of vaccine the protective efficacy about 94% • Mostly used in KSA	• The live attenuated vaccine is administered as a single subcutaneous dose.

Hepatitis B

- Blood-borne infection
- Usually, it is an acute infection, which may be either subclinical or symptomatic.
- In approximately 5 to 15% of cases, HBV infection fails to resolve and the affected individuals then become persistent carriers of the virus (presence of HBsAg for > 6 months)
- Persistent HBV infection may cause progressive liver disease including chronic active hepatitis and hepatocellular carcinoma
- In 2015, the global prevalence of HBV infection in the general population was 3.5%
- Prevalence was the highest in the African (6.1%) and Western Pacific regions (6.2%)
- A dults chronically infected may include 65 million women of childbearing age who can potentially transmit HBV to their babies

Agent Factor	
Agent	• The hepatitis B virus • It multiplies in liver cells.
RESERVOIR OF INFECTION	• The human cases are the only reservoir of infection. • Persistent carrier defined as the presence of HBsAg for more than 6 months
PERIOD OF INFECTIVITY	• The virus is present in the blood during the incubation period (for a month before jaundice) and acute phase of the disease. • Period of communicability is usually several months or until disappearance of HBsAg and appearance of surface antibody.
INFECTIVE MATERIAL	• Contaminated blood is the main source of infection • body secretions such as saliva, vaginal secretions and semen of infected person

Host factors	
Age	• The outcomes of HBV infection are age-dependent • The development of chronic HBV infection in inversely related to age
Hepatitis B and HIV infection	It is that 10% of the 40 million people infected with HIV worldwide are coinfected with HBV.
High-Risk groups	• Recipients of blood transfusions • Health care workers • Laboratory personnel • Percutaneous drug abusers • Infants of HBV carrier mothers • Recipients of solid organ transplants • patients who are immunocompromised

Mode of Transmission

1. Parenteral route

- Transfusions
- Dialysis
- Contaminated syringes and needles , Pricks of skin
- Handling of infected blood

2. Perinatal transmission

- Spread of infection from HBV carrier mothers to their babies (at time of delivery, thats why we give HBV vaccine(and immunoglobulin) given within 24 hours after delivery) *
- The majority of children born to mothers who are HBeAg- positive become chronically infected

3. Sexual transmission

Incubation Period

- It is clinically characterized by a tendency to a long incubation period
- Usually 30 to 180 days (average 75 days) Lower doses of the virus result often longer incubation period. (opposite to HAV)

Prevention and Control

- Since there is no specific treatment, prevention has been the major aim in managing viral hepatitis B.
- General preventive measures:
  - All blood donors should be screened for HBV infection
  - Health Care workers should be alerted to the importance of adequate sterilization of all instruments and to the practice of simple hygienic measures
  - Carriers should be told not to share tooth brushes and use barrier methods of contraception; they should not donate blood

Hepatitis B Vaccine

- The recommended schedule for vaccination is a 4 dose schedule where the dose at birth is followed by three additional doses at 2, 4 and 6 months with DPT vaccination.
- These doses may be given either as monovalent vaccine or as a combination (eg. With DPT and/or Hib)
- The minimum recommended interval between the doses is 4 weeks.

Immunization in adults

- Routine pre-exposure vaccination should be considered for high risk group
- The usual schedule for adults is 2 doses separated by no less than 4 weeks, and a third dose 4 to 6 months after the second dose

Hepatitis in KSA

- In 2007, the Saudi Ministry of Health (MOH) ranked viral hepatitis as the second most common viral disease after chickenpox, with almost 9000 new cases diagnosed in that year (52% HBV, 32% HCV, and 16% HAV).

Hepatitis C	• Hepatitis C is a contagious liver disease that results from infection with the hepatitis C virus.

Route of transmission:	• The HCV is most commonly transmitted through exposure to infectious blood
	  ○ Receipt of contaminated blood transfusions, blood products and organ transplants
	  ○ Injections given with contaminated syringes and needle-stick injuries in health-care settings
	  ○ Injection drug use
	  ○ Born to a hepatitis C-infected mother
	• Sexual transmitted route

Burden of Hepatitis C	• Every year, 3-4 million people are infected with the HCV. • About 130-150 million people are chronically infected and are at risk of developing liver cirrhosis and/or liver cancer. • More than 500,000 people die from hepatitis C - related liver diseases every years. • About 75-85% of newly infected persons develop chronic disease (it is more dangerous than HBV bc high chance it will be chronic) • 60- 70% of chronically infected people develop chronic liver disease; 5-20% develop cirrhosis and 1-5% die from cirrhosis or liver cancer. • In 25% of liver cancer patients, the underlying cause is hepatitis C.
Incubation Period	• The incubation period for hepatitis C is 2 weeks to 6 months. (same as HBV) • Prevention and Control
Prevention and control:	**the main preventive measures for hepatitis C is Screening of blood donors**

primary	• There is no vaccine for hepatitis C.
	• The risk of infection can be reduced by avoiding:
	  ○ unnecessary and unsafe injections;
	  ○ unsafe blood products;
	  ○ unsafe sharps waste collection and disposal
	  ○ use of illicit drugs and sharing of injection equipment
	  ○ unprotected sex with hepatitis C-infected people
	  ○ sharing of sharp personal items that may be contaminated with infected blood
	  ○ tattoos, piercings and acupuncture performed with contaminated equipment.

Secondary and tertiary prevention	For people infected with the HCV, WHO recommends: • Education and counselling on options for care and treatment • Immunization with the hepatitis A and B vaccines to prevent coinfection from these hepatitis viruses. • Early and appropriate medical management including antiviral therapy if appropriate • Regular monitoring for early diagnosis of chronic liver disease.

Outbreak Investigation

- **Endemic:**
  - Constant presence of prevalence of a disease in a given geographic area.
- **Epidemic:**
  - Sudden increase in the cases for a certain disease above what is normally expected in that population.
- **Pandemic:**
  - When an epidemic spread over several countries.
- **Outbreak:**
  - An epidemic that occurs in a limited geographic area (e.g. an institution, a home facility…)
- **Cluster:**
  - Aggregation of cases in a given area over a particular period without regard to whether the number of cases is more than expected.

Importance:

- Detecting unusual clusters can hint to the occurrence of an outbreak.

- Outbreaks Detection:

- **Analyzing surveillance data:**
  - Reviewing exposure from reports sent by labs and healthcare providers.
- **Health Ministry:**
  - Conducts periodical routine surveillance for infectious disease cases
- **Infection and control at the hospital:**
  - Review microbiological isolates of organisms in wards
- **Vigilant physician:**
  - Unusual cluster > reports to health authorities

- Factors that may affect the decision to investigate an outbreak:

1) Number and pattern of people involved (cluster of cases)
2) Type of disease (ease of transmission; causative agent)
3) Severity of disease; unusual presentation
4) Availability of effective control measures
5) If the disease needs prompt control measures to prevent fast spread.
6) Availability of staff and resources to conduct investigation.

- Reasons for conducting an outbreak investigation

- Control and prevention
- Learning and training
- Research opportunity
- Public or legal concerns

- Steps for conducting an outbreak investigation:

1-Prepare for field work:

- Do you have knowledge/resources/staff for the field?
- Need of laboratory tools?
- Equipment for protection?
- Action plan?
- Team members
- zoonotic disease? (veterinarian?)

2-Establish the existence of an outbreak:

- Number of cases higher than usual?
- Cluster with same complaints?

- Increase in reporting real or due to improvement of diagnosis and surveillance methods?
- Severity? control measure? does this need prompt response?

3-Verify the diagnosis:

- This is required to:
  1. Ensure properly diagnosed
  2. Rule out increase diagnosis due to lab error.
     - Review clinical findings and Labs
     - Frequency tables for clinical findings (presenting with same symptoms?)

4-Construct a working case definition:

- Case definition: criteria classify an individual having the disease or not.
- Identify + count cases.
- Criteria: objective measures.
- DO NOT include the risk factor in case definition.
- Define cases within a certain period of time.
- Different categories: confirmed, probable, possible, suspect

5-Find cases systematically and record information:

- Ask local health facilities about patients
- Ask the patients
- ER admission log
- Contact Lab to inform you about orders for testing for the disease.
- Media

What information should we collect from each case?

- Demographic data, Risk factors, S/Sx, Who reported the information, lab results.

Perform a Line List

- Document contains key information about each case
- Row = information about 1 case

6-Perform descriptive epidemiology:

- Important to observe time trends (epidemic curve), distribution by geographic area.
- Infer the risk of the disease
- Clues about possible etiology/risk factors to generate hypotheses.
- Shows where/among who the disease is to begin intervention

How to identify exposure period from epidemic curve?

- <u>If cluster</u>:
  - Peak Or median case
  - From that point, count back on the x-axis one average incubation
  - Start from the earliest case and count back one minimum incubation period
- <u>If no cluster</u> (continuous common source):
  - Earliest case count backwards a minimum incubation period
  - Last case count backwards one maximum incubation period.

Types of epidemics from epidemic curve

1. **Common Point Source**:
   - Exposed to same risk factor over limited period (1 incubation period)

• Shape: rapid rise, sharp peak, gradual decline

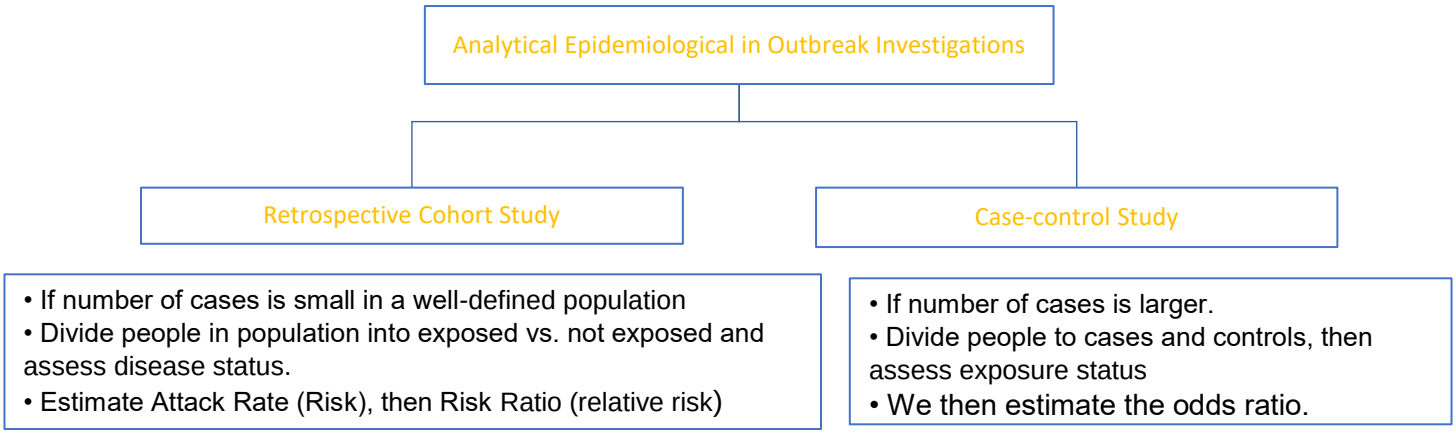
2. **Continuous Common Source (intermittent source)**:
   • Exposure over prolonged period (>1 incubation period)
   • People exposed continuously/intermittently to a common source
   • Shape: has several peaks without a clear incubation period
3. **Propagated Source (progressive source):**
   • Cases serve as sources for subsequent cases, subsequent cases serve as source for later cases.
   • Reflects disease transmitted from person to person.
   • Shape: Series of larger peaks

7-Develop a hypothesis: The hypotheses may address:

- Source of the agent (the reservoir)
- Mode of transmission (vehicles? vectors?)
- Exposure and risk factors:
  - Ask cases what could be exposure?
  - Epidemic curve trigger: What common exposure?
  - What special CCCs do the cases have?
  - Why do people in a specific area have the highest attack rate?

8-Evaluate the hypothesis:

1. Compare with established facts:
   - Labs - Environmental assessment - Epidemiologic evidence
2. Analytical epidemiological study (If findings aren't straightforward):
   - Compare 2 groups to look for association between the disease and exposure to the hypothesized source.



9-Reconsider, refine and re-evaluate your hypothesis:

- Sometimes epidemiological analyses don't answer questions of investigator.
- Investigator conduct further studies (study a different exposure/refine population)
- The investigator refines the hypothesis based on the results of epidemiologic analysis and if they were not confirmed by laboratory testing, and conduct further studies

10-Compare with laboratory and environmental studies:

- Coordinate results from analyses with evidence from Lab and/or environment
- Water-borne outbreak suspected > examine water source for contamination.

11-Implement prevention and control measures:

- Prevention and control measures > usually from the beginning of outbreak
- Measures implemented to interrupt (1≤) elements in "chain of infection"

12-initiate or maintain surveillance:

- Surveillance > ongoing from the beginning of investigation
- Not started yet > active surveillance, continuing until sure the outbreak stopped
- Reasons for surveillance:

1. Prevention and control measures are working?
2. Outbreak didn't spread outside the area targeted by the intervention.

13-Communicate findings:

Summarize everything that happened and what has been done:

- The outbreak
- Labs
- Sources detected
- Type of epidemiologic study conducted + results of analyses
- Coordination of results with evidence (lab and environment)
- Prevention and control measures implemented and containment of outbreak
- We communicate this summary:
  - To local health authority
  - Written report (scientific format) that is later added to the literature

Reporting and surveillance

What is Surveillance?

- The Centres for Disease Control and Prevention (CDC) defined Public Health Surveillance as:

"Ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality and to improve health"

- Surveillance means "information for action"
- It is the eyes (and ears) of public health
- It is a network of people and activities to keep this process
- Functions at local to international levels.

Describing Surveillance?

- Surveillance systems provide descriptive information regarding when and where health problems are occurring and who is affected (the basic epidemiologic parameters of time, place, and person)

Surveillance Vs Monitoring

- Surveillance and Monitoring are often used interchangeably but they are distinct.
- Monitoring refers to "ongoing measurements of health services or a health programme with a view to 'evaluate' the particular program / service or intervention, with constant adjustment of performance in relation to the results.
- Surveillance concerns general populations while monitoring applies to specific target groups (e.g. vaccinated infants).

The Objectives of Public Health Surveillance

what is the purpose of Public Health Surveillance?

1. To study the trends of disease
2. Early warning of epidemics
3. To provide quantitative estimates of magnitude of health

problem
4. To study the natural history of disease
5. Demonstrating the spread of a disease in time and Place
6. To develop epidemiologic research questions
7. To test epidemiologic hypothesis
8. Evaluation of control and preventive measures
9. Monitoring of change in infectious agent
10. Detecting changes in health practices

Types of Surveillance

▪ Passive surveillance ▪ Active Surveillance ▪ Sentinel surveillance

Passive surveillance

WHO Definition

▪Regular reporting of disease data by all institutions that see patients (or test specimens) and are part of a reporting network.

▪There is no active search for cases.

▪Relies on the cooperation of health-care providers —laboratories, hospitals, health facilities and private practitioners

▪This is the most common type of surveillance.

▪ In this type of surveillance criteria are established for reporting diseases, risk factors or health-related events then health practitioners are notified of the requirements and they report events as they come to their attention.

▪ The data recipient must wait for the data providers to report

▪ In most countries with a passive surveillance system, every health facility is required to send a monthly (sometimes weekly/daily) report of all cases on a standard form.

Advantages

▪ Simple to conduct ▪ Inexpensive ▪ Covers wide areas (whole countries or provinces)

Disadvantages

▪ It can be difficult to ensure completeness and timeliness of data (because it relies on an extensive network of health workers)

▪ Usually underestimate the true illness burden

Active Surveillance

Definition

▪ In active surveillance the organization conducting the surveillance actively seeks the relevant information

(healthcare providers are contacted and asked to provide details of any cases they have seen).

▪ Data must be obtained by searching for cases (e.g. health workers go into the community, search for cases of fever and take their blood slide for malarial parasite), and by periodically contacting those who may know of cases

Uses of Active Surveillance

▪ Active surveillance is used when there is an indication that something unusual is occurring

o Rare disease

o Disease on way to eradication

o During outbreaks

▪ Regular outreach to potential reporters, to stimulate the reporting of specific diseases or injuries.

Advantages

▪ Produce complete data of a good quality

Disadvantages

▪ Expensive

▪ high use of resources (For this reason, when it is used, it is for a limited time)

Sentinel Surveillance

Definition

▪ Reporting of cases of specific diseases or risk factors that may indicate that the preventive or therapeutic activity is not working as planned.

▪ It is used when high-quality data are needed about a disease that cannot be obtained through a passive system.

It involves only a limited network of carefully selected reporting sites

▪ Data is obtained from selected hospitals who agree to report all cases of the disease

▪ Data collected in a well-designed sentinel system can be used to

o Signal trends

o Identify outbreaks

o Monitor the burden of disease in a community

Advantages

▪ Rapid

▪ Economical alternative to other surveillance methods (Because it is conducted only in selected locations

Disadvantages

▪ May not be as effective for detecting rare diseases or diseases that occur outside the catchment areas

Features of a Surveillance System

▪ Practical, clear case definitions for each disease

▪ Workable, uniform and continuous data collection methods

▪ Rapidity of collection, analysis, interpretation and dissemination of data.

Organization and Structure of a Surveillance System

The essential components of a surveillance system are :

▪ An overall organization : Consisting of personnel, finances, logistics and administrative back up.

▪ The originators of data : This would include the sources of data, data collectors and data collecting mechanisms.

▪ The transmission of data to the surveillance centre, with specification of the mode of transmission and frequency of such transmission.

▪ Data management and analysis : This includes manual/ computerized data files, and statistical analysis procedures.

▪ The sensible interpretation or results : Including their consolidation and preparation of reports.

▪ A system of feed back of results : To the originators of data and to those who are in a position to enforce preventive steps.

▪ A system to periodically evaluate the surveillance system itself.

Steps in Establishing a Surveillance System

Criteria for Identifying High Priority Areas for Establishing Surveillance Activities

▪ The Frequency of the disease (incidence of mortality, and incidence/prevalence of morbidity due to the disease)

▪ The Severity (case fatality ratio, proportionate mortality ratio, hospitalization rates due to the disease, disability rates)

▪ The Economic impact (direct costs that add due to medical treatment for the disease and indirect costs due to reduction in productivity)
▪ Preventability
▪ The Public interest (community and political attitudes towards the disease).

Steps in Establishing a Surveillance System

Step 1:

Is it Justifiable to Establish a Surveillance System?

• Confirming if the disease is of public health importance and whether prevention/ control measures are available

Step 2:

Spell out the objectives of surveillance system :

The following issues should be addressed :

• Clearly specify the disease (s) proposed to be brought under surveillance.
• Specify : Who needs what information, for what purpose?
• The target population
• The health problem : e.g. whether only Acute MI or entire spectrum of IHD is to be put to surveillance ?
• Nature of control programmes : e.g. if it is a rare disease or a disease moving towards eradication, a fine surveillance will be needed; on the other hand if it is a common disease, a crude surveillance would suffice

Step 3:

Specify the organization and structure of the surveillance?

At the planning stage, clear specifications should be made as to "who will do what, how, and will be responsible to whom".

Step 4:

Clearly define the disease(s) being considered for surveillance?

▪ Case definitions should be accurately worked out after detailed consultation with experts.
▪ All those involved in the collection of data should be well trained in the use of these case definitions/ diagnostic methods.
▪ Case definitions/ diagnostic procedures should be simple enough so as to be understood and used by all those on which the system depends for reporting.

Case Definition

A set of uniform criteria used to define a disease for public health surveillance (possible, probable, confirmed)

▪ Enable public health officials to classify and count cases consistently across reporting areas.
▪ It is not intended to be used by healthcare providers for making a clinical diagnosis or determining how to meet an individual patient's health needs
▪ Refer to standard definitions stated by WHO and CDC
▪ Every year, case definitions are updated

Example of Case Definition

Smallpox:

Clinical Description

An illness with acute onset of fever >101 °F followed by a rash characterized by vesicles or firm pustules in the same stage of development without other apparent cause.

Laboratory Criteria for Confirmation

▪Isolation of smallpox (variola) virus from a clinical specimen, or

▪Polymerase chain reaction (PCR) identification of variola DNA in a clinical specimen, or

▪Negative stain electron microscopy (EM) identification of variola virus in a clinical specimen

Probable Case of Smallpox

A case that meets the clinical case definition that is not laboratory confirmed but has an epidemiological link to another confirmed or probable case.

Confirmed Case of Smallpox

A case of smallpox that is laboratory confirmed.

Smallpox Outbreak

- Anyone who meets original case definition
- Anyone with fever (>101 °F) or rash who was in a confirmed exposed area during the Bioterrorism (BT) event or came in contact with a confirmed or probable case should be considered a case. (until confirmed; if not confirmed; will be under observation and could be classified as “case”; and others as “confirmed cases”)

Step 5:

Specify the Details of Collection of Information

▪ Select the proper sources of data
▪ Specify the method of data collection
▪ The forms that will be used
▪ What time/place of diagnosis will be entered
▪ What will be the frequency of reporting?
▪ Decide the method of transmission of reports
▪ Central Collection of Data

Step 6:

The Organization and procedures of data Analysis

▪ Simple display of data :

o Data can be displayed through histograms/ bar diagrams/ line diagrams describing the data according to various characteristics of person, place and time.

o Descriptive statistics :

o Give the “Summary statistics” (Incidence rates / prevalence / proportions /Mean / Median) along with the measures of dispersion (SD) and the 95% confidence intervals.

Step 7:

Making Scientific interpretations out of the results

▪ Consider whether the apparent, statistically significant, increases or decreases in the disease incidence at a given place and time represent true changes.

▪ False increase or decrease may be due to

o Improvement in diagnostic procedures

o Duplicate reporting

o Enhanced reporting

o Increase in population size

Step 8:
Ensure proper feedback to all concerned
▪ Provide regular (usually monthly) feedback reports to all those who are in a position to take action on the surveillance data (as, secretaries and directors of health department as well as other department concerned with human development)

Step 9:
Periodically evaluate / review the surveillance system
▪ Periodic evaluation is important to identify defects and reorient the methodology
o See whether the case definitions need a change?
o Are there some problems in the timely and accurate reporting
o How can it be improved?

Evaluation of Surveillance System
1. Is the system detecting what it is supposed to detect?
The surveillance system data need to be compared with data produced by another detection mechanism
2. Is the system producing data in time for appropriate responses?
3. Can the system cope with changes?
The disease or our knowledge may be changing quickly. A surveillance system should adopt to such changes (flexibility)
4. Is the system as simple and cheap as possible?
5. Are the public health responses timely and appropriate?
Any system that does not lead to appropriate responses is flawed.

Example of National Surveillance Systems
• **Health Electronic Surveillance Network" (HESN)** to control and manage infectious diseases and epidemics online
HESN:
• It includes 7 modules they are: ▪Investigations ▪Outbreaks ▪Immunization ▪Family Health ▪Work Management ▪Inventory ▪Admin
Influenza Surveillance In Saudi Arabia (ISSA)
•Objectives of influenza surveillance :
The goal of influenza surveillance is to minimize the impact of the disease by providing useful information to public health authorities, which will help in planning appropriate control and intervention measures, allocate health resources, and make case management recommendations