Al-Azhar University – Gaza

Basics of Public Health

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Preface

We take a great pleasure in presenting introduction to public health handouts to you. One of the needs for all students in public health, health education, and related disciplines is to understand the basics of public health. Currently there are many textbooks on this topic, and none of the existing textbooks covers all the essential areas. This handout is designed to prepare students in public health and health education with the basics in all five of the core areas of public health identified by the Association of schools of public health: biostatistics, environmental health sciences, epidemiology, health policy and management, and social and behavioral sciences. Our purpose is to provide the readers with a basic orientation to public health and introduces basic concepts, public health approach, the core functions of public health (assessment, policy development, and assurance) and how public health is organized at the local, state, and national level, health indicators, concepts of disease occurrence, disease prevention and health promotion, obesity & challenges of NCDs in Palestine and tools required for engaging in public health activities. The remaining chapters delineate a framework to guide public health activities and provide specific tools, for example, basic epidemiological and statistical concepts. We hope that our students can use the models to recognize opportunities for becoming involved so they improve the health of their communities or their world.

Dr. Ahmed Najem

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1. Introduction to Public Health

Public health is a field for people who care about the greater good of human beings. If that sounds self-important, consider this: Millions of people are alive today thanks to a handful of public health initiatives, such as vaccination programs, motor vehicle safety laws, restrictions on the use of tobacco, family planning, and clean air and water standards.

The field of public health is constantly evolving in response to the needs of communities and populations around the world. The underlying mission of public health is to improve the conditions and behaviors that affect health so that all people can attain it. That mission includes not only the practice of public health policy, but the research of public health issues and the education of future leaders who eventually will translate that research into practices and policies to improve the health of people regionally, nationally, and globally.

Public health...

- has a real and lasting positive effect on people.
- helps promote a healthy environment.
- is a moral and ethical imperative.

Importance of Public Health

The work of public health professionals is important because public health initiatives affect people every day in every part of the world. It addresses broad issues that can affect the health and well-being of individuals, families, communities, populations, and societies both now, and for generations to come.

Public health programs help keep people alive. These programs have led to...

- increased life expectancies.
- worldwide reductions in infant and child mortality.
- eradication or reduction of many communicable diseases.

Questions commonly addressed about Public Health:

- What is public health?
- What is a public health system?
- Why take a public health approach?

- Can public health make a difference?

What is Public Health?

- "The science and art of preventing disease, prolonging life and promoting health and efficiency through organized community efforts" (Winslow, 1920).
- "Fulfilling society's interest in assuring conditions in which people can be healthy" (IOM report, 1988).

Key terms

- Population health has been defined as "the health outcomes of a group of individuals, including the distribution of such outcomes within the group". It is an approach to health that aims to improve the health of an entire human population.
- Prevention is reserved for those interventions that occur before the initial onset of disorder.

Vision of Public Health

Healthy People in Healthy Communities.

Missions of Public Health

- Promote physical and mental health
- Prevent disease, injury, disability
- Prevents epidemics and the spread of disease
- Protects against environmental hazards
- Responds to disasters and assists communities in recovery
- Prevents injuries
- Promotes healthy behaviors
- Assures the quality and accessibility of health services

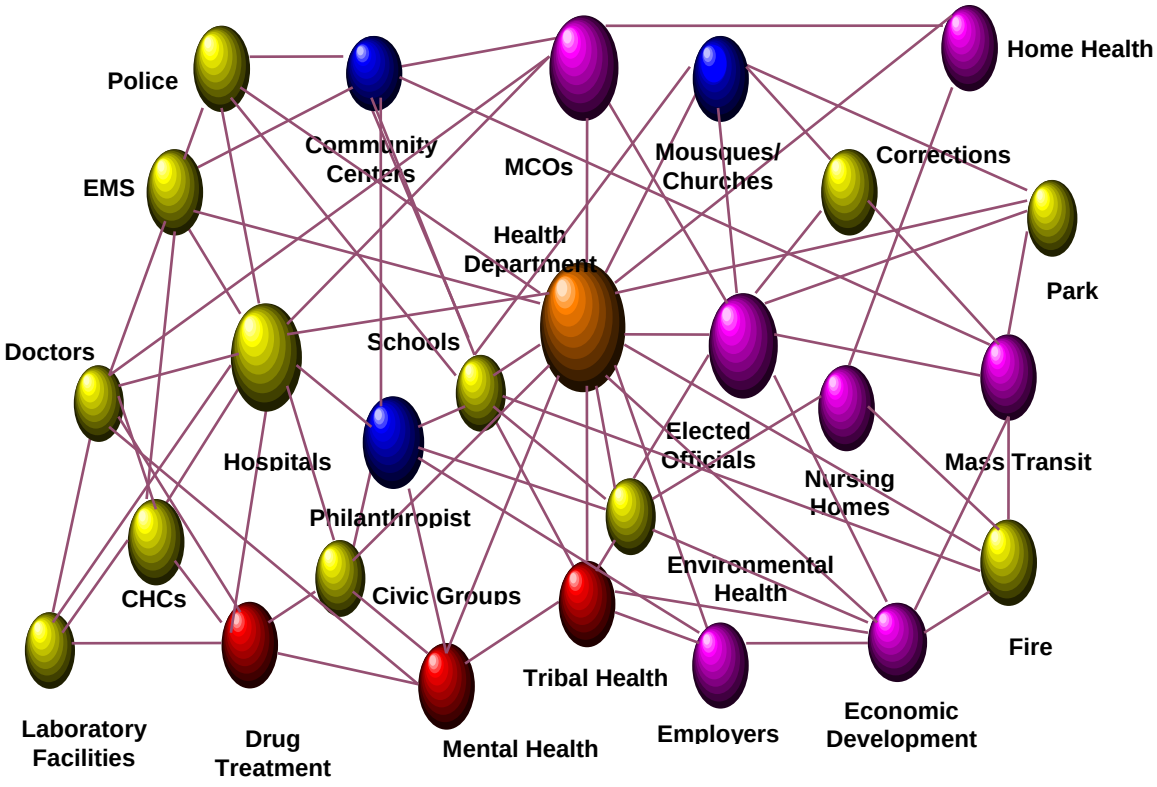
A Public Health System

WHO: All public, private, and voluntary entities that contribute to public health in a given area.

WHAT: A network of entities with differing roles, relationships, and interactions. All entities contribute to the health and well-being of the community.

NOTE: A public health system is more than the public health agency

Network of Public Health System

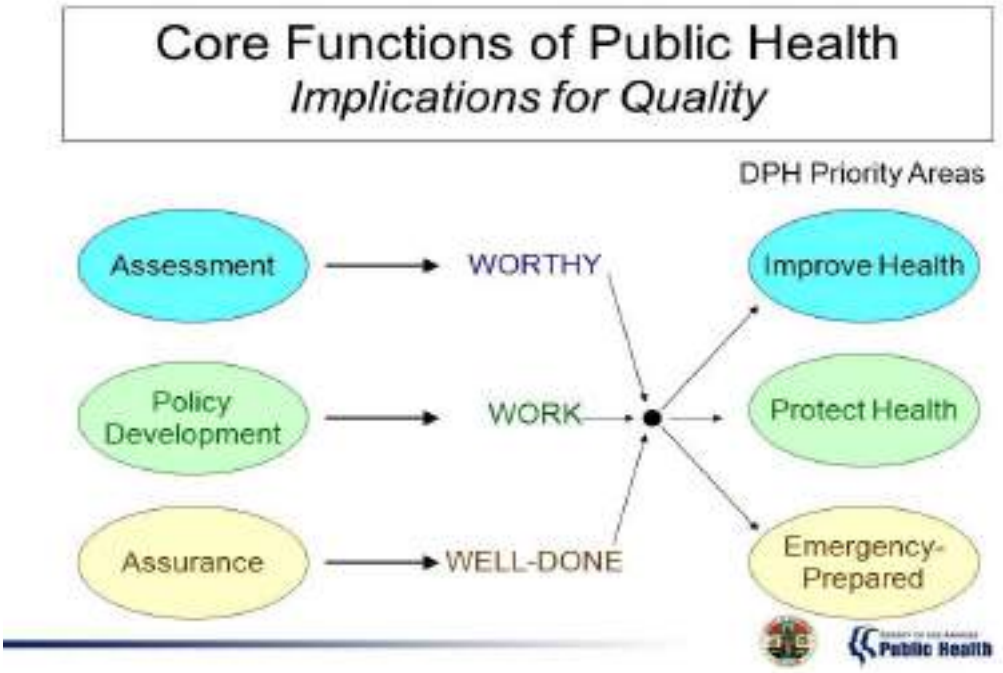


Workforce of Public Health

Public health professionals include, but are not limited to the following:

1. Administrators 2. Biostatisticians 3. Dieticians 4. Environmental health specialists 5. Epidemiologists 6. Health care providers 7. Health communication specialists 8. Health educators	9. Health law experts 10. Labratorians 11. Occupational health specialists 12. Public health nurses 13. Researchers 14. Sanitarians 15. Social scientists 16. Toxicologists 17. Others

Core Components of Public Health



10 Essential Services of Public Health

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 health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to personnel health services and assure the provision of health care.
8. Assure a competent public health and health care workforce.

9. Evaluate the effectiveness, accessibility, and quality of services.
10. Research for new insights and innovative solutions to health problems.

Core Components &
10 Essential Public Health Services (EPHS)

Core Component	Essential Public Health Service	The EPHS "in English" (CDC)
Assessment	Monitor Health	Understand the health issues at the state and local level
	Diagnosis and Investigate	Identify and respond to public health problems and threats
Policy Development	Inform, Educate, & Empower	Keep people informed about healthy issues and healthy issues
	Mobilize Community Partnerships	Engage people and organizations in health issues
	Develop Policy	Plan and implement sound health policies
Assurance	Enforce Law	Enforce public health laws and regulations
	Link to/Provide Care	Make sure people receive the medical care they need
	Assure Competent Workforce	Maintain a competent public health and medical workforce
	Evaluate	Evaluate and improve programs
	Research	Support innovation and identify and use best practices

2. Public Health Approach

What is Public health?

- **C.E.A. Winslow in 1923** defined Public Health as the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.
- **John M. Last's Dictionary of Public Health (2001) gives the following:**

Public Health is one of the efforts organized by society to protect, promote, and restore the peoples' health.

- **Public health** is the combination of sciences, skills, and beliefs that is directed to the maintenance and improvement of the health of all the people through collective or social actions.
- The programs, services, and institutions involved emphasize the prevention of disease and the health needs of the population as a whole.
- Public health activities change with changing technology and social values, but the goals remain the same: to reduce the amount of disease, premature death, and disease-produced discomfort and disability in the population.
- Public health is thus a social institution, a discipline, and a practice.

What is Health?

- The absence of Disease or Disability.
- The "complete physical, mental and social well being and not merely the absence of disease or infirmity". (W.H.O.)

Essential Public Health Functions

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

Public Health Approaches

- Define the health problem.

- Identify risk factors associated with the problem.
- Develop and test community-level interventions to control or prevent the cause or the problem.
- Implement interventions to improve the health of the population.
- Monitor those interventions to assess their effectiveness.

Public Health Approach of Prevention

Requires the collection, analysis, and interpretation of data to define the problem and outline:

- What?
- Where?
- When?
- Who?
- How

Requires a determination of:

- Preventable or not preventable
- Controllable or not controllable
- Priority

The potential for prevention or control frequently requires:

- A plan
- A champion
- A strategy/method
- A method
- The will
- Funding

Do it

- After implementation the cycle begins again, but this time to evaluate the program results.
- Did the strategy work as intended?
- If yes, can you expand or replicate the program?

Public VS Medical

<u>1. Public Health Approach Public Health Model</u>

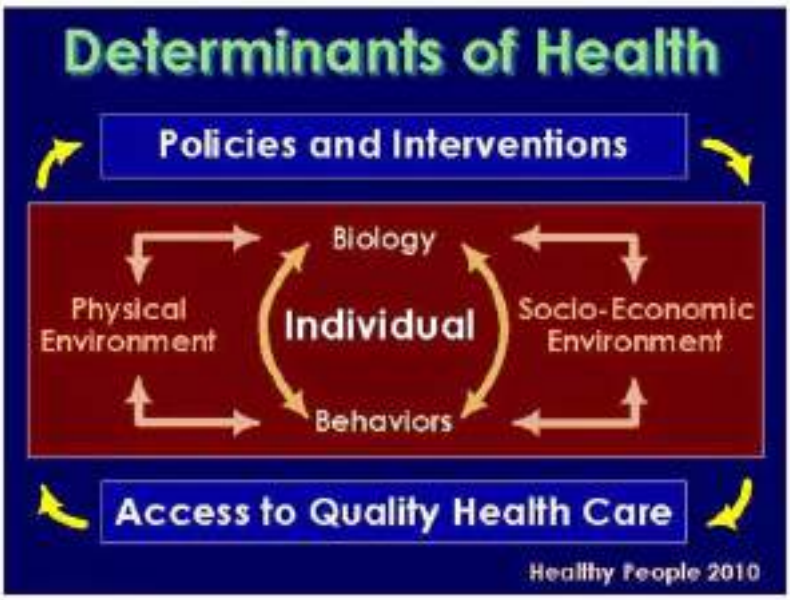
Population, Disease Prevention, Health Promotion, Interventions Environment Human behavior, Government (Some private)

<u>2. Medical Model</u>

Individual , Diagnosis , Treatment, (Some public. Intervention Medical care, Private

Determinants of Health


Income and social status
Personal health practices and coping skills
Social support networks
Health services
Determinants of Health
Employment and working conditions
Biology and genetic endowment
Physical environments
Healthy child development
Education


Determinants of Health
Policies and Interventions
Biology
Physical Environment
Individual
Socio-Economic Environment
Behaviors
Access to Quality Health Care
Healthy People 2010

Achievements of Public Health

- Vaccination
- Safer Workplaces
- Safer & Healthier Food
- Motor Vehicle Safety
- Recognition of Tobacco Use as a Health Hazard
- Healthier Mothers and Babies
- Fluoridation of Drinking Water

3. Demography in Public Health

Demography is the scientific study of human population.

- Demography statistics is a very important information for any country.
- It describes the size population, its changes –increase or decrease- and its population and gender.
- It helps in planning and implementing short term and long term health programs for the community.
- Before we plan any health intervention or programmes for the community we should know the size and composition of the community.
- We also need to know the changes that will occur to the size and composition to the population.

Demography studies 3 aspects of a population

1. Changes in population size
2. Composition of population
3. Distribution of population in place

Demographic processes

The demographic processes that determine the size, composition and distribution of a population are:

- Fertility, Mortality, Marriage, Migration , and Social mobility

Sources of Demographic information

- Population census
- Vital statistics
- Migration
- Census- Census describes the population in the static stage
- Vital Statistics and Migration information gives the changes occurring to the population.

<u>Population Census</u>

- Population census is the total process of collecting, compiling and publishing of demographic, economic and social data pertaining to a specified time of all persons in a community.

Methods of conducting population census

- De facto method: In this method the total population of persons actually present in the area on the day of census is taken.
- De jure method: In this method the total population of people is taken on the basis of their permanent residence.

Age pyramid

- Is a graphical representation of the population in various age groups of both sexes
- Age pyramid of Palestine has a broad base and a tapering top
- Broad base is due to the large population of children
- Narrow top is due to small population of elderly.

Median age

- Median age of population is that age which divides the population into two equal parts.
- The median age in developed countries like US and UK is higher than 30 years.
- The median age in Gaza is 18, compared with a world average of 28. In most European countries it's about 40, and it is 30 in Israel. Only in a dozen or so African countries is the median age lower, reaching 15 in Uganda.

Demographic characteristics of Palestinian Population

- Family size

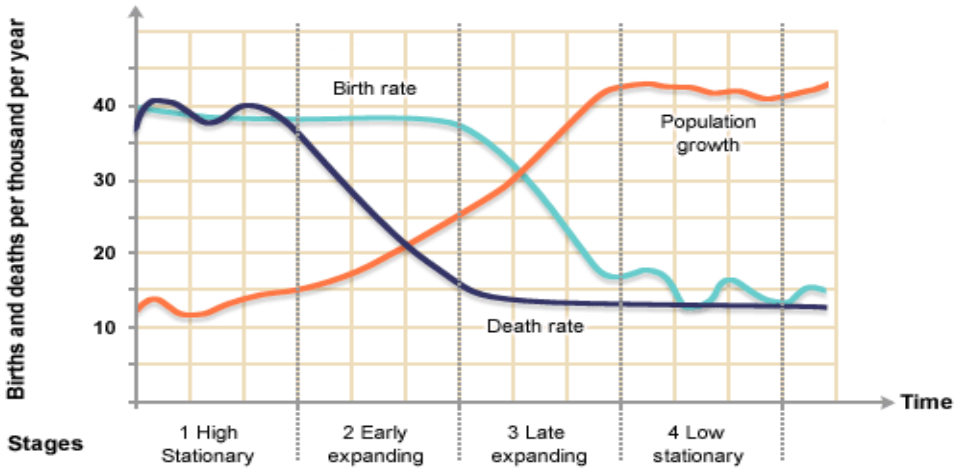
– The average household size in the Palestinian Territory is 5.6 persons in 2012 compared with 6.4 in 1997: 5.3 persons in the West Bank and 6.1 persons in Gaza Strip.

- Education status – Literacy:
  - definition: age 15 and over can read and write
  - total population: 95.3%
  - male: 97.9%
  - female: 92.6%
  - note: estimates are for the Palestinian Territories
- Population density
  - Population density of Palestine is generally high at 756 persons/km2, particularly in Gaza Strip it is 4,822 persons/km2 compared to a lower population density in the West Bank of 493 persons/km2 at mid 2014.
  - Population Density in Manila, Philippines is 42,857 persons/km2 "The Highest population density in the World"

– Population Density in Cairo, Egypt is 18,071 persons/km2.

Demographic Transition Model

The changes in these rates and the effect on population can be shown on the Demographic Transition Model (Population Cycle) - see diagram below:



This can be divided into four, and possibly five, stages:

Stage 1 - High Stationary

Birth Rate and Death rate are both high. Population growth is slow and fluctuating.

Reasons

Birth Rate is high as a result of:

- Lack of family planning
- High Infant Mortality Rate
- Need for workers in agriculture
- Religious beliefs

Death Rate is high because of:

- High levels of disease
- Famine
- Lack of clean water and sanitation
- Lack of health care
- War
- Competition for food from predators such as rats

Typical of Britain in the 18th century and the Least Economically Developed Countries (LEDC's) today.

Stage 2 - Early Expanding

Birth Rate remains high. Death Rate is falling. Population begins to rise steadily.

Reasons

Death Rate is falling as a result of:

- Improved health care (e.g. Smallpox Vaccine)
- Improved Hygiene (Water for drinking boiled)
- Improved sanitation

- Improved food production and storage
- Improved transport for food
- Decreased Infant Mortality Rates

Typical of Britain in 19th century; Bangladesh; Nigeria

Stage 3 - Late Expanding

Birth Rate starts to fall. Death Rate continues to fall. Population rising.

Reasons:

- Family planning available
- Lower Infant Mortality Rate
- Increased mechanization reduces need for workers.
- Increased standard of living
- Changing status of women

Typical of Britain in late 19th and early 20th century; China; Brazil

Stage 4 - Low Stationary

Birth Rate and Death Rate both low. Population steady. Typical of USA; Sweden; Japan; Britain

Stage 5 - Declining Population

Birth Rate remains low. Death rate begins to rise slightly, resulting in a declining population

Death rate rises slightly due to lifestyle choices such as a poor diet and smoking

Examples: Germany, Scotland

The Infant Mortality Rate is the number of children who die before their first birthday.

These changes are reflected in the population structure.

World population

- Total population of the world about 2000 years ago was 250 million.
- In 1800 the world population became 1000 million (1 billion).
- In 1987 the world population became 5 billion.
- In 1999 the world population became 6 billion.
- Expected to become 8 billion by 2025.
- About ¾th of world population lives in the developing countries.
- China and India are the two most populous countries in the world.
- The world population growth rate was at the peak in 1970.
- About 95% of the population growth is occurring in the developing countries.

Life expectancy

- Life expectancy is the average number of years which a person of a particular age may expect to live.

- It is one of the best indicators of a country's level of development and overall health status.
- The life expectancy of people all over the world has been increasing.

Life expectancy at birth

- In most countries the life expectancy of women is more than that of men.
- In Monaco is 89.52 years (2015) "The Highest in the World"
- In Japan is 84.74 years (2015)
- In Israel is 81.38 years (2015)
- In Jordan is 81 years (2015)
- In USA is 75.90 52 years (2015) ♀ 80 years & ♂ 76 years
- In Palestine is 75.01 years (2015), ♂ 72.97 years & ♀ 77.17 years
- In Egypt is 73.7 years (2015)
- In South Africa is 49.72 years (2015) "The Lowest in the World"

Fertility

- Fertility – Is the actual bearing of children by a woman.
- The reproductive age of a woman is between 15 – 45 years.
- Some factors affecting fertility are:
  - Age at marriage
  - Duration of married life
  - Spacing of children
  - Education
  - Socioeconomic status

- Birth rate =

$$\frac{\text{Number of live births during the year}}{\text{Estimated mid-year population}} \times 1000$$

- Growth rate = Crude birth rate – Crude death rate

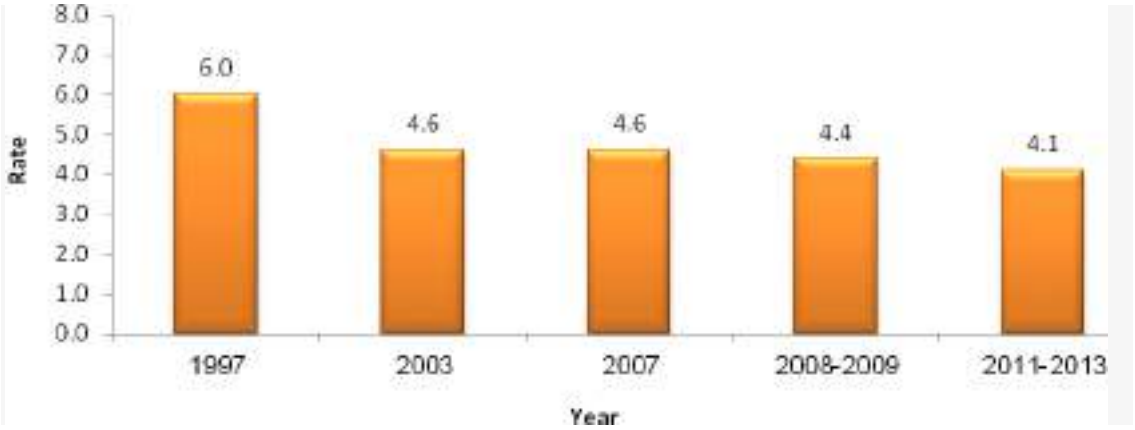
The Palestinian Central Bureau of Statistics (PCBS) presents the following information about Palestinians at the end of 2014, There is an increase in population of Palestinian in the world.

- The projected number of Palestinians in the world is 12.10 million, of whom 4.62 million are in State of Palestine, 1.46 million in Israel, 5.34 million in Arab countries and around 675 thousand in foreign countries.
- More than one-third of population in Gaza Strip
- The projected number of Palestinians living in State of Palestine at the end of 2014 is 4.62 million: around 2.83 million reside in the West Bank and 1.79 million in Gaza Strip. Palestinian refugees make up 43.1% of the Palestinian population in Palestine: 38.8% of them in the West Bank and 61.2% in Gaza Strip.

Decline in fertility rate

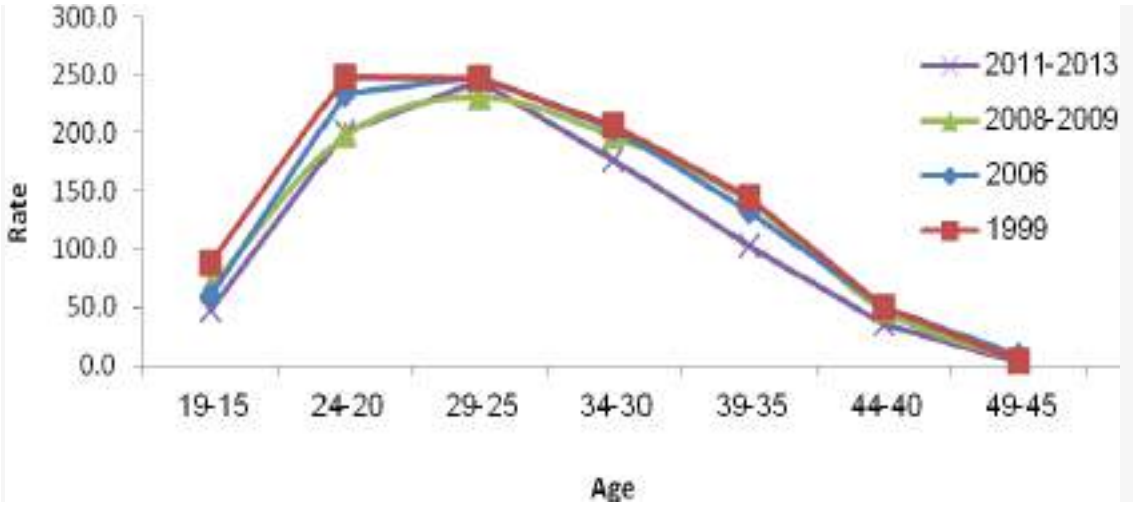
The total fertility rate declined during 2011-2013 to 4.1 births compared with 6.0 births in 1997. In Gaza Strip the rate was 4.5 births compared to 3.7 births in the West Bank during 2011-2013.

Total Fertility Rate in State of Palestine, Selected Years



There has been a decline in the specific fertility rate, particularly in the early reproductive years (15-24 years).

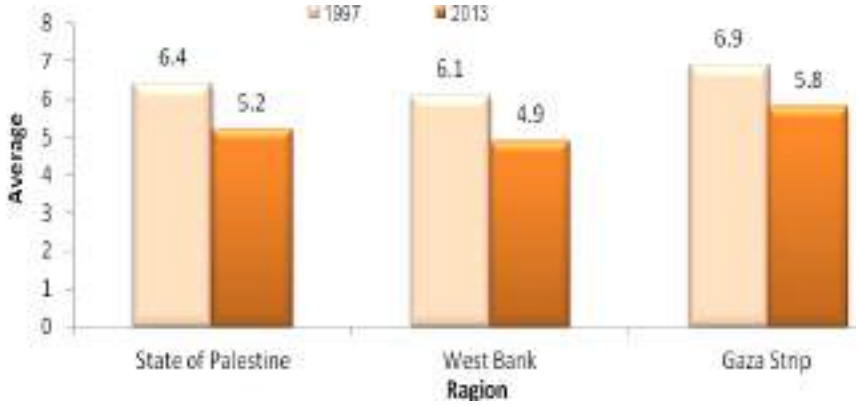
Age-Specific Fertility Rates in State of Palestine, Selected Years



Decrease in average household size

The average household size in Palestine was 5.2 persons in 2013 compared to 6.4 in 1997: 4.9 persons in the West Bank and 5.8 persons in Gaza Strip.

Average Household Size in State of Palestine by Region, 1997, 2013



Decreasing crude birth and death rate

The crude birth rate is 32.3 births for every 1000 of population: 29.4 in the West Bank compared to 36.8 in Gaza Strip. The rate is expected to decline to 29.0 by 2020. The crude death rate is 3.7 deaths for every 1000 of population: 3.8 in the West Bank compared to 3.5 in Gaza Strip. The rate is expected to decline to 3.4 by 2020.

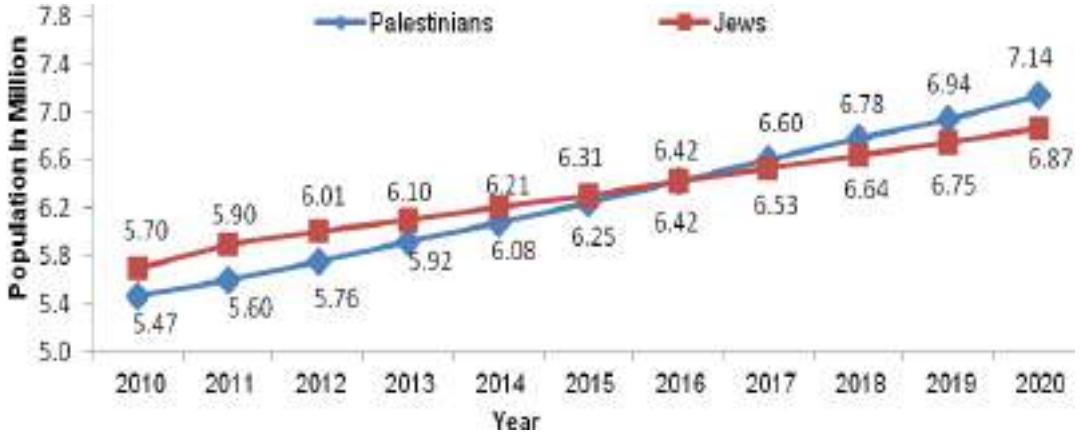
- High fertility rate among Palestinians in Jordan
- The total fertility rate for Palestinian woman living in Jordan was 3.3 births in 2010 compared to 2.5 in Syria in 2010 and 2.8 in Lebanon in 2011.

Selected Demographic Indicators by Country of Residence, Selected Years

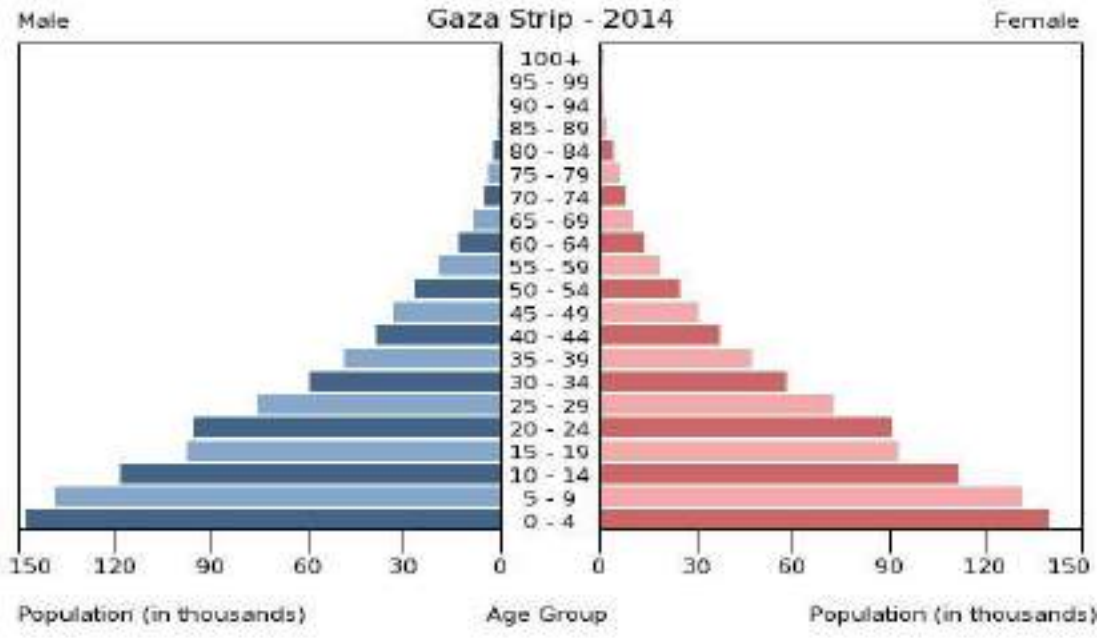
Country of Residence	Average Household Size	Total Fertility Rate
Jordan *	4.8	3.3
Syria *	4.1	2.5
Lebanon**	4.4	2.8

- The youthful Palestinian population in Israel
- The number of Palestinians living in Israel is 1.46 million, of whom about 35.4% are aged below 15 years compared to 4.3% aged 65 years and over.
- Higher fertility rate among Palestinians in Israel than among Jews
- The total fertility rate in 2013 among Palestinian women living in Israel was 3.4 births compared to 3.1 births among women Jews. The average Palestinian household size in Israel is 4.8 persons. The crude birth rate of Palestinians in Israel exceeded 23.5 births for every 1000 of population.
- The number of Palestinians in historical Palestine will exceed the number of Jews over time
- The number of Palestinians in historical Palestine totaled 6.08 million at the end of 2014. There were 6.10 million Jews at the end of 2013 according to estimates by the Israeli Central Bureau of Statistics and the number is expected to reach 6.21 million Jews by the end of 2014.
- The number of Palestinians and Jews will total about 6.42 million each by the end of 2016 provided that current growth rates remain constant. However, the number of Palestinians in historical Palestine will total 7.14 million compared to 6.87 million Jews by the end of 2020.

Number of Palestinian and Jews living in Historical Palestine



- Population in the Gaza Strip: 1,816,379



Age Structure of Population in the Gaza Strip:

- 0-14 years: 43.2% (male 402,848/female 381,155)
- 15-24 years: 20.6% (male 191,710/female 182,405)
- 25-54 years: 30.1% (male 280,551/female 266,756)
- 55-64 years: 3.5% (male 31,711/female 31,515)
- 65 years and over: 2.6% (male 19,617/female 28,111)

Sex ratio:

- at birth: 1.06 male(s)/female
- 0-14 years: 1.06 male(s)/female
- 15-24 years: 1.05 male(s)/female
- 25-54 years: 1.05 male(s)/female
- 55-64 years: 1.04 male(s)/female
- 65 years and over: 0.68 male(s)/female
- total population: 1.04 male(s)/female

4. Health Indicators

Quantifiable characteristics of specific populations which researcher use as supporting evidence for describing the health of a population are called **Health indicators** are Health indicators which used to measure health of a community.

- Health indicators can be used to compare health of two communities.
- It can be used to assess the health needs of a community.
- It is useful for monitoring and evaluation of health programs.

Qualities of an 'indicator'

- Validity – The indicator should measure what it is supposed to measure.
- Reliability – It should give the same value when measured by different people.
- Sensitivity – It should show the changes in the situation.

Health indicators

- Mortality indicators
- Morbidity indicators
- Disability rates
- Nutritional status indicators
- Health care delivery indicators
- Socio-economic indicators
- Indicators of quality of life

Health Indicators in Palestine (1997-2002)

1	Indicator	2002	2000	1997
2	Population Growth Rate	3.7%	3%	3.1%
3	Crude Birth Rate	27.2/1000	33.2/1000	34.5/1000
4	Crude Death Rate	3.1/1000 birth	3.2 / 1000 birth	3.5
5	Life Expectancy Rate	71.9	71.8	71.5
6	Infant Mortality Rate	23.3	22.7 /1000 birth	24
7	Maternal Mortality Rate (per 100,000)	13.8 (reported)	37.3 (reported)	77(Estimated)
8	Total Fertility Rate	4.31	4.31	5.58

Mortality indicators

- Crude death rate
- Specific death rate
- Case fatality rate
- Expectation of life
- Infant mortality rate
- Maternal mortality rate

1. **Crude death rate** : 'is the number of deaths (from all causes) per 1000 estimated mid-year population in one year, in a given place'

$$\frac{\text{Number of deaths during a year}}{\text{Mid-year population}} \times 1000$$

2. **Specific death rate** : Is the death rate due to a specific disease, or in a specific age or sex group etc.

   Example : Specific death rate due to Tuberculosis

$$\frac{\text{Number of deaths due to Tuberculosis during a year}}{\text{Mid-year population}} \times 1000$$

3. Case fatality rate

- It is the number of people dying due to a specific disease.
- It shows the severity of the disease

$$\frac{\text{Number of deaths due to a disease}}{\text{Total number of cases due to the disease}} \times 100$$

4. Infant Mortality Rate (IMR)

- Number of infant deaths in a year per 1000 live births

$$\frac{\text{Number of deaths of children less than 1 year of age in a year}}{\text{Number of live births in the same year}} \times 1000$$

Measurements of Morbidity

- Incidence
- Prevalence

1. Incidence

- There are 500 new cases of Hepatitis in a city with a population of 30,000 in 2008
- Incidence of hepatitis =

$$\frac{500}{30{,}000} \times 1000 = \textbf{16.7 per 1000 per year}$$

- The Incidence rate MUST contain the time period

2. Prevalence

- Prevalence is defined as all cases (old and new) present at a given point of time or a period of time in a given population.
- Prevalence is of <u>two types</u>:
  - Point prevalence
  - Period prevalence

Point Prevalence

- Point prevalence refers to the total number of cases (old and new) present at given point of time, usually a day.
- Prevalence of Cutaneous leishmaniasis in a city <u>on</u> 5th May, 2009
- Normally when we say prevalence it is <u>Point Prevalence</u>
- Is the total number of cases (old and new) existing during a defined period of time in a defined population.
- Prevalence of Pulmonary Tuberculosis in a city <u>in year 2008.</u>

Physical Quality of Life Index

- Quality of life is difficult to define and measure.
- One method is to combine three indicators – Infant Mortality rate, Life expectancy at 1 year of age and Literacy
- The index is calculated for each country

- The maximum is 100 and minimum 0

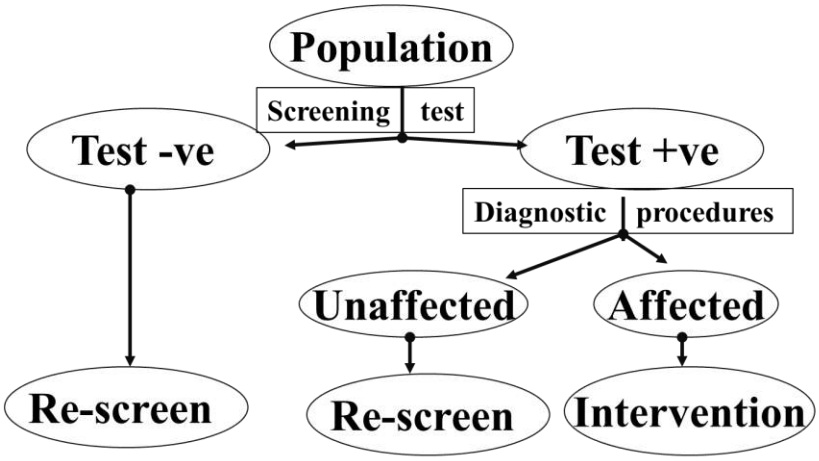
Human Development Index

- Human Development Index is calculated from Longevity (life expectancy at birth), Knowledge (adult literacy rate and mean years of schooling) and Income (Gross Domestic Product per capita)
- Maximum is 1 and minimum 0.

5. Screening and Epidemiology

Screening is the testing of apparently healthy populations to identify previously undiagnosed diseases or people at high risk of developing a disease. Screening aims to detect early disease before it becomes symptomatic. It is an important aspect of prevention, but not all diseases are suitable for screening.

Flow diagram for a screening program



The Principles of Screening

- The choice of disease for which to screen;
- The nature of the screening test or tests to be used;
- The availability of a treatment for those found to have the disease;
- The relative costs of the screening.

Types of screening

- Mass
- Multiple or multiphasic
- Targeted
- Case-finding or opportunistic

Factors appropriate for screening

- Important health problem
- High prevalence
- Natural history understood
- Long latent period
- Early detection improves prognosis

Evaluation of a screening program

- Reliability
- Feasibility
- Validity
- Performance
- Effectiveness

Reliability

- Biological variation
- Program method
- Intraobserver variability
- Interobserver variability

Feasibility

- **Acceptability**
  - Quick
  - Easy
  - Safe
- **Cost effectiveness**
  - Screening
  - Diagnosis
  - Follow-up
  - Intervention

Validity

- **Sensitivity:** Probability to test positive among truly affected
- **Specificity:** Probability to test negative among truly unaffected

Performance

- **PV+:-** Probability to be affected among test positives
- **PV-:-** Probability to be unaffected among test negatives
- **PCC:-** Probability to be correctly classified

Effectiveness

- **Outcome measures:**
  - Morbidity
  - Disability
  - Mortality
- **Bias**
  - Patient self-selection
  - Lead time
  - Length

Study designs for screening

1. Correlation Studies

- **Use:** Description of population
- **Strength:** Suggest possibility of benefit
- **Limitation:** Can't test hypothesis

2. Analytical Studies

- **Types:** Case-control and Cohorts
- **Use:** Comparison of rates
- **Advantage:** Test hypothesis
- **Limitation:** Selection, Lead time and length

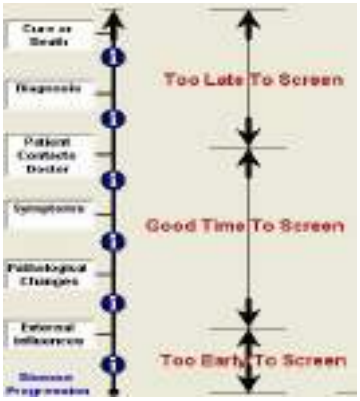
3. Randomized Trials

- **Use:** Comparison of rates
- **Strength:** Most valid test of hypothesis
- **Limitation:** Cost, ethics & feasibility

Disease : The disease must be an important health problem.

- There should be a recognizable latent or early symptomatic stage.
- The natural history of the disease, including latent to declared disease, should be adequately understood.

When to screen for disease?



Test :

- There should be a suitable test or examination.
- The test should be acceptable to the population.
- **Outcomes of a Screening Test**

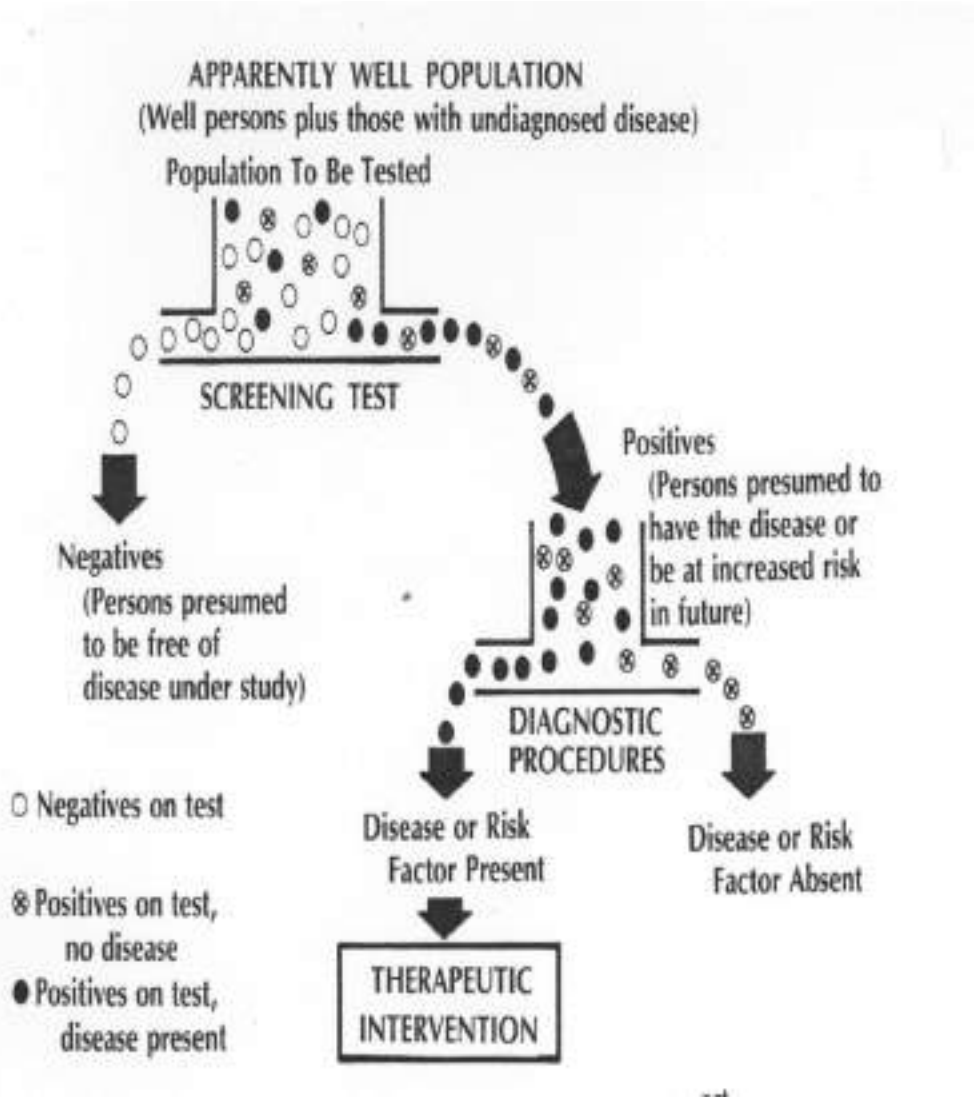
Screening Test	True Disease Status: Positive	True Disease Status: Negative	Total
Positive	True Positives (TP)	False Positives (FP)	TP+FP
Negative	False Negatives (FN)	True Negatives (TN)	FN+TN
Total	TP+FN	FP+TN	TP+FP+FN+TN

Treatment:

- There should be an acceptable treatment for the patients with recognized disease.
- There should be facilities for diagnosis and treatment should be available.
- There should be an agreed policy on whom to treat as patients.

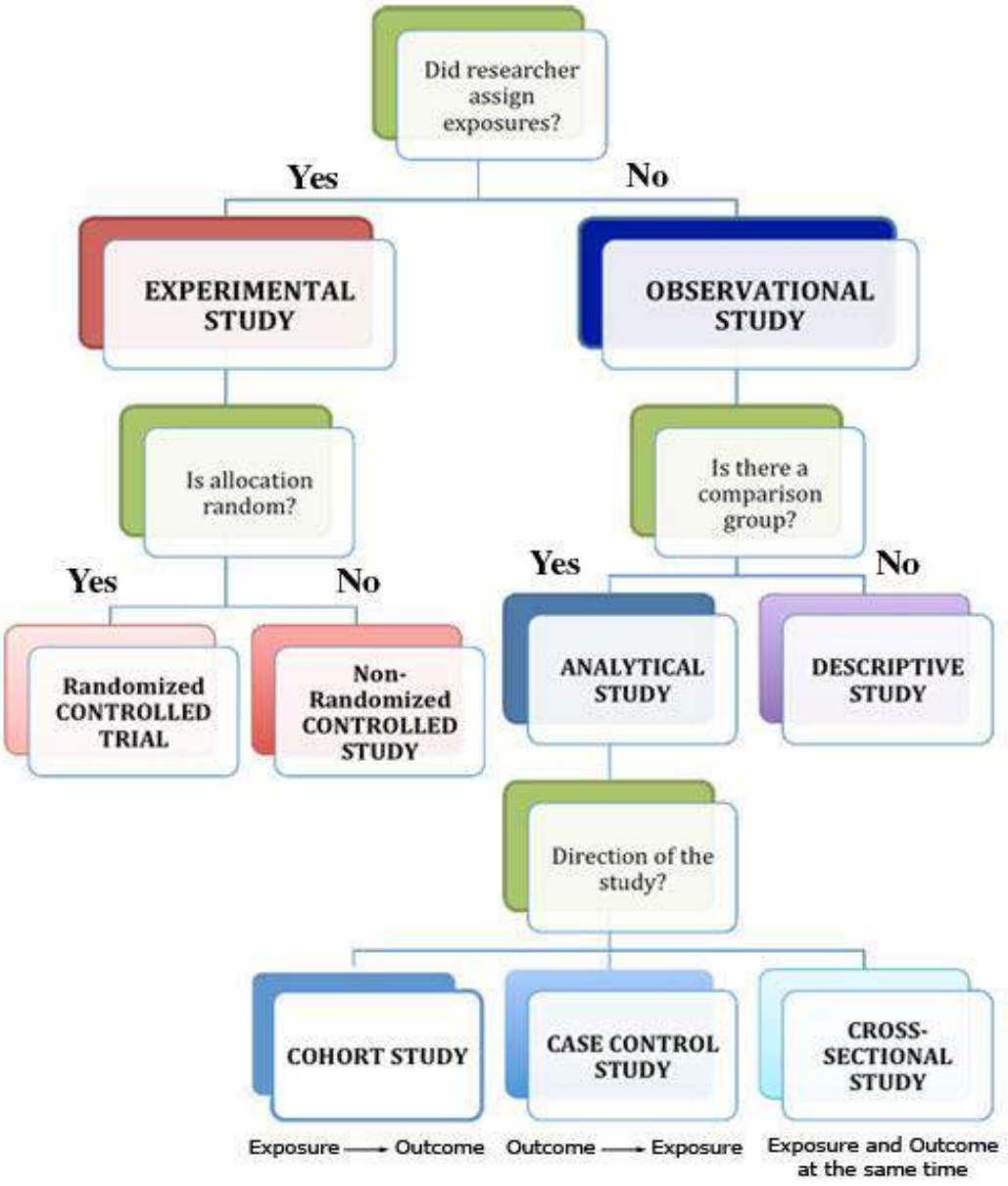
Costs:

- The cost of case finding (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.



Epidemiology is the study of the distribution and determinants of health-related states. or events (diseases) in specified populations and the application of this study to the control of health problems.

Types of Epidemiological Studies:



Observational Studies: Descriptive & Analytical Types

Observational studies involve no intervention other than asking questions and carrying out medical examinations and simple laboratory tests or X-ray examinations. In epidemiology, observational studies are more common than experimental ones, particularly if an investigator wants to determine whether an agent or exposure causes cancer in humans.

Descriptive Studies

Descriptive studies tend to be simpler and easier to conduct than analytical or experimental studies but they are nonetheless quite important. Descriptive studies can provide the background from which analytical studies emerge. They help to generate hypotheses, as opposed to testing them.

Advantages:

- A large range of outcomes because no subgroups are studied
- A large range of potential predictors again because no subgroups are studied

Disadvantages:

- Not possible to study subgroups
- No control for confounding as data is in aggregate form
- Not able to reproduce/replicate results as data was not collected in an experiment with defined perimeters.

1. Cross-Sectional Comparison Studies: "Am I like my neighbors?"

Cross-sectional studies compare data that are combined from smaller groups as opposed to very large descriptive studies. These studies focus on observations made at only one point in time so they are quickly completed and relatively inexpensive. But they cannot reveal a sequence of events over time since they sample data only once.

Cross-sectional studies often simply compare the rate of a particular cancer in one place versus another place.

2. Correlation (Ecologic) Studies: "What if I am exposed to this?"

Ecologic studies look at diet and cancer at the population level, think of this as the view from 30,000 feet. These types of studies represent a transition to analytical studies since they compare cancer rates of populations in relation to risk factors. They do not include outcome so they aren't considered analytical.

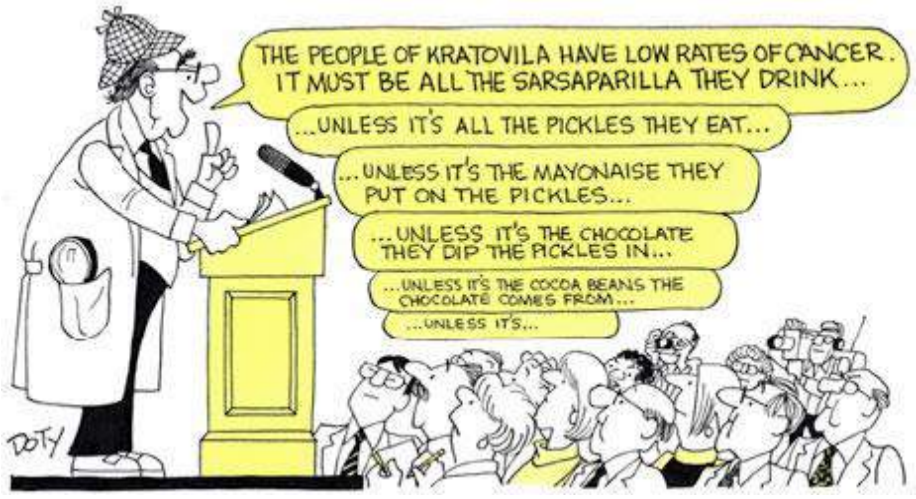
Examples:

- The diet-cancer correlation
- Following populations as they migrate to compare cancer rates

Advantages:

Ecologic studies can provide powerful clues pointing in a particular direction, especially when they compare large populations with different diets.

Disadvantages:



Ecologic studies can't prove cause and effect.

Scientists need more evidence from other studies to help prove the connection that ecologic studies point to.

Analytical Studies

Analytical studies measure both disease-related outcomes and risk factors. The vast majority (>99%) of all epidemiological studies in the medical

literature fall into this category. The advantages and disadvantages of these types of studies are the converse of those listed for descriptive studies.

Advantages:

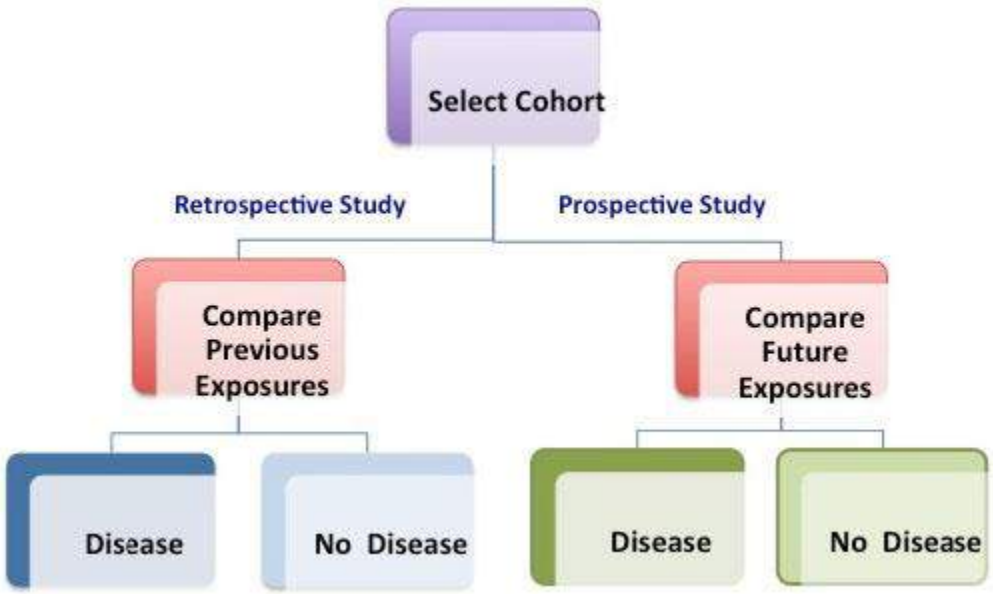
- The ability to focus on subgroups
- The ability to control for confounding
- Possible to reproduce/replicate results

Disadvantages:

- Limited variability in disease rates
- Narrow range of potential predictors

1. Cohort Studies: "What will happen to me"?

In cohort studies investigators compare populations that are assumed to be similar except that they have different exposures to factors of interest (e.g., diet, exercise, sun, asbestos, cigarette smoke), and determine whether or not the prevalence (likelihood) of getting the disease varies with exposure.



• Prospective studies begin prior to the exposure and study the population over time.

An example is the Nurses Health Study in which thousands of nurses kept records of lifestyle factors that may have been related to disease. Overtime, some of the nurses developed specific diseases, while others didn't.

Epidemiologists then looked at the lifestyle data gathered to determine whether there were any factors that were different among those who did versus did not develop the disease.

• Historical or retrospective studies look back in time for patterns of exposure that may have differed among the groups.

These studies look at groups of people who have or have not developed a disease and compare them. When these studies rely on health or occupational records they can be very useful. However, when they are based on subjects' memories, they may be less reliable.

Advantages:

- Cancer doesn't just suddenly appear in a person. Cohort studies allow researchers to study people over the long period of time that it takes for cancer to develop.
- Cohort studies have an advantage over case-control studies because they ask people to.

Disadvantages:

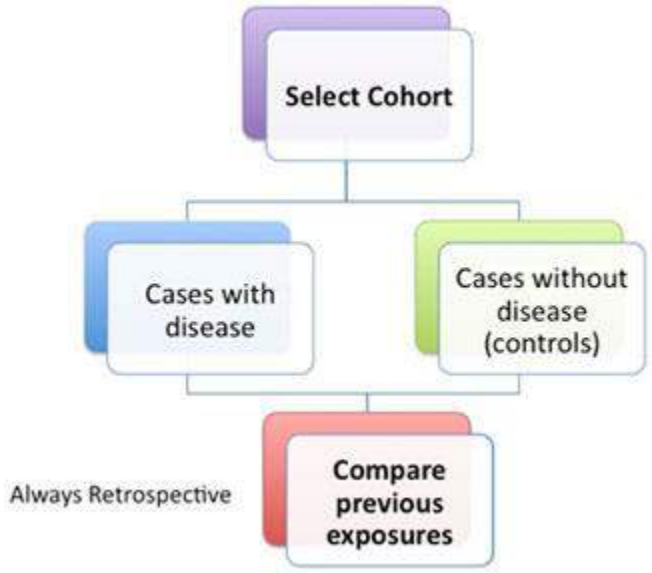
- As in any kind of dietary investigation, cohort studies need to be extremely large and follow participants over a long period of time in order to pack real scientific and statistical punch.
- Keep track of what they're eating while they're still healthy, rather than waiting until they develop cancer and then asking what they ate in the past (pre-diagnosis).
- Many different types of cancer (or other diseases) can be studied using the same cohort. *Source: American Institute of Cancer Research*

2. Case Control Studies: "Why me" study.

In *case control studies* investigators begin with people who have been diagnosed as having a disease (cases) and compare them to people without the disease (controls).

Using data from a variety of sources - personal interviews, medical and hospital records - cases and controls are compared with regard to past exposures in an attempt to identify differentiating factors.

- Similarities with historical cohort studies and Both types of studies take a look backward in time for exposures that may be related to disease.
- Differences with historical cohort studies
- Sample size



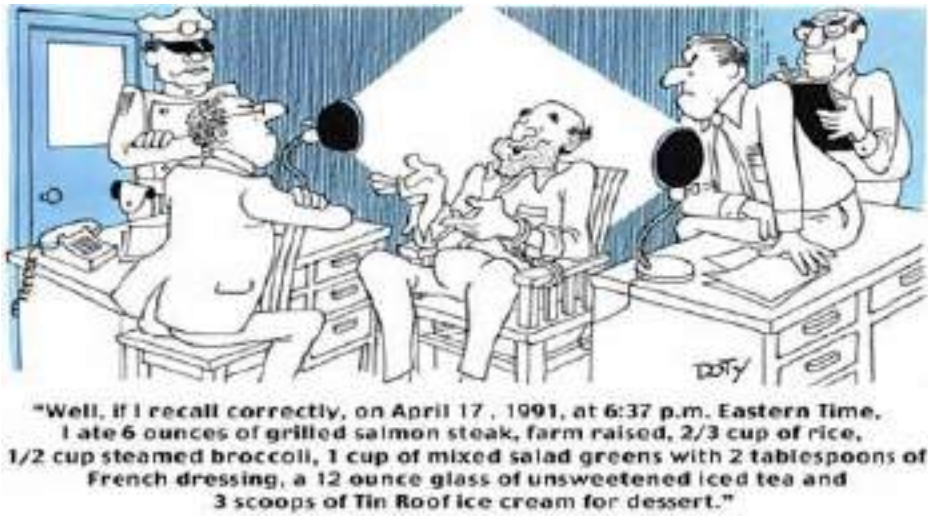
- In case-control studies, a relatively small group of cases is identified, and compared to an equal-sized group of matched controls.
- In historical cohort studies, a large cohort is divided among those who do versus do not have the disease.

<u>Advantages of case controlled studies:</u>

With enough subjects in the study and careful selection of controls, case-control studies provide a cost-effective way to study cancer.

Disadvantages:

As in eyewitness testimony in a courtroom, case-control studies depend on our often unreliable memories.



In case-control studies, cases and/or controls may remember their past diets differently. This is called 'recall bias'.

Honesty in reporting is also an issue.

New scientific developments may help avoid this problem. Biomarkers of dietary intake, which act like fingerprints of the foods we eat regularly, can be utilized vs. relying on faulty memories.

Summary of Analytical Study Designs

Most epidemiological studies are described as "hypothesis generating." That is, they identify trends in the general population that then confirm them in carefully controlled experimental settings.

The choice among the three types of epidemiological studies always reflects a trade-off among the goals (e.g., explore a single disease or multiple diseases) and the constraints (e.g., time and costs).

This chart shows strengths and weaknesses of several types of studies.

	Prospective Cohort	Historical Cohort	Case Control
Strengths	• Time relationships are known • Multiple diseases can be studied • Suitable for rare exposure situations • Presence of disease can be verified	• Multiple diseases can be studied • Relatively inexpensive • Relatively fast	• Good for rare diseases • High drop-out rate • Can be used to study multiple exposures • Relatively inexpensive • Relatively fast
Weaknesses	• Large cohort required • High drop-out • Long time-frame • Most expensive • Definitions of exposure and disease can vary over time	• Large cohort required • Reliance on non-reliable recall and/or historical data of exposure • Comparability of exposed and non-exposed is problematic	• Reliance on non-reliable recall and/or historical data of exposure • Time course can be difficult to verify • Comparability of cases and controls is problematic

Experimental Epidemiology Studies

Experimental (laboratory) studies involve more than observing and gathering data. Scientists make small, defined changes in one or more sets of the test subjects - cells, tissues, animals or people. Then they compare the various outcomes. These studies can be done in two basic ways: in vitro (test tubes) and in vivo (living organisms-mice or people)

In Vitro

In vitro studies are experiments performed in test tubes. These studies help researchers figure out for instance precisely how and why certain foods or food substances might protect against cancer. Seeking clues as to the complicated array of chain reactions that happen after we consume a particular nutrient, researchers examine animal or human cells or tissues removed from the body.

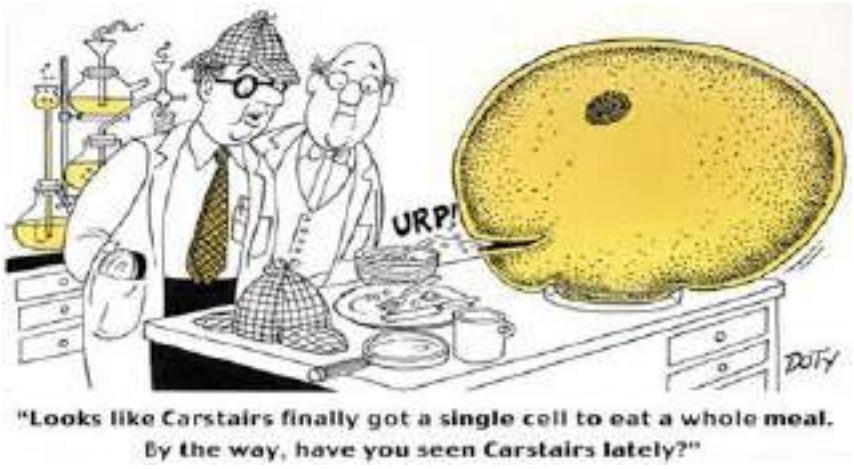
For example, an epidemiological study can suggest that eating green beans protects against cancer. But that's only an association. Using in vitro studies, scientists can look at the chain of events that happens when nutrients and cancer cells meet. Put those two types of studies together, and you're closer to solving the mystery than with either type of study alone.

Advantages:

In vitro studies are tightly structured, which means that scientists can control for many confounding variables. Once an in vitro study finds a "suspect" - a biological mechanism that might protect against or add to your risk of cancer - researchers can then test their hypotheses in an animal model.

Disadvantages:

In vitro studies can't tell us if an anti-cancer effect that happens at the cell level also occurs in the "real world" of the complex human body. In vitro does not mimic physiological conditions of a living organism like a mouse model or human.



"Looks like Carstairs finally got a single cell to eat a whole meal. By the way, have you seen Carstairs lately?"

They also can't tell us how much we might have to eat of any substance to reap anti-cancer benefits, and they can only involve food components, not whole foods, since one can't feed a cell an

apple.

In Vivo

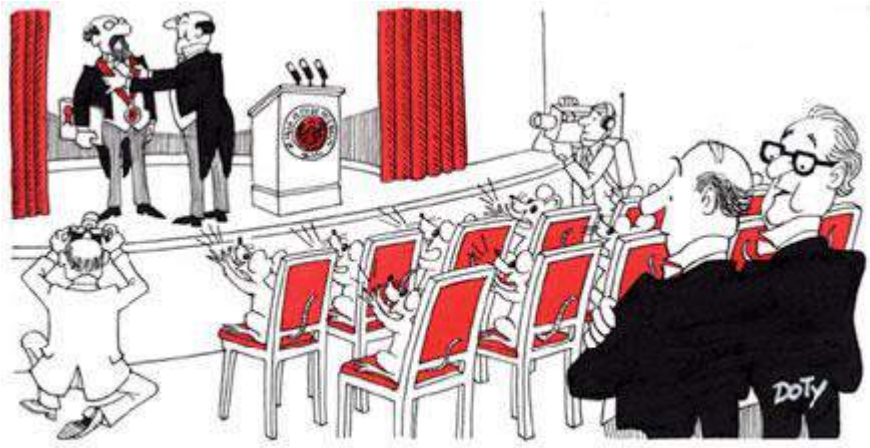
In vivo studies can put hypothesis to the test in complex living organisms. If cell or tissue studies (in vitro) provide evidence that intervention X protects against cancer, an in vivo study can give researchers the next clue.

Advantages:

Testing interventions in animal models allows scientists much stricter control than with humans. Unless they lock you in the lab, you're probably going to eat those Oreos, but a mouse eats what he's fed - so researchers know exactly what's going in and what's going out.

Disadvantages:

Humans aren't mice. While the fast majority of our biological processes are similar - especially the cancer process - many things that happen in mice don't happen the same way in humans, and vice versa.



"It's an award for a cancer cure, but it only works on mice."

Image courtesy of American Institute of Cancer Research

Clinical Trials - The next step

If an animal experiment is successful, usually the next usual formal epidemiological experiment is a randomized controlled clinical trial, conducted to test a preventive or therapeutic regimen or diagnostic procedure. In controlled trials, scientists don't just observe what happens to study subjects as they live their lives. Rather, they make specific changes to their lives to see how those changes affect them.

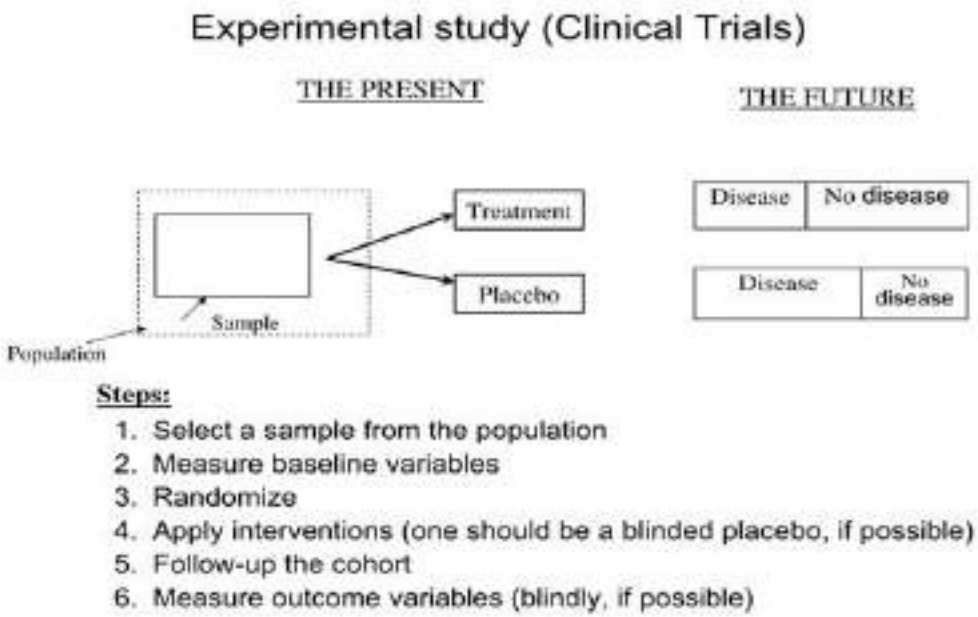


Chart courtesy of the National Cancer Institute (NCI)

One group of study participants, the "intervention group", consumes foods or nutrients scientists think may protect against cancer. Other participants, the "control group," get a different "food prescription" - often just a placebo.

Advantages:

Controlled trials avoid many of the types of bias that can be found in other studies. They also let scientists keep tight control over the enormous complexity of our daily lives.

"Anyone for a game of Blind Man's Bluff after dinner?"

Disadvantages:

Controlled trials are often called the scientific "gold standard." This can be true in many situations, but for unraveling the mystery of linkages between diet and cancer prevention, this investigation method may not be perfect.

It's hard to "blind" people to dietary modifications because you know what you're eating, and you'll be aware if someone changes it.

Image courtesy of American Institute of Cancer Research

That's why many controlled trials involving diet and cancer give the nutrients in the form of a supplement. One group gets the supplement being tested and the control group get a "placebo".

It's important to remember that even if scientists show that an isolated supplement produces no anti-cancer effects, this won't tell us anything conclusive about how whole foods or diets made up of many different foods affect cancer risk.

And since cancer can take decades to develop, it's hard to know if a study has lasted long enough to influence cancer development and/or prevention. Nevertheless, a positive result from a controlled trial can provide strong evidence that a particular nutrient has a protective effect against cancer so further testing or observational studies can be undertaken.

Meta-Analysis

Meta-analysis is a structured literature review technique that attempts to combine similar studies to determine the average effect size for a particular treatment under comparable circumstances with comparable participants. Meta-analysis is all about putting the different pieces of the puzzle together

in a scientific way. It combines the findings of many different studies using statistical methods. These studies offer a real, quantifiable sense of where the evidence is leading.

Cumulative Evidence

Cumulative evidence is another method used to look at the big picture. Rather than using a complex mathematical model, though, cumulative evidence simply means stacking up all the related studies and figuring out what they say overall. Think of a fictional detective looking at fingerprints, eyewitness testimony, DNA evidence, and circumstantial evidence, and putting them all together to see what kind of case they build.

Image courtesy of American Institute of Cancer Research

Meta-analysis can be used as a guide to answer the question:

'Does what we are doing make a difference to X' even if 'X' has been measured using different instruments across a range of different people?

Meta-analysis provides a systematic overview of quantitative research that has examined a particular question.

Advantages of meta-analysis:

It combines all the research on one topic into one large study with many participants.

Disadvantage: The danger is that in combining a large set of different studies the construct definitions can become imprecise and the results difficult to interpret meaningfully.

Steps in a meta-analysis

1. Search of literature

2. Selection of studies ('incorporation criteria')

- Based on quality criteria, e.g. the requirement of randomization and blinding in a clinical trial.
- Selection of specific studies on a well-defined subject, e.g. the treatment of breast cancer.
- Decide whether unpublished studies can be included to avoid publication bias.

3. Decide which dependent variables or summary measures are allowed in the comparison.

4. Statistical model selection

5. Reporting

How do you describe a disease?

- Symptoms and Signs
- Symptoms - High grade fever, Redness of eyes and Rash.
- Signs - Rash, Koplick's spots.
- Ex. Measles.
- We can describe the disease in a community in a scientific way – Descriptive epidemiology.

Descriptive Epidemiology

- Is the method by which Epidemiologists describe an epidemiological / health related event.
- Descriptive Epidemiology describes the distribution of cases/events in X3
    - Time, Place and Person

What purpose does Descriptive Epidemiology serve?

1. Epidemiologist becomes familiar with the data and thereby the problem.
2. Epidemiologist learns the extent/size of the problem.
3. Epidemiologist creates a detailed description which can be communicated.
4. Identify high risk group(s) and get a clue into the causation of disease (Hypothesis).

Time distribution

- The occurrence of disease changes over time.
- In Time distribution epidemiologist tries to describe

the changes in the disease occurrence.

- There are three kinds of time trends or fluctuation
  - Short-term fluctuations.
  - Periodic fluctuations.
  - Long-term or secular trends.

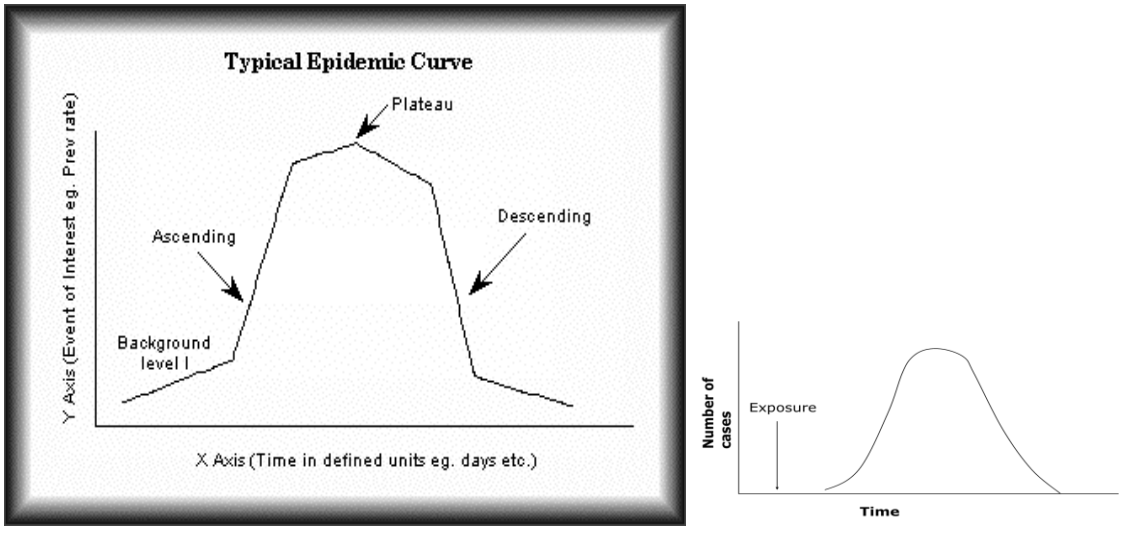
- There are three types of epidemics
  - Common-source epidemic
    - Single exposure or point source epidemic
    - Continuous or multiple exposure epidemic
  - Propagated epidemics
    - Person to person
    - Arthropod vector
    - Animal reservoir
  - Slow (modern) epidemics

Short-term fluctuations

- These are epidemics/outbreaks

Epidemic curve

- A graph of the time distribution of epidemic cases is called the 'epidemic curve'.
- The shape and size of the epidemic curve will help us know the type of epidemic.



Common-source: Single exposure epidemic (point source epidemic)

The main features of a 'point-source' epidemic are

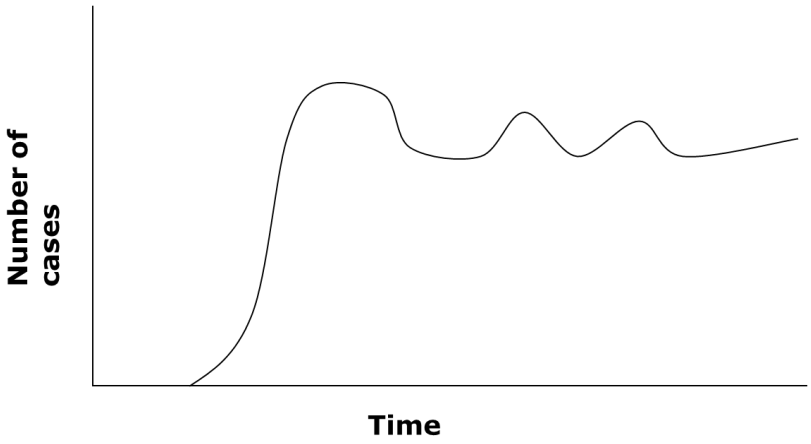
- The epidemic curve rises and falls rapidly.
- No secondary curves.
- All cases occur in ONE incubation period.

- Commonly seen in food poisoning, industrial pollution.

Common-source: Continuous or repeated exposure

- Exposure from the same source may be continuous or repeated.
- The cases occur for more than one incubation period.
- The epidemic curve will have more than one peak.

Single source continuous exposure epidemic



Propagated epidemics

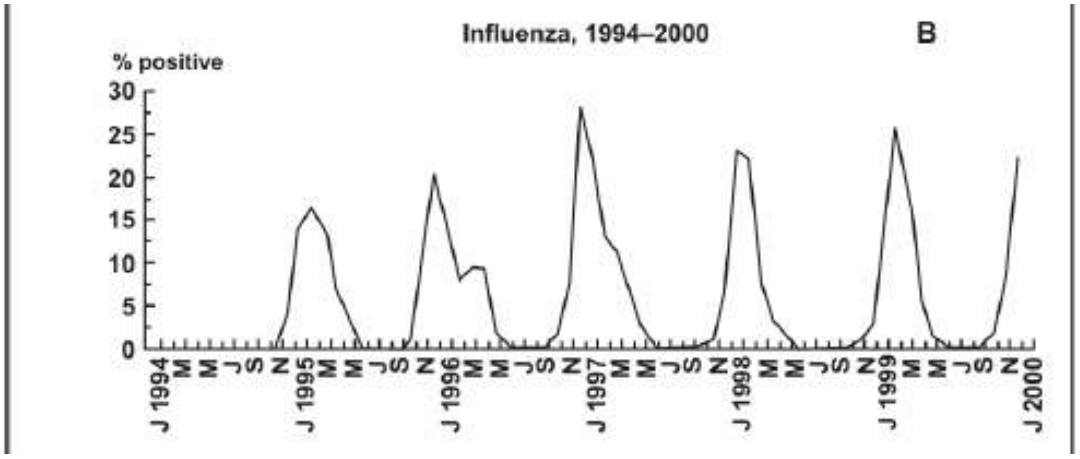
- Propagated epidemic is mainly due to person-to-person transmission.
  - E.g. Hepatitis
- Transmission continues till susceptible individuals are depleted.

Periodic fluctuation

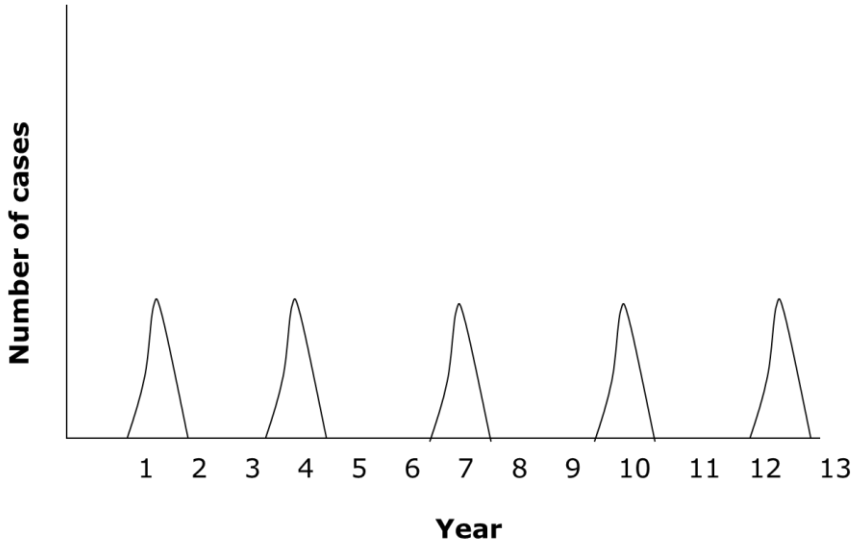
- Seasonal trend
  - Some occur more during certain seasons. E.g. respiratory diseases are more common during winter months.
- Cyclic trend
  - Some diseases show an increase every few years. E.g. measles show an increase every 2-3 years.

Time distribution-seasonal trend

Seasonal pattern of Influenza



Cyclic trend



Long term or Secular trend

- Secular trend means changes in the occurrence of disease over a long period of time, generally several years or decades.
- Example: Tuberculosis and Leprosy cases, Libya 1972-2005

Tuberculosis and Leprosy cases, Libya 1972-2005

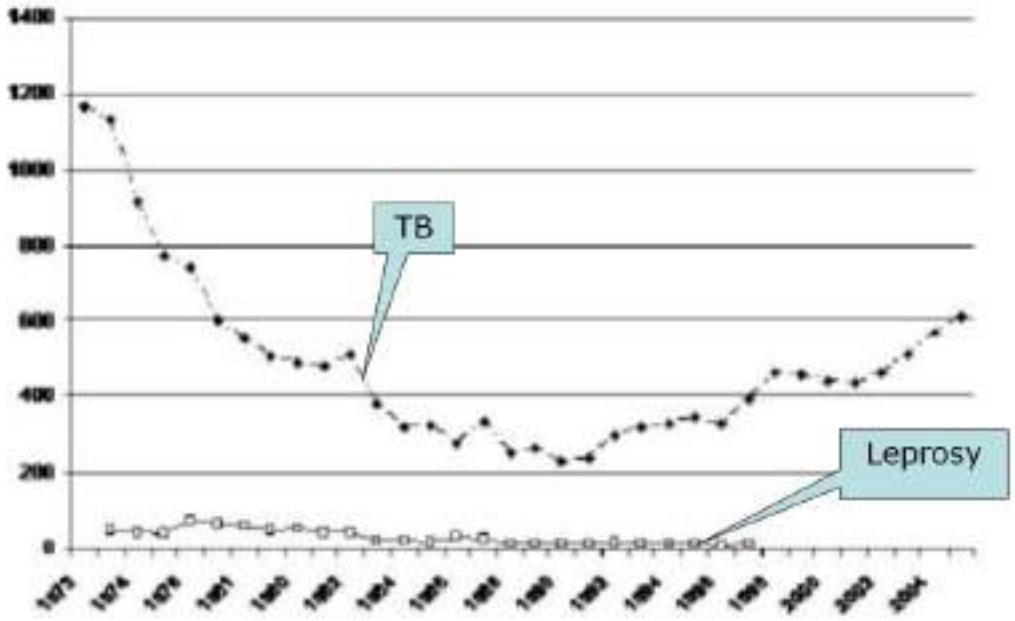
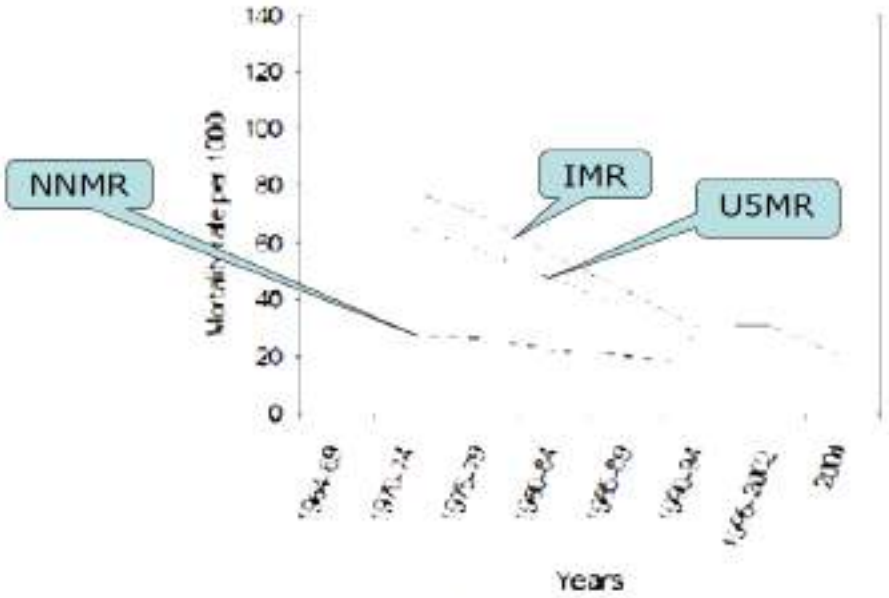


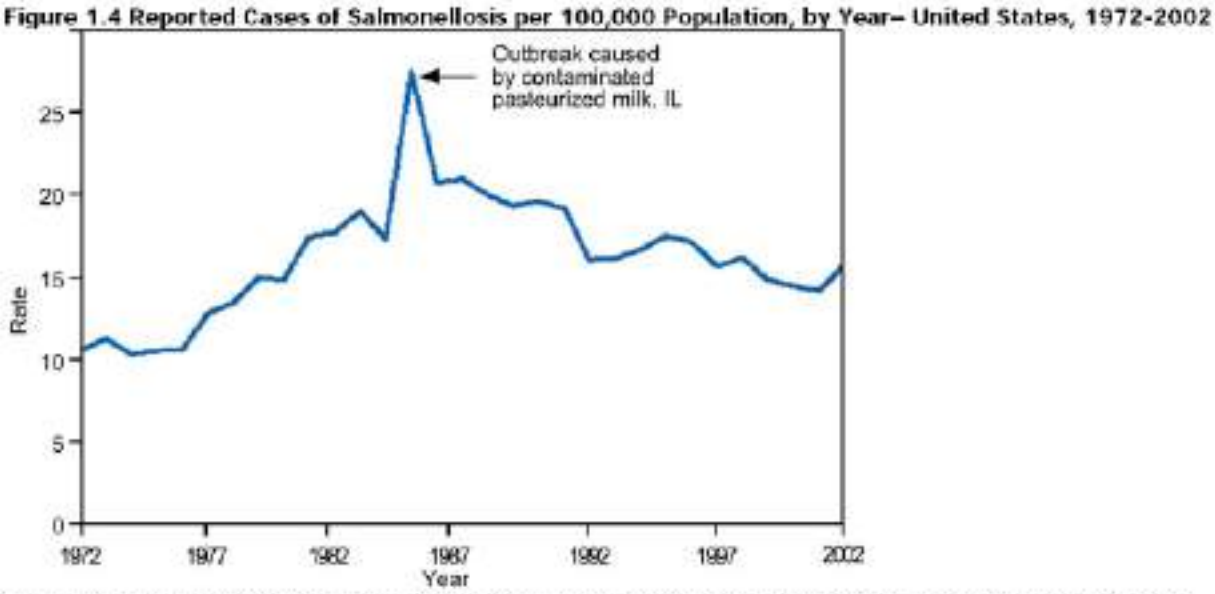
Figure 2: Secular trend in notified cases of tuberculosis and leprosy in Libya during the period 1972-2005.

Health indicators of Libya 1964-2004



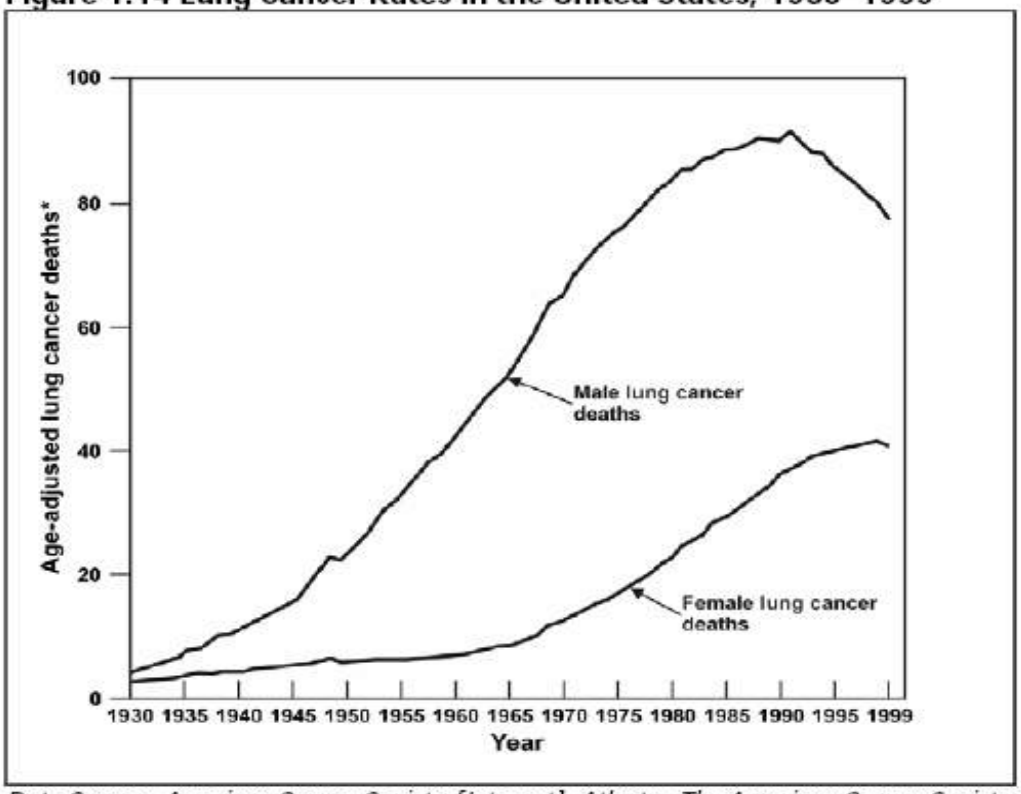
U5MR – Under 5 Mortality Rate; NN – NeoNatal; I - Infant

Time distribution



Source: Centers for Disease Control and Prevention. Summary of notifiable diseases–United States, 2002. Published April 30, 2004. for MMWR 2002;51(No. 53): p. 59.

Figure 1.14 Lung Cancer Rates in the United States, 1930–1999



Data Source: American Cancer Society [Internet]. Atlanta: The American Cancer Society, Inc. Available from: http://www.cancer.org/docroot/PRO/content/PRO_1_1_ Cancer_ Statistics_2005_Presentation.asp.

Time distribution – Uses

- Take appropriate action
- Know whether interventions are effective.
- Develop hypothesis regarding the source or cause of outbreak.

Place distribution

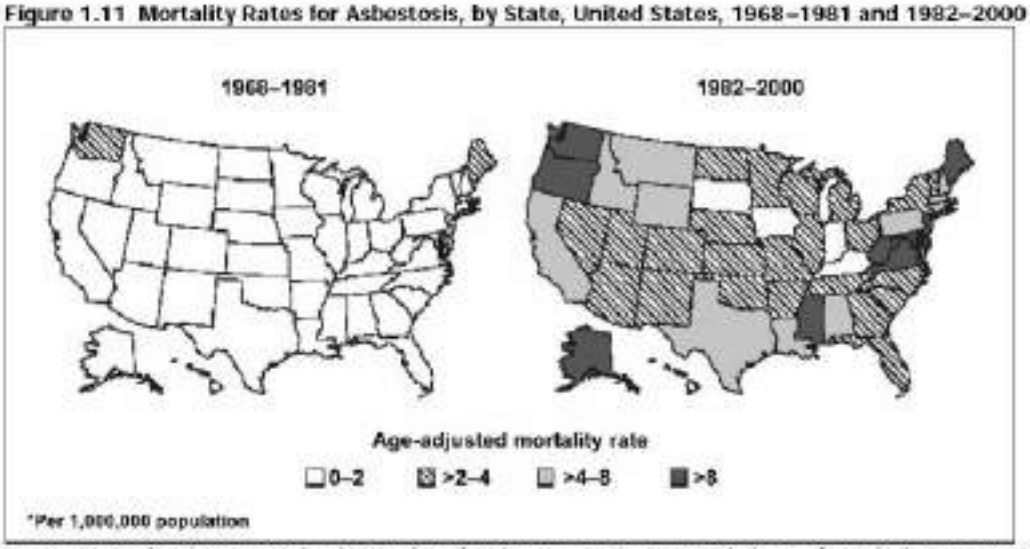
- Describes the distribution of cases in a geographic area.
- The distribution can be based on place of residence, place of work, place of recreation, place of travel etc. depending on the disease.
- We may have to try more than one distribution to learn more about the disease
- Two types of maps - Spot map and Area map.

Figure 1.1 Spot map of deaths from cholera in Golden Square area, London, 1854 (redrawn from original)

Source: Snow J. Snow on cholera. London: Humphrey Milford: Oxford University Press: 1936.

Place distribution (Area map)

Figure 1.11 Mortality Rates for Asbestosis, by State, United States, 1968–1981 and 1982–2000



Source: Centers for Disease Control and Prevention. Changing patterns of pneumoconiosis mortality–United States, 1968-2000. MMWR 2004;53:627-32.

Spot map vs Area map

- Spot map gives an idea of the number and distribution of cases in an area.
- Area map describes the rate of occurrence of cases by taking into account the population of the area.

Place distribution – uses

- Know the geographical extent of disease.
- Identify the source of infection or causative agent.
- To plan control or preventive measures.

Person distribution

- Personal characteristics like age, sex etc. almost invariably affect disease occurrence.
- So distribution of disease or health event among these categories help the epidemiologist in knowing more about the disease.

Person distribution – age

- Almost every health related event vary with age
    - Measles
    - Cancer
    - Hypertension

Person distribution (age)

Figure 1.13a Pertussis by 5-Year Age Groups

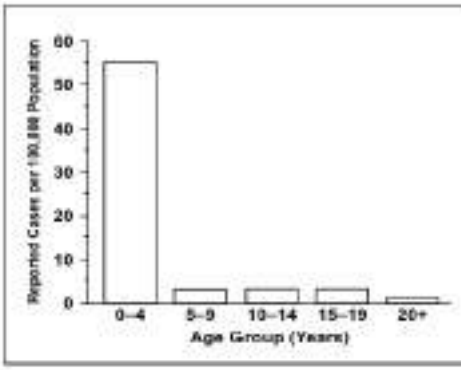
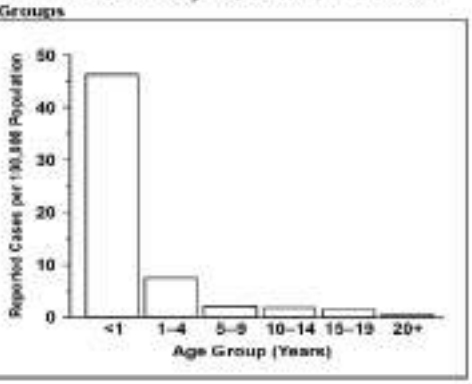


Figure 1.13b Pertussis by <1, 4-Year, Then 5-Year Age Groups



Person distribution (sex)

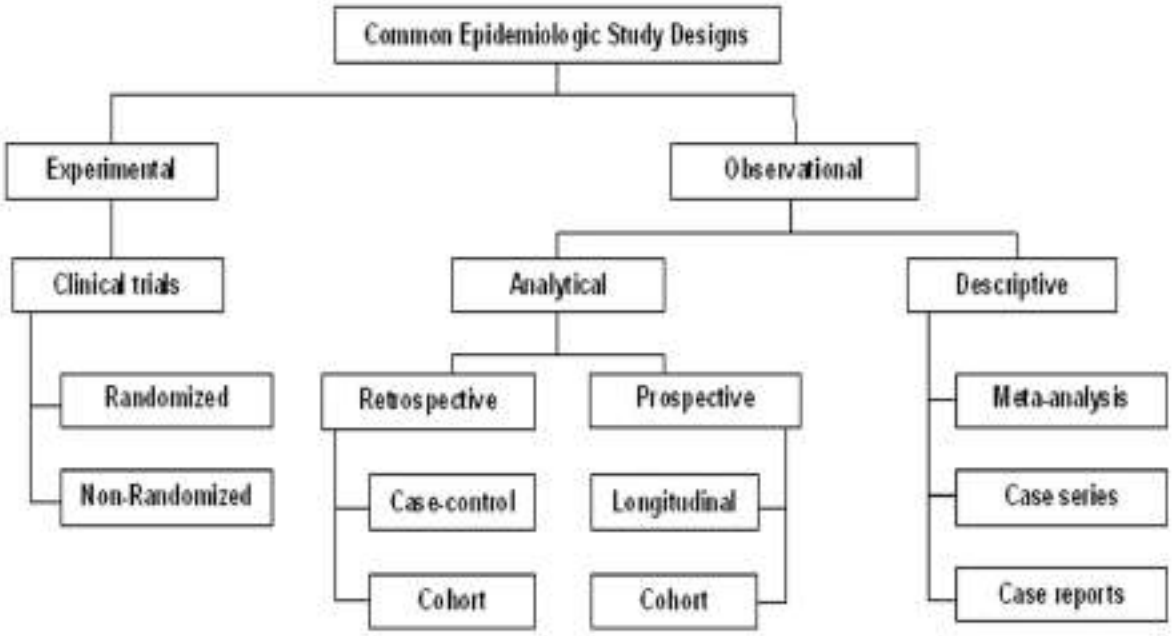
- Distribution of disease varies between males and females.

Person distribution – other attributes

- Race
- Ethnicity
- Nationality
- Behavior
- Socioeconomic groups

Experimental Epidemiology and Public Health

In experimental epidemiology the investigator does some intervention and observes what happens. He will make the people do something to see what is the effect.



Epidemiology Terms

Agent: A causative factor, such as a biological or chemical agent that must be present (or absent) in the environment for disease occurrence in a susceptible host.
Aggregate data: Data combined from several measurements or sets of measurements.

Analytic epidemiologic studies: Studies that examine groups of individuals in order to make comparisons and associations and to determine causal relationships; also known as cohort and case-control studies.

Bias: Any process or factor at any stage of a study from, its design to its execution to the application of information from the study, that produces results or conclusions that skew the results.

Case-control study: An analytic epidemiologic study design that assembles study groups after a disease has occurred; also called a retrospective study.

Cohort study: An analytic epidemiologic study type that assembles study groups before disease occurrence to observe and compare the rates of a health outcome over time; also called a prospective study.

Confounding factor: The distortion of the effect of one risk factor by the presence of another.

Correlation study: A descriptive epidemiologic study design used to compare aggregate populations for potential exposures of disease.

Cross- sectional survey: A descriptive epidemiologic study design that uses a representative sample of the population to collect information on current health status, personal characteristics, and potential risk factors or exposures at one point in time.

Descriptive epidemiologic studies: Epidemiologic study designs that contribute to the description of a disease or condition by examining the essential features of person, place, and time.

Experimental epidemiology uses an experimental model to confirm a causal relationship suggested by observational studies.

6. Case-Control and Cohort Studies

Problem

- 200 students appeared for Exam
- Only 90 passed, 110 failed
- Problem – Why many students failed?

What is the reason?

Analysis – Possible reasons for failure

1. Question paper difficult - No
2. Lecture taken – Yes
3. Attended lecture – All students did not attend.

- How do we know not attending the lecture is the correct reason?

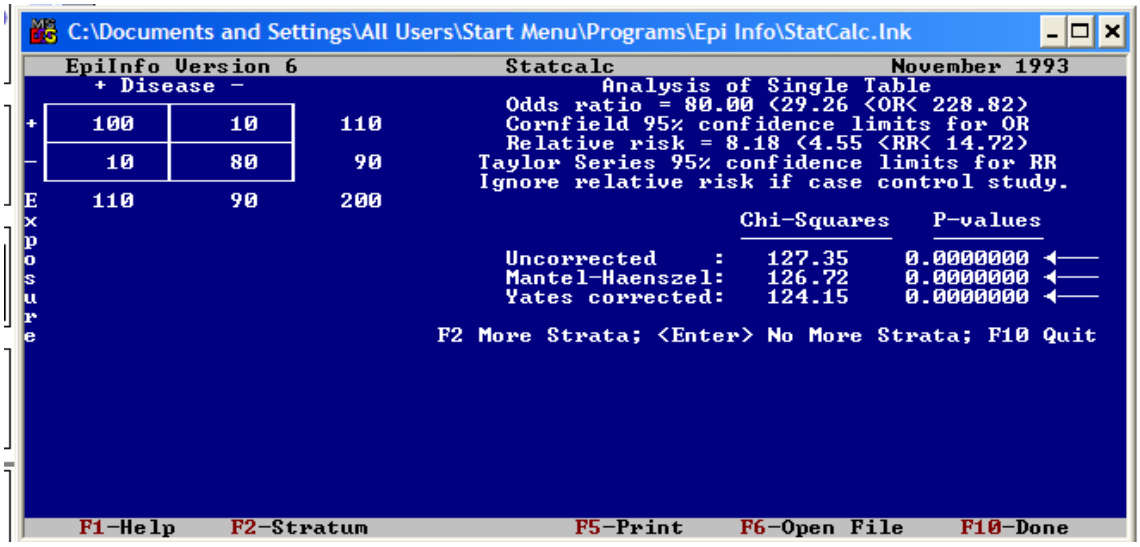
Reason	Failed in exam (Problem +)	Pass (Problem -)	
Reason + (absent from lecture)	a	b	a+b
Reason '–' (present for lecture)	c	d	c+d
	a+c	b+d	

1. Case Control study

Analysis

- Odds ratio = axd/bxc
- 100x80/10x10 = 80
- Students not attending lecture has 80 times more chance of failing in the exam than those who attend the lecture.

	Failed in exam (problem+)	Pass (Problem-)	
Reason '+' (**absent** from lecture)			a+b
Reason '–' (present for lecture)			c+d
	110 (a+c)	90 (b+d)	200



This result is not by chance because P-value is < (less than) 0.05

Phocomelia

- In 1950 many children in Europe were born with Phocomelia
- Doctors were worried. Why is this happening?
- They asked mothers of these children
    - Was there any problem during pregnancy? No
    - Did they suffer from any disease? No
    - Did they take any medicine? Yes – Thalidomide for morning sickness

Thalidomide tragedy

- They did a Case-Control study to find whether it is the reason
- Case-Control study proved that Thalidomide was the cause
- Thalidomide was banned

Analytical epidemiology

- We test whether there is an association between a disease and the suspected factor.
- We also measure the strength of association.

Case Control study

- Sometimes called 'retrospective study'
- Is the first step to test hypothesis
- Both cause and outcome (disease) have occurred before doing the study
- Proceeds backwards from effect to cause
- There is a control or comparison group to test the hypothesis
- This is the most important feature of Analytical epidemiology

Design of a Case Control study

	Cases (Disease+)	Control (Disease-)	
Risk factor present(+)	a	b	
Risk factor absent (-)	c	d	
	a+c	b+d	

	Cases (Disease +)	Control (Disease -)	
Risk factor +	a	b	
Risk factor -	c	d	
	a+c	b+d	

Steps in a Case Control (CC) study

- Selection of cases and controls

- Matching
- Measurement of exposure to risk factor
- Analysis and interpretation

Selection of Cases

- Cases selected should have the correct diagnosis
- Only cases with the confirmed diagnosis should be included
- Controls must be FREE from the disease under study.
- If there are sub-clinical cases, do laboratory test to make sure that the person has no disease

Sources of controls

- Hospitals (patients having other disease)
- Neighborhood controls
- General population
- How many controls will you take for a case?
    - In large studies generally 1
    - In small studies (below 50) up to 4

Matching

- Matching is a process by which we select controls in a such a way that they are similar to cases in important variables
- Age, Sex, Occupation etc.
- By matching we can neutralize any confounding factor.
- Examples:
    - For studying Lung cancer the Controls should be males and not females
    - For studying Lung cancer the Controls should be adult males and not small boys
    - For studying Breast cancer the controls should be females and not males!
    - For studying Breast cancer the controls should be adult females and not small girls

Measurement of exposure to cause

- There must be a clear Definition for the risk factor.
- That should be same for Cases and Controls
- E.g. Smoking- number of cigarettes, duration of smoking, type of cigarette etc.

Analysis

- Calculate exposure rates among cases and controls
- Calculate the disease risk associated with exposure (Odds ratio)

Cigarette smoking and Lung cancer

- Descriptive epidemiology of Lung cancer patients was done and the following are the important characteristics
  - Males
  - Cigarette smokers
- Hypothesis is 'cigarette smoking is the cause for lung cancer'

Analysis

	Cases (Lung cancer +)	Controls (No lung cancer)	
Smoking +	33(a)	55(b)	
Smoking -	2(c)	27(d)	
	35(a+c)	82(b+d)	

Exposure rate to smoking

Cases = a/a+c 33/35 = 94.2%

Controls = b/b+d 55/82 = 67%

Estimation of risk

- Those who are having lung cancer are smoking more(94.2%)
- However it does not mean that 94.2% of all smokers will develop lung cancer.
- We estimate risk to develop lung cancer in smokers by calculating 'Odds ratio'

Odds ratio

Odds ratio = ad/bc

33x27/55x2 = 8.1

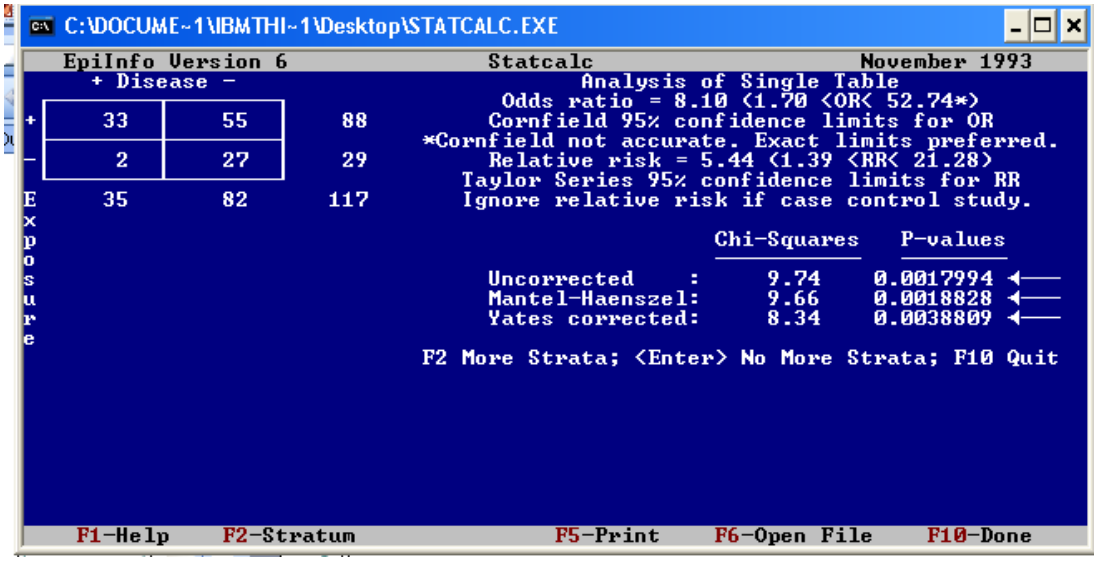
Those who smoke have 8.1 times the risk of developing Lung cancer than those who do not smoke

If the odds ratio is 1 means no risk

P- value

- We have found cigarette smokers has 8.1 times more risk of getting Lung cancer
- There are thousands of Lung cancer patients in the world
- We have taken only a small sample of 35 cases
- How do we know it is true for all lung cancer patients?
- To see if this association is due to chance.
- It is the probability that the difference is due to chance
- If P value is <0.05 it is considered statistically significant.
    - P value in lung cancer study is <0.001

Analysis



CC study – advantages

- Easy to conduct
- Inexpensive
- No risk to people
- No attrition (loss of patients) problems
- No ethical problems

CC study – disadvantages

- Problem of accuracy of data
  - Loss of memory
    - How many cigarettes a person smoked 20 years ago?
  - Incomplete records
    - What medicine a lady took in pregnancy?
- Getting good controls is difficult

2. Cohort study

Cohort

- Is a group of people who share a common characteristic or experience
  - People born on a same day
  - Students who joined college in a year
  - People doing same work e.g. doctors
- Also called Prospective study or Incidence study.
- Is usually done after doing Case-Control study to get more proof of the cause of disease.
- The study is done on people before the disease occurs.

Design of Cohort study

	Disease +	Disease -	
Study cohort (Risk factor +)	a	b	a+b
Control cohort (Risk factor -)	c	d	c+d
	a+c	b+d	

	Disease +	Disease -	
Study Cohort Risk factor +	a	b	a+b
Control Cohort Risk factor +	c	d	c+d
	a+c	b+d	

Elements of a Cohort study

1. Selection of study Cohort
2. Selection of comparison (Control) Cohort
3. Data collection and Follow-up
4. Analysis and interpretation

Selection of Study Cohort

- They are selected from general population or from specific groups e.g. Doctors, students etc.
- Members of the study cohort must NOT have the disease.
- Members of the study cohort must be exposed to the risk factor.
- They are selected from general population or from specific groups e.g. Doctors, students etc.

- Members of the control cohort must NOT have the disease.
- Members of the control cohort must NOT be exposed to the risk factor.
- Members of the control cohort must be similar to the study cohort in age, sex etc.

Follow up

- Both the Study cohort and Control cohort is followed up to see how many develop the disease.
- This is done by
    - Medical examination
    - Personal visit, Phone call etc.
- Follow up is difficult because some persons will not respond.

Analysis of Cohort study

- Incidence rate of disease among Study cohort is calculated.
- Incidence rate of disease among Control cohort is calculated.
- Then Relative Risk is calculated.

Smoking and Lung cancer

	Disease + Lung cancer +	Disease – No Lung cancer	
Study Cohort Smoking +	70 (a)	6930 (b)	7000 a+b
Control Cohort Smoking -	3 (c)	2997 (d)	3000 c+d
	a+c	b+d	

	Disease + Lung cancer +	Disease – No Lung cancer	
Study Cohort Smoking +	70 (a)	6930 (b)	7000 a+b
Control Cohort Smoking -	3 (c)	2997 (d)	3000 c+d
	a+c	b+d	

- Incidence rate among smokers = 70/7000 = 10 per 1000

- Incidence rate among non-smokers = 3/3000 = 1 per 1000

Relative risk =

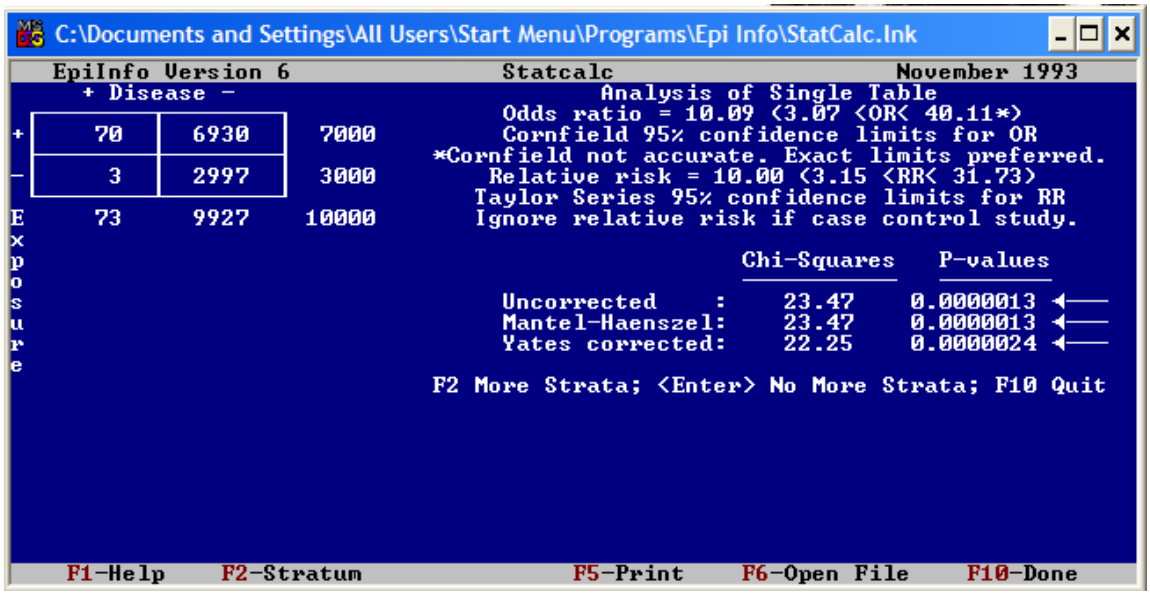
$$\frac{\text{Incidence of disease among exposed}}{\text{Incidence of disease among non-exposed}}$$

10/1= 10

- Relative risk of 10 means that those who smoke have 10 times more risk of developing lung cancer than those who are not smoking.
- If relative risk is 1, that means there is no risk.

P value

- There are many millions of cigarette smokers.
- We have studied only 7000.
- We have to know whether the Relative Risk of 10 is by chance or not.
- We calculate the P value. If the P value is less than(<) 0.05 we accept the Relative Risk.
- P value in our Lung cancer study is <0.001



This result is not by chance because P-value is < (less than) 0.05.

Advantage of Cohort study

- Incidence of disease can be calculated.
- More than one disease due to the risk factor can be studied.
    - Smoking and Lung cancer, peptic ulcer, Coronary heart disease etc.
- Gives better proof of the risk factor than Case Control study.

Disadvantages of Cohort study

- It takes long time to complete study.
- Persons may lose interest and will not come for follow-up.
- The person who is doing the study may lose interest or take another job.
- Cohort studies are expensive.
- Has more ethical problems.

7. Concepts of Disease Occurrence and Outbreak

How does disease occur?

- You may think that this is a very simple question.
- An answer everybody knows.
- But 200 years ago, 1000 years ago people did not know the answer.
- Even NOW we don't know ALL answers!
- In this lecture will try to learn what we know about disease causation.

Theories of Disease causation

- History
- Germ theory of causation

History:
Supernatural theory of disease

- Anger of God
- Punishment by God
- Curse by other people
- Invasion by evil spirit.

Germ theory:

- In 1860 Louis Pasteur demonstrated presence of bacteria in air.
- In 1873 he proposed the germ theory of disease.
- 1877 Robert Koch demonstrated that Anthrax was caused by a bacteria.
- But germ theory did not explain everything
- Presence of germs did not always cause disease.
- All diseases were not caused by germs.

Modern Medicine and Epidemiology

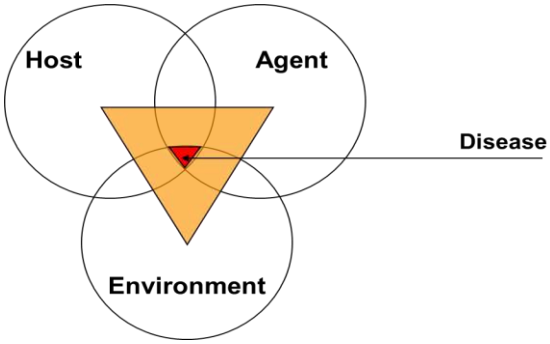
- An important concept of Epidemiology is that disease does NOT occur randomly in the population.
- Disease occurs in those individuals who are exposed to certain risk factors/or who are vulnerable.
- One of the important functions of Epidemiology is to find the cause of disease.

Concepts of disease causation

- Epidemiological triad.
- Rothman's Pie.
- Multifactorial causation.
- Web of causation.

Epidemiological triad

- Agent
- Host
- Environment



Disease is caused by the interaction of all three factors.

Agent factors

- Virus, Bacteria, stress, vitamin etc.
  - Virulence.
  - Ability to cause disease depends on the number or amount of agent.

Host factors

- Age.
- Sex.
- Immunity.

- Socioeconomic – overcrowding, educational status etc.
- Heredity.
- Nutritional status.
- Presence of other diseases.

Environmental factors

- Climate – temp, humidity etc.
- Presence of vectors.
- Sanitation.
- Availability of health services.

- When the required number of risk factors joins it is called Sufficient cause.
- If some risk factor is present always, it is called Necessary cause.
- Disease prevention can be achieved even by blocking just ONE risk factor!

Rothman's Causal Pies

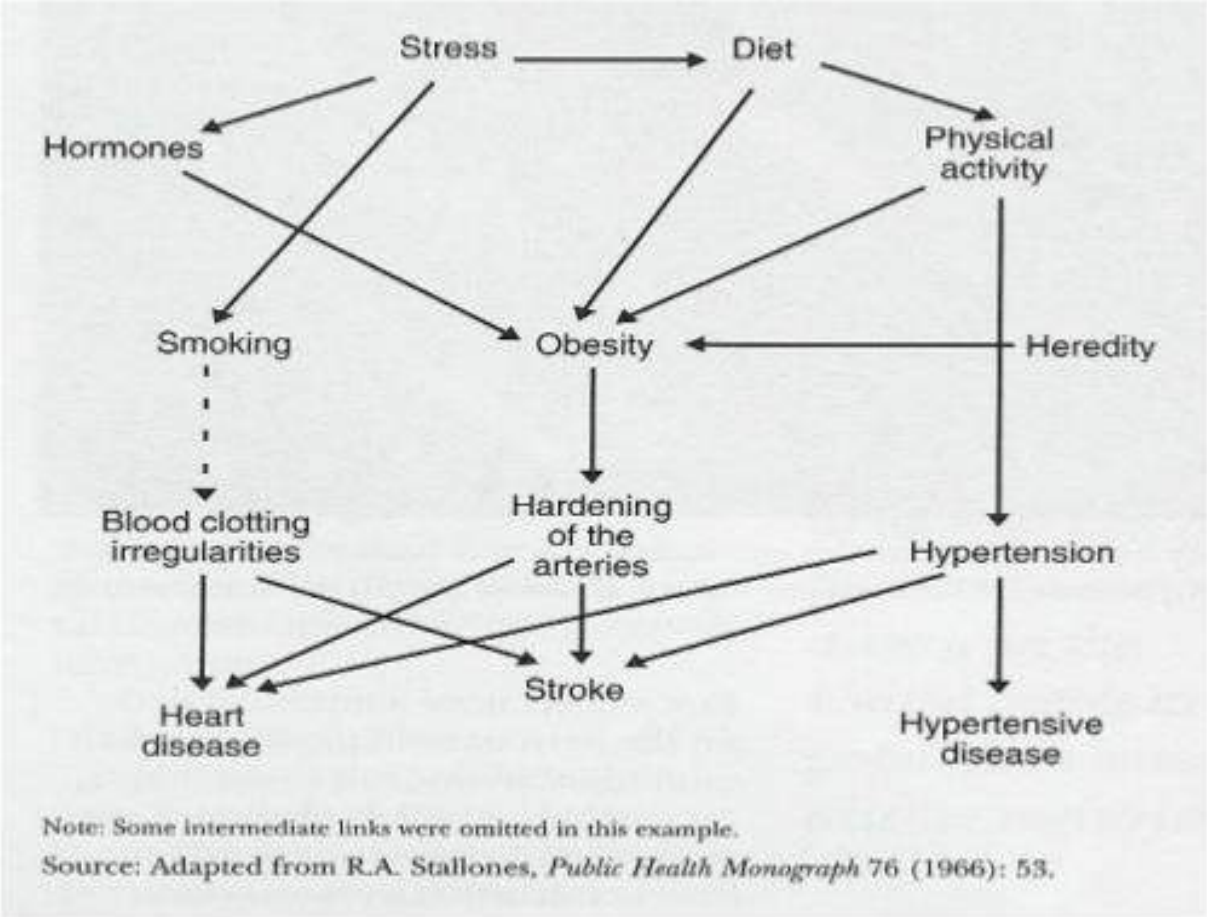
- In case of non-communicable diseases like Cardiovascular disease, Diabetes, Hypertension etc.
- There are many risk factors.
- All of them need not be present.
- The Epidemiological triad does not explain the causation satisfactorily.
- Not all risk factors are necessary to cause disease.

Multifactorial causation

- Suggested by Pettenkofer of Munich.
- Tuberculosis is not caused by presence of Mycobacterium tuberculosis alone.
- Contributing factors like overcrowding, malnutrition etc. needs to be present.
- Coronary heart disease – excess fat intake, smoking, lack of physical exercise, obesity etc.

Web of causation

- According to Mac Mohan and Pugh.
- Web of causation considers all predisposing factors or risk factors and their interaction.



Note: Some intermediate links were omitted in this example.

Source: Adapted from R.A. Stallones, *Public Health Monograph* 76 (1966): 53.

Level of disease

The amount of a particular disease that is usually present in a community is referred to as the baseline or endemic level of the disease.

This level is not necessarily the desired level, which may in fact be zero, but rather is the observed level. In the absence of intervention and assuming that the level is not high enough to deplete the pool of susceptible persons, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease.

While some diseases are so rare in a given population that a single case warrants an epidemiologic investigation (e.g., rabies, plague, polio), other diseases occur more commonly so that only deviations from the norm warrant investigation.

- **Sporadic** refers to a disease that occurs infrequently and irregularly.
- **Endemic** refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area.
- **Hyperendemic** refers to persistent, high levels of disease occurrence. Occasionally, the amount of disease in a community rises above the expected level.
- **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area.
- **Outbreak** carries the same definition of epidemic, but is often used for a more limited geographic area.
- **Cluster** refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
- **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

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

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

Investigation of an Outbreak

Definition of Outbreak/Epidemic

Outbreak is occurrence of disease/or any health-related event in a community in excess of expected level is called an Outbreak/epidemic.

Examples

- Outbreak of Cholera in Zimbabwe 2008.
- A Massachusetts college closes down after over 100 students fall ill with norovirus infections – March 2009.
- Outbreak of Salmonellosis in USA – peanut butter is the source of infection 2008.
- Outbreak of SARS in China 2001.

Investigation of outbreak (Epidemic)

- Investigating an outbreak is an important duty of Medical Officer/Doctors responsible for Public Health.
- They have to follow a systematic and scientific approach to find the cause of the outbreak and control the outbreak and prevent morbidity and mortality.

What is excess?

- It depends on the disease and the community.
- If it is a serious disease with high mortality even a small increase will be considered as an outbreak.
- If it is a mild disease only a big rise in incidence will be considered as outbreak.

What is an outbreak?

- Will one case of Polio in Palestine be an outbreak?
- Yes, because the expected number of Polio cases in Palestine is Zero!
- But in Nigeria and India more than 600 or 700 cases of Polio will be considered as an outbreak.
- There are 100 cases of Cutaneous Leishmaniasis every month in a city.
- Will 110 cases of Leishmaniasis be outbreak?
- Maybe yes/ maybe no, because the disease is not very serious.
- Will 150 cases of Leishmaniasis be an outbreak?
- Definitely yes.
- There are 2 cases of Rabies in a city every month.

- Will 5 cases of rabies be an outbreak?
- Yes, because even though 5 is small number the disease causes death.
- So we should consider it as an outbreak.

Outbreak versus Epidemic

- Both words have the same meaning.
- Usually a small Epidemic is called Outbreak.
- We normally use the word Outbreak to prevent fear among the public.
- People will become worried if they hear there is an Epidemic so we use the term Outbreak.

Steps in investigating an outbreak

1) Verification of diagnosis.
2) Confirmation of the existence of an outbreak.
3) Identification of cases and their characteristics.
4) Study of the ecological factors.
5) Further investigation of population at risk.
6) Data analysis.
7) Formulation of hypothesis.
8) Recommendation for prevention or control.

Step 1 Verification of diagnosis

- The first step is to confirm the diagnosis.
- Sometimes people report that there is an outbreak but the diagnosis may be wrong.
- E.g. Somebody may report outbreak of Smallpox, but the real diagnosis will Chickenpox.

Step 2 Confirmation of outbreak

- Next is to confirm that there is an Outbreak.
- Newspaper may report that there is an outbreak without knowing the real expected incidence of the disease in the area.
- When they see a few cases around their house they may think that there is an outbreak.
- So first check the records to see the actual incidence and make sure that there is an incidence more than the expected to confirm an outbreak.

Step 3 Identification of cases and their characteristics

- Identify all the cases in the outbreak and obtain all relevant information about the cases to identify source of outbreak.
- Information about cases should be obtained from hospitals, laboratory etc.
- Information about the exposure to risk factors should be obtained. E.g. in outbreak of typhoid information on source of food/water intake should be obtained.

Step 4 Study of ecological factors

- The ecological factors which may have made the outbreak possible should also be investigated.
- Change in temperature, movement of people, changes in the vector (e.g. mosquito), changes in animal reservoir etc.
- E.g. An increase in the mosquitoes may be responsible for an outbreak of Malaria.

Step 5 Further investigations population at risk

- Sometimes it may be necessary to obtain additional information of the population at risk like immune status, blood examination etc.

Step 6 Data analysis

- The cases are described in Time, Place and Person.
- This Descriptive epidemiology will help us know about the outbreak in detail.

Step 7 Formulation of Hypothesis

- When we do the Descriptive epidemiology we will get some idea about the cause and spread of the outbreak.
- Based on that we can formulate an hypothesis on the cause of outbreak.

Step 8 Recommendations for prevention and control

- The aim of investigating an outbreak is to control the outbreak and prevent future outbreaks.
- Once we know the cause outbreak and spread we can make recommendations to control/stop the outbreak.
- We can also give recommendation to prevent outbreak in future.

8. Disease Prevention & Health Promotion

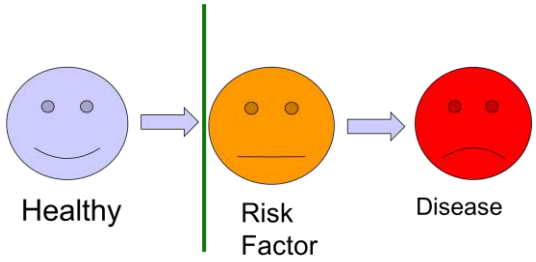
Levels of Prevention

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

Principles of prevention

- Disease prevention and control depend on the phase in the natural history of disease.
  - Pre-pathogenic phase.
  - Pathogenic phase.

Primordial prevention

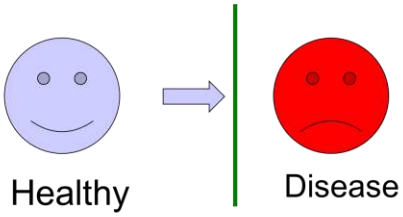


- In Primordial prevention we prevent emergence of risk factors.
- Most useful in preventing CHRONIC DISEASES e.g. Diabetes Mellitus & Hypertension.
- Risk factors like Smoking, Obesity, Sedentary life style etc. are prevented.

Methods of Primordial prevention

- Health education
  - Individual
  - Mass (Group)

Primary prevention

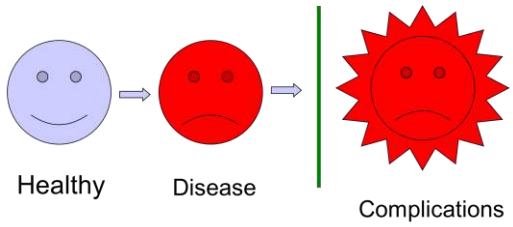


- Primary prevention is action taken before the onset of disease.

Methods of Primary prevention

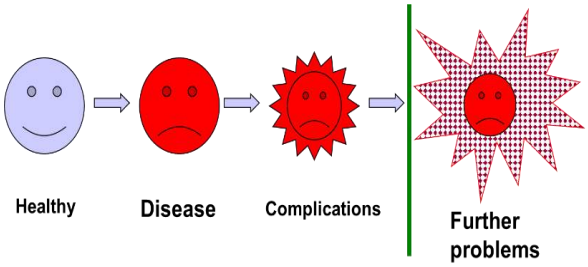
- *Population (mass) strategy*
  - We do the intervention to the entire population.
- High risk strategy
  - We do intervention only to people at high risk.
- *Population strategy*
  - Rubella vaccination to all children.
  - Hepatitis B vaccination to everybody.
- *High risk strategy*
  - Rubella vaccination to only girls.
  - Hepatitis B vaccination to doctors, laboratory workers etc.

Secondary prevention



- Action is taken AFTER the disease has occurred to prevent complications and further injury.
- Pulmonary tuberculosis if not treated can lead to hemoptysis, pneumothorax and even death.
- Diabetes Mellitus leading to renal failure.

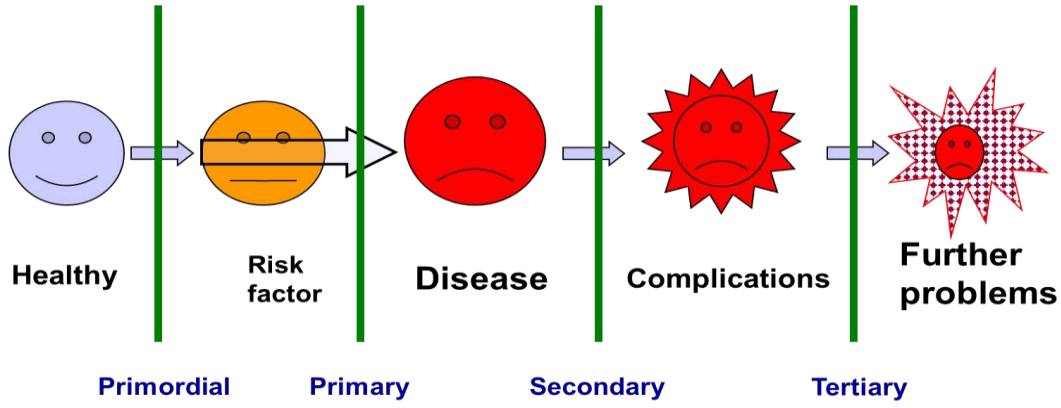
Tertiary prevention



- Disease has already occurred and even complications but we try to prevent further consequences of disease.

- Paralysis due to Poliomyelitis has occurred but we try to prevent further injury due paralyzed legs.

Summary of Prevention Levels



Modes of Intervention

- Primary
  - Health promotion.
  - Specific protection.
- Secondary prevention
  - Early diagnosis and treatment.
- Tertiary prevention
  - Disability limitation.
  - Rehabilitation.

Health promotion

- The goal is to improve health, make the body strong to prevent diseases.
  - Health education

- How to prevent diseases e.g. washing hands.

- Environmental improvement
  - Safe drinking water, prevent breeding of mosquitoes.
- Nutritional intervention
  - Give balanced diet.
- Lifestyle changes
  - Prevent smoking, do physical exercises.

Specific protection

- Immunization
- Chemoprophylaxis e.g. against Malaria.
- Nutrient supplementation e.g. Folic acid, Iron, Vitamin A.

Early diagnosis and treatment

- Diagnose disease early and treat to prevent complications- e.g. Tuberculosis.
  - Screening for Diabetes Mellitus, Hypertension.
  - Mass treatment e.g. Filariasis.

Disability limitation & Rehabilitation

- In case of paralysis due to Poliomyelitis.
- Providing crutches/calipers will prevent further injury to the leg.
- It will also help the patient to walk, work - Rehabilitation.

Concepts in disease control

- Disease Control.
- Disease Elimination.
- Disease Eradication.
- Disease Surveillance.

Disease Control

- Disease is controlled so that it is not a serious public health problem.
  - Tuberculosis is controlled in Palestine.
  - Not eliminated.

Disease Elimination

- Disease is not present in some countries.
- But disease is present in other countries.
- Immunization must be done to prevent disease.

- E.g. Polio is eliminated from Palestine (but present in Nigeria, India).

Disease Eradication

- The disease is not present anywhere in the world.
- The agent is also NOT present in the world.
- So there is no need to immunize
  - Example - Smallpox

Disease surveillance

- Surveillance is the collection of data which is analyzed to prevent disease and improve the health of community.
- AFP (acute flaccid paralysis) surveillance to detect Polio cases is necessary for Polio eradication.

9. Health Education and School Health

Health education is an essential tool of community medicine. It is process by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance or restoration of health.

- Health education is the part of health care that is concerned with promoting healthy behavior.
- Many health problems are due to the lack of knowledge regarding health among the people.
- Health education is a process which produces changes in the health practices of people.
- Health education about common diseases is an essential component of Primary Health Care.

Aims of health education

1. To ensure that health is valued as an asset of the country.
2. To equip people with skills, knowledge and attitudes to solve their own health problems.
3. To promote the development and proper use of health services.

Areas of Health Education

- Human Biology
- Nutrition
- Hygiene
- Mother and Child health
- Prevention of Communicable diseases
- Prevention of Accidents
- Use of Health Services
- Mental Health

Principles of Health Education

- To be effective Health education should be imparted following certain principles.
- Merely talking about health will not lead to behavior change.
- The basic aim of Health education is to produce behavior change for better health.
- Interest
- Participation
- Comprehension
- Communication
- Motivation
- Reinforcement
- Learning by doing
- Good Human relations

"Interest" Principle of Health Education

- People will listen to and learn only things that they are interested in.
- Health educators should find out the health needs of the people.
- And then give information to satisfy those needs.

"Participation" Principle of Health Education

- Participation is one of the most important principles of Health Education.
- Participation will lead to active learning, which is more effective that passive learning.
- Group discussion, panel discussion, workshop are examples of active learning.

"Comprehension" Principle of Health Education

- Health education to be effective the teacher should know the level of education and literacy of the audience.
- Health education should be within the mental capacity of the audience.

"Communication" Principle of Health Education

- Communication is the process by which the health information is transferred to the target audience.
- The language and words used should be simple and understandable to the audience.

"Motivation" Principle of Health Education

- Stimulation or awakening of the desire to learn is called motivation.
- Some of the motives are – praise, reward and punishment.
- The health educator should try to stimulate the desire to learn.

"Reinforcement" Principle of Health Education

- Repeating the health message is important for learning.
- The health message should be given repeatedly.

"Learning by doing" Principle of Health Education

- Learning should be active and not passive.
- People should learn by doing.

"Good Human relations" Principle of Health Education

- People relate the health message with the person giving the message.
- So the Health educator must be kind and sympathetic.
- People should consider him/her as their friend.
- So good human relations is very important for health education.

Stages in Education

1. Awareness
2. Motivation
    1) Interest
    2) Evaluation
    3) Decision-making

Audiovisual aids

- For effective Health Education merely talking is not enough.
- Some audiovisual aid has to be used to convey the message in a more effective way.
- There are many Audiovisual aids to assist health education.
- Audiovisual aids can be classified into
    - Auditory aids
        - Radio
        - Tape recorder
        - Microphones/Amplifier /Speaker or earphones
    - Visual aids
        - Posters
        - Black board/White board
        - Flannel graph
        - Slides
        - Films (silent)
        - Overhead Projector
    - Combined AV aids
        - Television
        - Films/Videos
        - LCD projector
- Audio visual aids are to assist the health educator and not replace him.

Methods of Health education

- Health education can be done at 3 levels
    - Individual
    - Group
    - General Public.

Individual level

- Doctors, nurses and other health professionals who come in contact with patients can provide health education at individual level.
    - Cardiac patient can be given health education about healthy diet, exercise etc.
    - A pregnant lady can be given health education about diet, child care etc.
- The advantage of this method is that the person gets full attention and he can ask questions, clear doubts and discuss very personal or intimate health topics.
- The main disadvantage is that the number of people to whom we can provide such health education will be very small.

Group health education

- In this method health education is given to a group of people.
- Mothers, school children, patients, industrial workers.
- Choice of the topic of health education must be selected with care to make sure that it is of interest to the group.
- Group health education must not be passive in which the health educator alone talks.
- There should be active participation by the group members.
- The health educator must allow the group members to ask questions and give suggestions.

Methods of group education

- Methods used for group education are:
    - Group discussion
    - Panel discussion
    - Symposium
    - Workshop
    - Role playing

Group discussion

- Group discussion is a very effective method of health education.
- The size of the group should between 2-20.
- The group should have a leader who will start the discussion, keep the discussion on the topic,

encourage all members to participate, prevent any individual from dominating the discussion.

- There should be a "recorder" who will note the points being discussed and prepare a final report.
- The advantage of group discussion is that every member of the group gets a chance to put his viewpoint and the entire group will accept the decisions of the group.
- Disadvantage is that some members may dominate the discussion or they may stray from the main point and discuss irrelevant things.

Panel discussion

- In this a panel of speakers (4-8) will discuss the topic of interest before an audience.
- The chairman will open the discussion, manage and finally conclude the discussion.
- The speakers will talk briefly about the topic.
- The audience can ask questions, give suggestions, present their problems and the speakers will respond to it.

Symposium

- Is a series of lectures by experts on a topic.
- The audience can ask questions after the presentation.

Role playing

- A small drama is enacted by a group showing a health situation of importance.
    - Antenatal visit, use of oral rehydration solution.
- The role is enacted before a small group of people (about 25 members).
- After the role play there is a discussion during the audience can clear their doubts.

Health education to General Public

- It is done through mass media.
    - Television, radio, newspaper, posters etc.

- It is the best way of conveying information to a large population.
- However it is not effective in changing human behavior.

Barriers of communication

- Health education is basically communication between the health educator and the target audience.
- For effective health education there should be good communication.
- If communication is not good health education will be a failure.
- Types of Barriers includes:
  - Physiological – difficulties in hearing.
  - Psychological – emotional disturbance.
  - Environmental – noise, invisibility.
  - Cultural – illiteracy, social class difference, gender differences.

School Health

The School Health Services Program is a component of the public health system that provides basic health services to all public school students.

The services include:

- Health appraisals.
- Nursing assessments.
- Child-specific training.
- Preventative dental screenings and services; vision, hearing, scoliosis, and growth and development screenings.
- Health counseling.
- Referral and follow-up of suspected or confirmed health problems
- First aid and emergency health services
- Assistance with medication administration
- Health care procedures for students with chronic or acute health conditions.

The goal of school health services is to ensure that students are healthy, in school, and ready to learn. Additionally, school health registered nurses work closely with school staff and parents to promote healthy

behaviors (such as, maintaining a healthy weight and choosing to be physical active) and reduce risk-taking behaviors (such as, eliminating the use of tobacco).

Objectives of school health program:

- health promotion of school children,
- prevention and control of health hazards, and
- rehabilitation of the handicapped.

The school child is the subject of special consideration for many reasons:

- This group is of vital importance to the health of the community,
- They constitute a sizeable segment of the population.
- School children are subject to the risks and dangers of communicable diseases.
- They undergo the stresses and strains of growth and development.
- The physical, mental and emotional stresses should always be considered.
- Unsanitary environmental hazards are gaining lots of attention due to its impact on health.
- There is close relationship between health and education: "Education is fundamental to health and health is vital for efficient education".
- Supervision of health in schools needs to be comprehensive and continuous.

<u>Targets of School Health:</u>

- Creation of a suitable environment indispensable for healthy development.
- To have a clear picture of the health conditions of students and employees through various types of medical inspection and evaluation.
- The early discovery of deviations from normal, and the application of prompt corrections.
- Training of scholars in health habits through efficient programs of health education.
- Care for the handicapped, maladjusted or crippled .

Program of School Health

1. Health Promotion.
2. Prevention of health hazards.
3. Medical Care .
4. Health Education.

Health Promotion

- Adequate nutrition,
- Sanitary school environment,
- Meeting the needs for mental development (emotional & behavioral adjustment),Physical fitness and activities, (for musculoskeletal development)
- Prevention of mental fatigue,
- Social activities and recreation.

School Environment

- Value of Sanitary Environment:
  - Basic preventive measure of communicable diseases.
  - Contributes to health promotion .
  - Provides feeling of comfort, and enhances educational achievement.
  - Draws good example of clean environment.

Objectives medical examination of Students

- Case-finding, specially of unapparent disease ,
- Assessment of health status of school children, (planning and evaluation of school health services.)
- Primary examination at school entry (baseline for follow-up of health status).
- Health education and guidance of students,

Medical Care :

1. Health Appraisal includes:-

- comprehensive medical examination,
- screening tests,
- clinical (curative) service, and
- survey studies.

2. Screening Tests:

They are simple tests which can be carried out frequently to:

- To screen for certain pathological conditions or diseases.
- To screen suspected cases of disease, who need further investigation for final diagnosis.

Examples of screening tests include:

- weight and height,
- visual acuity,
- acuity of hearing,
- IQ testing, and
- dental examination.

3. Clinical Service:

- School health units,
- referrals to specialized clinics,
- referrals to hospitals for diagnosis and treatment of disease.
- Some cases may need specialized diagnosis or/and management.

4. Survey Studies:

- Occasionally required for investigation of a particular disease or health problem, especially when precise data are not available, (e.g. nutritional deficiency and parasitic diseases, and handicapping conditions).

Objective of survey study:

- to find out ecological data
    - (host – agent – environment)
- -or health problem under study,
- (which are needed for planning and evaluation of prevention and control programs).

5. Handicapping conditions:

- May be congenital or acquired.
- Children with minor or mild cases of disability can attend regular schools,
- Severe forms (e.g. the deaf, blind, or mentally retarded) can attend special institutes.
- Some forms of handicapping conditions in regular school:
  Heart disease: Rheumatic valvular disease is the most important.

- Musculoskeletal deformities: mild paralytic poliomyelitis, and healed rickets.
- Impaired vision: mainly due to errors of refraction, and may be corneal opacity.
- Impaired hearing: neglected chronic otitis media, ear injury by foreign body, and occasionally ototoxic drugs and complicated meningitis.

School Health Record:

Each school child should have his own health record, for registration of events and activities related to health.

Contents of Record:

- Personal and social data.
- Results of health appraisal.
- Immunizations /date/age.
- Any morbidity, and management record.

Value of Health Record:

- For reference whenever registered health data are needed;
- e.g. past medical history to assist diagnosis of existing disease.
- Allows follow-up of chronic disease.
- Collecting statistical data and indices of school children, (for future planning and evaluation of health services).

Role of Teacher:

- Screening suspected cases through supervision of the students in the classrooms.
- Participation in health education program.
- Supporting mental health promotion.

Role of School Health Physician:

- Health appraisal, including medical examination, and medical care of the sick.
- First aid and emergency service.
- Participation in prevention and control of communicable diseases.
- General inspection of the school environment.
- Participation in health education program.
- Supervising preparation of statistical indices and health reports.

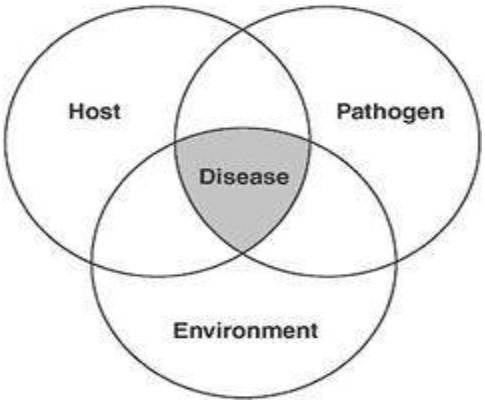
10. Environmental & Water Health

Environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. Other terms referring to or concerning environmental health are environmental public health, and public health protection / environmental health protection.

Role of Environment in Health

- Health of man depends on the interaction between Agent, Host and Environment – Epidemiological triad

Epidemiological triad



- Physical environment includes air, water, soil, housing etc.
- Biological environment includes plants, animals, insects, bacteria etc.
- Social environment includes customs, culture, habits, occupation etc.

-

Environment and disease

- Many of the diseases in man are caused by adverse environmental factors like
  - Water pollution, air pollution, soil pollution, poor housing, insect vectors, animal reservoirs etc.
- Due to industrialization and urbanization environmental pollution has increased, resulting in increased morbidity

Environmental sanitation

- Environmental sanitation is not merely sanitary disposal of excreta.
- It means – clean home, clean farm , clean business, clean neighborhood and clean community.
- The purpose of environmental health is to create and maintain conditions that will promote health and prevent disease

Water and Health

Many diseases occurring in man are due to lack of safe drinking water. Common water-borne diseases are: Viral hepatitis E&A, Polio, diarrhea, typhoid, cholera, amoebiasis etc. Providing safe drinking water is very important to prevent diseases in human.

Sources of water supply

- Rain
- Surface water
  - Reservoirs, Ponds, Sea (after desalination)
  - Rivers
- Ground water
  - Shallow well.
  - Deep well.

Purification of water

- Purification in small scale (small quantity) – e.g. in a house.
- Boiling, Filtration, Chemical (chlorine tablets, bleaching powder).
- Purification of water in large scale (large quantity).
- Purification of water for supplying to a city is different from purification on a small scale.

There are two methods of purification.

1) Slow sand filtration.
2) Rapid sand filtration.

1) <u>Slow sand filtration</u>

- There are 3 steps

a. Storage
b. Filtration
c. Chlorination

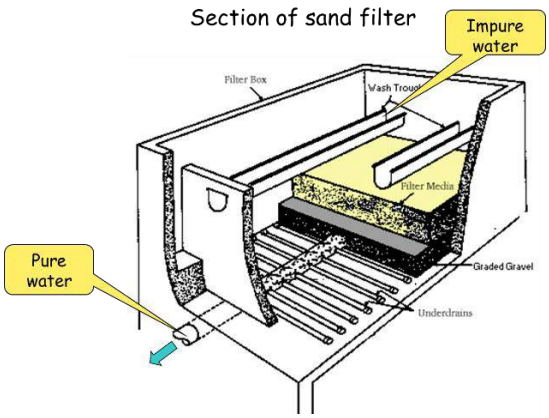
Storage

- Water is first stored in large tanks for about 10 days.
- This will result in impurities settling down.
- Some organic material will be oxidized.
- A great decrease (90%) in the number of bacteria occurs in the water.

Filtration

- Large Sand filters are used to filter water.

- The sand filter consists of sand of different sizes about 1-1.5 mts in thickness.
- When water flows through the sand it gets filtered.



Chlorination (the same as step in Rapid Sand filtration)

2) <u>Rapid Sand filtration</u>

There are three steps in rapid sand filtration

a. Mixing with Alum
b. Filtration
c. Chlorination

Mixing with Alum

- In rapid filtration method water is Not stored
- Water is mixed with Alum, which will combine with the impurities and form big particles.
- The particles of Alum will settle down with the impurities and are removed.
- The clear water is filtered using rapid sand filter.

Disinfection

- The last step in water purification is disinfection.
- Destroys most of the infectious agents in the water.
- Chlorination is the most commonly used method.

Chlorination

- First the amount of chlorine required to destroy all microbes and organic matter is calculated. It is the 'chlorine demand' of water.
- Then chlorine (gas) is added till free chlorine appears in water.
- Wait for 1 hour for the chlorine to kill all the bacteria.
- However some viruses, cysts are not destroyed.

<u>Residual chlorine</u>

- 0.5mg of chlorine per liter of water is added extra to protect against contamination during distribution of water.
- This is called 'residual chlorine'

Purification of water on small scale

- *Boiling*
  - Water must be boiled for 5-10minutes.
  - Care must be taken to prevent contamination later.
- *Chlorination*
  - Small quantities of water may be disinfected with chlorine tablet 0.5g for 20L.
  - Bleaching powder can be used to disinfect wells. 2.5gm for 1000L.

11. Waste disposal & Water quality standards

Garbage on a city street

Solid waste disposal

Solid waste includes food waste, paper, plastics, wood, metal, glass, bricks, concrete and any discarded material. Usually human excreta is NOT included in this.

Health hazards of waste

- Fly breeding.
- Attracts rats.
- Soil and water may get contaminated.
- Produces bad smell.
- Bad to look at.

Methods of disposal

- Burning/incineration
- Dumping
- Controlled tipping
- Composting

Burning/incineration

- All combustible material can be burned.
- Materials like glass, metal, concrete will not burn.
- Hospital waste is burned in incinerators.

Dumping

- A simple method is to dump the waste in low lying areas.
- It will fill the area and the waste will over a period of time turn to manure.
- However open dumping will attract birds, flies, rats etc.
- Must be done far away from the cities.

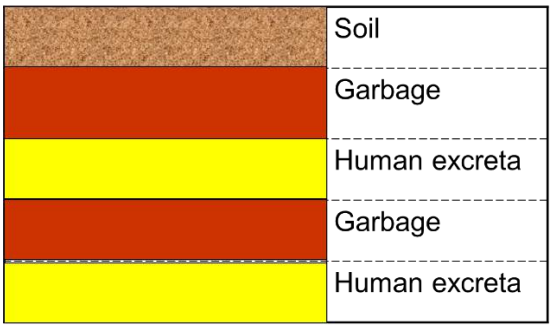
Controlled tipping

- Is a good method
- Pits or trenches are dug and one layer of waste is deposited and is covered with earth.
- Then another layer is added till the pit is filled.
- Over a period of time the waste will turn into manure.

Composting

- Is a method of combined disposal of waste and human feces
- A pit or trench is dug.
- A layer of human feces is spread and over it a layer of waste is spread and then human excreta and so on till it reaches the surface level.
- A final layer waste is added and covered with earth.
- After 4-6 months it will be converted to manure.

Cross section of compost pit



Disposal of human excreta

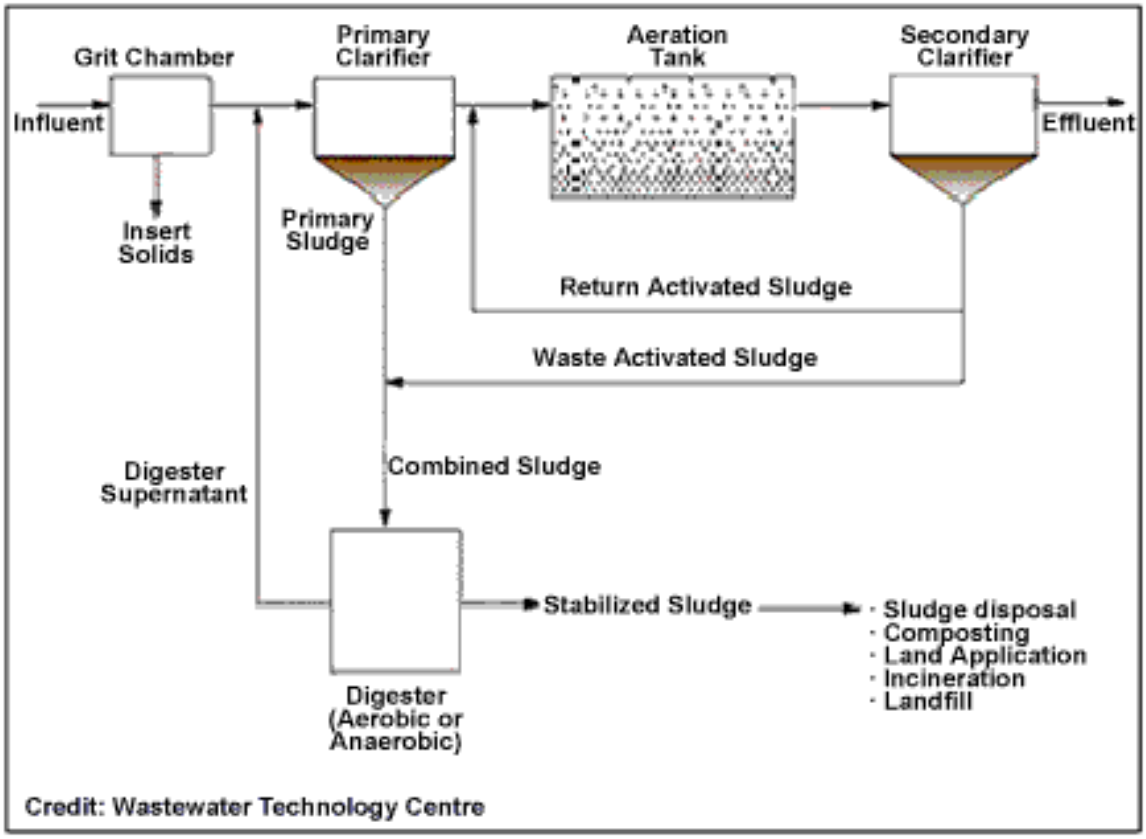
- Human excreta is infected material containing many pathogenic organisms.
- Contamination of soil, water and food can lead to many diseases.
- 'Sewage' is waste water containing human excreta and industrial wastes.

- Sewage is taken to treatment plants to make it safe.

Important stages of purification of sewage are:

- Filtration – to remove large solid waste like stones, glass, metal pieces etc.
- Primary sedimentation
- Aeration and oxidation
- Secondary sedimentation
- Sometimes untreated sewage is directly discharged into sea.

Pictorial representation of a sewage treatment plant



Sewage treatment

- The effluent is harmless and can be used for irrigation.
- The sludge can be disposed of by composting or dumping.

Excreta disposal in 'unsewered' areas – villages, small settlements

- Pit latrines – for temporary camps/emergencies
  - A large pit is dug and people defecate into it.
  - When it is 2/3rd full it is covered with earth and a new pit is dug.
- Septic tanks – for individual homes, public latrines.
- Chemical toilets – used in planes and boats-
  - Excreta is sterilized by the chemical and disposed off.

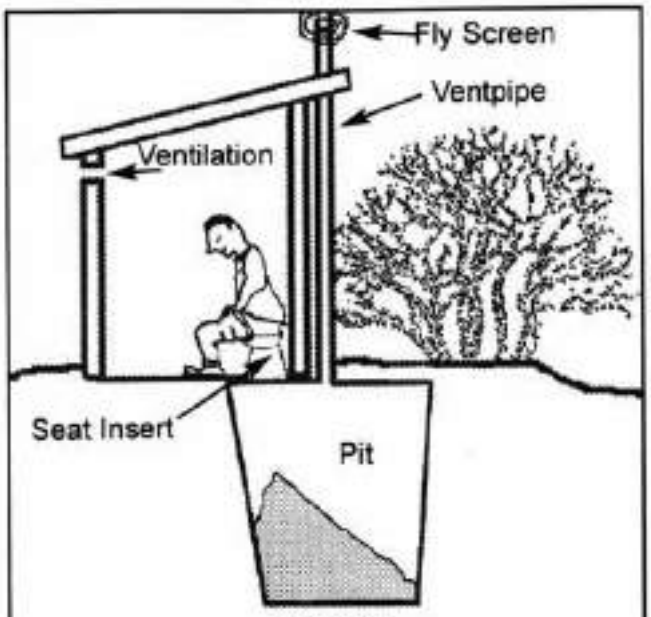
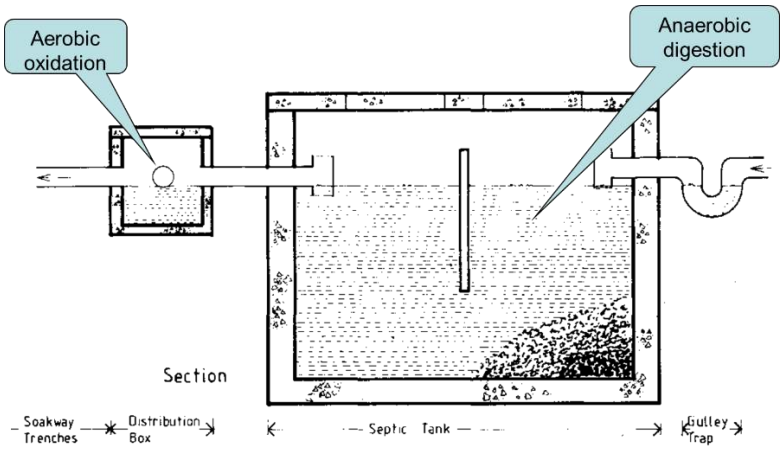


Figure 5.5

THE BOTVIP LATRINE: BOTSWANA'S RURAL VENTILATED IMPROVED PIT LATRINE

Source: van Nostrabd, John, and Wilson, James G. (1983). United Nations TAG Technical Note #8. Rural Ventilated Improved Pit Latrines: A Field Manual for Botswana. November 1983.

Pictorial representation of septic tank



Water quality standards

- Physical standards
  - Turbidity. Turbidity is the presence of suspended particles which make the water 'not-clear'. Drinking water must be clear.
  - Color. Drinking water should not have any color.
  - Taste and odor. Drinking water should not have any bad taste or odor.
- Chemical standards
  - Chloride – should not be more than 200mg/litre.
  - Calcium (hardness) – calcium should not be more than 100-300mg/litre.
  - pH – pH should be between 6.5-8.5.
- Biological standards
  - E coli – must not be present in any 100 ml samples of drinking water.
  - Viruses – drinking water should not contain any virus.
  - Protozoa – drinking water should not contain any protozoa (amoeba).

  - Cysts/eggs – drinking water should not contain any eggs of helminths.
- Biological quality of water is tested by 'presumptive coliform test'.

13. Food Hygiene & Food Poisoning

1. Food Hygiene

- Food is a very important route of infection
- Food can be contaminated at any point from production to consumption.
- Food can be contaminated with microbes like bacteria and virus or with harmful chemical substances.
- Food hygiene is the science of clean and safe practices during food production, distribution, cooking and serving of food.

Food-borne diseases

- Bacterial – Typhoid fever, salmonellosis, dysentery.
- Viral – viral hepatitis, poliomyelitis
- Parasitic – tapeworm, roundworm, amoebiasis.
- Chemical poisons – Pesticides.
- Others (due to toxins) – lathyrism, aflatoxicosis.

Prevention of food-borne diseases – Food Handlers

- Persons having diseases like typhoid, viral hepatitis, diarrhea, infected wound etc. should not touch, cook or serve food.
- People handling food should be educated about the importance of food hygiene and how to prevent contamination of food.
- They should be kept under medical surveillance.

Prevention of food-borne diseases - milk

- Microbes grow very fast in milk, so milk hygiene is very important.
- Milk should be pasteurized before storage.
- Domestic milk should be boiled or kept in refrigerators.

Prevention of food-borne diseases – meat hygiene

- Meat of animals suffering from disease can infect people.

- Contamination can occur after slaughter of animals.
- Tapeworm, Hydatid disease, Anthrax etc.

Meat hygiene

- So only healthy animals examined and approved by veterinary doctors should be killed for meat.
- Meat should be stored at low temperature to prevent bacterial growth.

Prevention of food-borne diseases – General principles

- Food must be cooked at the right temperature and duration.
- Food must be stored at low temperature for future use.
- Food must be kept covered to prevent flies from sitting on it.
- The floor and surroundings where food is cooked and stored must be clean and free of flies, cockroaches etc.
- Vessels used for cooking must be cleaned without any leftover food.
- Manufacturer's instructions must be followed for processed food.
- Do NOT use if you suspect the food is not safe.
- Food items must not be stored with other poisonous substances and chemicals.

2. Food poisoning

Food poisoning is an acute disease caused by ingestion of food or drink contaminated with either bacteria, their toxins or other chemicals.

- Types of food poisoning
  - Bacterial – Salmonella, Staphylococcus, Botulism.
  - Non-bacterial.

<u>Salmonella food poisoning</u>

- Agent – S. typhimurium, S. enteritidis.
- Source of infection
  - contaminated milk, milk products, eggs, egg product.
  - Animals like rat, mice.
- Incubation period is 12-24 hours
- Common symptoms are – nausea, vomiting, diarrhea, fever etc.

Staphylococcal food poisoning

- Agent – S. aureus.
- Source of infection – man (boil/pustule) or animals (contaminated milk or milk products).
- The bacteria produces toxin which causes the disease.
- Incubation period – 1-6 hours.

Botulism

- Agent – Cl. Botulinum
- Source of infection – sausages, cheese
- Caused by pre-formed toxin
- Symptoms are NOT gastrointestinal
  - Dysphagia, diplopia, ptosis, dysarthria, muscle weakness and sometimes quadriplegia.
- If untreated can result in death due to cardiac or respiratory failure.

Prevention and control

Primary prevention

- Food hygiene and personal hygiene.
- Proper storage of food
  - Low temperature for long storage.
  - Cover food to protect from flies and dust.
- Food handlers
  - Should be free of boils/pustule, infected wounds, diarrhea.

Secondary prevention

- Early diagnosis and treatment
  - Antitoxin for botulism.

13. Communicable Disease and Immunizations

Communicable diseases spread from one person to another or from an animal to a person. The spread often happens via airborne viruses or bacteria, but also through blood or other bodily fluid. The terms infectious and contagious are also used to describe communicable disease which are prevented by immunization.

- ✓ The two public health interventions that have had the greatest impact on the world's health are **clean water** and **vaccines**.
- ✓ **Immunization is the most cost-effective public health intervention**,
- ✓ vaccines prevent illness or death for millions of individuals every year.
- ❖ Almost **two million children still die** each year from diseases for which are available at low cost .
- ❖ Over 90 000 fall victim to paralytic polio, which could also have been prevented by immunization

Outbreaks :

Simply it is moving from epidemic to pandemic :

- ❖ Measles outbreaks were reported in 1988 in countries or areas with coverage between 64-85% (Zimbabwe , Kambaramie etal 1991) and Caribbean countries after several years of low incidence.
- ❖ Polio outbreaks in countries with relatively high coverage (64-87%) with 3 or more doses of OPV in routine immunization schedule (Deming 1992).

At the beginning of the 1990s there were several outbreaks of diphtheria

in Russia Soviet union and Ukraine which is related to low immunity In adults, low boostering of antibody levels from declining exposure to C diphtheria and low coverage in young children.

❖ Outbreaks in developing countries such as Algeria ,China ,Ecuador ,Jordan ,Sudan ,and Yemen (Gales etall 1995b) highlight the need to maintain immunity against diphtheria in all population and to monitor the epidemiology of diphtheria in developing countries.

The benefits of immunization

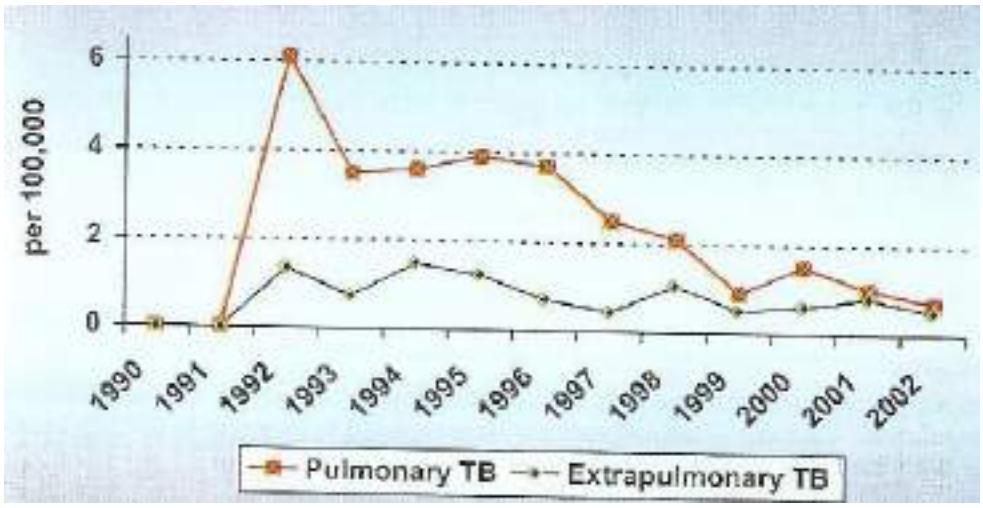
- ✓ It is better to keep people from falling ill than to treat them once they are ill.
- ✓ **Suffering**, **disability**, and **death are avoided**.
- ✓ immunization change the relative age distribution of cases with a shift to older ages.
- ✓ Immunization **averted** about two million deaths in 2002.
- ✓ Strain on **health-care systems is eased**.
- ✓ **Money is frequently saved** that can be used for other health services.
- ✓ Immunization is a proven tool for controlling and even eradicating disease.
- ✓ World Health Organization (WHO) from 1967 to 1977 eradicated the natural occurrence of smallpox " it was killing every fourth victim ".

Eradication of poliomyelitis is within reach , infections have fallen by 99%.

- ✓ Measles deaths dropped worldwide by almost 40% .
- ✓ Maternal and neonatal tetanus will soon be eliminated in 14 of 57 high-risk countries.
- ✓ hepatitis B vaccine, which is now routinely given to infants in 77% of WHO's Member States.
- ✓ In 2005, only 66 cases of measles were reported to the Centers for Disease Control and Prevention (CDC).

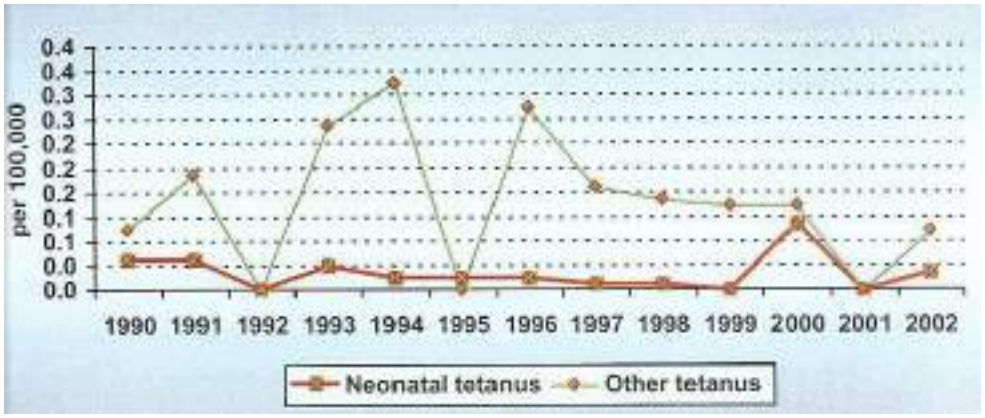
A recent survey by UNICEF reported a decline in infant mortality in Gaza from **76/1000** in 1978 to **40/1000** in 1991, and the mortality in children under age 5 declined from **105/1000** to **52/1000**. Both rates for 1991 were below those in Egypt (**62/1000** and **85/1000**, respectively).

An immunization program implemented jointly by the government health service and the UN Relief Works Agency (UNRWA) has controlled or eradicated vaccine-preventable diseases in addition to other health services .



Annual reported incidence rate of tuberculosis in Palestine , 1990–2002 (per 100.000)

Annual reported incidence rate of measles in Palestine , 1990–2002 (per 100.000)



Annual reported incidence rate of tetanus in Palestine , 1990–2002 (per 100.000)

The cost-effectiveness of immunization

✓ Immunization is considered among the most cost-effective of health investments.
✓ In the United States, cost-benefit analysis indicate that every dollar invested in a vaccine dose saves US$ 2 to US$ 27 in health expenses.

WHO immunization work

❖ WHO works with partners including governments, UN agencies and other international organizations, NGOs and the private sector.

❖ WHO's specific responsibilities include:

- Supporting and facilitating research and development;
- Ensuring the quality and safety of vaccines;
- Developing policies and strategies for maximizing the use of vaccines;
- Reducing financial and technical barriers to the introduction of vaccines and technologies; and
- Supporting countries in acquiring the skills and infrastructure needed to achieve disease control and eradication.

Definition of Immunization:

It is a process to increase host resistance to specific microorganism or a disease agent to prevent them from causing disease or provides protection from most of infections diseases and that is indicated by the presence of antibody to that organism.

Classification of immunity :

1. **Non specific** : inherited, natural resistance (Skin, mucous membrane, phagocytosis)

2. **Specific**:

A- active immunity : is produced by human body. It is stimulation of the immune system to produce antibodies, it is divided as :
Natural active: is formed or received without intervention made by health staff such as the immunity acquired after having infectious disease as antibodies produced.
Artificial active: includes most of vaccines given to public and specifically for children to improve their immune status including tetanus toxoid.

B- Passive immunity : is formed outside the person's body and it is temporary immunity lasts for many years or for life time . It is transfer of antibodies produced by one human or animal and given to another, and it provides protection against some infections but this protection is temporary.

- **Natural passive** : as transplacental transmission of antibodies from mother to her baby, antibodies are transported across the placenta during the last 1-2 months of pregnancy, and also the presence of antibodies in human milk given immunity to the child.
- **Artificial passive** : as giving anti-tetanus serum and immunoglobulin or other types of serums. These are prepared in labs outside human body and they give human body temporary immunity.

Definition of vaccine:

It is a suspension of live or killed microorganism given to induce immunity to specified disease.

HISTORY OF IMMUNIZATION

- A significant breakthrough came in 1796 when British physician **Edward Jenner** discovered that he could immunize patients against **smallpox**.
- In 1885 **Louis Pasteur** created the first successful vaccine against rabies,

The date of introduction of first generation of vaccines for use in humans :

1798 Smallpox	1885 Rabies	1897 Plague	1923 Diphtheria	1926 Pertussis	1927 BCG
1927 Tetanus	1935 Yellow Fever	1955 IPV	1962 OPV	1964 Measles	1967 Mumps
1970 Rubella	1981 Hepatitis B				

Gaza and West Bank Vaccination Program:

The vaccination program in the West Bank and Gaza has undergone several changes in the last 15years. Prior to 1994, vaccination services in Palestine were provided by UNRWA to refugee children in the West Bank and Gaza and by the Israeli authority to non-refugee Palestinian Children. In 1994, vaccination of non-refugee children became the responsibility of the Palestinian authority Ministry of Health (MOH) and there was a concerted effort to unify the schedules of the MOH and UNRWA in both the West Bank and Gaza.

Beginning in 1996, the MOH followed a policy of vaccine independence in procurement. During 2001 - 2002 the Japanese government provided assistance ، and since 2003, UNICEF has served as the intermediary for vaccine procurement for both MOH and UNRWA.

Children vaccination Programme in Gaza

Time	Vaccine	Site
Birth -3 months	BCG	Lt upper arm
2nd month	OPV DPT Hep.B Hib.	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM Outer mid.thigh IM
4th month	OPV DPT Hep.B	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM
6TH month	OPV DPT Hep.B	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM
9th month	Measles Hib.	Rt upper arm subcut. Outer mid.thigh IM
12-24 month	OPV (Booster dose) DPT (Booster dose)	Oral drops Lt. outer mid. Thigh IM

Vaccine coverage among UNRWA fields in Palestine and other countries

	Gaza	WB	Jordan	Syria	Lebanon
BCG	100	99.8	99.8	99.8	100
Polio	100	98.8	99.3	99.8	100
DPT	100	99.2	99.3	99.8	100
Hep	100	99.1	99.3	99.8	100
Measles	100	98.7	98.3	99.7	100
MMR	100	90.8	98.7	99.9	100
All vaccine	100	98.7	98.9	99.7	100

Types of vaccines:

1. Live attenuated :
prepared in labs by repeated culturing, organisms have the ability to produce immunity but does not cause disease
- Viral : measles, mumps, OPV, rubella, yellow fever
- Bacterial: BCG, oral typhoid

2. Inactivated:
- Produced by growing the bacteria or viruses in culture media then inactivated or killed heat and chemicals

Types of inactivated vaccines:
a. Whole (viruses – bacteria): viral influenza, polio, rabies hepatitis A, pertusis
b. Fractional : diphtheria, tetanus, influenza
c. Polysaccharide : hemophilus influenza type b, meningococal, pneumococcal

Causes of inadequate immunization:
1. Limited access
2. Vaccination cost
3. Patient disinterest

Important notes, terms, definitions :
Eradication : is irreversible termination
BCG : Bacille Calmette Guerin
Herd immunity : group of people are protected against infectious disease
Primary responses : occurs on the first exposure to antigen 3-14 days
Secondary exposure : is the response on second and subsequent exposure to antigen.

Children known to have rare congenital immune deficiency syndrome should receive IPV rather than OPV
DPT : Diphtheria . Pertussis (whooping cough) . Tetanus
MMR : Measles . Mumps . Rubella
TT : Tetanus Toxoid
OPV : Oral Polio Vaccine
IPV : Intramuscular Polio Vaccine
Hib : Hemophilus influenza type b (prevent meningitis)
Hep.B :
Freezing damages the killed vaccines and (Tetanus Toxoid , DPT, Hep.B)
Freezing does not damage live attenuated vaccines (BCG, OPV, Measles)
Heat and sunlight can damage vaccines especially live attenuated ones (Polio, Measles, BCG)
Cross immunity : immunity shifted from a person provides immunity to another agent such as BCG.

WHO Expanded Program on Immunization (EPI):
a. Child immunization
b. Vaccination of pregnant women with tetanus toxoid
EPI objectives:
1. Reducing of six target disease " tuberculosis, diphtheria, neonatal tetanus, whooping cough ,poliomyelitis and measles".
2. Eradication of the morality rate from six target disease
3. Eradication of the polio and elimination of neonatal tetanus and measles.

❖ ***Most programs before 1974 used only smallpox , BCG and DPT.***

Vaccines used by the Expanded Program on Immunization from 1974 onwards :

* BCG * Polio * DTP * Measles

Added later : * Yellow Fever (in endemic countries) * Hepatitis B

❖ *Regions and countries with the **greatest resources**, **Infrastructure** and **political** will were able to raise coverage faster and higher.*

❖ Hepatitis vaccine was integrated into a national immunization program in all countries in 1997

❖ Vaccination against yellow fever is recommended in endemic countries

Commonly used vaccines :

- BCG
- Polio
- DTP
- Hepatitis B
- MMR

Other vaccines :

- Hib Vaccine
- Hepatitis A Vaccine
- Varicella (Chickenpox) Vaccine
- Cholera Vaccine
- Influenza Vaccine
- Meningococcus Vaccine
- Pneumococcus Vaccine
- Rabies Vaccine
- Smallpox Vaccine
- Typhoid Vaccine
- Yellow Fever Vaccine

Tuberculosis Vaccine

Tuberculosis (TB) is caused by a bacterium, *Mycobacterium tuberculosis*. The infection primarily attacks the lungs. Extremely contagious, TB is spread through the simple act of sneezing, talking and coughing.

How is the tuberculosis vaccine made?
It is made by weakening a strain of bacteria similar to tuberculosis that was first isolated in cows.

Does the tuberculosis vaccine have side effects?
About three of every 10,000 people immunized with the tuberculosis vaccine develop a painful swelling under the arm.

Polio Vaccine

Polio is caused by a virus and is highly contagious.

How were the "inactivated" and "oral" polio virus vaccines made?
OPV was made by weakening the three strains of polio virus that caused disease by growing them in monkey kidney cells.
IPV, unlike OPV, cannot reproduce itself (or replicate) and, therefore, cannot possibly revert back to natural polio.

Diphtheria vaccine

The diphtheria vaccine is contained in a preparation called "DTP" (the "D" stands for diphtheria).
The dangers associated with diphtheria come from the toxin released by the bacterium, Corynebacterium diphtheriae.

How is the diphtheria vaccine made?
The bacteria that causes diphtheria makes a harmful protein, called a toxin. The diphtheria vaccine is made by taking the diphtheria toxin and inactivating it with a chemical. The inactivated toxin is called a "toxoid."

Tetanus vaccine

The tetanus vaccine is contained in a preparation called DTP (the "T" stands for tetanus).
Tetanus is another disease caused by a toxin-releasing bacterium, Clostridium tetani. Unlike most vaccine- preventable diseases, tetanus is not a disease that you catch from someone else. The bacteria live in the soil and usually enter the body following a puncture wound of the skin. on the ground.

How is the tetanus vaccine made?

The tetanus vaccine is made by taking the tetanus toxin and inactivating it with a chemical. The inactivated toxin is called a "toxoid." Once injected, the toxoid elicits an immune response against the toxin, but, unlike the toxin, doesn't cause disease.

Pertussis vaccine

The pertussis vaccine is contained in a preparation called DTP (the "P" stands for pertussis).

Pertussis (widely known as whooping cough) is one of the most contagious diseases around. Caused by a bacterium (Bordetella pertussis), whooping cough makes children cough uncontrollably.

How is the pertussis vaccine made?

The bacteria that cause pertussis make several harmful proteins, called toxins.

The pertussis vaccine is made by taking two to five of these toxins and inactivating them with a chemical.

MMR: measles vaccine :

The measles vaccine is contained in a combination vaccine called MMR (measles, mumps and rubella, also known as German measles).

Measles is a disease that is caused by a virus.

How is the measles vaccine made?

The measles vaccine is a live, "weakened" form of natural measles virus.

MMR: mumps vaccine :

Mumps is a virus, just like measles. The mumps virus usually causes swelling in the salivary or parotid glands, just below the ear, lasting for seven days.

Before the mumps vaccine, mumps was the most common cause of meningitis (inflammation of the lining of the brain and spinal cord).

How is the mumps vaccine made?

Like the measles vaccine, the mumps vaccine is a live, "weakened" form of natural mumps virus.

MMR: rubella vaccine :

Rubella is a viral infection also known as German measles. Rubella infection of children causes a mild rash on the face, swelling of glands behind the ear,

How is the rubella vaccine made?

Like the measles and mumps vaccines, the rubella vaccine is a live, "weakened" form of natural rubella virus.

Girls are immunized with rubella vaccine to protect their future children

Hepatitis A Vaccine :

Hepatitis A is a virus that causes hepatitis (inflammation of the liver).
The hepatitis A vaccine is given to people who are traveling to parts of the world where hepatitis A virus infections are common.

How is the hepatitis A vaccine made?

The hepatitis A vaccine is made by taking whole hepatitis A virus and killing it with the chemical formaldehyde. Because the virus is inactivated, it cannot possibly cause hepatitis

Hepatitis B Vaccine :

The hepatitis B vaccine is given to prevent the severe liver disease that can develop when children or adults are infected with hepatitis B virus.
Hepatitis B virus infections are known as the "silent epidemic" because many infected people don't experience symptoms until decades later when they develop hepatitis, cirrhosis (severe liver disease), or cancer of the liver (hepatocellular carcinoma).
It is one of two vaccines that can prevent cancer. The other vaccine is the human papillomavirus (HPV) vaccine.

How is the hepatitis B vaccine made?

People are protected against hepatitis B virus infection by making an immune response to a protein that sits on the surface of the virus.

Today, the surface protein is manufactured in the laboratory.

Hib Vaccine :

Haemophilus influenzae type b (Hib) is a bacterium that infects the lining of the brain, causing meningitis.

How is the Hib vaccine made?

The Hib vaccine is made from the sugar coating (polysaccharide) of the bacteria. Protection against Hib is mediated by antibodies directed against the Hib polysaccharide. The meningococcal vaccine was recommended for all adolescents in 2005.

Meningococcus Vaccine :

A new meningococcal vaccine was licensed in early 2005.

The bacterium, *Neisseria meningitidis*, primarily targets children under 1 year of age. Because meningococcus is contagious, outbreaks can occur in childcare centers and schools. Cases also occur in high schools and on college campuses.

How is the meningococcal vaccine made?

Meningococcus is similar to pneumococcus and *Haemophilus influenzae* type b
(Hib) in that protection against disease occurs when one develops antibodies to
the sugar (or polysaccharide) that coats the bacterium.

The cholera vaccine :

Cholera is a bacterium (*Vibrio cholera*) that attacks the intestines, causing diarrhea in about 5 percent of those infected. Each year about 120,000 cases of cholera are reported to the World Health Organization from 50 countries. It is generally not required or recommended for travel anywhere in the world, with perhaps a few local exceptions.

How is the cholera vaccine made?

The cholera vaccine is made by taking the whole cholera bacteria and killing (or inactivating) it with a chemical.

Rabies Vaccine :

Rabies is a virus that attacks the brain and nervous system. It is transmitted by a bite from a rabid animal (meaning an animal infected with rabies virus). The rabies vaccine is given to prevent the progressive, invariably fatal, disease, rabies. There are only three known cases of people surviving rabies once the developed symptoms of the disease.

How is the rabies vaccine made?

The rabies vaccine is grown in cells in the laboratory. After the virus is grown in these cells, it is purified away from the cells and treated with a chemical (called beta-propiolactone) that completely kills the virus.

Typhoid Vaccine :

Typhoid is caused by a bacterium (*Salmonella typhi*) that attacks the intestines, causing fever, stomach pain and rash.

The typhoid vaccine is not required for international travel. The typhoid vaccine should be used only by people traveling to high-risk areas .

Typhoid bacteria are ingested in contaminated food or water .

What is the typhoid vaccine?

The typhoid vaccine comes in two forms:

"Ty21a" is a weakened form of the live bacteria and is given by mouth to people 6 years of age and older. The "polysaccharide" vaccine is made from the sugar that coats the surface of the bacteria.

Influenza Vaccine

The influenza vaccine is given to those who are at high risk of developing severe influenza. The influenza vaccine is unusual in that each year a different vaccine is made. Because strains of influenza virus that circulate in the community can differ from one season to the next, the vaccine must change to best protect against those different strains.

Pneumococcus Vaccine

Pneumococcus is a bacterium that causes several different types of serious infections in children.

How is the pneumococcal vaccine made?

Like the Hib vaccine, the pneumococcal vaccine is made from the sugar coating (polysaccharide) of the bacteria.

Varicella (Chickenpox) Vaccine :

Chickenpox is an infection caused by varicella virus, and it is highly contagious. The varicella vaccine is given to prevent chickenpox and the severe, and occasionally fatal, consequences of chickenpox. This vaccine is given to children between 12 and 15 months and again between 4 and 6 years of age.

How is the varicella vaccine made?

Like the MMR vaccine, the varicella vaccine is a live, "weakened" form of natural varicella virus.

Yellow Fever Vaccine :

Yellow fever is a virus that causes hepatitis (inflammation of the liver) and hemorrhaging (severe bleeding problems).

The yellow fever vaccine is recommended for travel to countries with risk of yellow fever transmission. Many of these countries are located in Africa and South America.

How is the yellow fever vaccine made?

The yellow fever vaccine is made by growing yellow fever virus in eggs. By growing the virus in eggs over and over again it became much weaker. This "live, weakened" virus, when injected, causes an immune response that protects
against yellow fever.

Cold chain :

It is the cycle of transportation of vaccines from the factory to the child including transportation ,airplane ,boats ,central store ,regional store ,district store ,health center ,MCH center ,immunizing staff ,mother and child

REMEMBER :

- Vaccines are sensitive to heat so they are damaged if they are exposed to heat
- The more the temp rises ,the more rapid the vaccines loses its potency
- Vaccine potency can’t be regained once it is lost
- Returning vaccine to the freezer will not restore its potency

Vaccine monitor and safety measures :

- vaccine vial monitor
- The freezing watch indicator
- Mini –maxi thermometer
- Vaccine storage

What damage the vaccines ?

All vaccines lose their potency after a certain time ,even with good care ,expiry date must be noted.

Heat and sunlight can damage vaccines, especially the live attenuated ones(Polio ,Measles and BCG) .

Freezing damage the killed vaccines and toxoid (DPT,DT,TT,and Hepatitis B.

Disinfectants or antiseptics can damage vaccines (such as spirits and detergents) and antibiotics such as streptomycin on BCG.

The response of any country to outbreaks depend on many factors as :

1. Availability of resources 2. Stage of development of surveillance system
3. Current vaccine coverage ,vaccine incidence 4. Program objective

contraindication of the vaccination :

- Very severely ill children who need to be hospitalized or children who have very high fever should delay vaccine
- Children who have Avery severe reaction from DPT injection DON'T give this child any more doses of DPT ,give him DT vaccine
- BCG is the only vaccine which should not be administered to children with clinically apparent AIDS or immune deficiency
- BCG is the only vaccine which should not be administered to children with clinically apparent AIDS or immune deficiency

Effectiveness and safety

- ✓ All vaccines used for routine immunization are very effective in preventing disease, although no vaccine attains 100% effectiveness.
- ✓ More than one dose of a vaccine is generally given to increase the chance of developing immunity.
- ✓ Vaccines are very safe, and side effects are minor ─ especially when compared to the diseases they are designed to prevent.
- ✓ Serious complications occur rarely. For example **:**

severe allergic reactions result at a rate of one for every 100 000 doses of measles vaccine. Two to four cases of vaccine-associated paralytic polio have been reported for every one million children receiving oral polio vaccine.

Global immunization coverage :

- Coverage has greatly increased since WHO's Expanded Programme on Immunization began in 1974.
- In 2003, global 3 doses DTP coverage was 78% — up from 20% in 1980.
- However, 27 million children worldwide were not reached by DTP3 in 2003,

including 9.9 million in South Asia and 9.6 million in sub-Saharan Africa.

- Those who miss out on routine vaccination programmes tend to be :
  - People living in remote locations,
  - Urban slums and border areas.
  - People with various social barriers,
  - People lacking awareness or motivation to be vaccinated
  - People who refuse.
- Many adults in the United States are not sufficiently protected against tetanus, diphtheria, measles, mumps, and German measles.
- Health authorities recommend that most adults 65 years of age and older, and those with respiratory illnesses, be immunized against influenza (yearly) and pneumococcus (once).

Vaccines under development :

- vaccines will be delivered orally ,by nasal spray or other ways that doesn't require neither trained person nor expensive equipment
- **Rotavirus diarrhea**, which kills 300 000 to 600 000 children under age five every year;
- **Human papillomavirus**, a leading cause of cervical cancer, which afflicts some 500 000 women each year,
- **Pneumococcal** disease, which causes a large fraction of the world's approximately two million annual deaths from childhood pneumonia.
- **Group A meningococcal** disease, a frequently fatal form of meningitis that causes recurring epidemics in a number of countries.
- vaccines against rotavirus, pneumococcal disease, and Men A may be available in developing countries by 2008-2009.
- Parasite vaccine**.**

- Malaria vaccine

14. Obesity & Challenges of NCDs in Palestine

Obesity is excessive weight that may impair health.

How do we measure If someone is obese?

Body Mass Index (BMI)

- **BMI Categories**:
  - Normal weight = 18.5-24.9
  - Overweight = 25-29.9
  - Obesity = BMI of 30 or greater

Just the Facts about obesity!

- According to WHO:
  As of 2005
  - 1.6 billion adults (over 15 years old) are overweight
  - 400 million are obese
  - Projects by 2015, 2.3 billion will be overweight and 700 million obese

Causes of Obesity

Simple equation…when you eat more than you use..it is stored in your body as "fat".

- Global shift in how we eat
- Western diet of processed food
- Higher sugar, fat and calories in what we eat
- Less nutrients
- Reduced intake of vitamins and minerals

Low and Middle Income Countries

- Double Burden of Disease
  - According to WHO there is a "double burden" of disease
    - Countries that are developing are still having issues of infectious disease and under-nutrition
    - There is also an increase of chronic disease related to obesity…especially in urban settings
    - Causes inadequate prenatal care, lack of infant and child nutrition and eating high fat and high sugar foods

What does obesity do to our bodies?

With more people gaining too much weight. There are health issues to consider

- Cardiovascular disease
- Diabetes type 2
- Musculoskeletal disorders
- Cancers-endometrial, cervical and colon
- Infertility
- Gallstones
- Premature death and disability

Heart Disease and Diabetes

- Heart Disease
  - The world's number #1 cause of death
  - Kills 17 million each year around the world
  - Heart attack
  - Stroke
- Diabetes type 2
  - Becoming global epidemic
  - WHO projects diabetes will increase by 50% across the world

Diabetes Type 2

Type 2 diabetes usually starts as insulin resistance. Cells stop responding properly to insulin and sugar is unable to get from the blood into the cells. Over time, the pancreas cannot make enough insulin to keep blood sugars in the normal range and the body becomes progressively less able to regulate blood sugar.

- Increasing at alarming rates in all age groups
- Mostly caused by being overweight and obese
- According to WHO
  - Diabetes affects more than 200 million people in the world
  - Diabetes effects mostly low and middle income countries
  - Over half of the deaths were women…55%
  - Can be prevented

Symptoms

- Blurred vision
- Erectile dysfunction
- Fatigue
- Frequent or slow-healing infections
- Increased appetite
- Increased thirst
- Increased urination

Compilations

- Heart disease and stroke
- Glaucoma

- Neuropathy…especially the feet
- Skin complications...wounds do not heal well
- Diabetic retinopathy (eye disease)
- Kidney disease and kidney failure
- Damage to blood vessels that supply the legs and feet (peripheral vascular disease)

What about children?

- When children are overweight, they are more likely to be overweight and obese as adults.
- <u>How can children avoid being obese?</u>
  - This starts as soon as we are born….

Healthy Starts

- Before we are born
  - Mothers who:
    - Normal BMI during pregnancy
    - Eat healthy and exercise moderately
    - Gain 11.5-16 kg
    - Prenatal care
- When we are babies
    - Study shows babies weaned before 4 months gained more weight than recommended

<u>According to WHO: Breastfeed for at least 6 months exclusively and beyond if possible</u>

Childhood Obesity

- Rates of childhood obesity are alarming
- Problem is worldwide
- Estimated in 2010 42 million children under age 5 are considered overweight

- Tripled in past 30 years
  - Age 6-11 6.5% to 19.6%
  - Age 12-19 5.0% to 18.1%

- Genetic Link
  - Multifactorial condition related to sedentary lifestyle, too much good intake and choice of foods actually alter genetic make-up, creating higher risk of obesity

- Behavioral
  - Children will more likely choose healthier foods if they are offered to them at young ages and in the home

- Environment

- In homes where healthy food is not available, or the food choices are not healthy. Obesity can occur

Why does this matter?

- Premature death
- Developing heart disease at younger ages
- Developing diabetes type 2 at younger ages

What can be done?

- Childhood obesity is preventable
- Role of the schools
- Role of health care professionals

Nutrition

- Nutrition counts!
  - Nutrition is everything! Healthy foods, fruits, vegetables, legumes…a colorful diet is best!
  - Low sugar, low fat
  - Play an hour a day!

What can Schools do to help?
Create "healthy" eating policy during school hours.
Meaning…no junk food

- Provide healthy snacks for children to have or purchase…local fruits and vegetables that children like to eat
- Have an exercise activity every day during school hours of at least 20 minutes
- Use activities as a "reward" rather than food

Reducing Childhood Obesity
Takes collaborative effort from everyone

- From health care professionals:
  - Advocate for healthy eating.
  - Advocate obtaining nutritious food.
  - Advocate for exercise…one hour a day to play.
  - Advocate for health promoting exercise.
  - Educate the public via mass and social media.

WHO Strategy
WHO Strategy for preventing overweight and obesity

- Adopted by World Health Assembly in 2004 and WHO Global Strategy on Diet, Physical Activity and Health
  Four objectives:
  1) Reduce risk factors of chronic disease

2) Increase awareness and understanding
3) Implement global, regional, national policies actions plans
4) Monitor science and promote research

Let's talk about each one…

- Reduce risk factors for chronic disease
- To reduce, there needs to be more exercise and better eating habits
- Increase awareness and understanding
- To understand the influence of diet and why physical activity makes a difference

And the last two…

- To develop and implement global, regional, national policies and action plans and Work to improve diets and definition of physical activity.

Monitor Science and promote research

- On how diet affects the body, how to influences
- How much physical activity is best for most

Evidence

- Where is the evidence?
- The Global Strategy on Diet, Physical Activity and Health have determined:
  - When threats to health are addressed, people can remain health into their 80's and 90's
  - Risk reduction…even modest has sustainable benefits
  - Healthy living with not smoking is considered effective in reducing threats of no communicable disease

- Something as simple as eating fruits and vegetables can save millions of lives; according to WHO, 2002:
  - Low fruit and vegetable intake
  - million lives could be saved with enough fruits and vegetables
  - WHO states:
  - Fruits and vegetables need to be part of the daily diet to prevent disease such as obesity and non-communicable disease
  - The statistics are startling

  - Lack of enough fruits and vegetables cause

- 19% of Gastro-Intestinal deaths
- 31% of Ischemic heart disease
- 11% of stroke

How much fruit is enough?

- WHO recommends at least 400 gms of fruit and vegetables each day…
- This will prevent chronic disease related to overweight and obesity
  - Heart disease
  - Diabetes
  - Cancers

Essential Understandings

- It is well known that obesity is preventable. It is caused by eating more than we need…so how can we prevent obesity?
  - Each of us can…according to WHO
    - Have a balance of energy and healthy weight
    - Limit how much fat we eat…we need to eat some. But not too much.
    - Increase fruits and vegetables
    - Limit sugars
    - Increase exercise to at least 30-60 minutes per day on most days!

Challenges of NCDs in Palestine

No communicable diseases (NCDs), also known as chronic diseases, are not passed from person to person. They are of long duration and generally slow progression. The 4 main types of no communicable diseases are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes. NCDs already disproportionately affect low- and middle-income countries where nearly three quarters of NCD deaths – 28 million – occur.

Public Health and NCDs

NCDs of Interest..

- Heart
- HTN
- Diabetes
- CVD
- Cancer (Breast)
- Dyslipidemia
- Obesity ?!

Targeted Diseases

- High prevalence
- An increasing morbidity and mortality burden
- An increasing economic, social, and psychological burden
- Early detection improves prognosis
- Public awareness is crucial for prevention
- Comprehensive management is generally absent

How High is the Risk ?

- After the age of 35 years:
  - 1 out of six may develop diabetes
  - 1 out of 3 may develop hypertension
  - 1 out of 2 have dyslipidemia
  - 2 out of 3 are overweight
  - 2 out of 5 are obese
  - 1 adult male out of 3 is a smoker

Global Trends of NCDs

2025	2000	1995	Year	Region
5.4	4.2	4.0	Prevalence %	**World**
300	154.4	135.3	Number (millions)	
7.6	6.2	5.9	Prevalence %	**Developed countries**
72.2	54.8	51	Number (millions)	
4.9	3.5	3.3	Prevalence %	**Developing countries**
227.7	99.6	84.3	Number (millions)	

Estimated prevalence of diabetes and number of cases of diabetes in millions. (Adapted from King et al, 1998).

NCDs in Palestine

<u>Demographic & Epidemiological Transition</u>

- Better control of communicable diseases
- Relative increase ageing of populations

- Decrease in Infant Mortality Rate
- Socio-economic transformation

Risk Factors

Modifiable:

- Caloric excess - obesity
- Diet
- Physical inactivity
- Smoking
- Stress

Non- modifiable:

- Age & Gender
- Ethnic group & Family history
- Personal history
- Stress

Nutrition

- Traditional nutrition
  - High fibers, whole grains
  - Less animal fat
  - More complex carbohydrate
- Modern diet
  - Less fibers ,refined grains
  - More animal fat
  - More simple sugar

Qualitatively Poor Diet

- High-fat (cholesterol)
- Low Unsaturated fatty acids
- High rapidly absorbed carbohydrates (simple sugar)
- Low Fiber & High Salt
- Low Vitamins

Urbanization

- Caloric Excess
- Less Physical Activity
- Increased Tobacco Consumption
- Predominance of Overweight and Obesity
- Qualitatively Poor Diet

Duality of Health Problems

Modern diseases in modern countries

- Diabetes Mellitus
- Hypertension
- Coronary heart diseases
- Cancer.

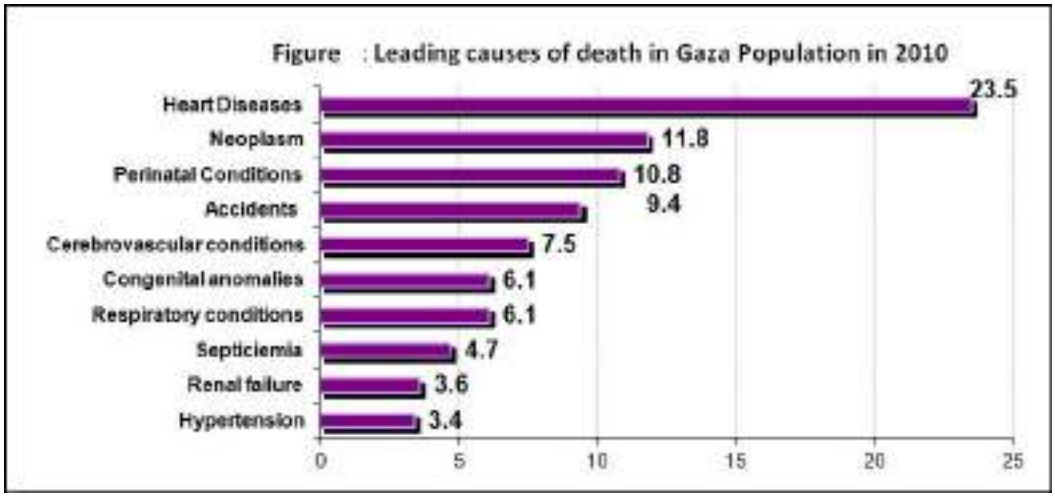
Diseases of underdevelopment countries

- Infectious diseases
- Malnutrition
- Poor housing conditions

Leading Causes of Death

Disease	Palestine	Israeli Arabs	Global
Infectious diseases	6.6	5	33
CVD	30	42	30
Cancer	19	18	12
DM	2.3	2.7	2

Leading causes of death in Gaza Population



Cost of chronic diseases

- Economic
- Impact of the quality of life
- Decrease the productivity of individuals

A CHALLENGE AND AN OPPORTUNITY

- The rapid rise of non-communicable diseases represents one of the major health challenges to global development in this century. This growing challenge threatens economic and social development as well as the lives and health of millions of people

- Non communicable diseases are estimated to have contributed to almost 60% (31.7 million) of deaths in the world and 43% of the global burden of disease.
- Based on current trends, by the year 2020 these diseases are expected to account for 73% of deaths and 60% of the disease burden.
- Developing Countries suffer the greatest impact of non-communicable diseases.
- The total number of deaths attributable to non-communicable diseases, 77% occurred in developing countries,
- The disease burden represents, 85% in these countries.

LESSONS LEARNED

- Noncommunicable diseases are to a great extent preventable through interventions against the major risk factors and their environmental, economic, social and behavioural determinants in the population.
- A comprehensive long-term strategy for control of noncommunicable diseases must necessarily include prevention of the emergence of risk factors in the first place.

Chronic Disease Management

- All treatment plans and education programs must be adapted to the cultural and social environment for the patients.

Hospital acquired infection is cross infection of one patient by another or by doctors, nurses and other hospital staff while in hospital. The prevalence of hospital acquired infection is about 7-12% all over the world.

Common sites of Nosocomial infection

- Urinary tract – is the most common site
- Surgical site infections

- Pneumonia
- Bacteraemia
- Skin infection
- Gastroenteritis

Common organisms causing infections

- Bacteria : S aureus, E coli, Proteus, Klebsiella, Pseudomonas, S marcescens
- Virus : Hepatitis B and C
- Fungi : Candida

Hospital acquired infections

- Source
- Routes of spread
- Recipients

Sources of infections

- Patients
  - Patients suffering from infectious diseases are potential sources of infection.
  - Viral infections – measles, viral hepatitis.
  - Skin infections – discharging wounds, infected skin lesions.
  - Respiratory infections – sore throat, pulmonary tuberculosis.
  - Urinary tract infections.

- Staff
  - Doctors, nurses and other ward staff.
  - They may be carriers of Staphylococcus aureus.

- Environment
  - Hospital dust.
  - Bed linen, furniture, door handle.
  - Hospital equipment – ECG machine, Scanning machine etc.

Routes of spread

- Direct contact
- Droplet infection
- Airborne
- Release of hospital dust into air
- Through hospital procedures like catheterization, intravenous procedures etc.

Recipients of infections

- All patients are potential recipients of cross infection.
- Those who are severely ill and under corticosteroid therapy are more at risk.
- Patients in intensive care units are more at risk.

Preventive measures of infections

- Isolation

  - Infectious patients must be isolated.
- Hospital staff
  - Those who suffer from skin diseases, sore throat, diarrhea should not work in the hospital till they are cured.
- Hand washing
  - The most common route of infection is through hands. So hands must be washed before touching a patient or doing any procedure.
- Dust control
  - Use of vacuum cleaners for cleaning will prevent dust.
- Disinfection
  - Articles used by patients must be disinfected.
- Control of droplet infection
  - Use of face masks, proper bed spacing, good ventilation.
- Administrative measures
  - There should be a hospital infection control committee to monitor the infection and infection control.

15. Maternal and Child Health

Healthy children need healthy mothers

Human health

- Health and disease are determined by many factors that interact in social, psychological and biological form.
- Those that world-wide are associate with indicators of poverty and low levels of education.

Individual health

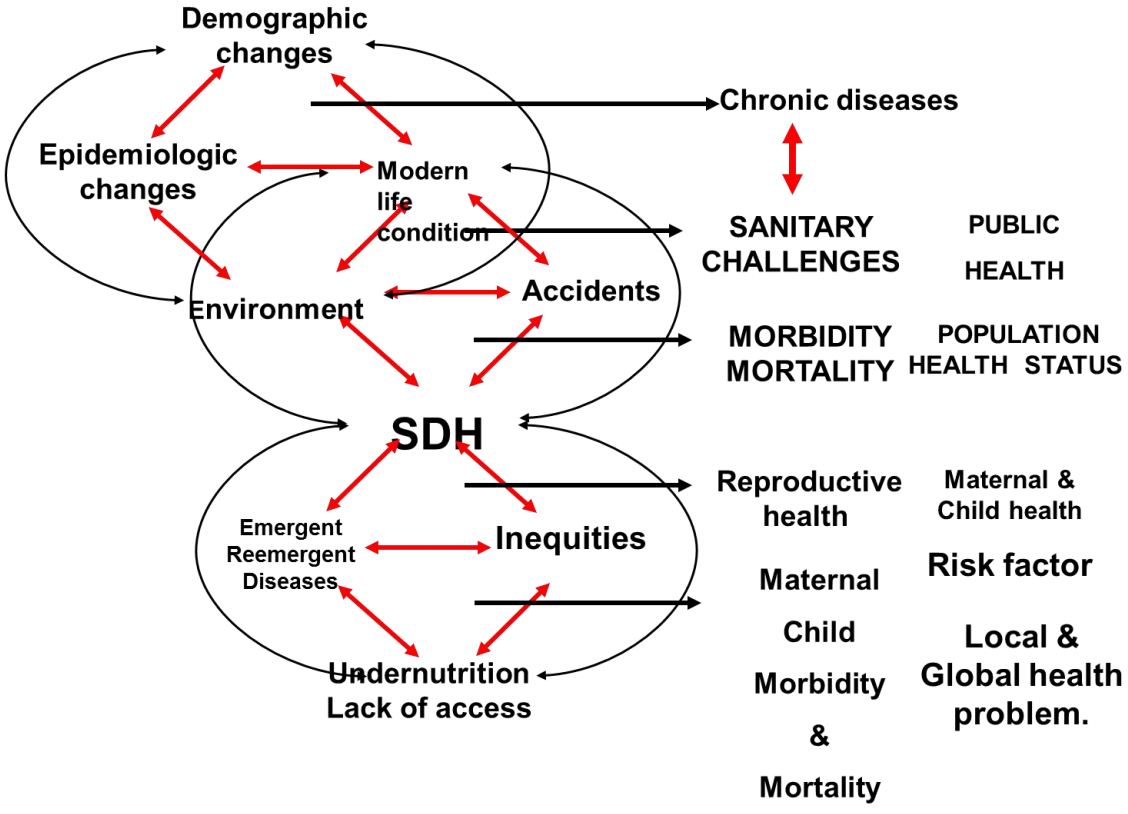
- Individual health is affected by individual factors, social interaction, cultural structures and values society resources.
- Economic levels and health services efficacy and effectiveness have direct implications in the individual, familiar and communities health; from the local to the global setting.

Public health

- Like a science and art, Public health is to promote health, to prevent diseases and to prolong the life through organized efforts of the society.
- The gains in health have been obtained as a result of improvements in the economic income, education, water provision, nutrition, hygiene, house, health services and the result of new knowledge on the causes, prevention and treatment of diseases.

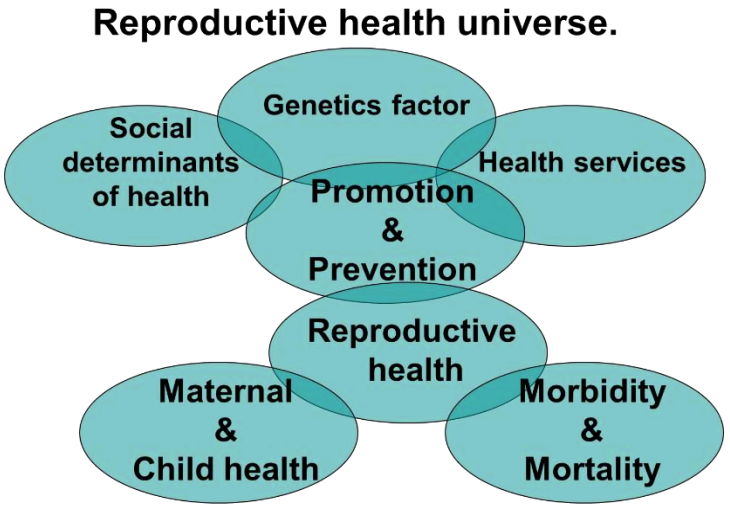
Public health challenges

- Actual sanitary challenges requires to implement new strategies of public health that prevent the diseases appearance and promote total development of health.
- These challenges exist due to the priority of diseases treatment services by on promotion programs and primary prevention of diseases.



Reproductive health

- Addresses the reproductive processes, functions and system at all stages of life.
- Implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so.
- Implicit the right to be informed of and to have access to safe, effective, affordable and acceptable methods of fertility regulation of their choice.
- Women right of access to appropriate health care services to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant.



Maternal health

- Health of women during pregnancy, childbirth and the postpartum period.
- Motherhood, for too many women it is associated with suffering, ill-health and death.
- Hemorrhage, infection, HBP, unsafe abortion and obstructed labor still are major direct causes of maternal morbidity and mortality.

Maternal health care

- Is a concept that encompasses family planning, preconception, prenatal, and postnatal care.
- Goals of preconception care can include providing education, health promotion, screening and interventions for women of reproductive age to reduce risk factors that might affect future pregnancies.

Maternal Prenatal care

- Prenatal care is the comprehensive care that women receive and provide for themselves throughout their pregnancy.
- Women who begin prenatal care early in their pregnancies have better birth outcomes than women who receive little or no care during their pregnancies.

Maternal Postnatal care

- Postnatal care issues include recovery from childbirth, concerns about newborn care, nutrition, breastfeeding and family planning.
- Time just after delivery is especially critical for newborns and mothers, especially during the first 24 hours. Two-thirds of all maternal deaths occur in this postnatal period;.

Maternal health and developing countries

- Most women do not have a good access to the health care and sexual health education services.
- A woman in sub-Saharan Africa has a 1 in 16 chance of dying in pregnancy or childbirth, compared to a 1 in 4,000 risk in a developing country – the largest difference between poor and rich countries of any health indicator.
- At the level of preconception and prenatal care, pregnancy complications and childbirth are the leading causes of death among women of reproductive age.

- Less than one percent of these deaths occur in developed countries, showing that they could be avoided if resources and services were available.

Maternal & child health

- There are birth-related disabilities that affect many more women and go untreated like injuries to pelvic muscles, organs or the spinal cord.
- At least 20% of the burden of disease in children below the age of 5 is related to poor maternal health and nutrition, as well as quality of care at delivery and during the newborn period.
- Yearly 8 million babies die before or during delivery or in the first week of life.
- Further, many children are tragically left motherless each year.
- These children are 10 times more likely to die within two years of their mothers' death.
- Maternal and child health and disease has multi-factor origin and can exist of sequential and continuous form.
- Bad maternal conditions account for the fourth leading cause of death for women after HIV/AIDS, malaria, and tuberculosis

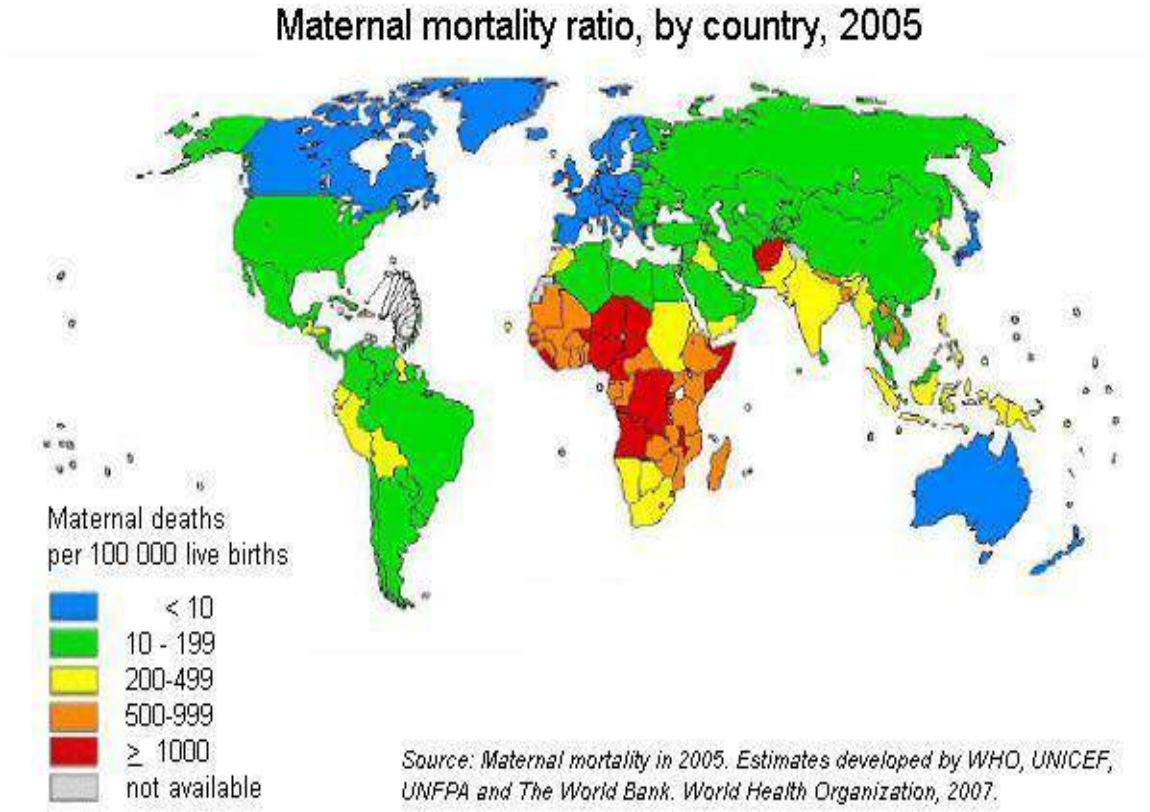
Maternal Death

- Death of a woman while pregnant or within 42 days of 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.
- Burden of maternal mortality is an important input to health decision-making.

Burden of morbidity and mortality in maternal period.

- Global burden of disease in pregnancy woman (GBDPW) analysis provides a comprehensive and comparable assessment of mortality and loss of health due to pregnancy and its risk factors in all regions.

- Is assessed using the disability-adjusted life year (DALY), that combines years of life lost due to premature mortality.
- To facilitate the identification of maternal deaths in circumstances in which cause of death attribution is inadequate, a new category has been introduced:
- Pregnancy-related death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.



- Critical indicator of population health reflecting the overall state of maternal health as well as quality and accessibility of PHC available to pregnant women and infants. Maternal mortality ratio is measured per 100 000 live births.
- Measuring maternal mortality accurately is difficult except where comprehensive registration of deaths and of causes of death exists.

- Maternal deaths are clustered around the intrapartum (labour, delivery and the immediate postpartum); the most common direct cause globally is obstetric haemorrhage.
- Other major causes are: obstetric haemorrhage; anaemia; sepsis/infection obstructed labour; hypertensive disorders and unsafe abortions.

Maternal death risks

Risk of maternal death is affected by many factors like:

- Frequency and spacing of births.
- Nutrition level (maternal undernutrition)
- Stature and maternal age.
- Appropriate medical and midwife support.
- Access to emergency and intensive treatment if were necessary.
- Lack of management capacity in the health system.
- No political will and lack of management capacity in the health system.
- Another risk to expectant women is malaria. It can lead to anaemia, which increases the risk for maternal and infant mortality and developmental problems for babies.
- A majority of these deaths and disabilities are preventable, being mainly due to insufficient care during pregnancy and delivery.
- HIV infection is an increasing threat. Mother-to-child transmission of HIV continues to be a major problem, with up to 45 per cent of HIV-infected mothers transmitting infection to their children.
- Further, HIV is becoming a major cause of maternal mortality in highly affected countries in Southern Africa, especially with the TB re-emergency.

Children health

- Child's health includes physical, mental and social well-being too.

- Each year more than 10 million children under the age of five die.
- At least 6.6 million child deaths can be prevented each year if affordable health interventions are made available to the mothers and children who need them.

Underlying causes of Child illness and death

- Poverty: More than 200 million children under five live in absolute poverty, on less than $1 per day.
- Under-nutrition and malnutrition: At least 200 million children under five are malnourished.
- High fertility and short birth intervals.

Infant mortality

- Critical indicator of population health reflecting the overall state of maternal health as well as quality and accessibility of PHC available to pregnant women and infants.
- Infant Mortality Rate (IMR): number of infant deaths per 1,000 live births in a population.

Other indicators :

- Neonatal Death: Death of an infant less than 28 days after birth (<28 days).
- Postneonatal Death: Death of an infant between 28 days and one year after birth (28-364 days).
- Low Birthweight (LBW): Birth weight less than 2,500 grams and VLBW 1500.

Infant and neonatal mortality

- Infant mortality rate is made up of two components: neonatal mortality (death in the first 28 days of life) & postneonatal mortality (death from the infants' 29th day but within the first year).

- The leading causes of neonatal death include birth defects, disorders related to short gestation and LBW, and pregnancy complications.
- The most to be preventable are those related to preterm birth and LBW, which represent approximately 20 percent of neonatal deaths.
- Postneonatal death reflects events experienced in infancy, including SIDS, birth defects, injuries, and homicide. SIDS is the leading cause of postneonatal death.
- Most neonatal deaths usually occur in the first 24 hours of life, and three-quarters of neonatal deaths occur in the first week after birth.
- Most newborn deaths are preventable through affordable interventions. To address the high burden of newborn deaths care must be available during pregnancy, labour and postpartum.

Perinatal and fetal mortality

- Health of infants depends in large part on their health in utero. A fetus with severe defects or growth problems may not be delivered alive.
- Because only live births are counted in infant mortality rates, perinatal and fetal mortality rates provide a more complete picture of perinatal health than does the infant mortality rate alone.
- The perinatal mortality rate includes both deaths of live-born infants through the first 7 days of life and fetal deaths after 28 weeks of gestation.
- This rate is a useful overall measure of perinatal health and the quality of health care provided to pregnant women and newborns.
- Fetal death often is associated with maternal complications of pregnancy, such as problems with amniotic fluid levels and blood disorders.
- Also when birth defects, such as anencephalus, renal agenesis, and hydrocephalus, are present.
- Rates of fetal mortality are 35 percent greater than average in women who use tobacco during pregnancy and 77 percent higher in women who use alcohol.

- Targeting prenatal risk screening and intervention to high-risk groups is critical to reducing this gap.
- Information about 4 million neonatal deaths worldwide is limited, even less information is available for stillbirths (babies born dead in the last 12 weeks of pregnancy) and there are no systematic global estimates.
- The numbers of stillbirths are high and regions in which most stillbirths occur, with under-reporting being a major challenge.

Under-five mortality rate (U5MR)

- Indicates the probability of dying between birth and exactly five years of age, expressed per 1,000 live births, if subject to current mortality rates.
- It has several advantages as a barometer of child well-being in general and child health in particular. It measures an 'outcome' of the development process.

Is known to be the result of a wide variety of inputs:

- nutritional status and the health knowledge of mothers;
- level of immunization and oral rehydration therapy;
- availability of maternal and child health services (including prenatal care);
- Income and food availability in the family;
- Availability of safe drinking water and basic sanitation;
- Safety of the child's environment, among other factors
- U5MR is less susceptible to the fallacy due that is a picture of the health status of the majority of children (and of society as a whole).

Children < 5 years mortality (2008) Worldwide

- Globally, 80 percent of all child deaths to children under five are due to only a handful of causes:
- pneumonia (19 %),
- diarrhea (18 %),
- malaria (8 %),
- neonatal pneumonia or sepsis (10 %),
- pre-term delivery (10 %),
- asphyxia at birth (8 %),
- measles (4 %), & HIV/AIDS (3 %).

Some emerging and reemerging problems to Mothers & Childern

- HIV/AIDS and TB plus Multirresistant TB.
- Dengue.
- Others viral haemorragic fever.
- Old neglected diseases with new burden.
- Cholera outbreaks in Africa and Asia.
- Avian and swyne flu.
- Conflicts, war and infraestructure destruction.
- Bad governance and uneffective polices.

Core interventions to prevent child deaths

- Preventive interventions:
- Vaccination
- Folic acid supplementation

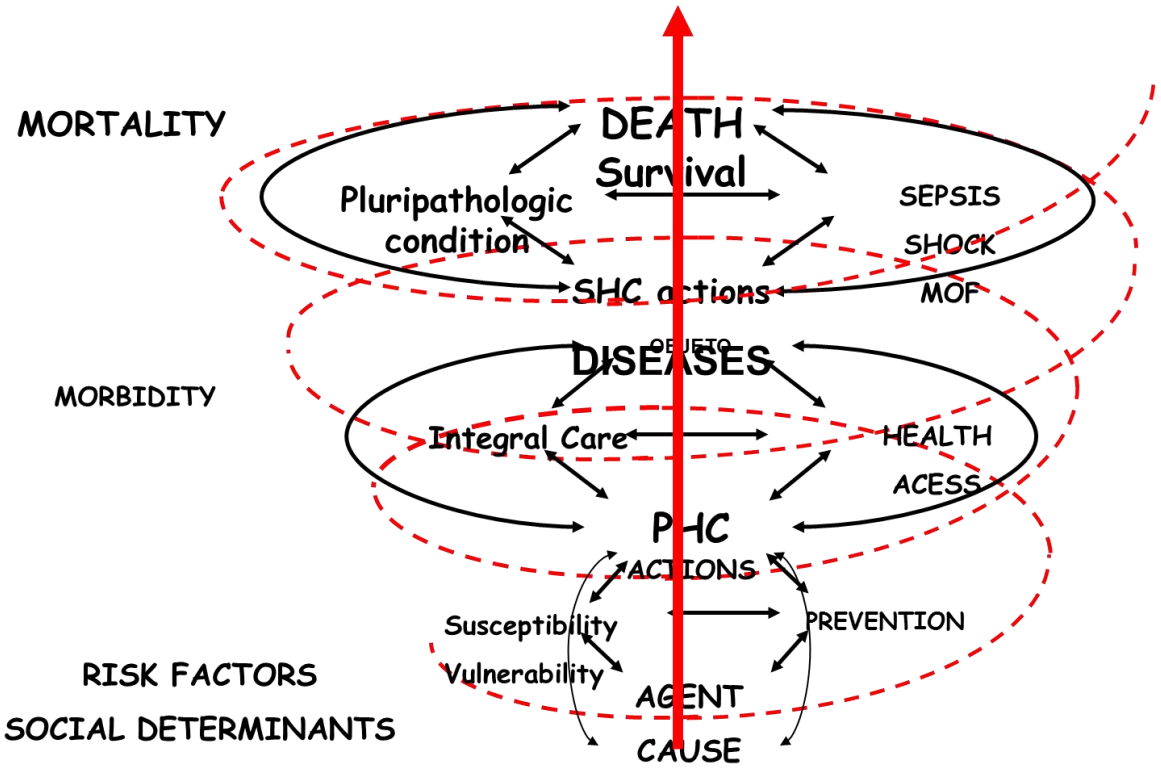
- Tetanus toxoid
- Syphilis screening and treatment
- Pre-eclampsia and eclampsia prevention (calcium supplementation)
- Intermittent presumptive treatment for malaria in pregnancy
- Antibiotics for premature rupture of membranes
- Detection and management of breech (caesarian section)
- Labor surveillance
- Clean delivery practices
- Breastfeeding
- Prevention and management of hypothermia
- Kangaroo mother care (skin-to-skin contact) for low birth-weight newborns
- Newborn temperature management
- Insecticide-treated materials
- Complementary feeding
- Zinc
- Hib vaccine
- Water, sanitation, hygiene
- Antenatal steroids
- Vitamin A
- Nevirapine and replacement feeding to prevent HIV transmission
- Measles vaccine

Treatment interventions

- Detection and treatment of asymptomatic bacteriuria.
- Corticosteroids for preterm labor.

- Newborn resuscitation
- Community-based pneumonia case management, including antibiotics
- Oral rehydration therapy
- Antibiotics for dysentery, sepsis, emerging and reemeging diseases.
- Antimalarials
- Zinc for diarrhea
- Vitamin A in respiratory diseases.

Maternal & child health, A Hollistic approach.



Remember:

- Maternal, neonatal and child mortality has been very persistent in a global context.
- Now 38 percent of all child deaths (4 million) occur in the first month of life.
- More than 10 million children under 5yr die each year. Most result from preventable and treatable causes. That's 30,000 children a day.
- Most of these children live in developing countries.

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