INTRODUCTION TO PUBLIC HEALTH

Dr .Ayda Ahmad Helles

THREE QUESTIONS

What is health?

What is public health?

What are the determinants of health?

Who is responsible for the health of individual & the population?

WHAT IS HEALTH?

- Persons are healthy when they are doing their activities with no apparent symptoms of disease.
- Health is a state of being well and free from disease (Oxford Students Dictionary, 1991)

HEALTH DEFINITION

A complete state of physical, mental, and social well-being and not merely the absence of disease (WHO, 1948)

- Physical: All body systems are properly functioning.
- Mental: Ability of person to 1. Adjust within himself and others.
  2. Cope with stress.
- Social: Ability of a person to 1. Live & react in harmony.
  2. Adjust within family & community.
  3. Be an active member of a community.

HEALTH

Health is like a mirage –
it is unattainable,
but worth pursuing!"
Dubos, 1959

HEALTH DEFINITION

- A state of equilibrium of the person with the biological, physical, and social environment, with the object of maximum functional capability

- A relative state in which one can function well physically, mentally, socially, and spiritually to express the full range of one's unique potentialities within the environment in which one is living.

- The ability to adapt (Lancet, 2009)

WHAT IS PUBLIC HEALTH

“ Is the science and art of prolonging life and promoting health through the organized efforts of society”

“Lewis in Holland et al, 1991”

“The process of mobilizing and engaging local, state, national and international resources to assure the conditions in which people can be healthy”

“The Oxford Textbook of Public Health”

WHAT IS PUBLIC HEALTH

- The science and practice of protecting and improving the health of the community, as by preventive medicine, health education, control of communicable diseases, application of sanitary measures and monitoring of environmental hazards"

  - The American Heritage Dictionary of Public Health

Prevention

Education

Promotion

Public Health

The “Big Picture”

PUBLIC HEALTH

" Public health is what we, as a society, do collectively to assure the conditions in which people can be healthy"

Institute of Medicine Report (IOM). The Future of Public Health

"Public Health is a science and art of saving the lives of millions at once by single decision or intervention"

PUBLIC HEALTH

- " Public Health is the science and art of preventing disease, prolonging life, and promoting health and efficiency through organized community effort for the sanitation of the environment, the control of communicable infections, the education of the individual in personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and for the development of the social machinery to insure everyone a standard of living adequate for the maintenance of health, so organizing these benefits as to enable every citizen to realize his birthright to health and longevity."
- CEA Winslow 1920, former Chair of Department and Professor of Public Health, Yale University

EARLY NAMES OF PUBLIC HEALTH

- Preventive medicine
- Social medicine
- Community medicine
- Community Health

  - Now they are dimensions of Public Health

THE MISSION OF PUBLIC HEALTH

“ **Fulfilling society's interests in assuring conditions in which people can be healthy”**

“Detels & Breslow, 2002”

PUBLIC HEALTH IS MANY THINGS

- A system
- A Profession
- A Method
- Government Service
- The health of the public

In medicine, patients typically are seen and managed individually.

In public health, the focus is on groups of people or populations rather than on individuals.


individual
how?
why?
accident
clinician
immediate issue

money
job
education
access to
health services
individual
how?
why?
vision
safe
well maintained
accident
clinician
immediate issue
knowledge
attitudes
safe roads
alcohol
drugs
LAWS
support
community
attitudes
enforcement
legislation

DETERMINANTS OF HEALTH

The determinants of health are

Things that make people healthy or not

The range of personal, social, economic, and environmental factors that influence health status

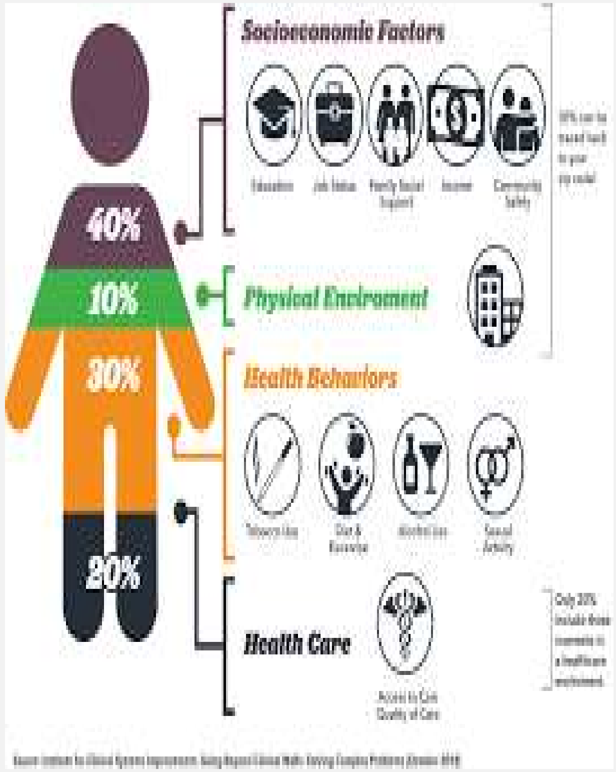
DETERMINANTS OF HEALTH

- **Income and social status :**higher income and social status are linked to better health. The greater the gap between the richest and poorest people, the greater the differences in health.
- **Education :** low education levels are linked with poor health, more stress, and lower self-confidence.
- **Physical environment:** Safe water and clean air, healthy workplaces, working conditions, safe houses, communities, and roads, all contribute to good health.
- **Social support networks:** greater support from families, friends, and communities is linked to better health.
- **Culture:** customs and traditions, as well as the beliefs of the family and community, all affect health.
- **Health services -** access and use of services that prevent and treat disease influences health

DETERMINANTS OF HEALTH

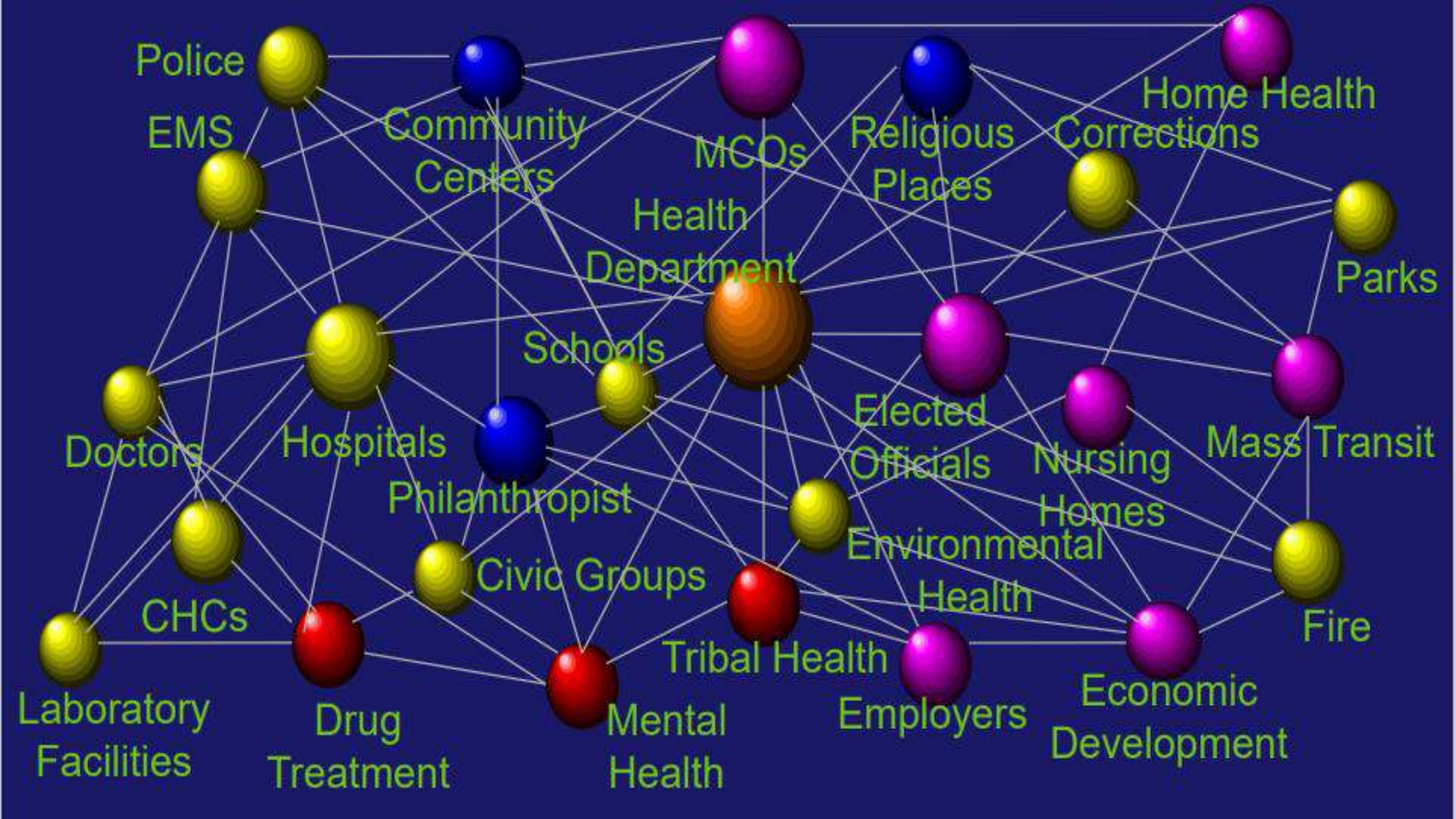
The person's individual characteristics and behaviors:

- **Biology:** sex, age. Men and women suffer from different types of diseases at different ages.
- **Genetics –** inheritance plays a part in determining lifespan, healthiness, and the likelihood of developing certain illnesses.
- **Personal behavior and coping skills** – balanced eating, keeping active, smoking, and how we deal with life's stresses and challenges all affect health.



The Public Health System

IOM, 2003


Police
Community Centers
MCOs
Religious Places
Home Health
Corrections
EMS
Health Department
Parks
Schools
Hospitals
Doctors
Philanthropist
Elected Officials
Nursing Homes
Mass Transit
CHCs
Civic Groups
Environmental Health
Fire
Tribal Health
Laboratory Facilities
Drug Treatment
Mental Health
Employers
Economic Development

Public Health *vs.* Medicine

- **Public Health**
  - Population
  - Disease Prevention
  - Health Promotion
  - Interventions
    - Environment
    - Human behavior
  - Government (Some private)

- **Medicine**
  - Individual
  - Diagnosis
  - Treatment
  - Intervention
    - Medical care
  - Private (Some public)

Source: Brandt, AM and Gardner, M. 2000. American Journal Public Health. 90:707-715.

PUBLIC HEALTH DISCIPLINES

Public health encompasses various activities and disciplines, such as:

- Epidemiology
- Biostatistics
- Social and behavioral sciences
- Environmental Health
- Health policy and management

CORE FUNCTIONS OF PUBLIC HEALTH

Assessment

- Assessing and monitoring the health of communities and populations at risk to identify health problems and priorities.

What are the health problems of a population or individual?

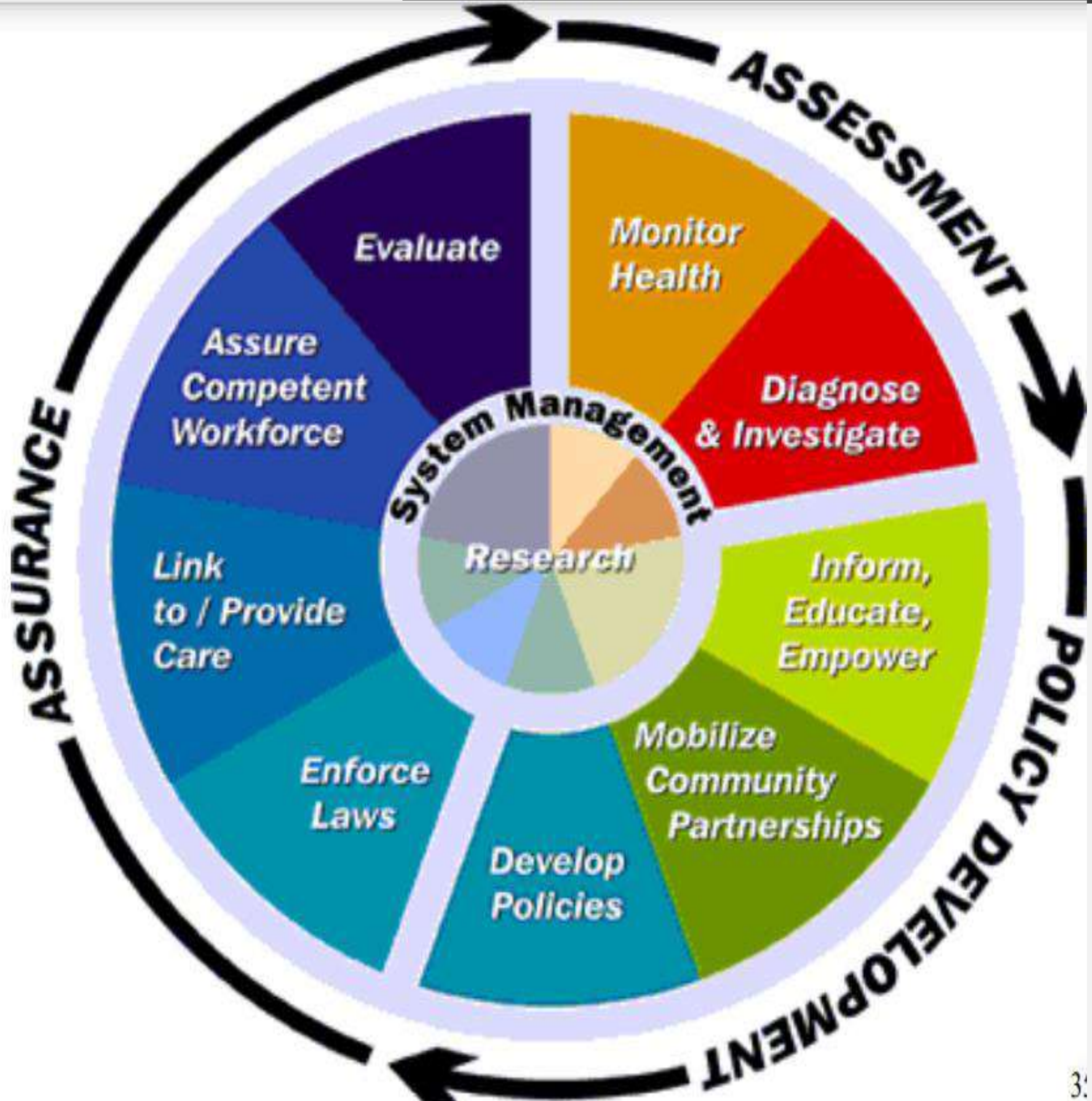
Policy Development

- Collectively deciding which actions or interventions are most appropriate for the problems identified.
- Public health promotes using a scientific knowledge base in policy and decision-making.

Assurance

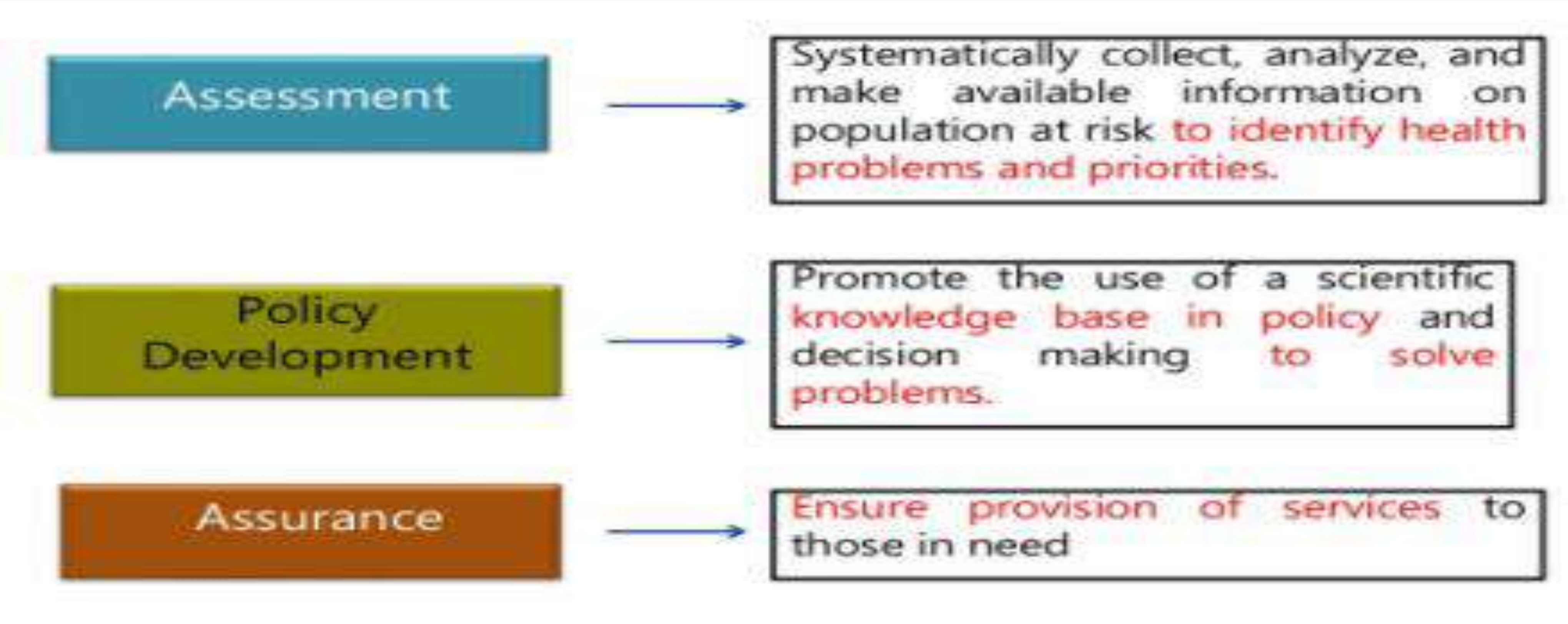
- To assure that all populations have access to appropriate and cost-effective care, including health promotion and disease prevention services.

10 ESSENTIAL PUBLIC HEALTH SERVICES



1. **Monitor health** status to identify and solve 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** and action to identify and solve health problems
5. **Develop policies** and plans that support individual and community health efforts
6. **Enforce laws** and regulations that protect health and ensure safety
7. **Link people to needed services** and assure the provision of health care when otherwise unavailable
8. **Assure a competent healthcare workforce**
9. **Evaluate** the effectiveness, accessibility, and quality of health services
10. **Research** for new insights and innovative solutions to health problems

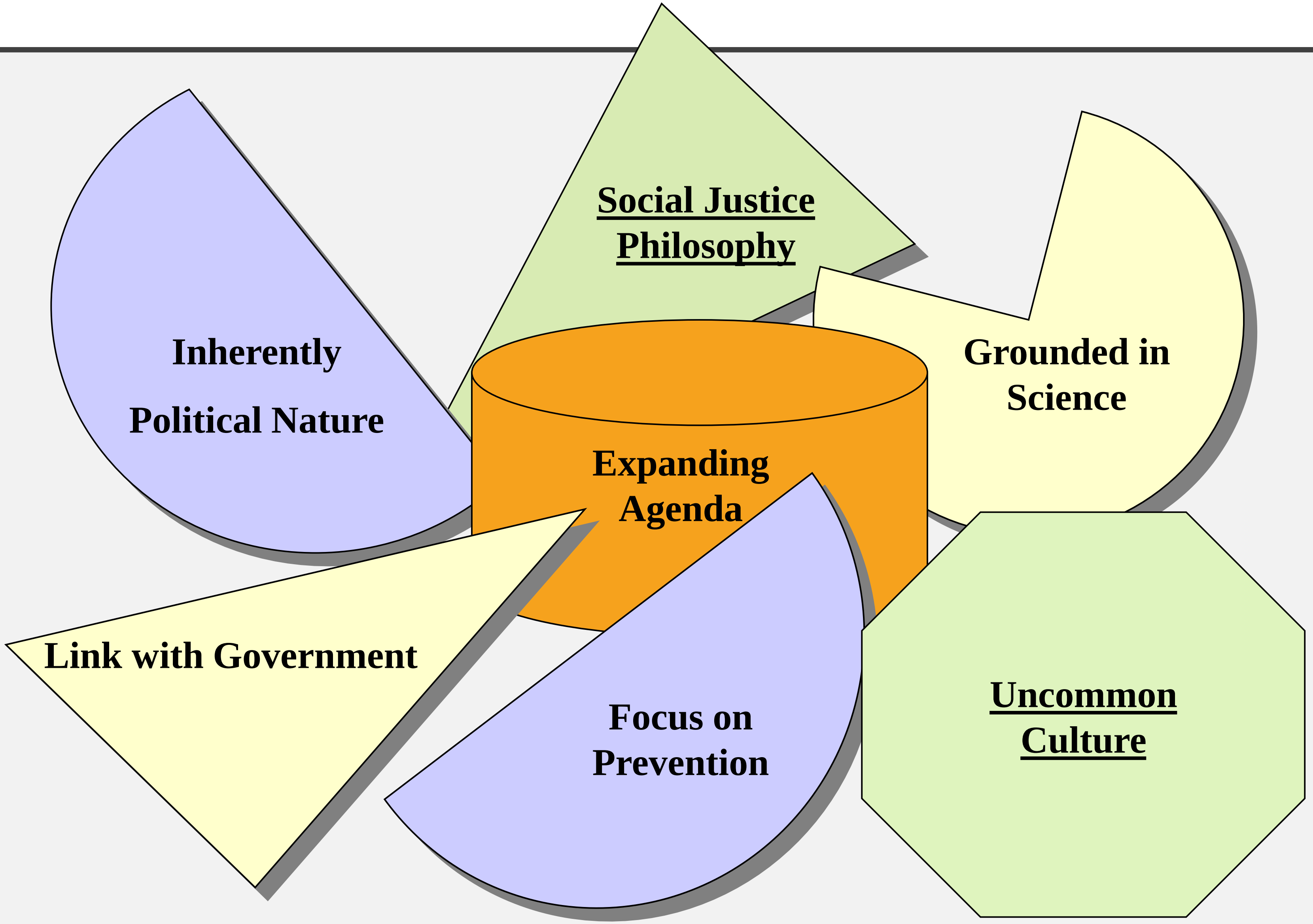
THE CORE FUNCTIONS OF PUBLIC HEALTH



UNIQUE FEATURES OF PUBLIC HEALTH

1. BASED ON THE SOCIAL JUSTICE PHILOSOPHY
2. INHERENTLY POLITICAL IN NATURE
3. DYNAMIC, EVER-CHANGING AGENDA
4. CLOSELY LINKED WITH GOVERNMENT
5. GROUNDED IN THE SCIENCES
6. PREVENTION IS THE PRIMARY STRATEGY
7. UNCOMMON CULTURE AND BOND

UNIQUE FEATURES OF PUBLIC HEALTH



INTRODUCTION TO PUBLIC HEALTH

What is Social Justice?

Justice indicates fairness in the distribution of benefits and burdens in society.

Access to health services, or even good health itself is considered a social benefit… and conversely, poor health is considered a burden.

There are significant factors within society that impede the fair distribution of benefits and services (e.g. social class, heredity, racism)

INTRODUCTION TO PUBLIC HEALTH

What is Social Justice?

Many modern public health problems disproportionately affect some groups (Poor Public Education Systems Poverty)…

Collective actions are then necessary

This means that those less affected take on greater burdens while not directly benefiting from those actions

INTRODUCTION TO PUBLIC HEALTH

Uncommon Culture

Public health is multidisciplinary-interdisciplinary and utilizes a population-level focus.

The link between people working in Public Health is NOT a specific professional degree or work setting…

Public Health professionals are connected by the intended outcomes of their work.. <u>Promoting</u>, <u>protecting</u>, and <u>preserving</u> the public's health.

CORE ACTIVITIES OF PUBLIC HEALTH

1. Prevents epidemics and spread of diseases
2. Protects against environmental hazards
3. Responds to disasters and assists communities in recovery
4. Prevents injuries
5. Promotes healthy behaviors
6. Assures the quality, accessibility and accountability of health services

CORE ACTIVITIES OF PUBLIC HEALTH

7. Monitoring the health status of the population
8. Mobilizing community action
9. Reaching out to link high-risk and hard-to-reach people to needed services
10. Researching to develop new insights and innovative solutions
11. Leading the development of sound health policy and planning
12. Humanitarian response

TEN GREAT PUBLIC HEALTH ACHIEVEMENTS

1. Vaccination
2. Motor-vehicle safety
3. Safer workplaces
4. Control of infectious diseases
5. Decline in deaths from coronary heart disease and stroke
6. Safer and healthier foods
7. Healthier mothers and babies
8. Family planning
9. Fluoridation of drinking water
10. Recognition of tobacco use as a health hazard,

PUBLIC HEALTH PROBLEMS AND DISEASES

1. Communicable diseases
2. Non communicable diseases
3. Environmental pollution
4. Maternal and child health problems
5. Malnutrition and micronutrient deficiency
6. Municipal and hospital waste
7. Geriatric health problems
8. Population problems

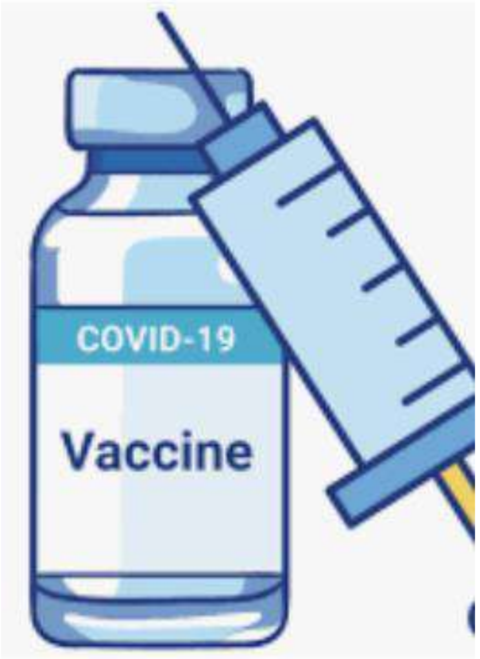
History of Public Health

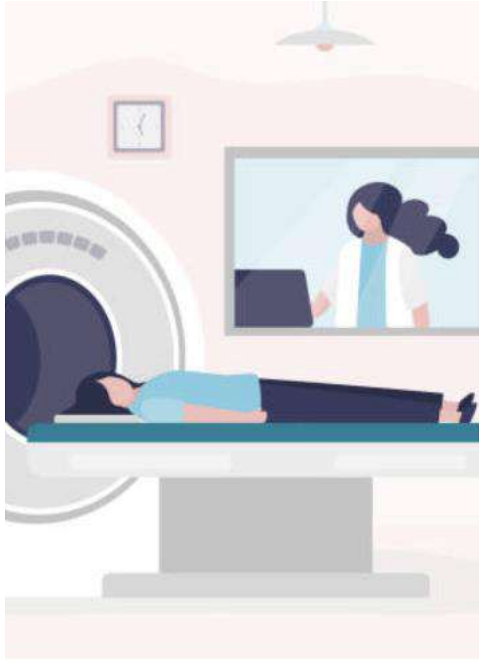
Introduction to Public Health

First Year Medical Students

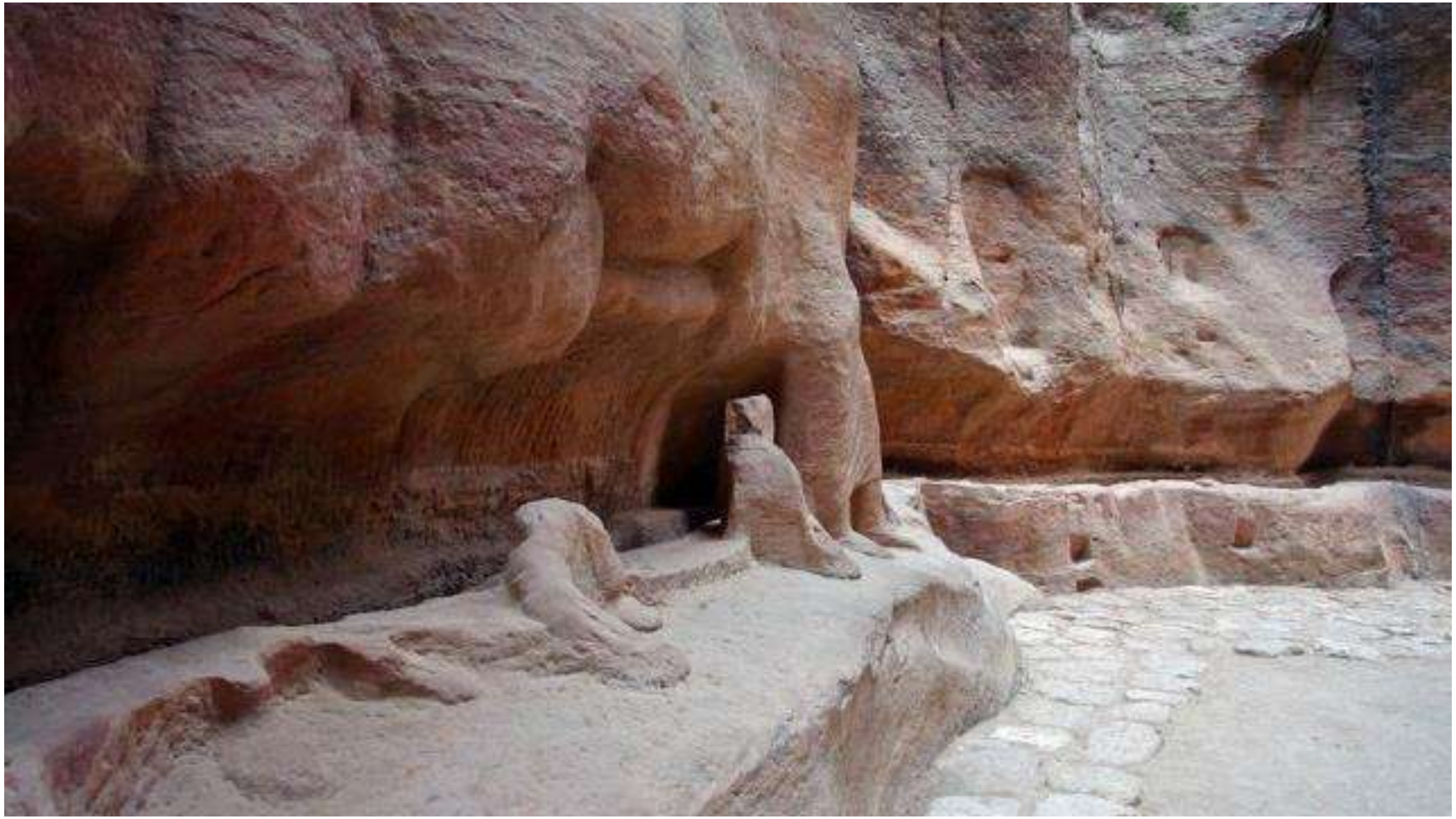
Al Azhar University, Gaza

Which technological advancement contributed the most to improving public health?





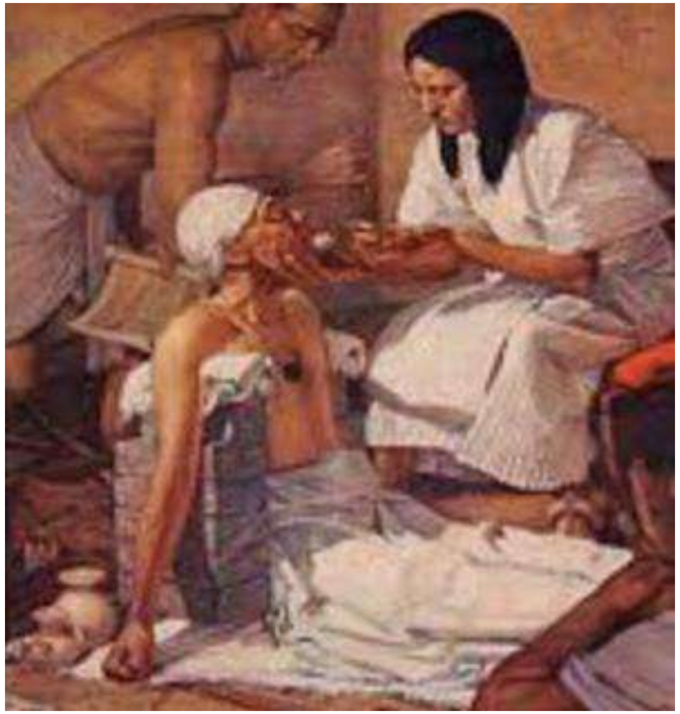
Running water



Toilets

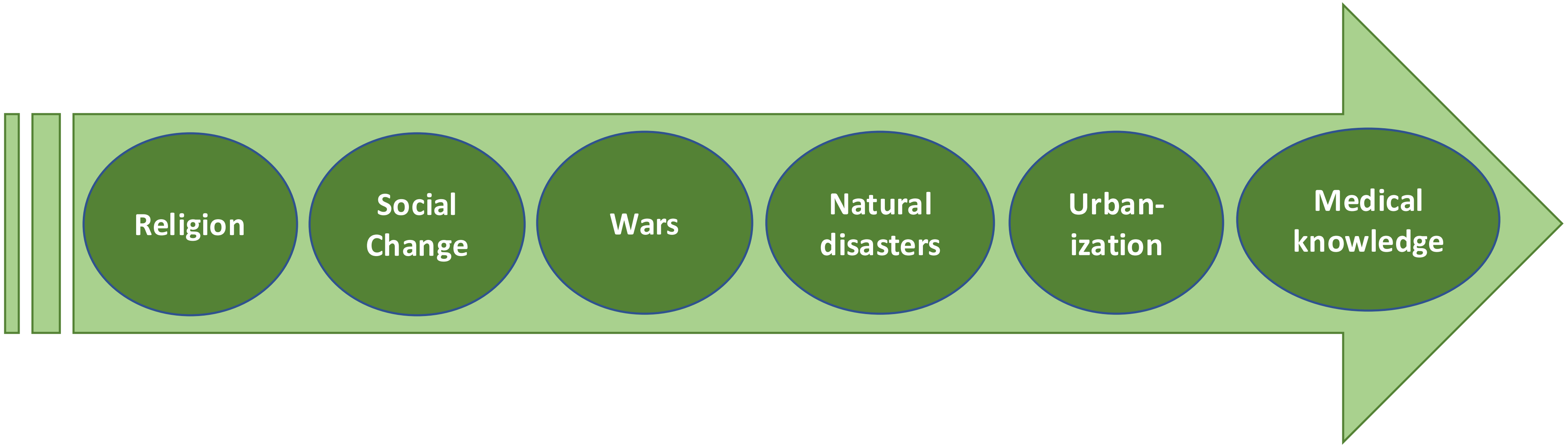
Public health laws
Code of Hammurabi (1700 BC)

- Basic public health measures such as the supply of clean water and sewage management are not as recent as we think they are
- Even medical documentation and the regulation of medical practice began thousands of years ago



- All ancient societies faced disease and death
- They developed remedies to prevent disease and prolong life
- Oftentimes, strategies to prevent disease were invented before scientific evidence on disease causation were known

The development of Public Health



Our ancestors

- *Homo Sapiens* who lived in Africa were hunter gatherers
- They lived in groups and survived by hunting and gathering food
- Illness and death were related to starvation and injuries while hunting animals

Transition to food raising societies

- 9,000 to 8,000 BC, societies in SWANA (and later Europe) transitioned from hunting and fishing for food to agriculture
  - Domestication of animals
  - Growing wheat and vegetables
  - Pottery and storing of food
- Humans began to survive longer and their population increased

- ***What do you think were the main determinants of illness and death among domesticated and food raising societies?***

The First Epidemiological Transition

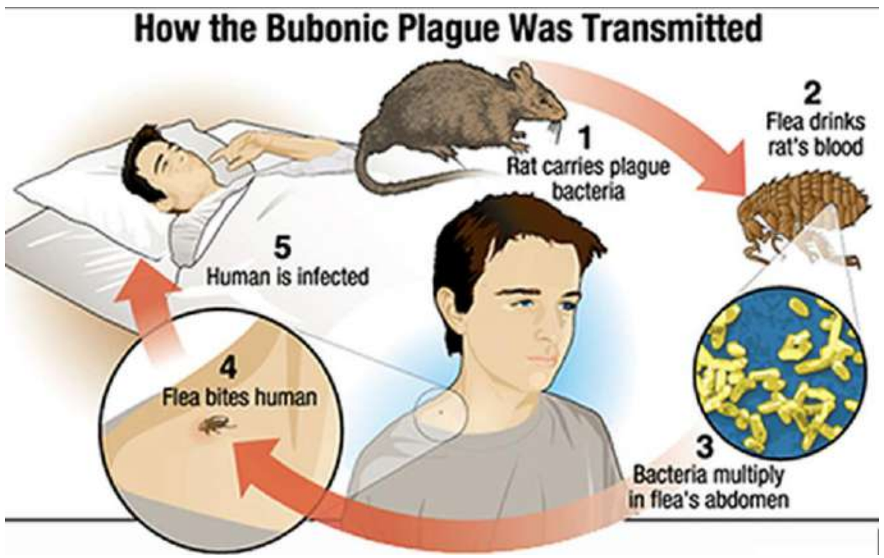
- Took place during the Neolithic age when societies transitioned form hunter-gatherers to food-raising societies
- Hunter gatherers died from starvation, cold, injuries
- In food-raising societies, bacterial and parasitic infections became the main causes of illness and death

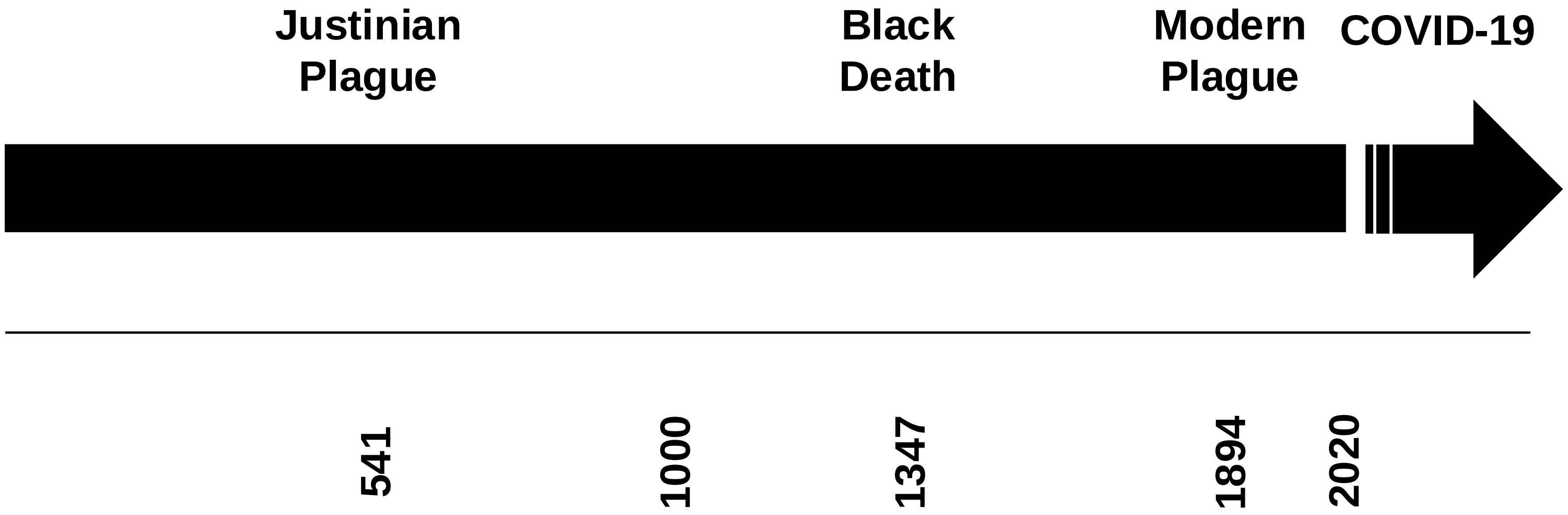
Theories of disease causation

The Divine Theory

- Disease is a punishment sent by God as chastisement for sin or disobedience
- Renouncing all sins and obeying God would restore health and immunity to disease
- Religious clergy were also doctors

The Plague


How the Bubonic Plague Was Transmitted
1
Rat carries plague bacteria
2
Flea drinks rat's blood
3
Bacteria multiply in flea's abdomen
4
Flea bites human
5
Human is infected


Justinian Plague
Black Death
Modern Plague
COVID-19
541
1000
1347
1894
2020

The plague

- The plague gave rise to critical social and public health developments
- Major demographic changes in Europe (50% of the population died)
- Re/birth of the idea of producing knowledge through evidence and experimentation
- The Renaissance (rebirth)
- The invention of the quarantine as a public health prevention strategy

- ***What is quarantine?***

- “Plagues, like other natural disasters, challenge established ways of thinking and may prompt intellectual innovation as well as doubt and dismay.”

(Slack 2012)

- ***Outbreak:*** A spike in an infectious disease that affects a limited number of people
- **Epidemic:** An infectious disease that spreads in a specific area (country) affects a large number of people
- ***Pandemic:*** An epidemic that affects entire continents and kills massive numbers of people

Theories of disease causation

Natural causation

- A conceptual breakthrough (fifth century Greece)
- Causes of disease are in nature
- Hippocrates
- The universe and the human body are made of elements that correspond to each other; *a disorder in one will cause a disorder in the other*
- Universe: earth, water, air, fire
- Body (humors): black bile (cold & dry); phlegm (cold & wet), blood (hot & wet), yellow bile (hot & dry)

Smallpox

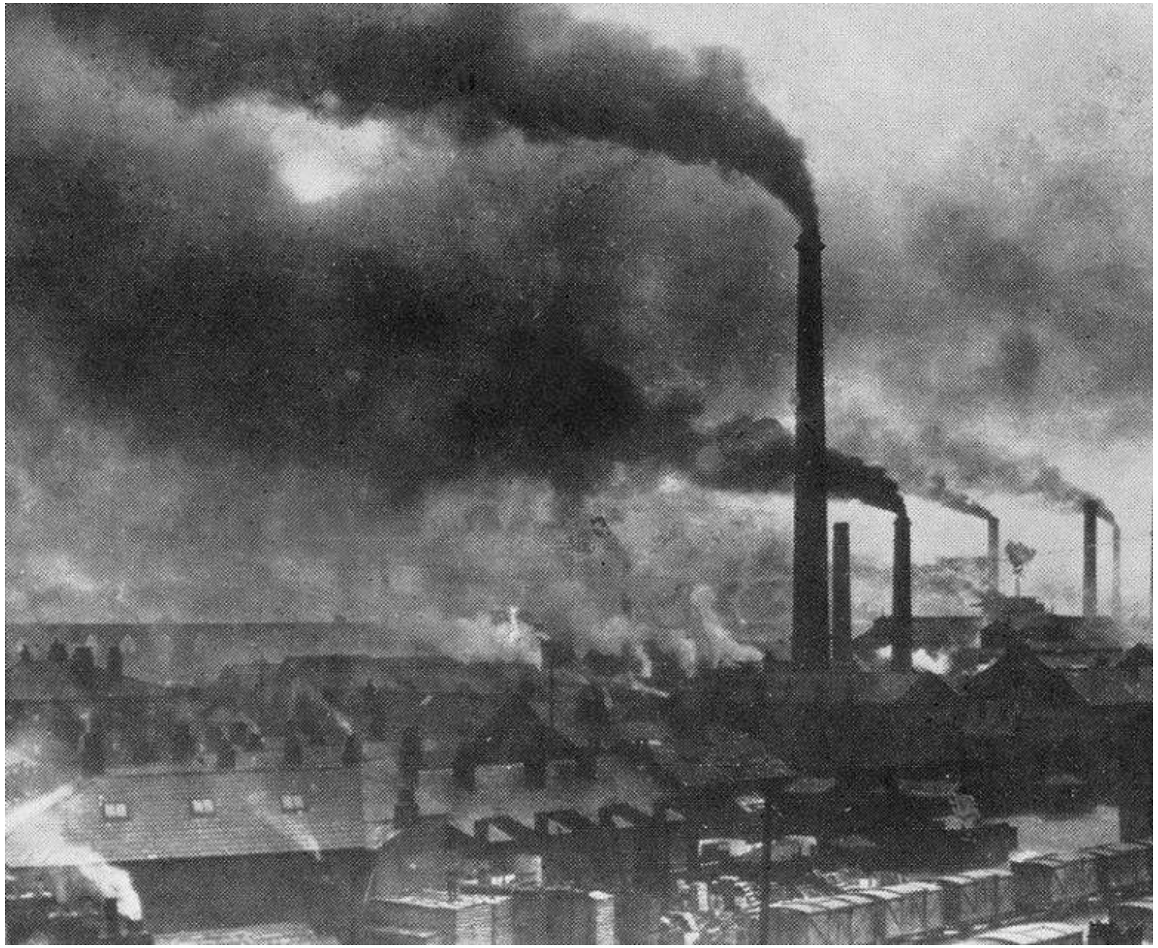
- European colonization of the Americas
- Near elimination of the indigenous people
- >50 million perished in 100 years
  - Warfare
  - Starvation
  - Smallpox
- Was it the first case of biological warfare?

Variolation and the eradication of smallpox

- Variolation is the inoculation of the disease from an infected to a healthy person to prevent them from acquiring a more virulent form
- Edward Jenner (1796) inoculated an orphaned child with cowpox to provide immunity against smallpox
- Smallpox is the only infectious disease that has been eradicated through vaccination (1977)

Cholera outbreaks in London (John Snow)

- Life expectancy 1850: 43 years



Cholera

- Cholera in 19th century England
- Miasma theory: cholera is caused by bad air rotting from organic matter
- John Snow, a scientist, hypothesized that a cholera outbreak in London in 1847 was caused by infected water
- He conducted one of the first urban epidemiological survey studies where he mapped cholera cases in every household to their source of water
- John Snow did not know about or see the *vibrio cholera* in water

Theories of disease causation

Germ Theory (1850-1920)

- Disease is caused by microorganisms “germs” that invade the body and are too small to be seen by the naked eye
- Bacteria
- Viruses

Developments of the germ theory

Pasteurization

- Louis Pasteur provided proof for the germ theory (~1850s)
- Micro-organisms multiply and spoil milk, meat, cheese, and cause illness
- These micro-organisms can be killed by heating

Vaccine development

- Vaccines can be developed through attenuation—weakening the micro-organism that causes the disease so that it can produce immunity but not disease, and introducing it into the body
- 1884-1885 produced a vaccine for rabies

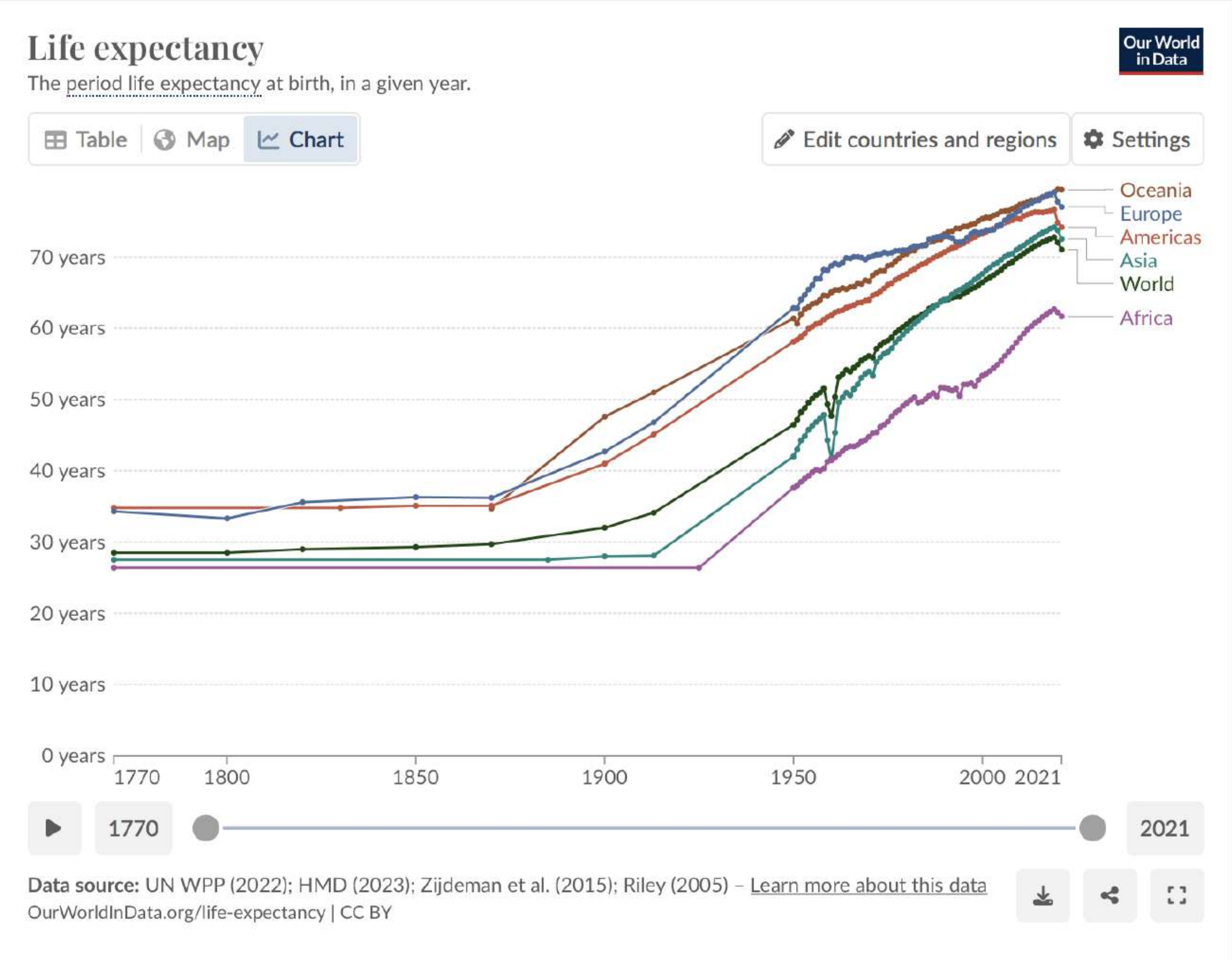
Polio

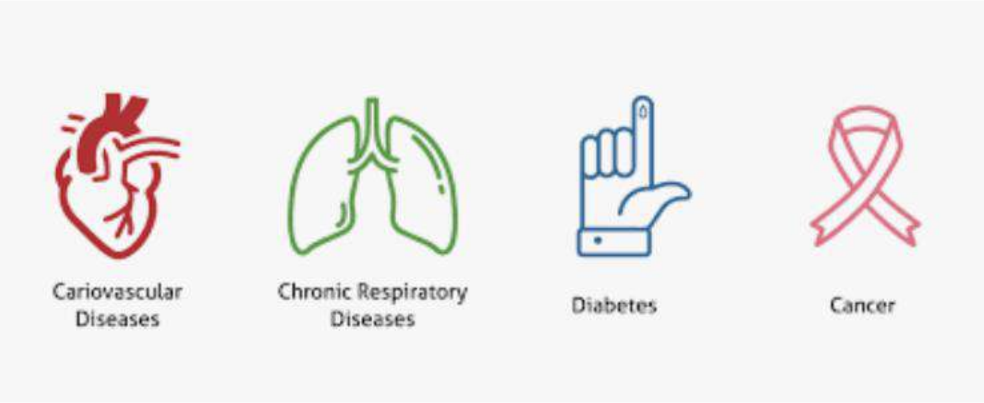
- Jonas Salk developed the inactivated polio vaccine (IPV) in 1954
- Later, a live attenuated polio vaccine to be administered orally (OPV) was developed
  - Less expensive
  - Easier to administer
- Polio has been endemic in a few countries only since the 1990s and its eradication was within site
- However, war and political crises have dissipated the promise of eradicating this infectious disease

The 1848 Public Health Act in England

- Addressed the organization of public health and all factors that affect it: poverty, housing, water, sewerage, the environment, safety and food
- Designated accountabilities and penalties → saw health as the responsibility of local governments

Almost everywhere in the world, people live longer and healthier lives than 100 years ago

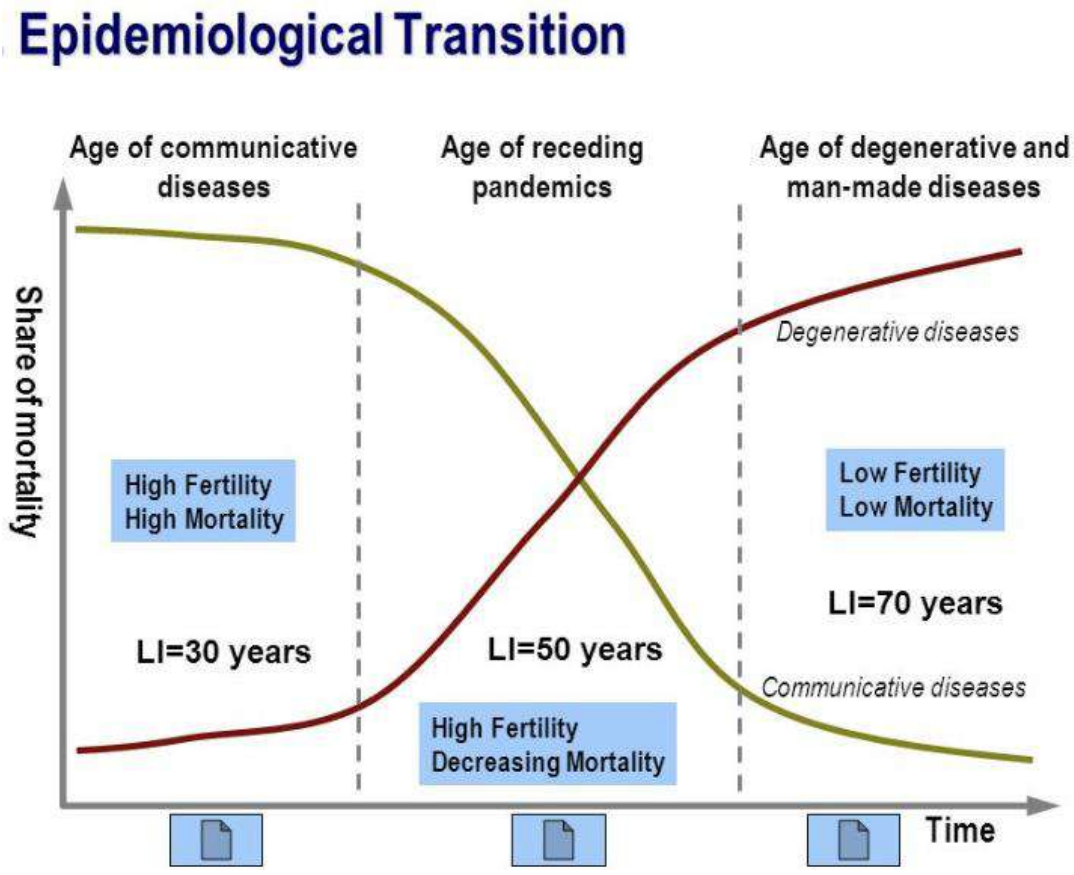




From communicable to non-communicable disease

Epidemiological transition theory

- Decline in overall mortality and infant mortality
- Decline in fertility
- Increase in life expectancy
- Change in population disease profile from infectious (communicable) to non-communicable



WHO (World Health Organization)

- Established in 1948 as a UN agency
- International organization
- Has 6 regional offices including one in the Eastern Mediterranean
- Official mandate is to promote health and safety internationally
- It provides assistance to governments, especially in low-income countries

- ***Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity***

Who funds WHO?

USA	15.9%
Gates Foundation	9.4%
UK	7.7%
GAVI, Vaccine Alliance	6.6%
Germany	5.2%
Japan	3.8%
UN-OCHA	3.4%
Rotary International	2.5%
World Bank	2.4%
European Commission	2.3%
Other	40.7%

14 August 2024 | News release

WHO Director-General declares mpox outbreak a public health emergency of international concern

16 August 2024 | Statement

Humanitarian pauses vital for critical polio vaccination campaign in the Gaza Strip

Alma-Ata (1978) and PHC Health Care for All by 2000!

Health is

A fundamental

Human right

- Alma-Ata → Health for all by the year 2000
- PHC → a wider notion of health based on social justice and community participation
- **WHOs definition of health:**
- “Health is a state of physical, mental, and spiritual well-being, not merely an absence of disease or infirmity”

- Inequalities are unacceptable; social justice is integral to health planning
- Multi-sectoral action (housing, education, agriculture, …)
- Health ≈ economic and social development
- Governments are responsible
- People have the right to participate

- PHC is essential health care that is universally accessible
- Governments should sustain PHC as part of a comprehensive health system, in coordination with other sectors
- Better use of the world's resources (much of which is spent on military) → disarmament

Post Alma-Ata

- Changes in the global political climate
- Comprehensive PHC → selective PHC
- Horizontal → vertical programs
- Structural adjustment programs in poor countries (disinvestment in health and education)

- In sum, in the 1980s and 1990s, there was a move from the spirit of Alma-Ata which outlined a philosophy of holistic health to an approach that focused on vertical, “practical” programs with specific goals
- GAVI: Growth monitoring, vitamin A, breast feeding, immunication
- The community participation component of Alma-Ata was lost

EXPANDING PUBLIC HEALTH CONCEPT
HEALTH TRANSITION

Dr .Ayda Ahmad Helles

- **Health**

A complete state of physical, mental, and social well-being and not merely the absence of disease

- **Public health**

Public Health is the science and art of preventing disease, prolonging life, and promoting health and efficiency through organized community effort

PUBLIC HEALTH CONCEPT

Public health is concerned with protecting the health of entire populations

Sanitation

Food safety

Clean water

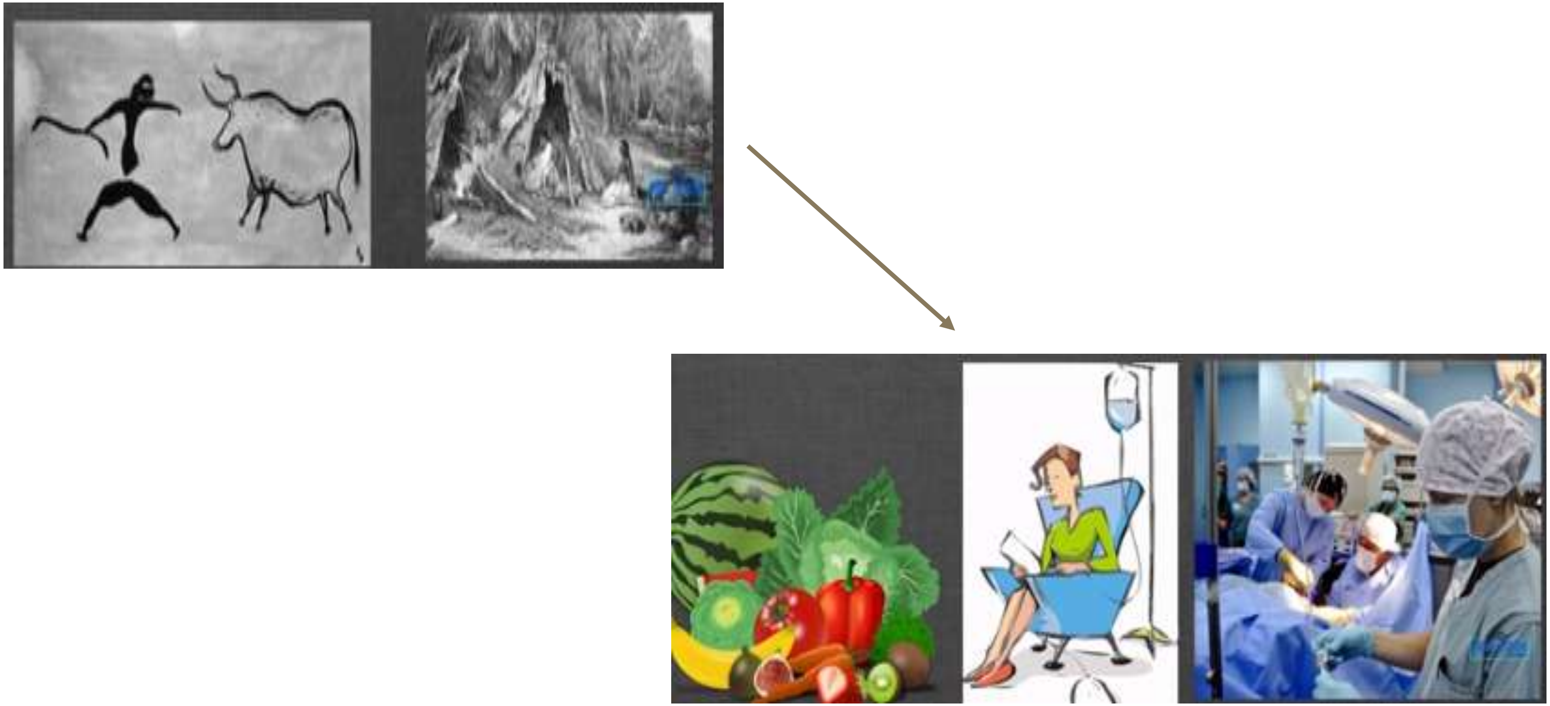
Controlling infectious diseases

Noncommunicable diseases prevention

THE HEALTH TRANSITION

- **Health transition:** the shifts that have taken place in the pattern and causes of death

- Health transition is used to refer to the transitions in morbidity and mortality from infectious to noncommunicable disease, as a consequence of medical interventions and improvements in material conditions of living



THE HEALTH TRANSITION

The health transition has been covered by two separate terms:

1. Demographic transition

2. Epidemiological transition

DEMOGRAPHIC TRANSITION

Changing population patterns in terms of fertility, life expectancy, mortality, and leading causes of death

DEMOGRAPHIC TRANSITION

A change in the population dynamics of a country as it moves from

High fertility and mortality rates

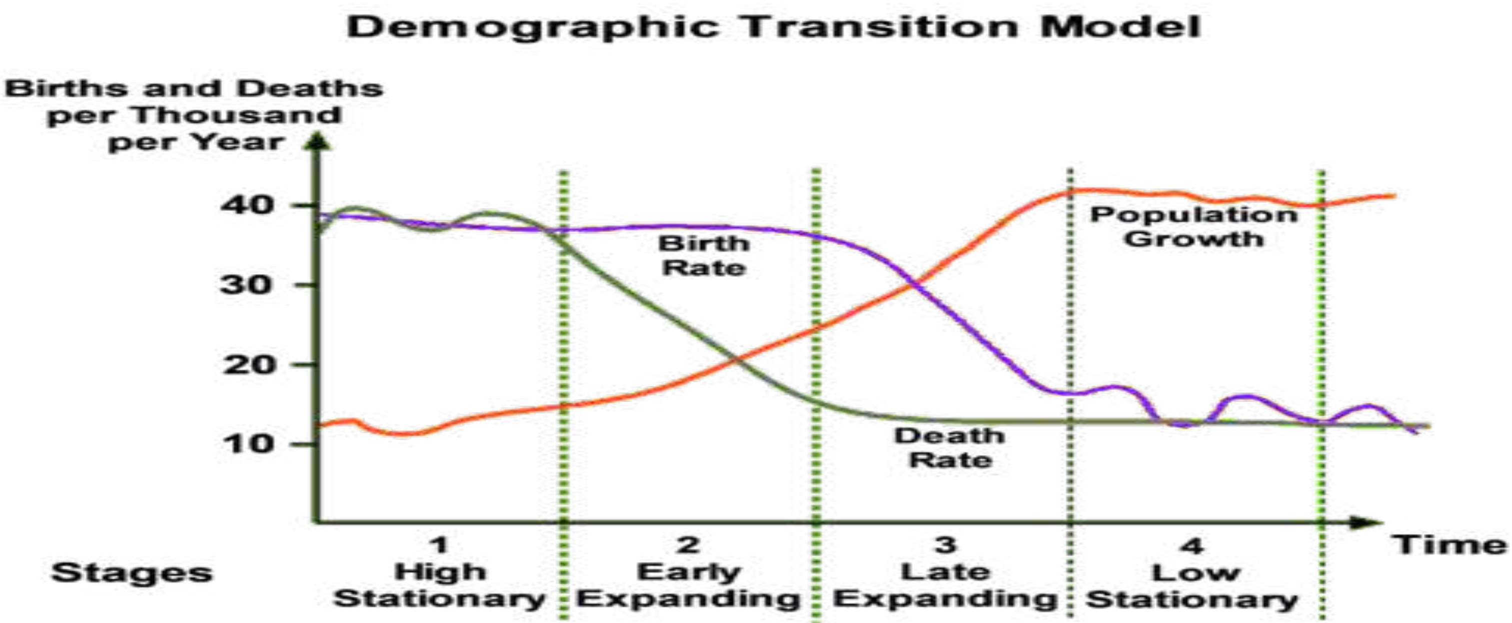
↓

Low fertility and mortality rates

Characterized by major growth in:

- the number and proportion of middle-aged and elderly persons.

DEMOGRAPHIC TRANSITION



DEMOGRAPHIC TRANSITION

3 stages:

From

High stable stationary stage: stable high birth and death rates.

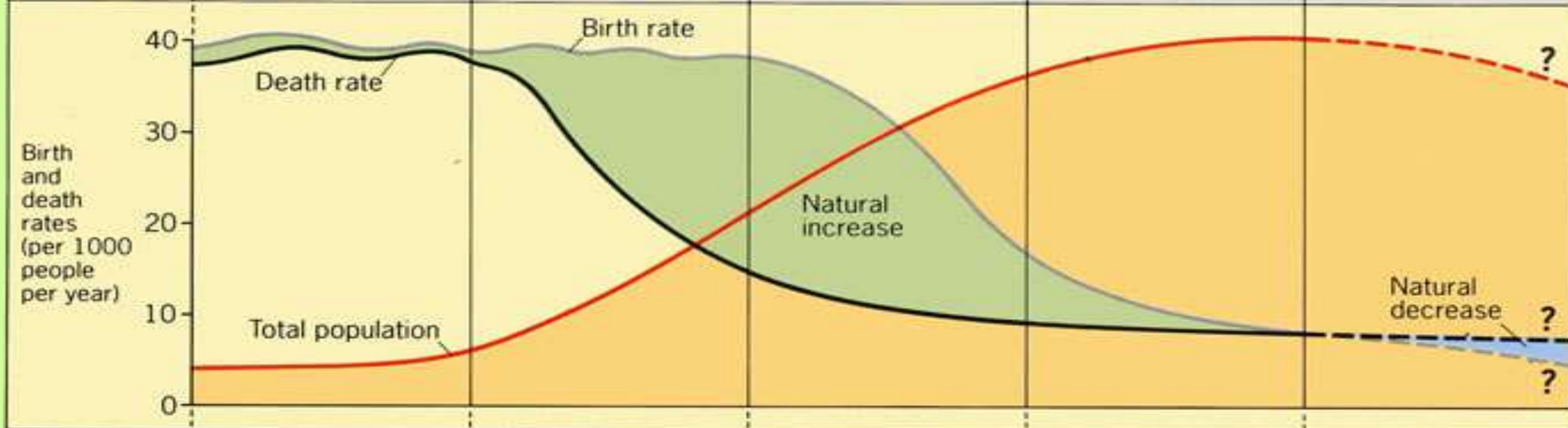
Through

Transitional stage: sustained birth rates and falling death rates – population increases

To

Low stable stationary stage: low birth and death rates

Stage	1 High stationary	2 Early expanding	3 Late expanding	4 Low stationary	5 ? Declining?



Examples	A few remote groups	Egypt, Kenya, India	Brazil	USA, Japan France, UK	Germany
Birth rate	High	High	Falling	Low	Very low
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Very rapid increase	Increase slows down	Stable or slow increase	Slow decrease
Reasons for changes in birth rate	Many children needed for farming. Many children die at an early age. Religious/social encouragement. No family planning.		Improved medical care and diet. Fewer children needed.	Family planning. Good health. Improving status of women. Later marriages.	
Reasons for changes in death rate	Disease, famine. Poor medical knowledge so many children die.	Improvements in medical care, water supply and sanitation. Fewer children die.		Good health care. Reliable food supply.	

DEMOGRAPHIC TRANSITION

- Developed vs. developing nations
- All industrialized nations have gone through these phases of demographic transition
- The developing nations have completed Phase I and are currently in Phase II – a phase of explosive rates of natural increase
- Countries in Western Europe took roughly 200 years to complete their transitions

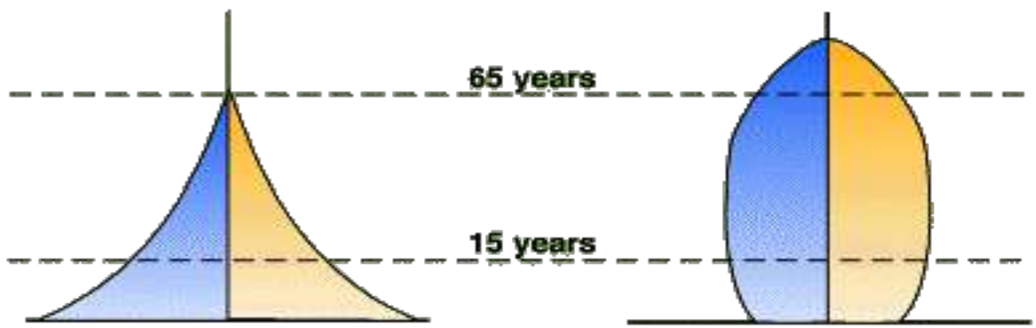
POPULATION PYRAMID

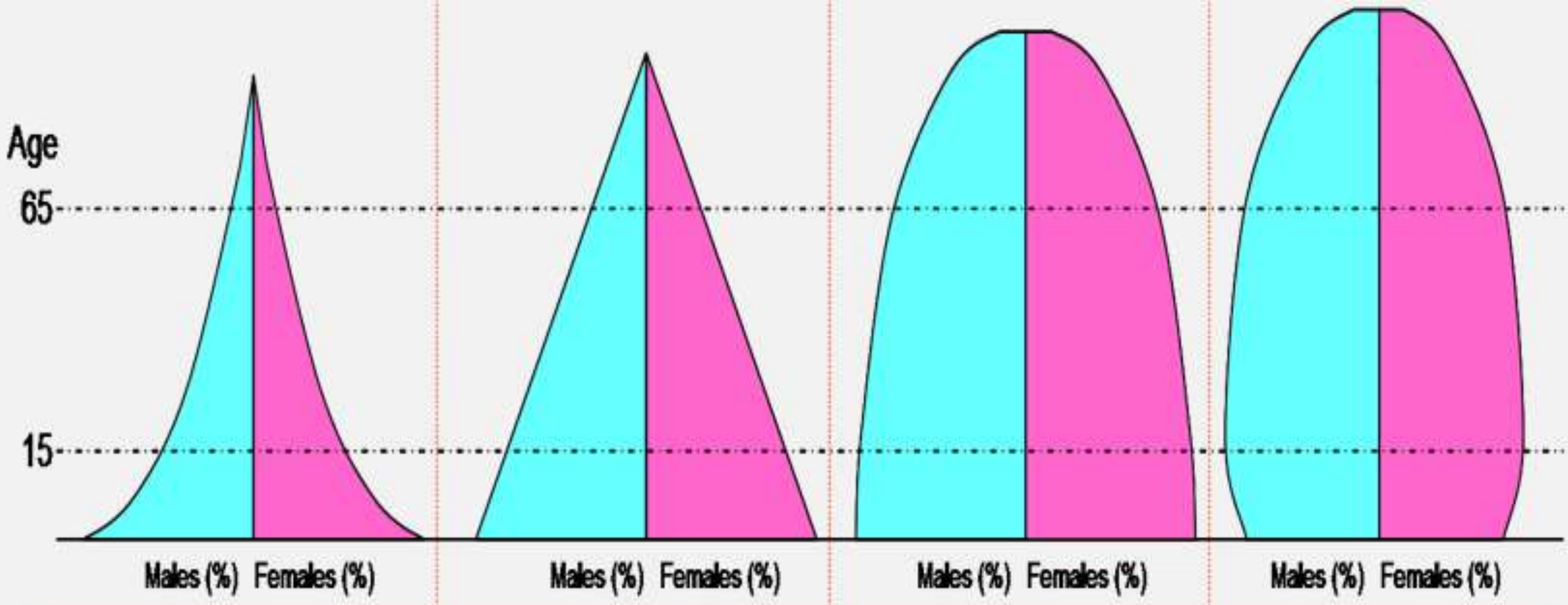
Pyramid A

Typical of Developing Countries
High Death Rate
High Birth Rate
Low Life Expectancy

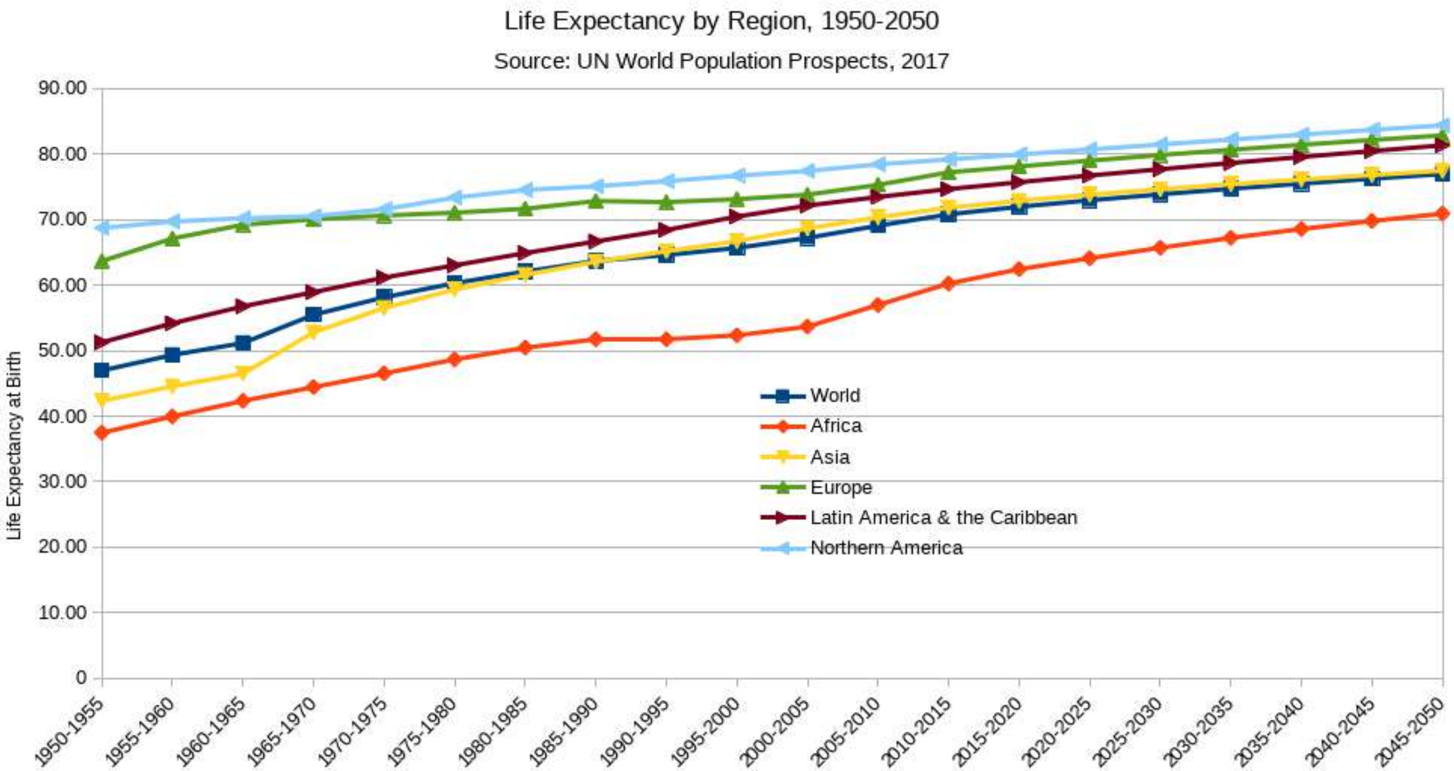
Pyramid B

Typical of Developed Countries
Low Death Rate
Lower Birth Rate
Longer Life Expectancy





High birth rate; rapid fall in each upward age group due to high death rates; short life expectancy.	High birth rate; fall in death rate as more living in middle age; slightly longer life expectancy.	Declining birth rate; low death rate; more people living to old age.	Low birth rate; low death rate; higher dependency ratio; longer life expectancy


Life Expectancy by Region, 1950-2050
Source: UN World Population Prospects, 2017
Life Expectancy at Birth
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0
1950-1955
1955-1960
1960-1965
1965-1970
1970-1975
1975-1980
1980-1985
1985-1990
1990-1995
1995-2000
2000-2005
2005-2010
2010-2015
2015-2020
2020-2025
2025-2030
2030-2035
2035-2040
2040-2045
2045-2050
World
Africa
Asia
Europe
Latin America & the Caribbean
Northern America

#	Country	Life Expectancy (both sexes)	Females Life Expectancy	Males Life Expectancy
1	Hong Kong	**85.63**	88.26	82.97
2	Japan	**84.85**	87.88	81.83
3	South Korea	**84.43**	87.28	81.32
4	French Polynesia	**84.19**	86.62	81.90
5	Switzerland	**84.09**	85.95	82.17
6	Australia	**84.07**	85.85	82.28
7	Italy	**83.87**	85.87	81.75
8	Singapore	**83.86**	86.36	81.38
9	Spain	**83.80**	86.44	81.10
10	Réunion	**83.67**	86.45	80.67
11	Malta	**83.47**	85.39	81.48
12	Norway	**83.46**	84.97	81.94
189	Sierra Leone	**61.96**	63.70	60.23
190	Niger	**61.43**	62.41	60.49
191	Burkina Faso	**61.29**	63.43	59.11
192	Benin	**60.96**	62.42	59.52
193	Guinea	**60.90**	62.09	59.66
194	Mali	**60.68**	62.15	59.25
195	Somalia	**58.97**	61.55	56.49
196	Lesotho	**57.80**	60.44	55.03
197	South Sudan	**57.74**	60.75	54.76
198	Central African Republic	**57.67**	59.56	55.51
199	Chad	**55.24**	57.19	53.36
200	Nigeria	**54.64**	54.94	54.33

AGING POPULATIONS: TRENDS IN NUMBER OF PERSONS (MILLIONS) AGED 60

	1950	1975	2000	2025	Increase (fold) 1950-2025
Brazil	2	6	14	32	15
Mexico	1	3	7	18	13
Nigeria	1	3	6	16	12
Indonesia	4	7	15	31	8
China	42	74	135	284	7
Bangladesh	3	3	7	17	6
Japan	6	13	26	33	6
India	32	30	66	146	5
USSR	16	34	54	71	4
USA	19	32	40	67	4
Italy	6	10	14	16	3
Germany	7	12	13	15	2

EPIDEMIOLOGICAL TRANSITION

- **Epidemiological Transition:** the fundamental changes in the nature of the diseases affecting human populations leading to shifts in birth rates, death rates, and life expectancy that have occurred over human history.

Past

Deficiency diseases

Infectious diseases

Short latent period,single cause

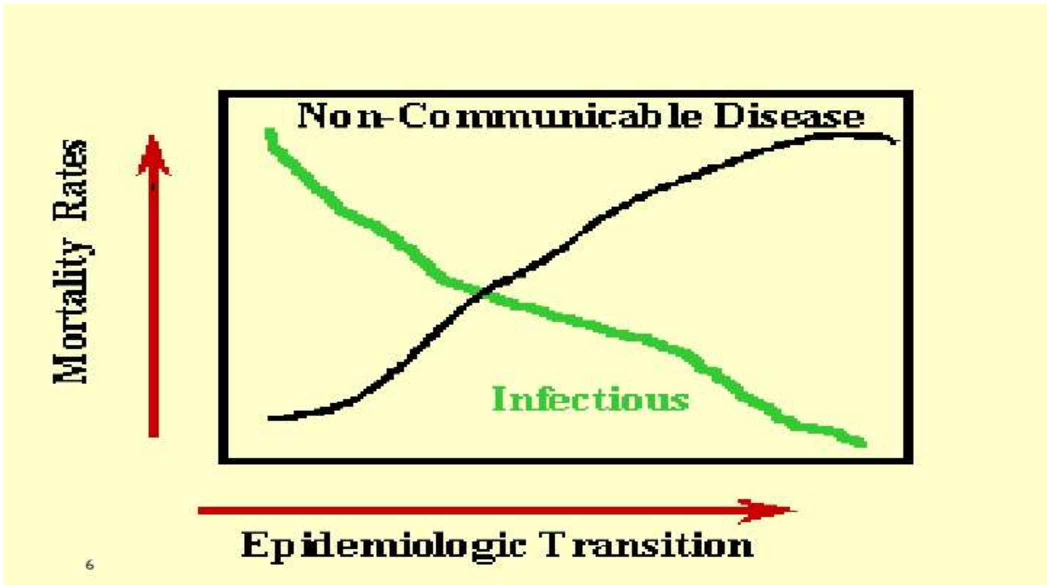
Present

Chronic diseases

Cancer, CVD,diabetes

long latent period, multiple causes

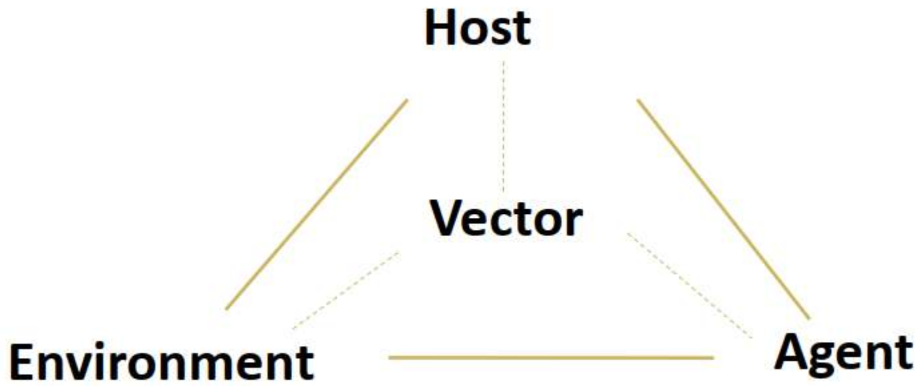
EPIDEMIOLOGICAL TRANSITION



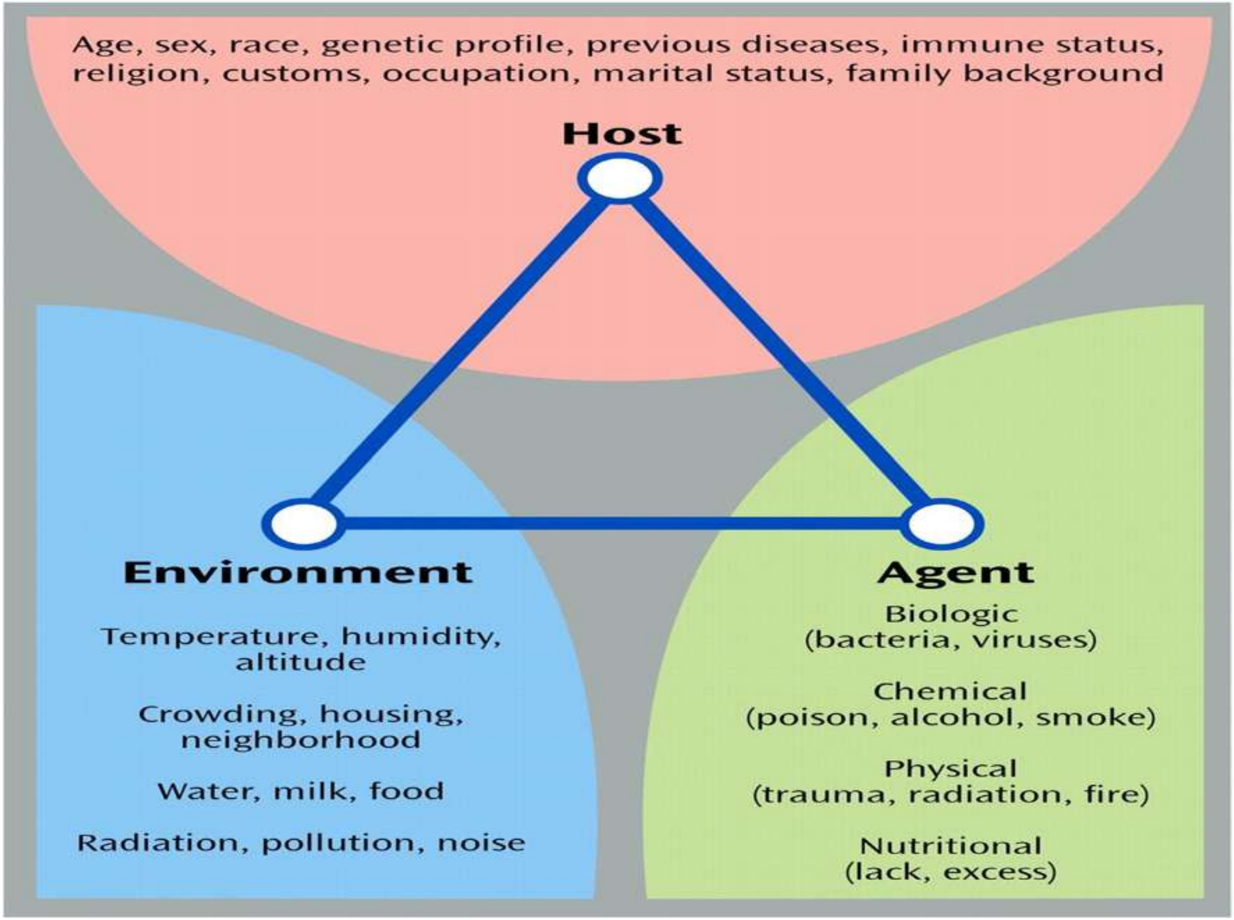
Epidemiologic Transition

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Infectious and parasitic diseases Accidents and animal attacks "Natural checks" on population	Receding pandemics Sanitation, nutrition, medicine lead to lower CDR	Degenerative and man-made diseases Heart disease, cancer, diabetes, obesity	Delayed degenerative diseases Extend life expectancy due to medical advances	Potential resurgence of infectious diseases due to globalization

INFECTIOUS DISEASES		CHRONIC DISEASES		



HOST-AGENT-ENVIRONMENT PARADIGM

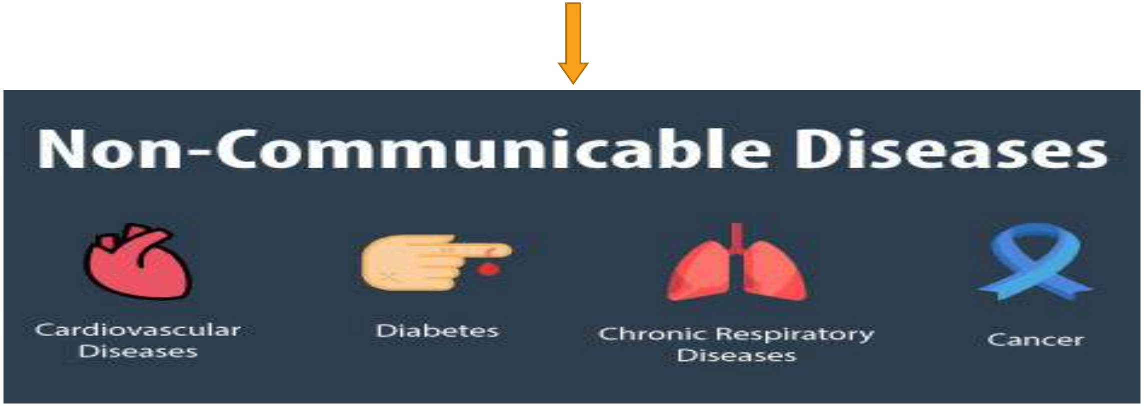

Age, sex, race, genetic profile, previous diseases, immune status, religion, customs, occupation, marital status, family background
Host
Environment
Temperature, humidity, altitude
Crowding, housing, neighborhood
Water, milk, food
Radiation, pollution, noise
Agent
Biologic (bacteria, viruses)
Chemical (poison, alcohol, smoke)
Physical (trauma, radiation, fire)
Nutritional (lack, excess)


Economic Stability
Education Access & Quality
Health Care Access & Quality
Neighborhood & Built Environment
Social & Community Context
SDOH
SOCIAL DETERMINANTS OF HEALTH


HEALTH
LIFE STYLE
FAMILY HISTORY
REST
ENVIRONMENT
DIET
SLEEP
HYGIENE
EXERCISE
STRESS
HEALTH CARE
RELATIONSHIPS

LIFESTYLE


TOBACCO USE
ALCOHOL USE
UNHEALTHY DIET
PHYSICAL INACTIVITY
AIR POLLUTION

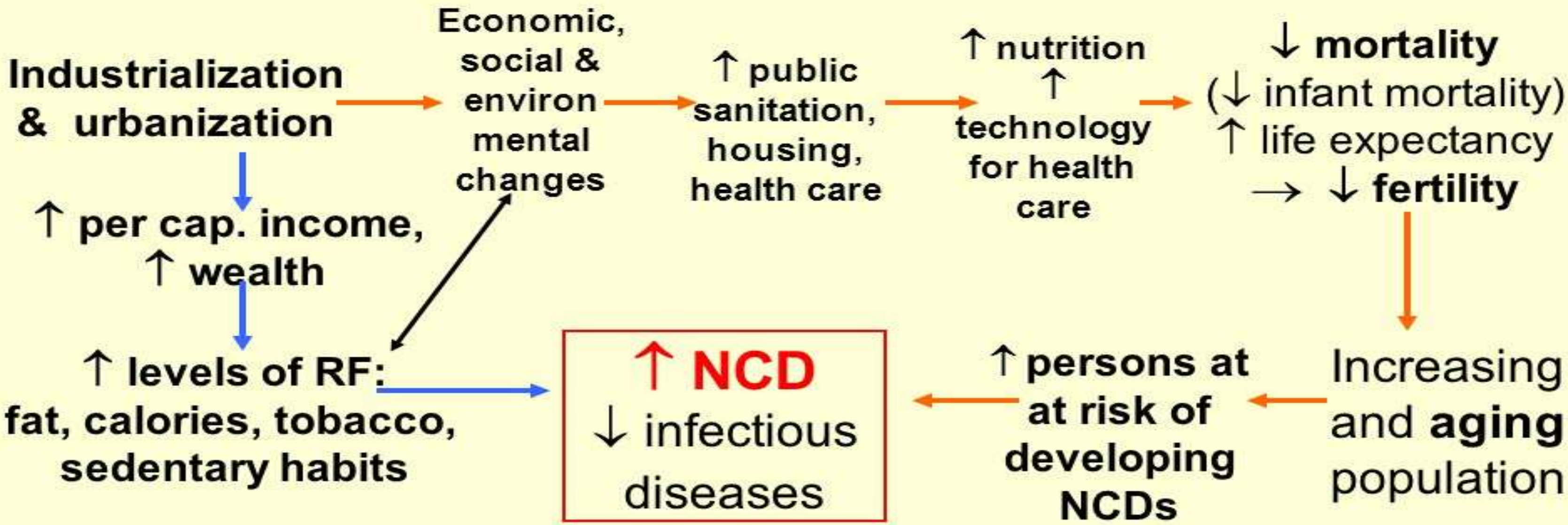

Non-Communicable Diseases
Cardiovascular Diseases
Diabetes
Chronic Respiratory Diseases
Cancer

HEALTH TRANSITION

- **Lifestyle transition**
  - Behaviors (e.g. smoking, sedentary habits)
  - Nutritional transition (e.g. □ fats, □ complex carbohydrates)
- Industrialization
- Urbanization
- Globalization of world markets and mass media

- **Health care transition**
  - Availability of preventive and curative services, immunization,

Health transition: demographic transition and epidemiologic transition



IUMSP-GCT

HEALTH TRANSITION

From: stable high birth and death rates

Communicable diseases- median age at death: low- easly preventable, cheap to treat

To: Low birth and death rates

Degenerative and "man-made" diseases. Median age at death: high. Difficult to prevent (age at death closer to "biological maximum" and expensive to treat.

WHAT ARE THE CHALLENGES

- **Globalization**

"The spread of products, technology, information, and jobs across borders and cultures".

?POSITIVE

?NEGATIVE

EFFECTS OF GLOBALIZATION ON HEALTH

- Tobacco induced diseases
- Food markets & obesity as well as chemicals in food
- Rapid spread of infectious diseases
- Depression in aged and fragmented population
- Adverse effects on the environment

LIFE EXPECTANCY IN PALESTINE

- Palestine has witnessed a noticeable improvement in life expectancy since the beginning of the last decade of the previous century, where life expectancy has increased by about 6-8 years during the last two decades.
- In particular life expectancy increased for both males and females from 67 years in 1992 to 72.9 years for males and 74 years for females in mid of the year 2019.
- The life expectancy is expected to increase during the coming years

https://www.worldometers.info/demographics/life-expectancy/

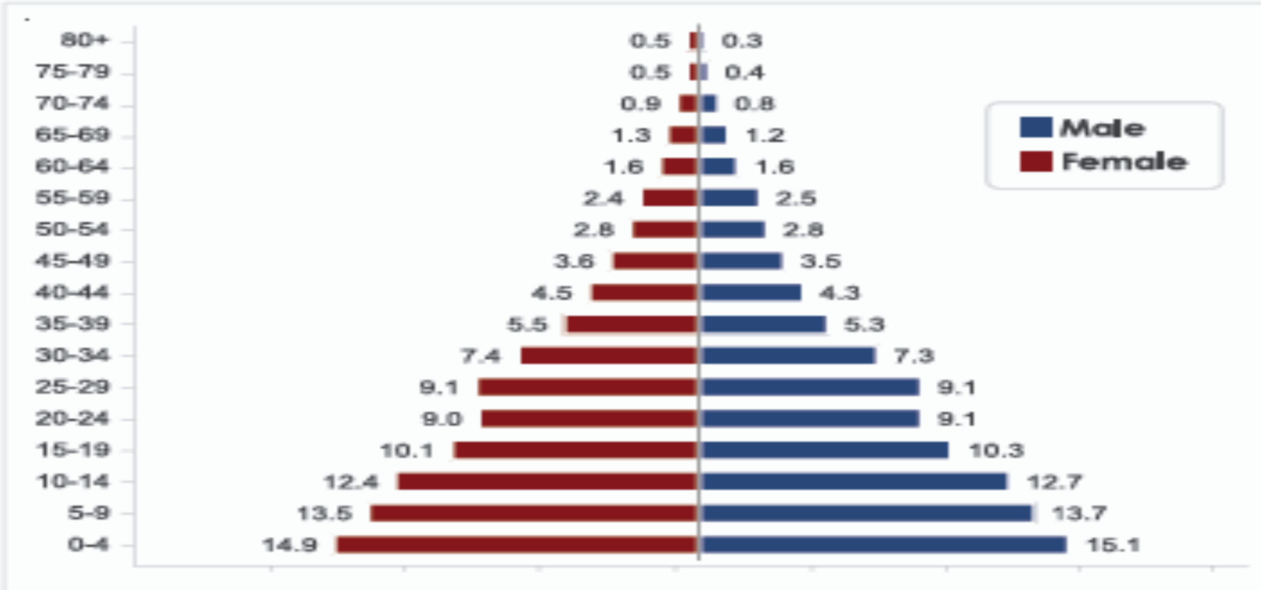


Figure (1) : Population Pyramid of Gaza Strip by Gender & Age Group 2020

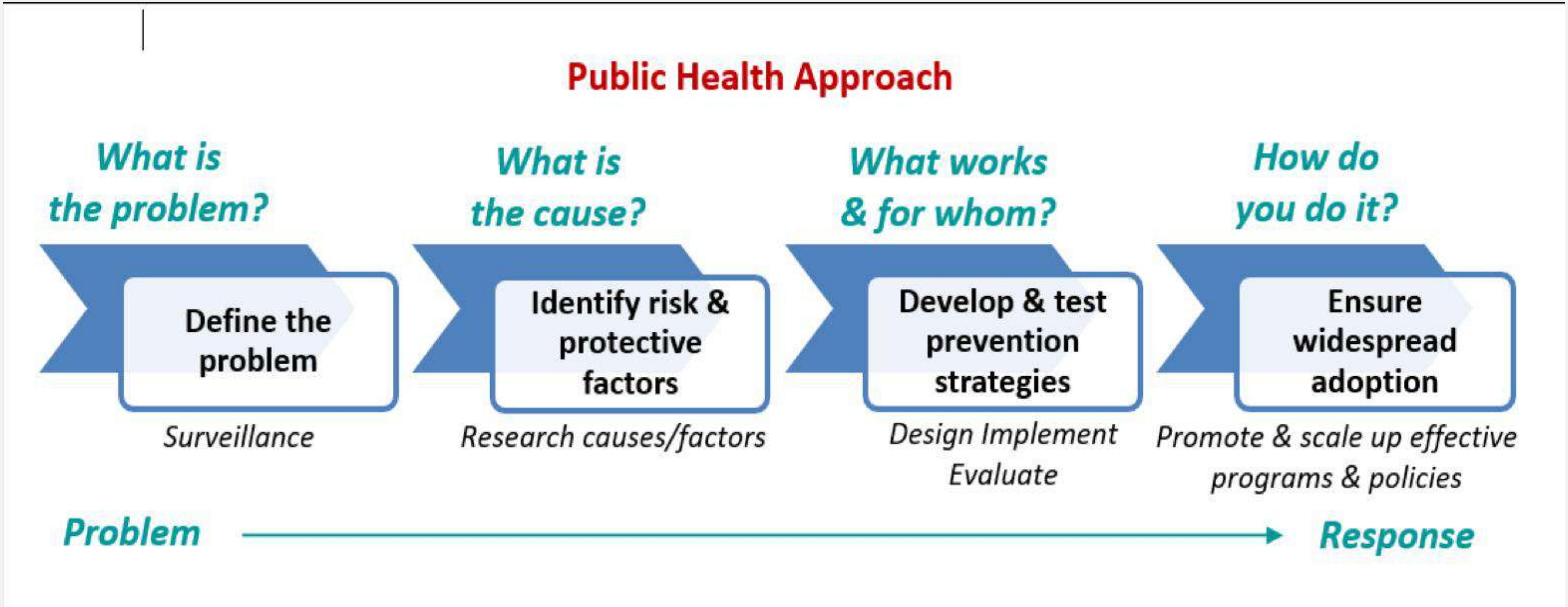
PUBLIC HEALTH AND EPIDEMIOLOGY

PUBLIC HEALTH DISCIPLINES

Public health encompasses various activities and disciplines, such as:

- Epidemiology
- Biostatistics
- Social and behavioral sciences
- Environmental Health
- Health policy and management

A PUBLIC HEALTH APPROACH



EPIDEMIOLOGY

epi: “on or upon”
+
demos: “the (common) people”
+
logy: “study”
=

Epidemiology

EPIDEMIOLOGY

- Epidemiology is the study and analysis of the distribution (who, when, and where), patterns and determinants of health and disease conditions in a defined population. and the development of knowledge on how to prevent and control them.

- It is a cornerstone of public health

THE HISTORICAL CONTEXT

- Epidemiology originates from Hippocrates' observation more than 2000 years ago that environmental factors influence the occurrence of disease.

WHAT IS EPIDEMIOLOGY

The study of the frequency, distribution and determinants of states of health in human populations and the application of this study to control health problems and improve health outcomes

WHAT IS THE ROLE OF EPIDEMIOLOGY IN PUBLIC HEALTH?

" Epidemiology is the science devoted to the systematic study of the natural history of disease- its distribution in populations and the factors which determine distribution ….The basic science of public health work and of preventive medicine"

Higher Education of Public Health. Report of the Milbank Memoria Fund Commissions, Cecil G. Sheps, Chairman. 1976, pg 60-61

EPIDEMIOLOGY

- Epidemiology as defined by Last is "the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the prevention and control of health problems".

- Epidemiologists are concerned not only with death, illness and disability, but also with more positive health states and, most importantly, with the means to improve health.

Box 1.2. Definition of epidemiology[9]

The word "epidemiology" is derived from the Greek words: *epi* "upon", *demos* "people" and *logos* "study".

This broad definition of epidemiology can be further elaborated as follows:

Term	Explanation
Study	includes: surveillance, observation, hypothesis testing, analytic research and experiments.
Distribution	refers to analysis of: times, persons, places and classes of people affected.
Determinants	include factors that influence health: biological, chemical, physical, social, cultural, economic, genetic and behavioural.
Health-related states and events	refer to: diseases, causes of death, behaviours such as use of tobacco, positive health states, reactions to preventive regimes and provision and use of health services.
Specified populations	include those with identifiable characteristics, such as occupational groups.
Application to prevention and control	the aims of public health—to promote, protect, and restore health.

SCOPE

- A focus of an epidemiological study is the population defined in geographical or other terms; for example, a specific group of hospital patients or factory workers could be the unit of study.

- A common population used in epidemiology is one selected from a specific area or country at a specific time. This forms the base for defining subgroups with respect to sex, age group or ethnicity. The structures of populations vary between geographical areas and time periods.

- Epidemiological analyses must take such variation into account.

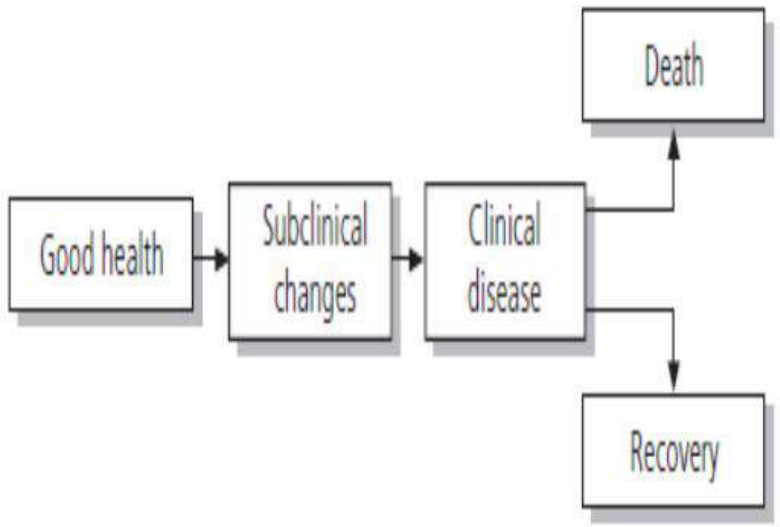
EPIDEMIOLOGY AND PUBLIC HEALTH

- Public health, broadly speaking, refers to collective actions to improve population health. Epidemiology, one of the tools for improving public health, is used in several ways.
- Early studies in epidemiology were concerned with the causes (etiology) of communicable diseases, and such work continues to be essential since it can lead to the identification of preventive methods. In this sense, epidemiology is a basic medical science with the goal of improving the health of populations, and especially the health of the disadvantaged.

NATURAL HISTORY OF DISEASE

Epidemiology is also concerned with the course and outcome (natural history) of diseases in individuals and groups.

Figure 1.4. Natural history



A physiologist may study blood pressure, the epidemiologist will probably study hypertension

The nutritionist studies adult weight, the epidemiologist studies obesity

WHAT ARE THE OBJECTIVES OF EPIDEMIOLOGY?

1. To determine the extent/frequency of disease (states of health) and/or behaviors in a community.

2. To identify the etiology or the cause/s of a disease and the factors that impact upon a person's risk for a disease.

3. To study the natural history and prognosis of disease.

4. To evaluate new preventive and therapeutic measures and new modes of health care delivery.

5. To provide the foundation for developing public policy and regulatory decisions relating to public health problems.

“A MAJOR CHALLENGE FOR EPIDEMIOLOGY today is to become an effective instrument in the SHAPING AND EVALUATION OF HEALTH POLICIES AND PRACTICES… Epidemiologists must OBTAIN AND ANALYSE THE INFORMATION NEEDED and PRESENT IT to health planners IN SUCH A WAY THAT THIS INFORMATION CAN BE USED in policy, planning and evaluation.

Michel Thuriaux, Epidemiology and Statistics Unit, WHO Regional Office for Europe, 1992

However, as epidemiologist/public health practitioners we most often need to act/intervene under conditions of uncertainty based on the available evidence

Types of epidemiology

Descriptive

Analytical

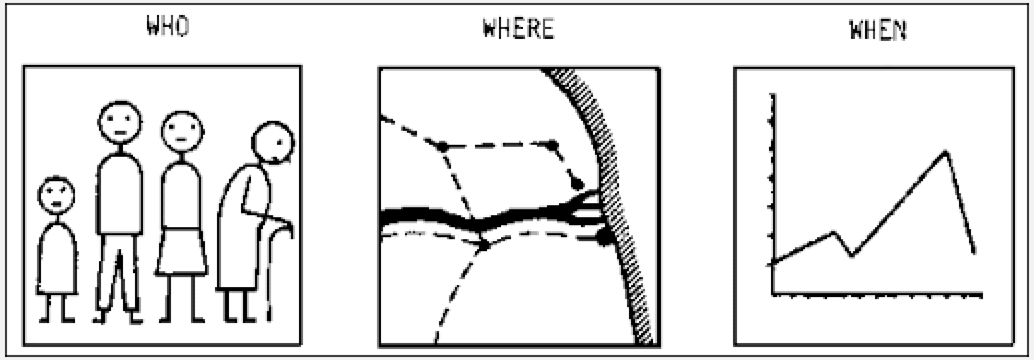
DESCRIPTIVE AND ANALYTICAL EPIDEMIOLOGY

Descriptive Epidemiology:
Examines the distribution of a disease/behavior/state of health in a defined population, and observes the features of its distribution in terms of person, place and time

What? Who? Where? When?

DESCRIPTIVE EPIDEMIOLOGY

- **Description of disease occurrence, by person, place and time**
- **Not intended to confirm causes**

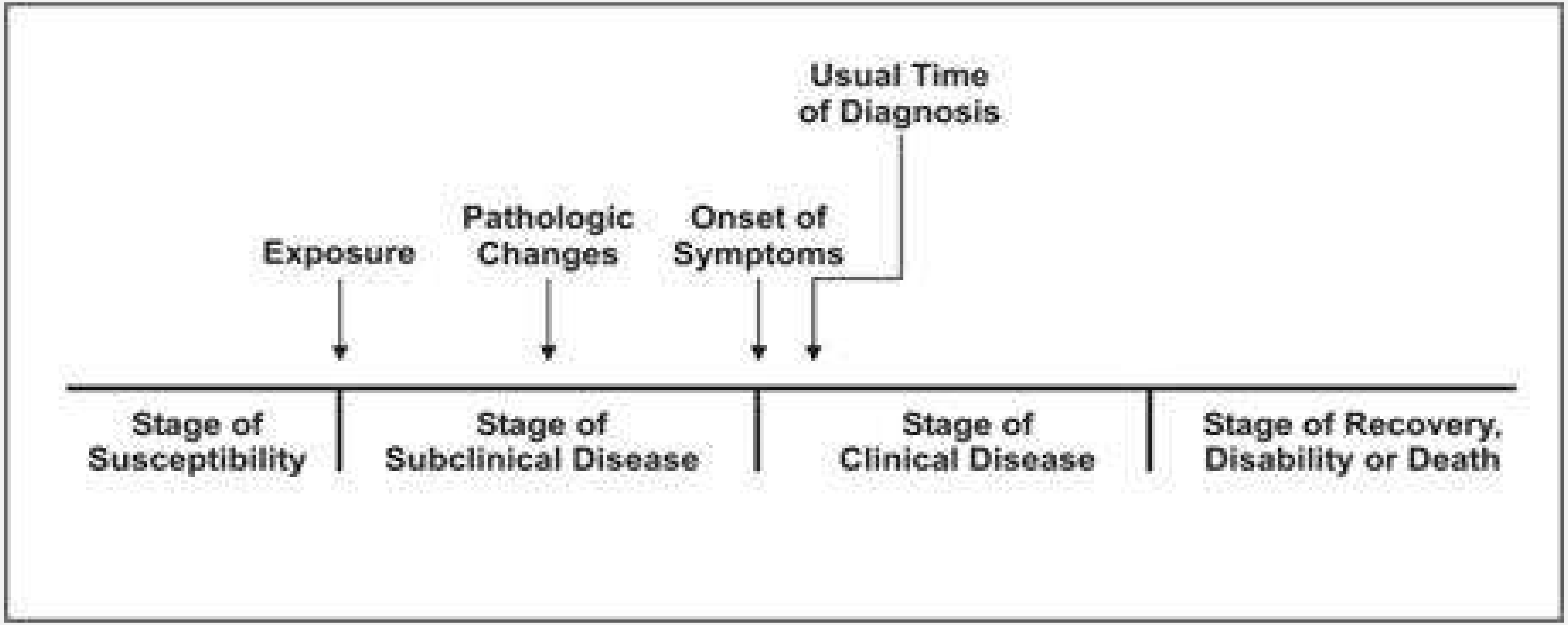


ANALYTICAL EPIDEMIOLOGY

- **Hypothesis-testing**
- **Tests a specific hypothesis about the relationship between a disease/behavior/state of health and a putative cause, by conducting epidemiologic investigations that relates the exposure of interest to the outcome of interest (or not)**

WHY?

SPECTRUM OF A DISEASE



"Epidemiology functions as a lens through which a clinician can see along the dimension that stretches beyond the individual patient and beyond the threshold of the clinic/hospital, toward the population from which the patient came"

- Anthony et al., 1997

CAUSATION

A major goal of epidemiology is to assist in the prevention and control of disease and in the promotion of health by discovering the causes of disease and the ways in which they can be modified

Study Design in Epidemiology

Introduction to Public Health

First Year Medical Students

Al Azhar University, Gaza

What is epidemiologic research?

- Epidemiologic research is a systematic approach to study the differences in disease distribution in a population

- Observational
- Experimental

Every study should begin with a research question

What is a good research question?

- Relevant مناسب
- Original إبداعي
- Feasible to study ممكن
- Ethical أخلاقي

Which of the following questions fulfills all 4 criteria for a good research question?

- Does cigarette smoking cause lung cancer?
- What is the relationship between wearing a helmet while driving a motorcycle and knee injuries?
- Does separating twin siblings at birth and raising them in different environments change their heart disease risk?
- How does psychological trauma in childhood affect mental health in adulthood?

How do we decide which study design to use?

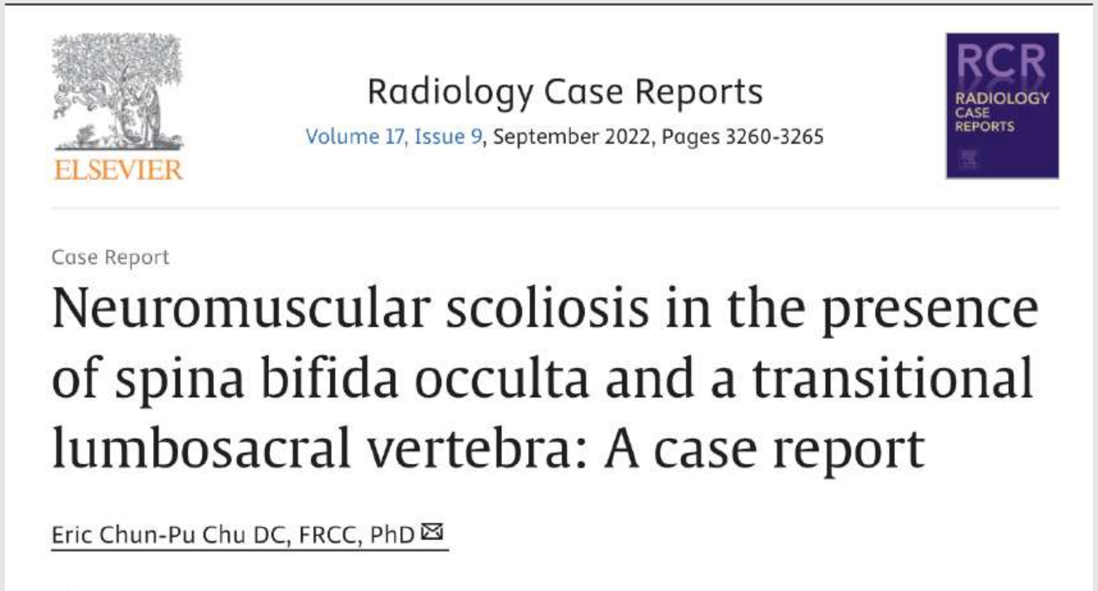
- The research question
- The outcome
- The exposure
- Resources
  - Money
  - Time

4 Ws and H in epidemiological studies

What?	
Who?	PERSON
Where?	PLACE
When?	TIME
How?	

Types of observational studies

- Case report: describes person, place and time information about a specific case “usually about unexpected symptoms or events”


ELSEVIER

Radiology Case Reports

Volume 17, Issue 9, September 2022, Pages 3260-3265

RCR RADIOLOGY CASE REPORTS

Case Report

Neuromuscular scoliosis in the presence of spina bifida occulta and a transitional lumbosacral vertebra: A case report

Eric Chun-Pu Chu DC, FRCC, PhD

Types of observational studies

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
2020, VOL. 33, NO. 5, 736–742
https://doi.org/10.1080/14767058.2018.1500543

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ORIGINAL ARTICLE

Prenatal diagnosis of closed spina bifida: multicenter case series and review of the literature

Hérbene José Figuinha Milani[a], Enoch Quinderé de Sá Barreto[a], La Hong Chau[b], Nguyen Ha To[b], Antonio Fernandes Moron[a], Simon Meagher[c], Fabricio Da Silva Costa[c,d] and Edward Araujo Júnior[a]

[a]Department of Obstetrics, Paulista School of Medicine, Federal University of São Paulo (EPM-UNIFESP), São Paulo, Brazil; [b]Department of Imaging Diagnostic, Tudu Maternity Hospital, Ho Chi Minh City, Vietnam; [c]Monash Ultrasound for Women, Melbourne, Victoria, Australia; [d]Department of Obstetrics and Gynaecology, Monash University, Clayton, Victoria, Australia

- Case series: describes person, place, and time information about a group of cases “data may be used in analytical studies”

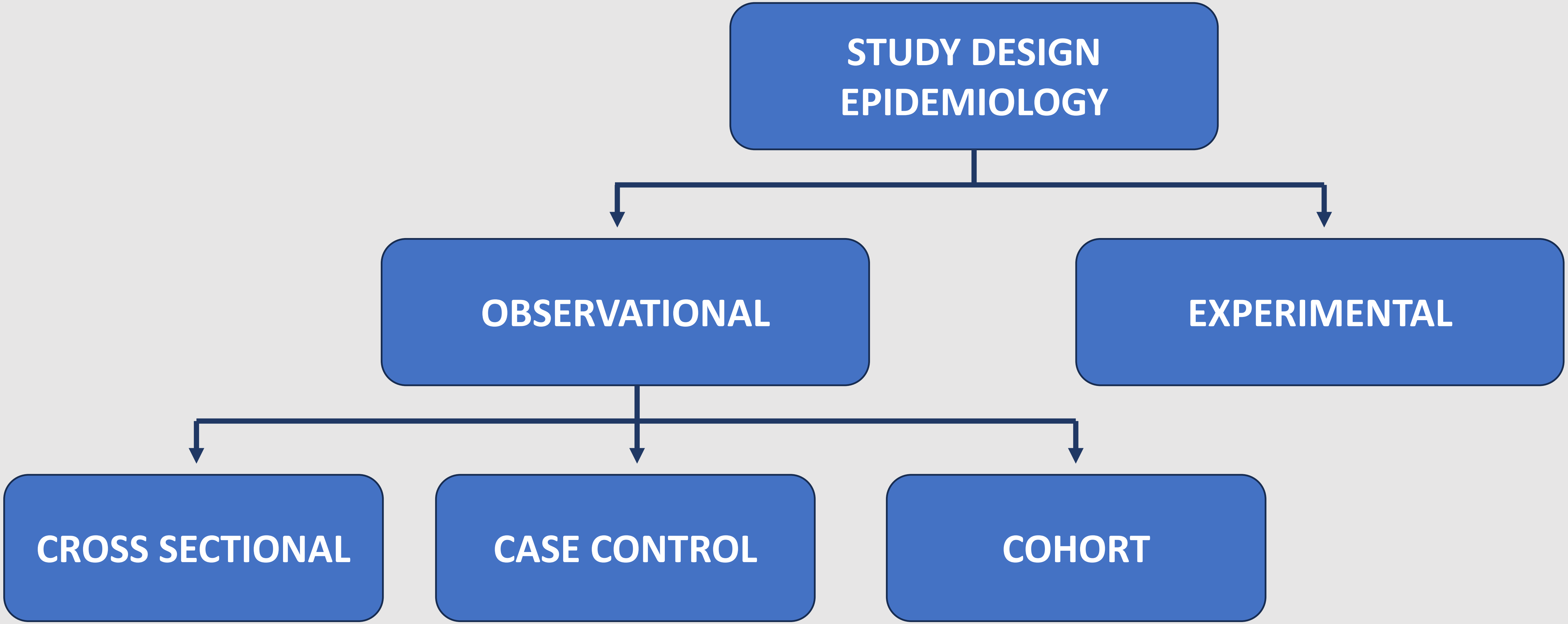
- Incidence studies describe the number of new cases of a disease during a specific time in a specific population

#2 **ORIGINAL CONTRIBUTION**

Incidence, Prevalence, and Characteristics of Fractures in Children, Adolescents, and Adults With Spina Bifida

Nienke P. Dosa, MD, MPH; Michael Eckrich, MD; Danielle A. Katz, MD; Margaret Turk, MD; Gregory S. Liptak, MD, MPH

SUNY Upstate Medical Center, Syracuse, New York


STUDY DESIGN EPIDEMIOLOGY
OBSERVATIONAL
EXPERIMENTAL
CROSS SECTIONAL
CASE CONTROL
COHORT

Cross-sectional study design

- Survey studies
- Prevalence studies

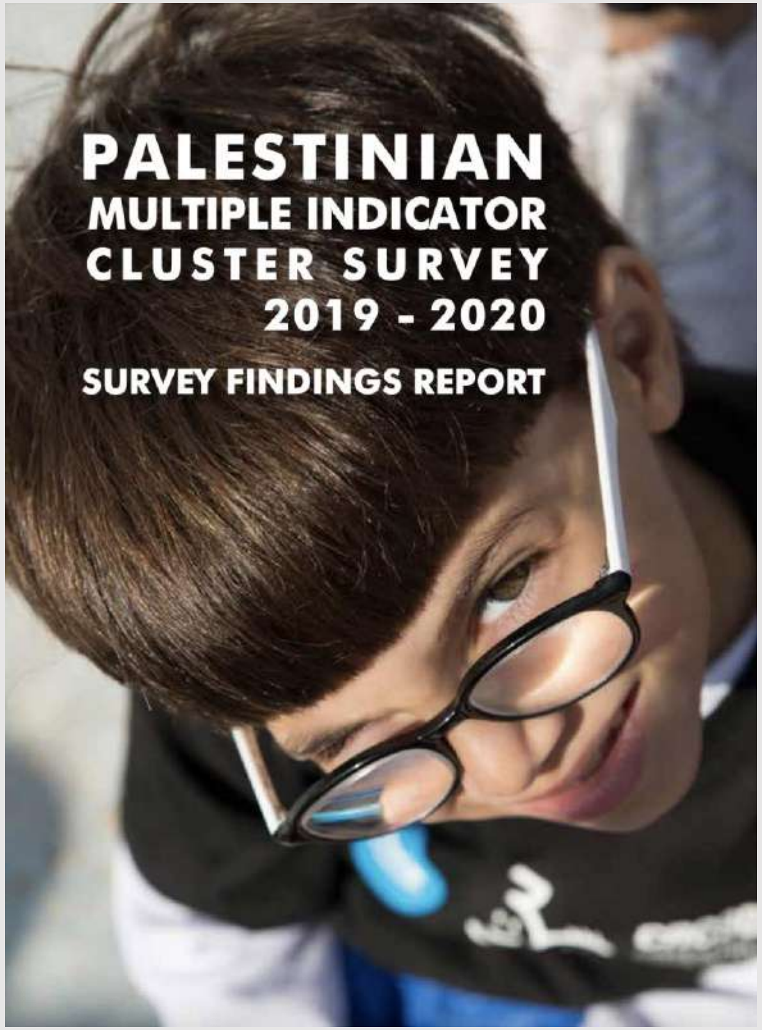
- Exposure and outcome are measured at the same time
- Sample selection and data collection are carried out without prior knowledge of exposure or outcome

Cross-sectional study design

Table CS.3: Early childhood mortality rates by demographic characteristics

Neonatal, post-neonatal, infant, child and under-five mortality rates for the five year period preceding the survey, by demographic characteristics, Palestine, 2019-2020

	Neonatal mortality rate1	Post-neonatal mortality rate2, A	Infant mortality rate3	Child mortality rate4	Under-five mortality rate5
Total	**9.4**	**2.7**	**12.1**	**2.2**	**14.2**
Sex of child					
Male	11.5	2.6	14.0	2.3	16.3
Female	7.1	2.9	10.0	2.0	12.0
Mother's age at birth					
<20	(17.1)	(0.0)	(17.1)	(6.9)	(23.9)
20-34	8.1	3.2	11.2	1.2	12.5
35+	13.2	1.7	15.0	4.6	19.5



Cross-sectional study design

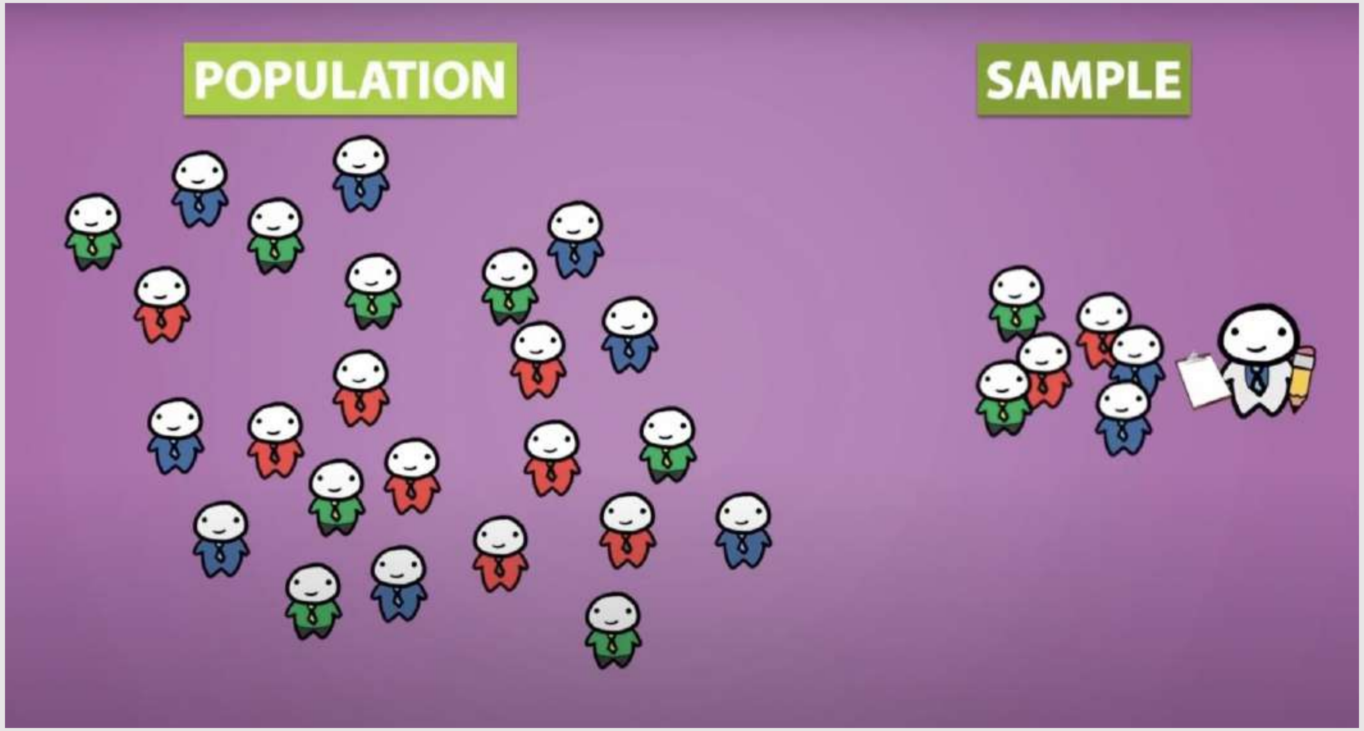
ADVANTAGES المزايا

- Relatively efficient and cost effective
- Generate prevalence estimate
- Good first step to exploring a research question
- Allows examining multiple exposures and multiple outcomes

DISAVANTAGES العيوب

- Cannot infer causality
- Recall bias

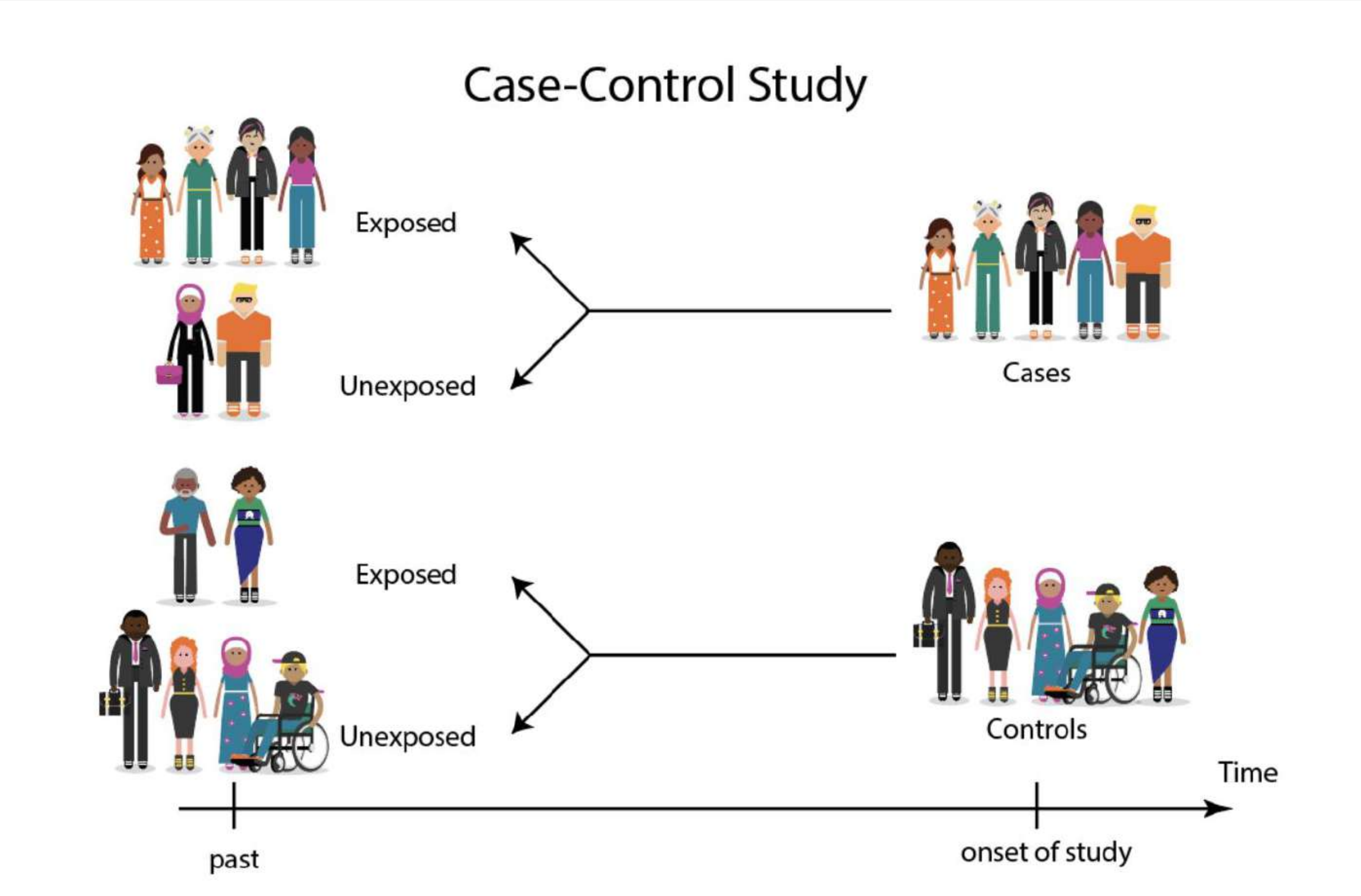
Probability selection of sample is critical in cross-sectional studies



- Every person in the population should have an equal probability of being selected into the sample
- Population = N
- Sample = n

Case-control study design

- Cases are selected based on having the outcome
  - How many of the cases have the exposure?
- An equal number of controls are selected based on not having the outcome
  - How many of the controls have the exposure?



Controls are oftentimes matched with cases on important confounders such as age, sex, education, etc.

Case-control study design

- The association between cigarette smoking (exposure) and lung cancer (outcome) was established through case-control epidemiological studies

THE YALE JOURNAL OF BIOLOGY AND MEDICINE **63** (1990), 29–46

Research on Smoking and Lung Cancer: A Landmark in the History of Chronic Disease Epidemiology

COLIN WHITE, M.Sc., M.B., B.S.

Professor Emeritus of Public Health, Yale University School of Medicine, New Haven, Connecticut

Received September 12, 1989

This paper describes the history of the epidemiologic research on lung cancer prior to 1970 and its effect on chronic disease epidemiology. In the 1930s, epidemiology was largely concerned with acute infectious diseases. As the evidence grew that the incidence of lung cancer was increasing among men, however, epidemiologists undertook research into the etiology of the disease. In 1950, Doll and Hill, in England, and Wynder and Graham, in the United States, published substantial case-control studies that implicated the use of tobacco as a major risk factor for the disease. A controversy developed over the credibility of this finding and was increased in 1954 when a cohort study by Doll and Hill and another by Hammond and Horn each gave estimates that the risk of lung cancer was greatly increased among smokers relative to the risk among comparable non-smokers. An account is given of the disputes surrounding these and related studies. The controversy had a stimulating effect in fostering the developing discipline of chronic disease and epidemiology.

Case-control study design

Advantages

- Relatively inexpensive
- Good design for outcomes that have a long latency period (e.g., lung cancer)
- Can examine multiple exposures
- Can infer causality

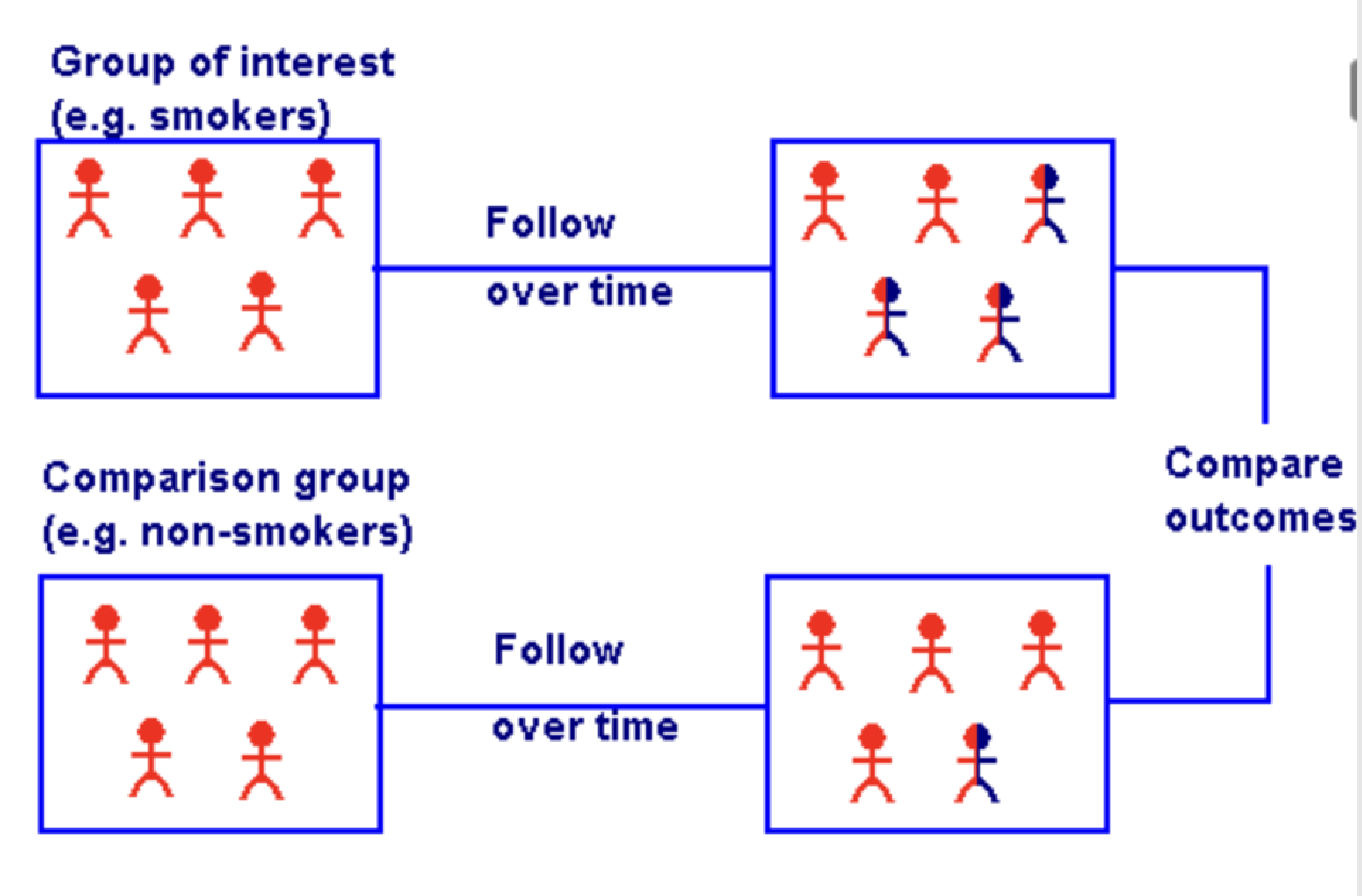
Disadvantages

- Can examine one outcome only
- Recall bias

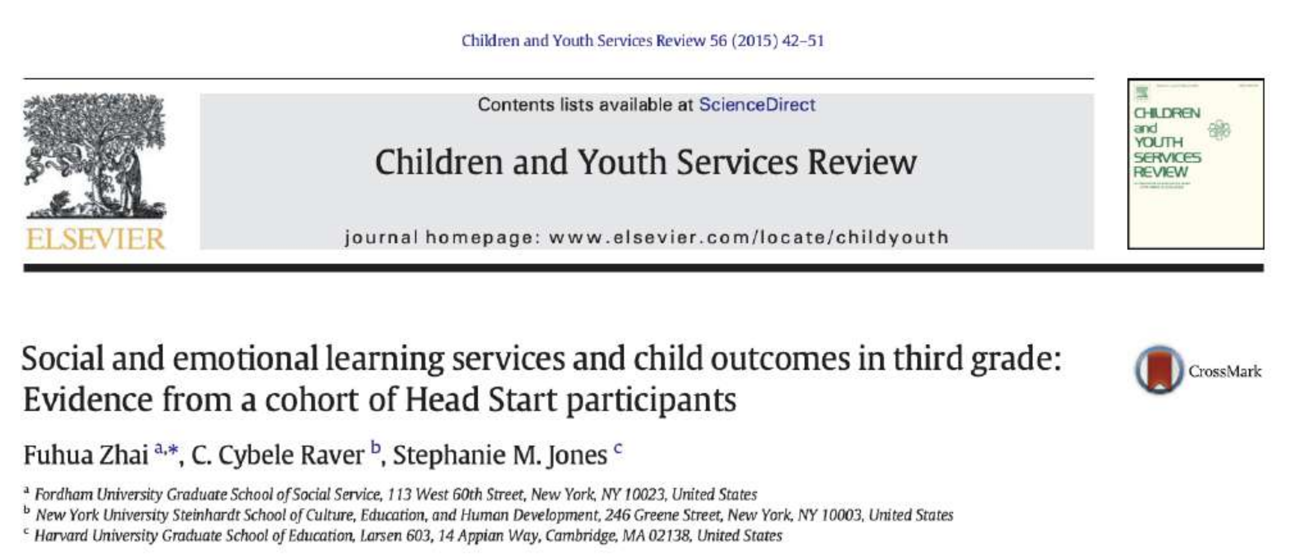
Cohort study design

- Cases are selected based on having the exposure
  - How many of the cases will develop the outcome?
- Controls are selected based on not having the exposure
  - How many of the controls will develop the outcome?

Cohort study design



Cohort study design


Children and Youth Services Review 56 (2015) 42–51

Contents lists available at ScienceDirect

Children and Youth Services Review

journal homepage: www.elsevier.com/locate/childyouth

ELSEVIER

Social and emotional learning services and child outcomes in third grade: Evidence from a cohort of Head Start participants

Fuhua Zhai [a,*], C. Cybele Raver [b], Stephanie M. Jones [c]

[a] Fordham University Graduate School of Social Service, 113 West 60th Street, New York, NY 10023, United States
[b] New York University Steinhardt School of Culture, Education, and Human Development, 246 Greene Street, New York, NY 10003, United States
[c] Harvard University Graduate School of Education, Larsen 603, 14 Appian Way, Cambridge, MA 02138, United States

Exposure

- Enrolling 3-5-year-old children in pre-school
  - Education
  - Nutrition
  - Meetings with parent

Outcome

- Cognitive and socioemotional readiness for elementary school

Cohort study design

Advantages

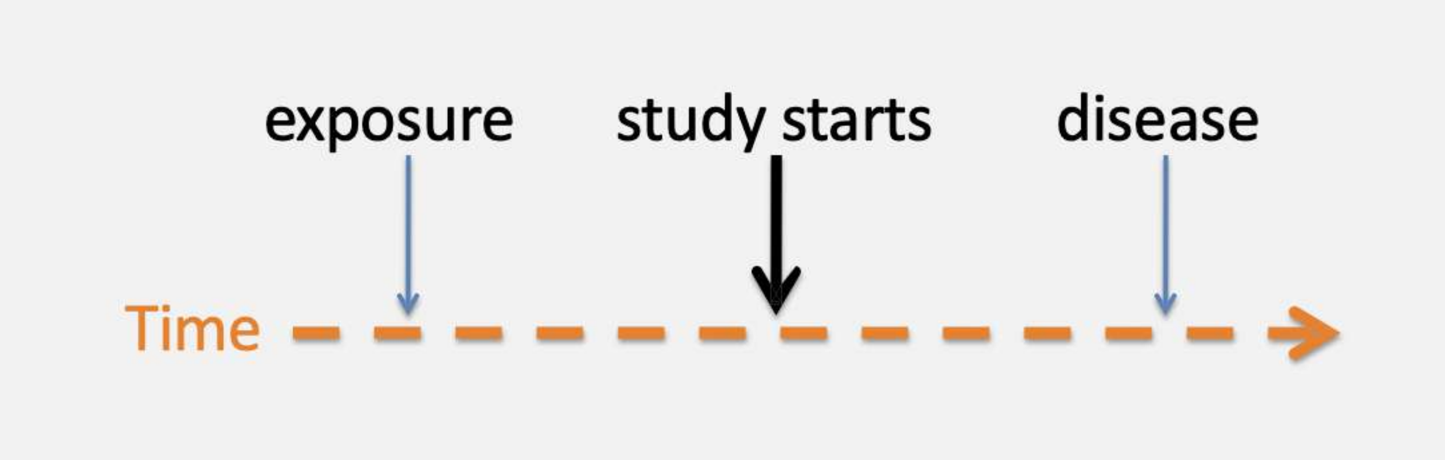
- Good study design for rare exposures
- Can examine multiple outcomes
- No recall bias
- Can infer causality

Disadvantages

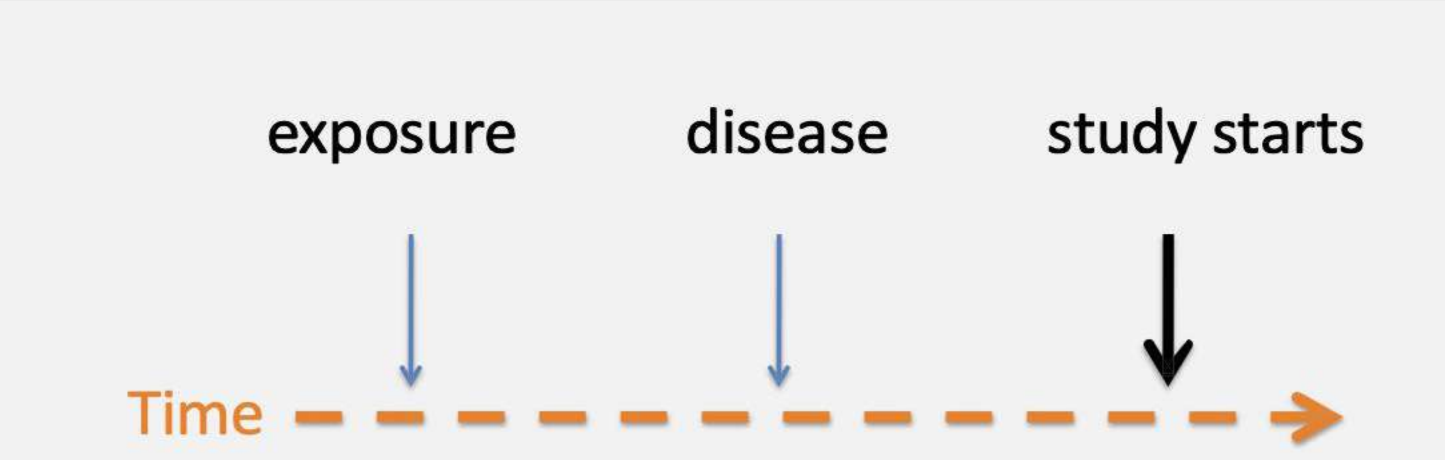
- Impractical for rare diseases
- Can be expensive
  - E.g., following up children for 5-10 years

Prospective and retrospective cohort study design

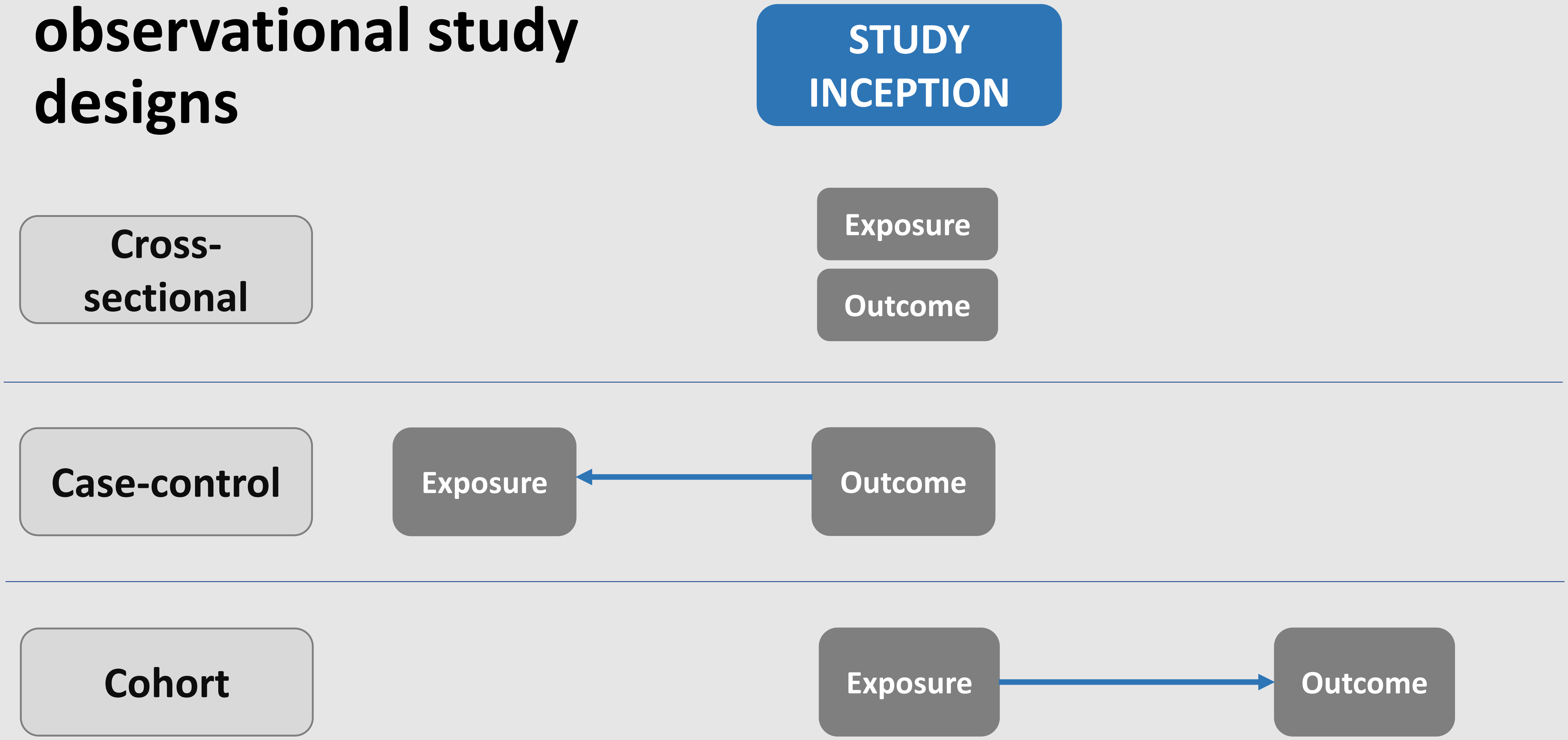
PROSPECTIVE



RETROSPECTIVE

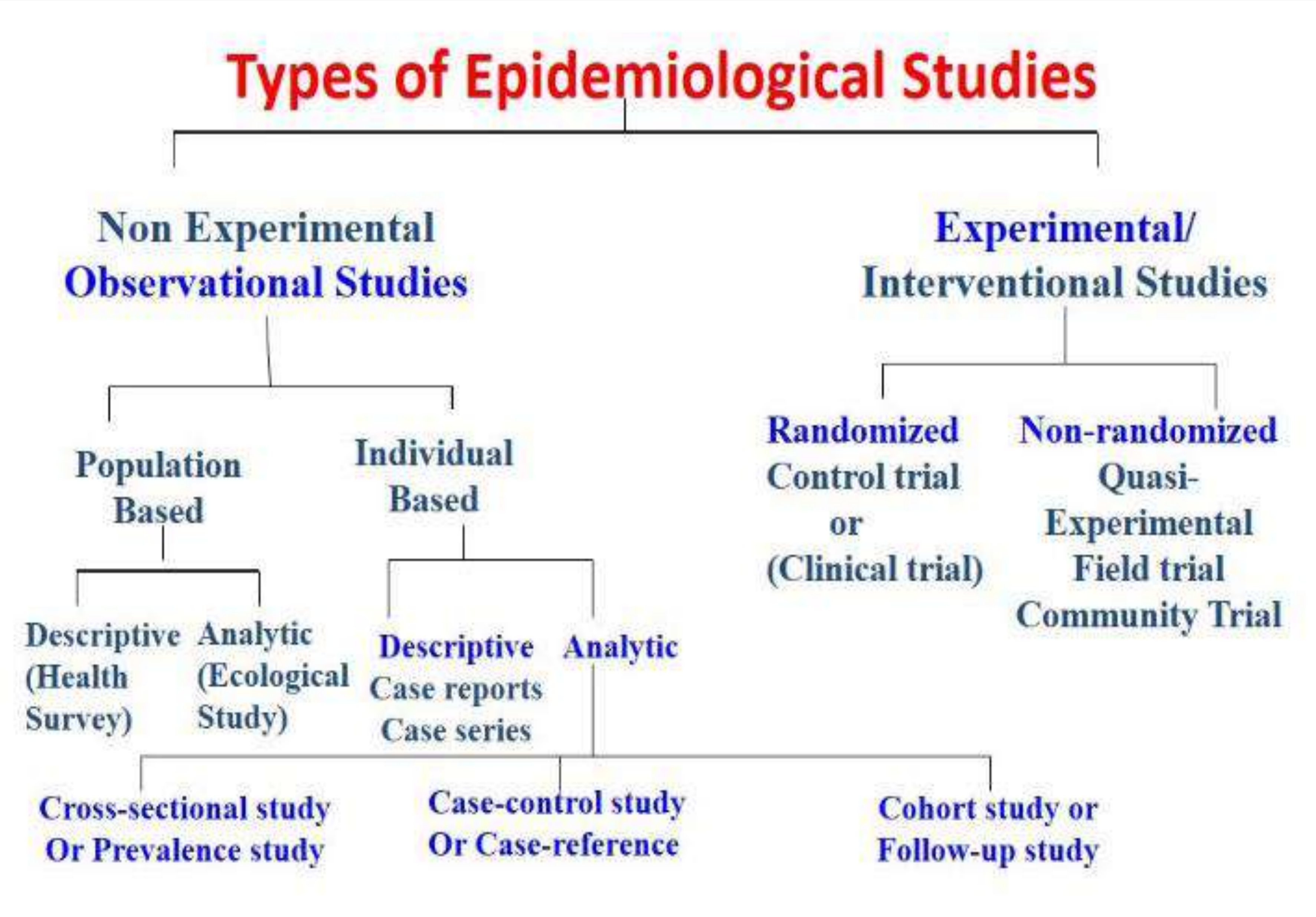


Summary of the 3 observational study designs



EPIDEMIOLOGIC STUDY DESIGNS
EXPERIMENTAL

Dr .Ayda Ahmad Helles

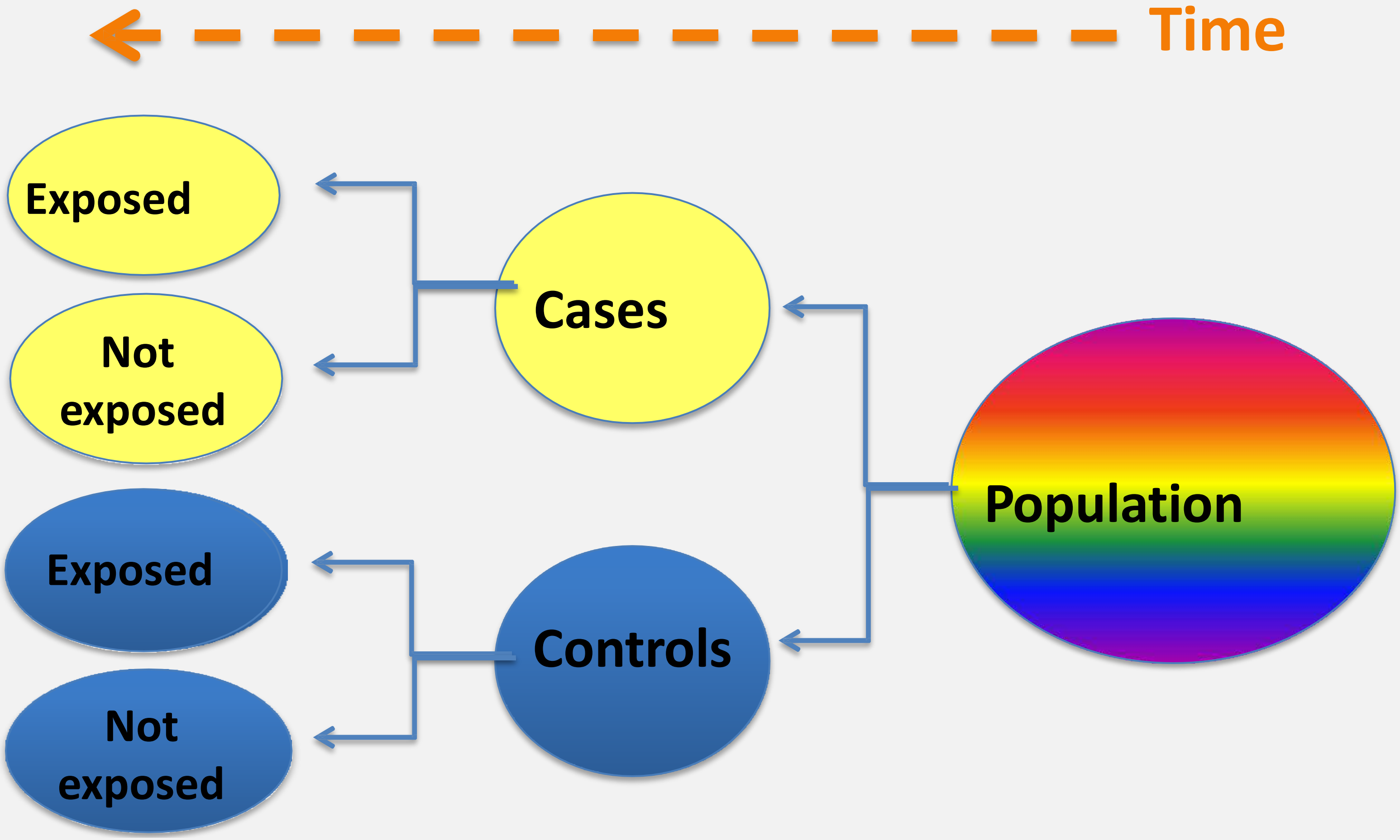

Types of Epidemiological Studies
Non Experimental Observational Studies
Experimental/ Interventional Studies
Population Based
Individual Based
Descriptive (Health Survey)
Analytic (Ecological Study)
Descriptive Case reports Case series
Analytic
Cross-sectional study Or Prevalence study
Case-control study Or Case-reference
Cohort study or Follow-up study
Randomized Control trial or (Clinical trial)
Non-randomized Quasi-Experimental Field trial Community Trial

CROSS SECTIONAL STUDY

- Measure existing disease and current exposure levels at one point in time

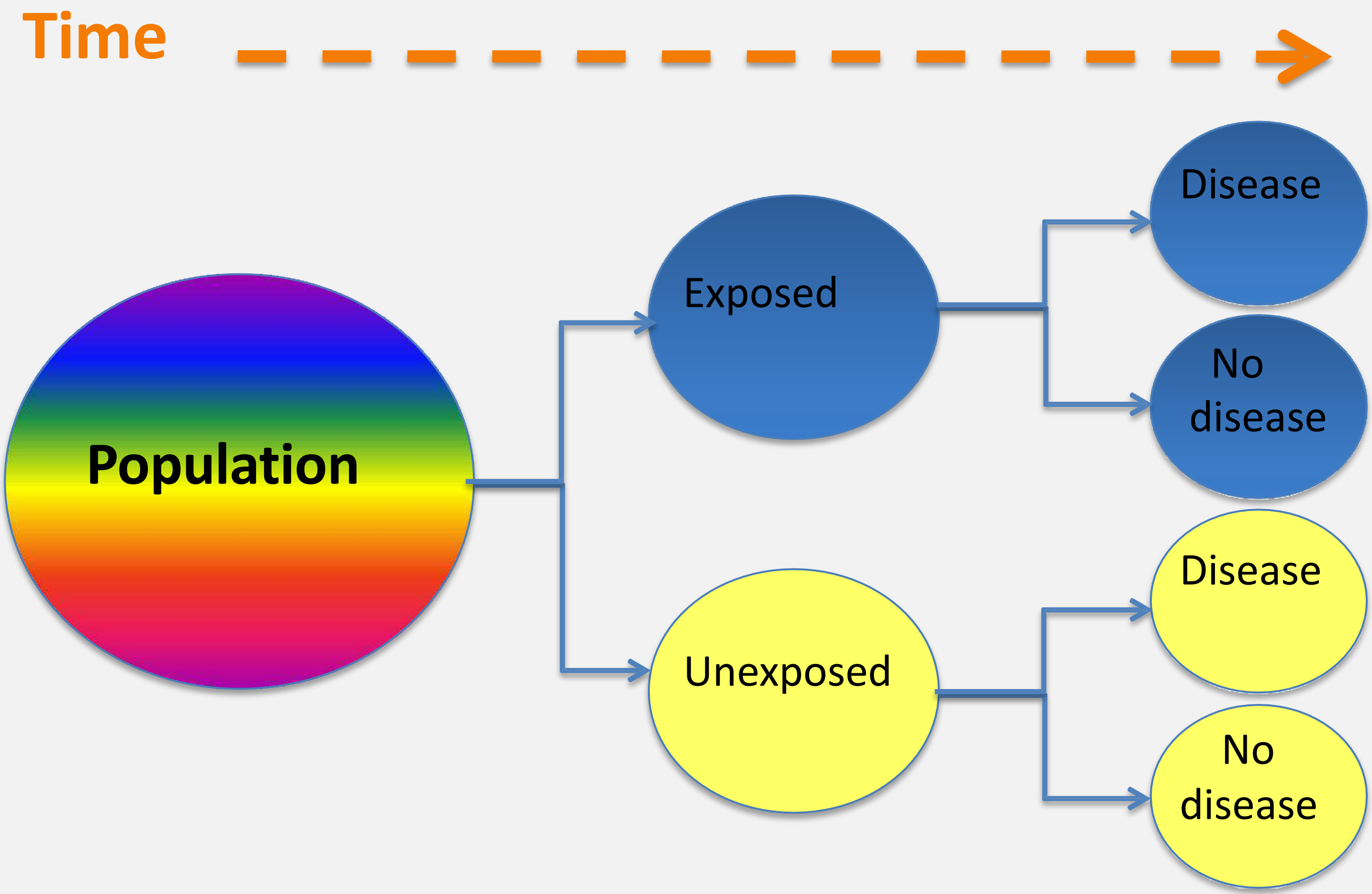
CASE-CONTROL STUDIES

- Identify individuals with existing disease/s and retrospectively measure exposure

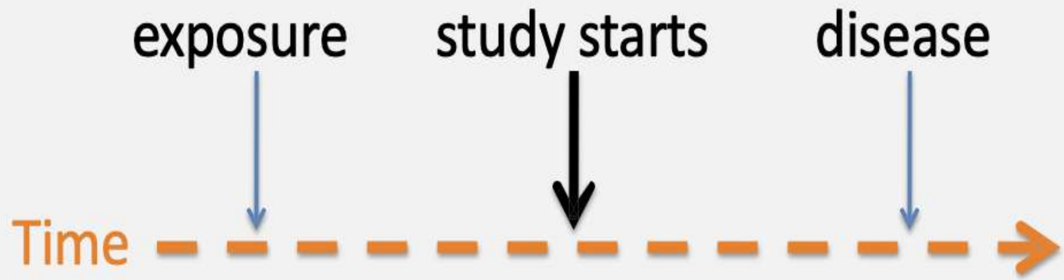


COHORT STUDIES

- Identify exposed and unexposed individuals and follow them over time measuring outcome/s (Prospective)

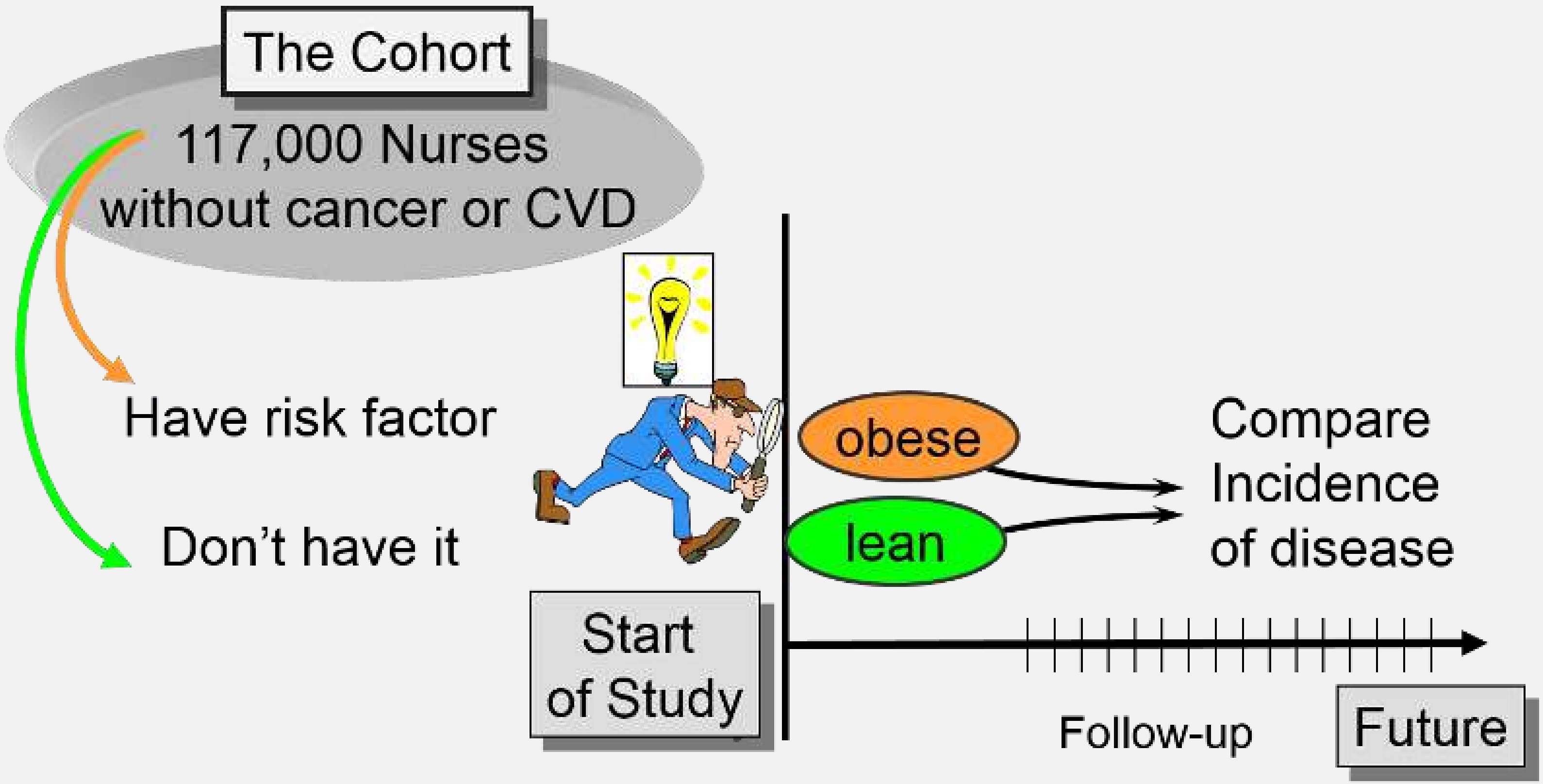


PROSPECTIVE

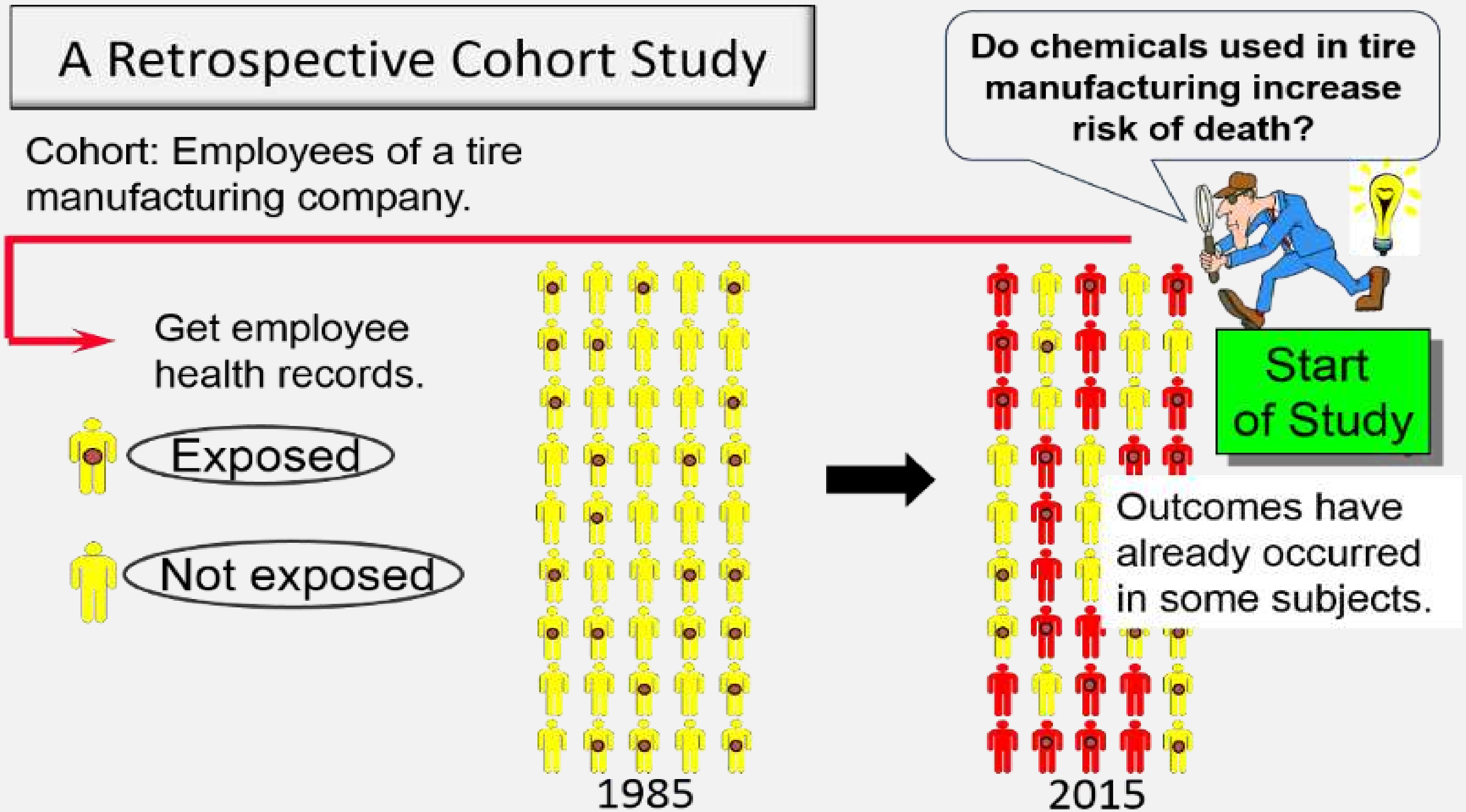


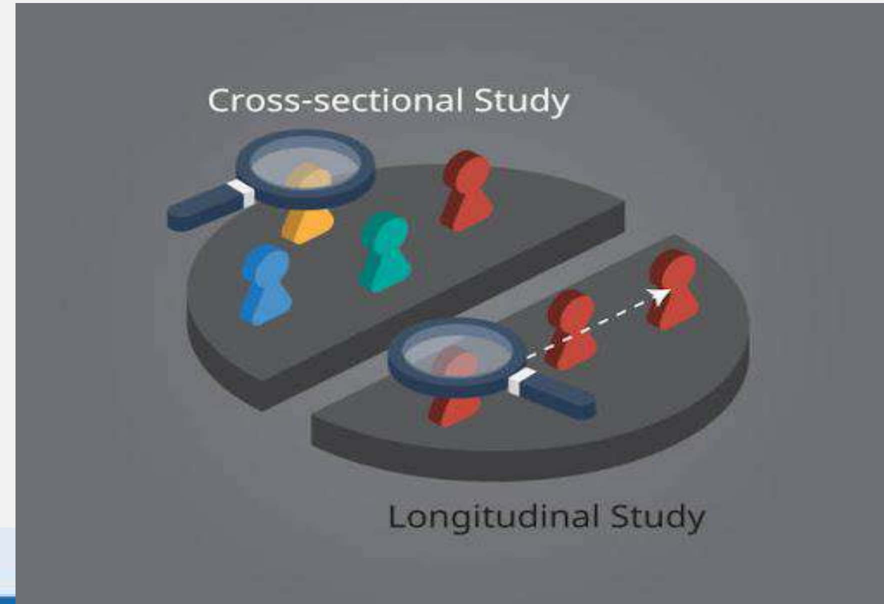
RETROSPECTIVE

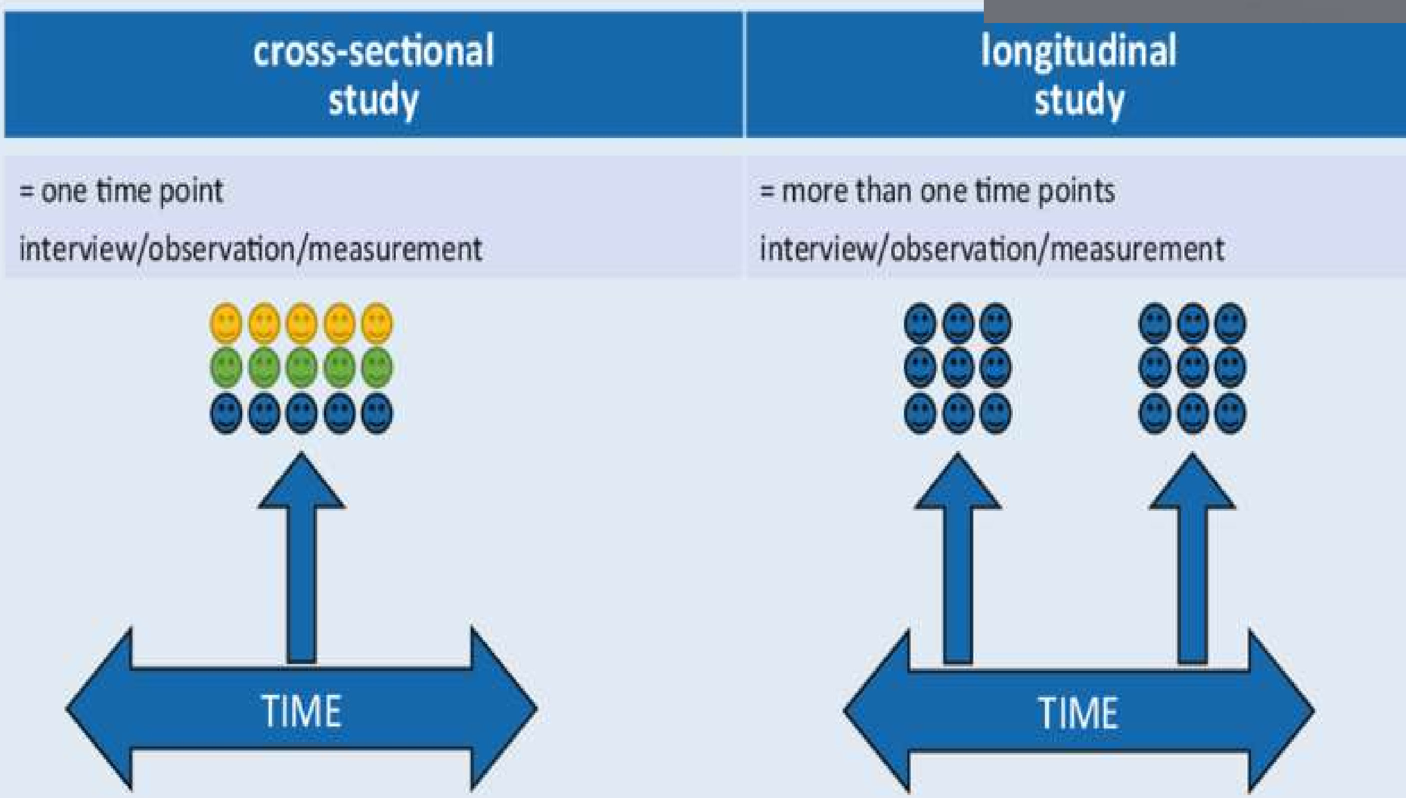
PROSPECTIVE



RETROSPECTIVE




Cross-sectional Study
Longitudinal Study


cross-sectional study
longitudinal study
= one time point
interview/observation/measurement
= more than one time points
interview/observation/measurement
TIME
TIME

ECOLOGICAL STUDIES

- In **ecological studies** the unit of observation is the population or community.
- An ecologic study **focuses on the comparison of groups**, rather than individuals.
- Used to understand the relationship between outcome and exposure at a population level, where 'population' represents a group of individuals with a shared characteristic such as geography, socio-economic status, employment

DISTINGUISHING STUDY DESIGNS

- ECOLOGIC STUDIES: No individual link between exposure and outcome. The unit of measure is the group

- CROSS-SECTIONAL STUDIES: Identify exposure and disease in a population at the same time.

- CASE-CONTROL STUDIES: Start by identifying cases with the disease, get controls and asses for past exposure.

- COHORT STUDIES: Start by identifying an "exposed" population group before the disease occurs

EXPERIMENTAL STUDY DESIGNS

Experimental studies are ones where researchers introduce an **intervention** and study the effects.

EXPERIMENTAL STUDY DESIGNS

1. **Randomized control trials, clinical trials:**

compare the effects of drugs, surgical techniques, medical devices, diagnostic procedures, diets, or other medical treatments.

2. **field trials:**

preventive interventions applied to individuals (e.g., a vaccine trial).

3. **Community trials:**

community mass education program, smoking prevention program in schools, and dietary intervention at the family level.

QUASI EXPERIMENTAL STUDY DESIGNS

Individual Trials vs. Community Trials

The key difference is that in community trials the treatments being studied are allocated not to individuals, but to entire communities.

Individual Trial:
Treatment allocated to *individuals*, e.g., HIV treated with 2 drugs vs. 3 drug regimen

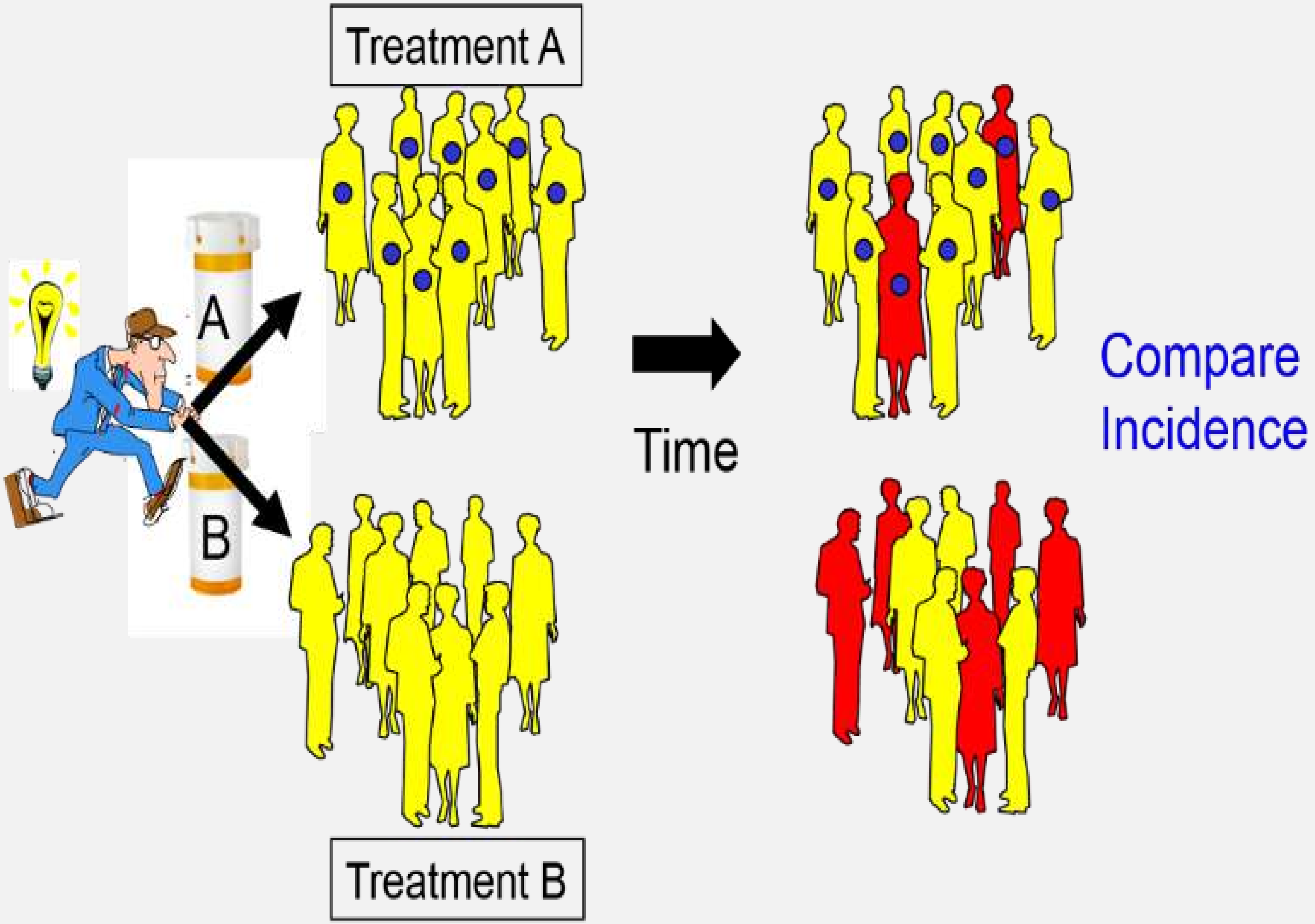
Community Trial:
Treatment allocated to entire *communities*, e.g., comparing the impact of fluoridation of drinking water on the incidence of dental caries in Newburgh, NY versus no fluoridation in a similar community (Kingston, NY).

RANDOMIZED CONTROLLED TRIALS (RCTS)

- **Experimental:** exposure is assigned
- **Randomized:** Random allocation of exposure or treatment

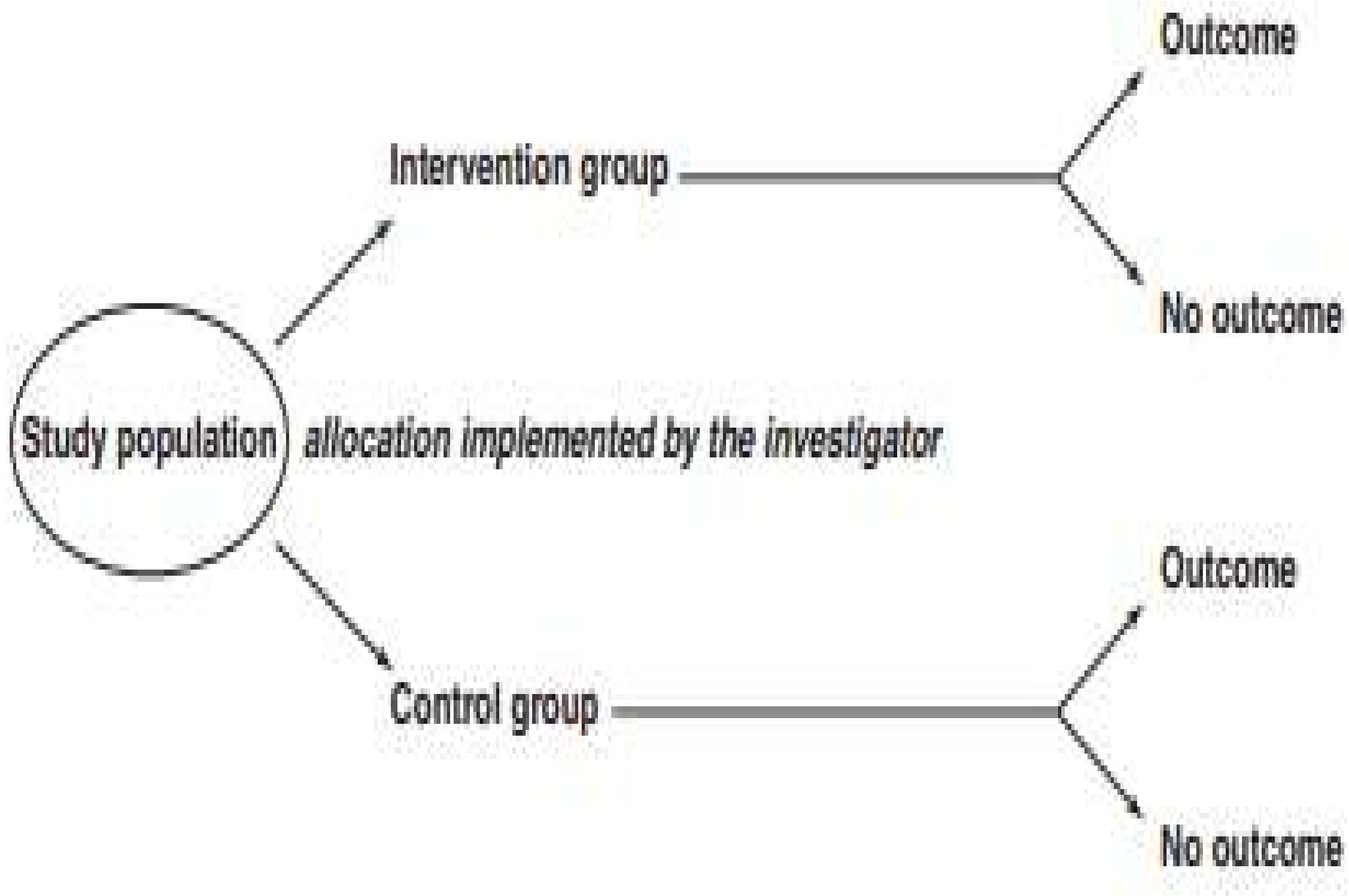
Gold Standard for causal inference

- Eligible people are randomly assigned to one of two or more groups.
- One group receives the intervention (such as a new drug) while the control group receives nothing or an inactive placebo.
- The researchers then study what happens to people in each group.
- Any difference in outcomes can then be linked to the intervention.

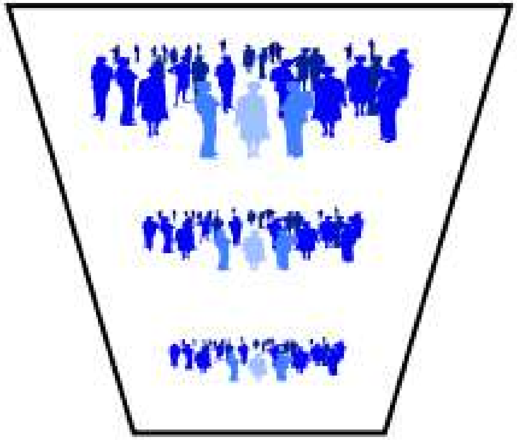


the investigators assign subjects to the exposure groups

?? cohort


Outcome
Intervention group
No outcome
Study population
allocation implemented by the investigator
Outcome
Control group
No outcome

Doing a randomised controlled trial



Population

Eligible individuals

Consenting individuals

Randomise

Intervention | **Control group**

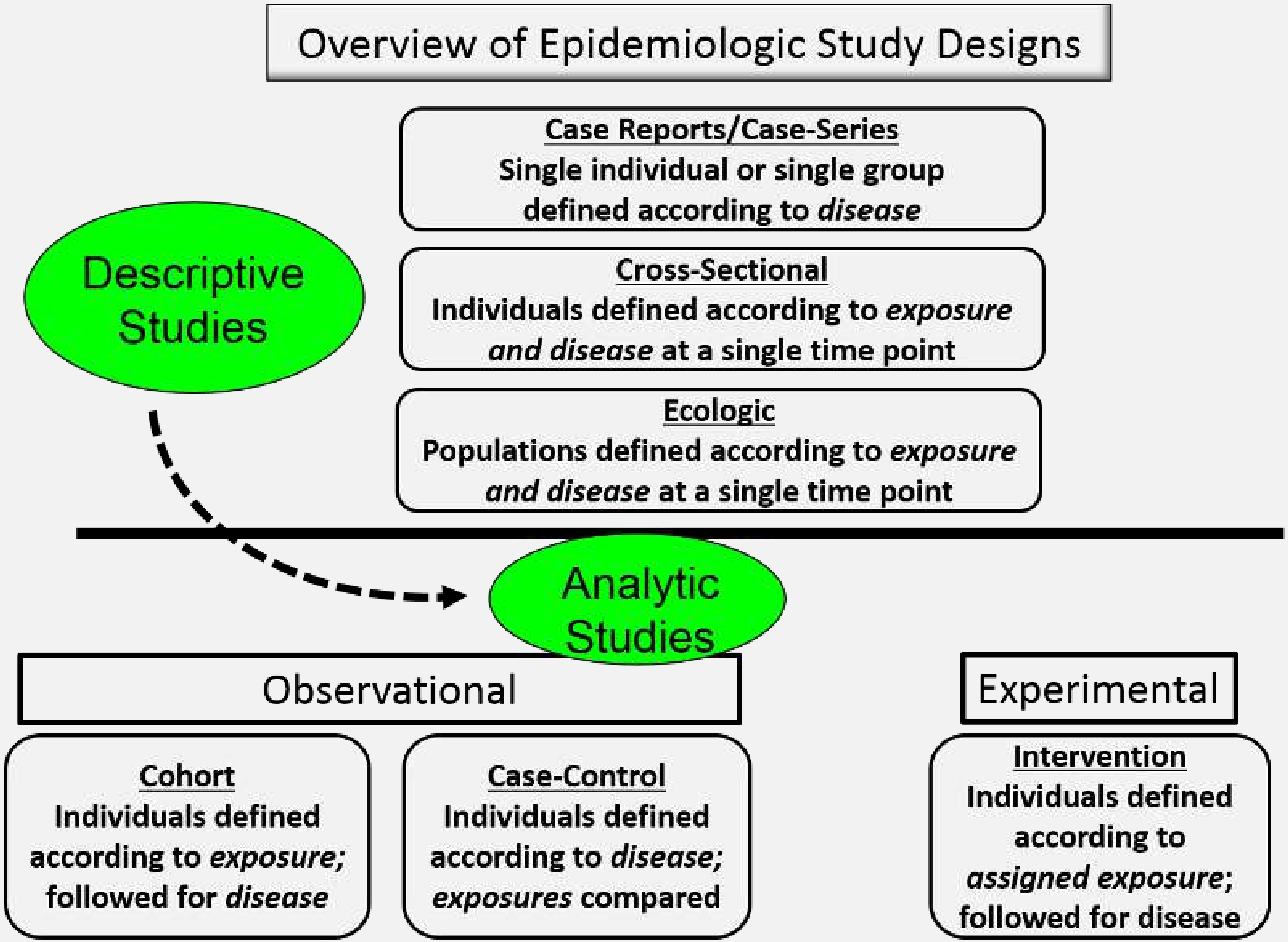
(Baseline measurements)

Measure & compare outcomes

Look at :
Non-compliance
Completeness of follow-up

RANDOMIZED CONTROLLED TRIALS

- Advantages
  - Least subject to biases of all study designs (**IF** designed and implemented well…!)
- Disadvantages
  - Loss-to-follow-up
  - Randomization issues
  - Ethical limitations


Overview of Epidemiologic Study Designs
Descriptive Studies
Case Reports/Case-Series
Single individual or single group defined according to *disease*
Cross-Sectional
Individuals defined according to *exposure and disease* at a single time point
Ecologic
Populations defined according to *exposure and disease* at a single time point
Analytic Studies
Observational
Cohort
Individuals defined according to *exposure;* followed for *disease*
Case-Control
Individuals defined according to *disease; exposures* compared
Experimental
Intervention
Individuals defined according to *assigned exposure*; followed for disease

CHOICE OF DESIGN

- Depends on:
  - Research Questions
  - Research Goals
  - Researcher Skills
  - Time and Funds
  - Available resources
- It is also related to:
  - Status of existent knowledge
  - Occurrence of disease
  - Duration of latent period
  - Nature and availability of information

RESEARCH QUESTION AND STUDY TYPE

	Research question	study type
Knowing that a problem exists but knowing little about its characteristics or possible causes	What is the nature/ magnitude of the problem? Who is affected? How do the affected people behave? What do we know think or believe about the problem and its causes?	**Descriptive studies** •**Descriptive case studies** • **Cross-sectional surveys**

RESEARCH QUESTION AND STUDY TYPE

	Research question	study type
Suspecting that certain factors contribute to the problem	Are certain factors indeed associated with the problem? (e.g. is low fiber diet related to carcinoma of large intestine?)	**Analytical studies:** • **Cross sectional comparative studies** • **Case-control studies** • **Cohort studies**

RESEARCH QUESTION AND STUDY TYPE

	Research question	study type
Having established that certain factors are associated with the problem: desiring to establish the extent to which a particular factor causes or contributes to the problem.	What is the cause of the problem? Will the removal of particular factor prevent or reduce the problem? (e.g., stopping smoking, providing safe water etc.)	**Cohort studies** **Experimental or quasi experimental studies**

RESEARCH QUESTION AND STUDY TYPE

Having sufficient knowledge about causes to develop and assess an intervention that would prevent, control or solve the problem	What is the effect of a particular intervention/strategy? (e.g., treating with a particular drug, being exposed to a certain type of health education) Which of the two alternate strategies give better results? Which strategy is most cost-effective?	**Experimental or Quasi-experimental studies**

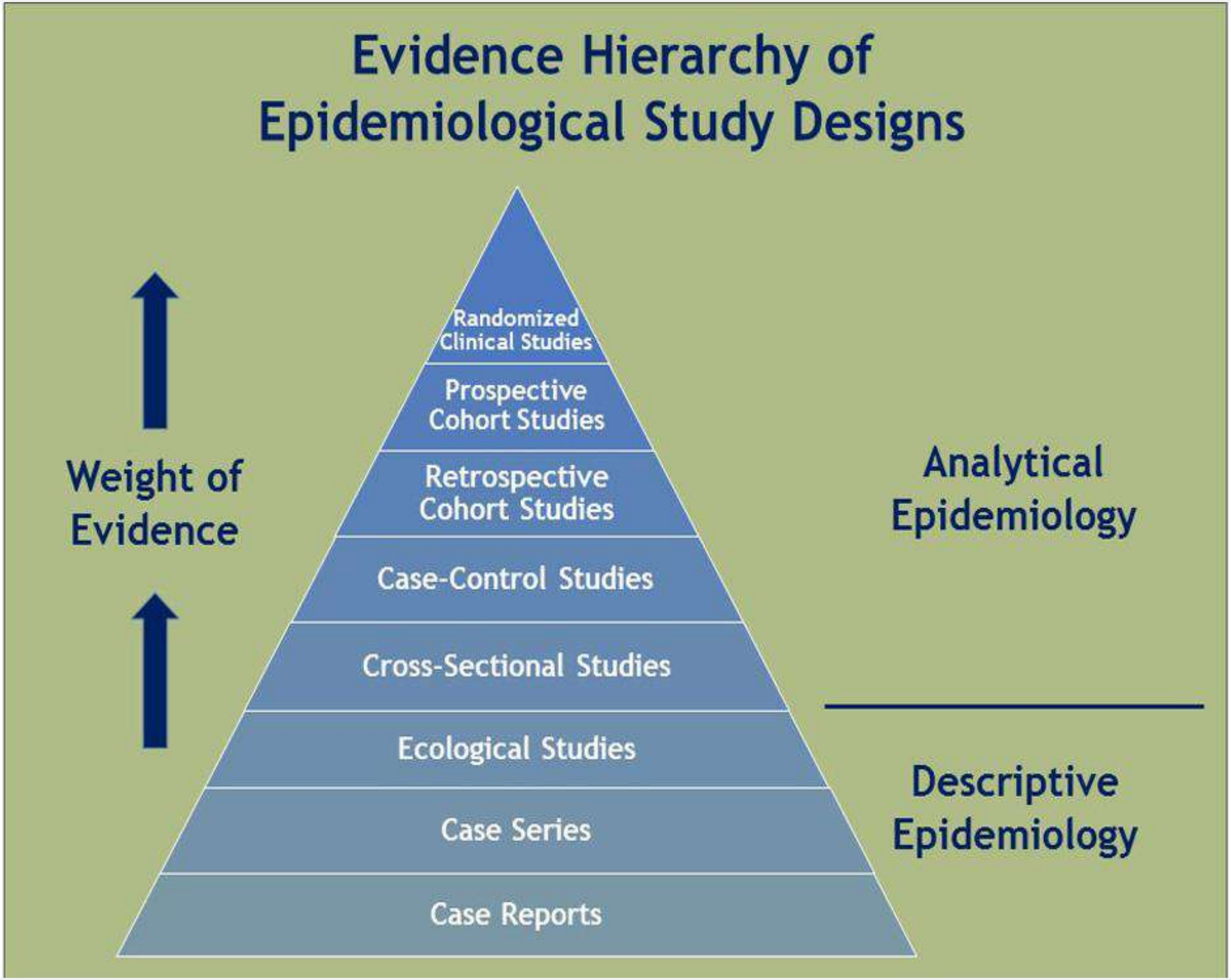
Increasing Knowledge of Disease/Exposure

Descriptive Studies — Develop hypothesis

Case-control Studies — Investigate it's relationship to outcomes

Cohort Studies — Define it's meaning with exposures

Clinical trials — Test link experimentally


Evidence Hierarchy of
Epidemiological Study Designs
Weight of Evidence
Randomized Clinical Studies
Prospective Cohort Studies
Retrospective Cohort Studies
Case-Control Studies
Cross-Sectional Studies
Ecological Studies
Case Series
Case Reports
Analytical Epidemiology
Descriptive Epidemiology

TYPES OF ANALYTICAL STUDIES

1. Study of a new drug

1. Study of the effectiveness of a drug in preventing flu in a community

2. Study of who have received flu vaccines and did they get ill

3. Study of who has flu and if they were vaccinated

4. Survey of how many cases of flu in different occupation

5. Compare cases of flu and air quality in communities

PREVENTION

Dr .Ayda Ahmad Helles

DEFINITION OF DISEASE PREVENTION

"Activities designed to protect patients or other members of the public from actual or potential health threats and their harmful consequences."

OR

"Prevention is the action aimed at eradicating, eliminating or minimizing the impact of disease and disability."

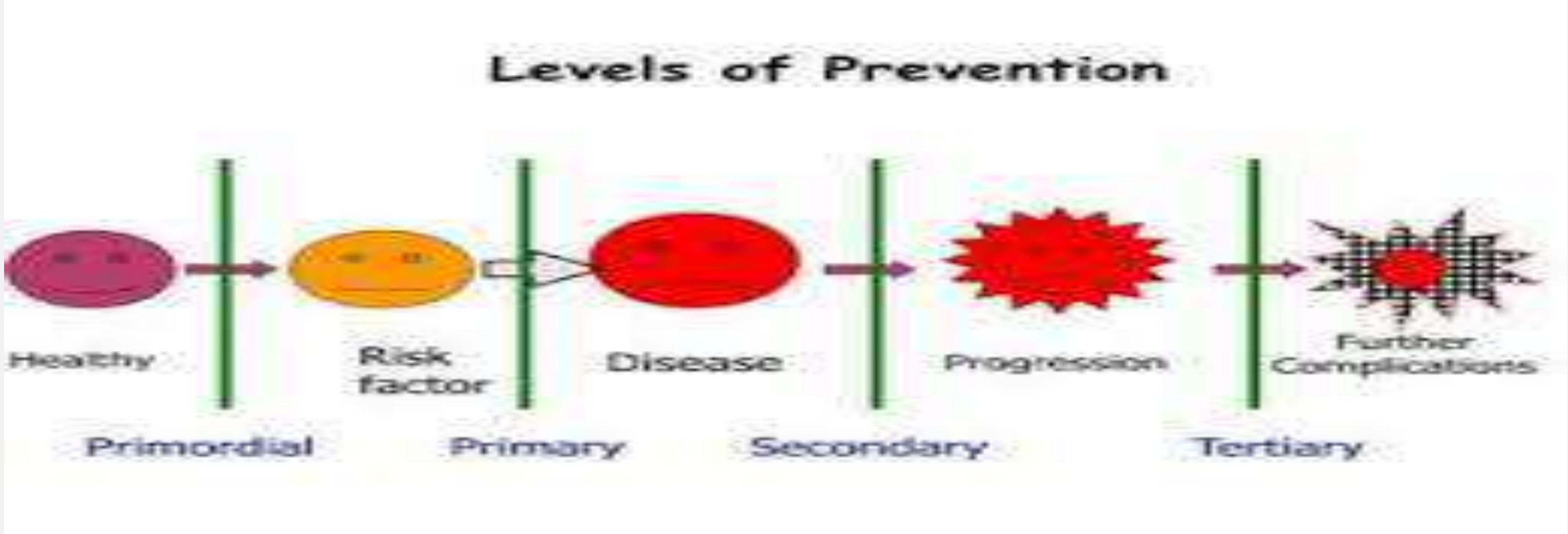
DISEASE PREVENTION

Successful prevention depends upon:

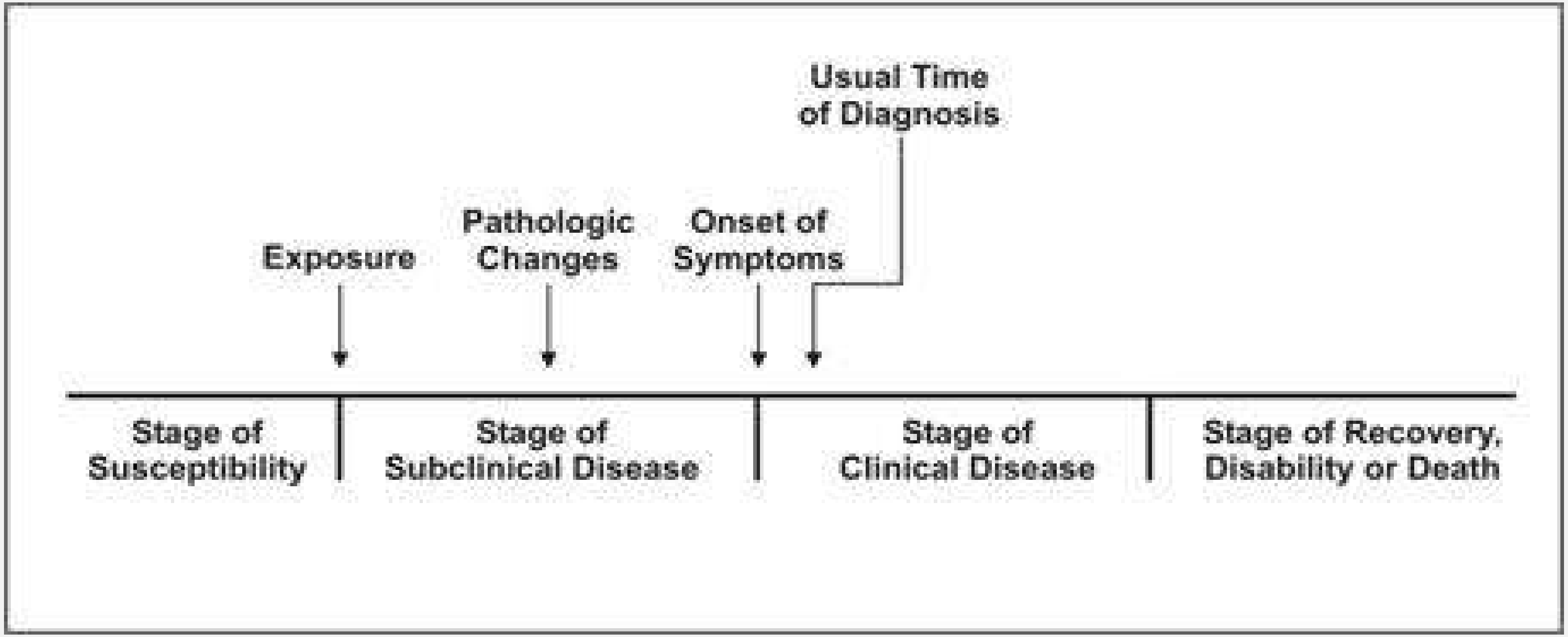
- A knowledge of causation,
- Dynamics of transmission,
- Identification of risk factors and risk groups,
- Availability of prophylactic or early detection and treatment measures,
- An organization for applying these measures to appropriate persons or groups, and
- Continuous evaluation of and development of procedures applied

LEVELS OF PREVENTION

1) Primordial Prevention
2) Primary Prevention
3) Secondary Prevention
4) Tertiary Prevention



THE NATURAL HISTORY OF A DISEASE



PRIMORDIAL PREVENTION

"This is a prevention of the development of risk factors in a population group , which has not yet appeared."

- Targeted entire population
- Special Attention is Given to preventing Chronic Disease.
- decreases risk factors for obesity, cardiovascular disease, type 2 diabetes
- The main intervention in primordial prevention is through individual and mass education
- many adult health problems (e.g., obesity, hypertension) have their early origins in childhood, because this is the time when lifestyles are formed (for example, smoking, eating patterns, physical exercise).

PRIMORDIAL PREVENTION

Ex:

- Government policy: Increasing taxes on cigarettes; Decreasing advertisement of tobacco

- Built Environment: Access to safe walking paths; access to stores with healthy food options

PRIMARY PREVENTION

- "Primary prevention can be defined as the action taken prior to the onset of disease, which removes the possibility that the disease will ever occur."
- In this Actions are taken before the onset of the Disease.
- target population Normal healthy persons but at danger
- prevent a disease from progressing in a susceptible individual to subclinical disease
- cost effective
- No loss.

PRIMARY PREVENTION

- **It signifies intervention in the pre-pathogenesis phase of a disease or health problem.**
- **It includes the concept of "positive health", a concept that encourages achievement and maintenance of "an acceptable level of health that will enable every individual to lead a socially and economically productive life".**

Primary Prevention

Achieved by

Achieved by

Health promotion

- Health education
- Environmental modifications
- Nutritional interventions
- Life style and behavioral changes

Specific protection

- Immunization and seroprophylaxis
- chemoprophylaxis
- Use of specific nutrients or supplementations
- Safety of drugs and foods
- Control of environmental hazards, e.g. air pollution

HEALTH PROMOTION

Health promotion is " the process of enabling people to increase control over their health and its determinants and thereby improve their health".

GENERAL HEALTH PROMOTION

- **Health education** to improve healthy habits and health consciousness in the community.
- **Environmental modifications** Healthful physical environment (Housing, water supply, excreta disposal, etc.,), Good working condition
- **Nutritional interventions,** Improvement in nutritional standards of the community.
- **Lifestyle and behavioral changes**, Marriage Counseling, smoking

SPECIFIC PROTECTION

- Use of Specific immunization (DPT, MMR vaccines)
- Use of specific nutrients (vitamin A for Children, iron-folic acid tablets for Pregnant mothers)
- Protection against accidents (Use of helmet, seat belt, etc.,)
- Protection against occupational hazards.
- Avoidance of allergens.
- Protection from air pollution

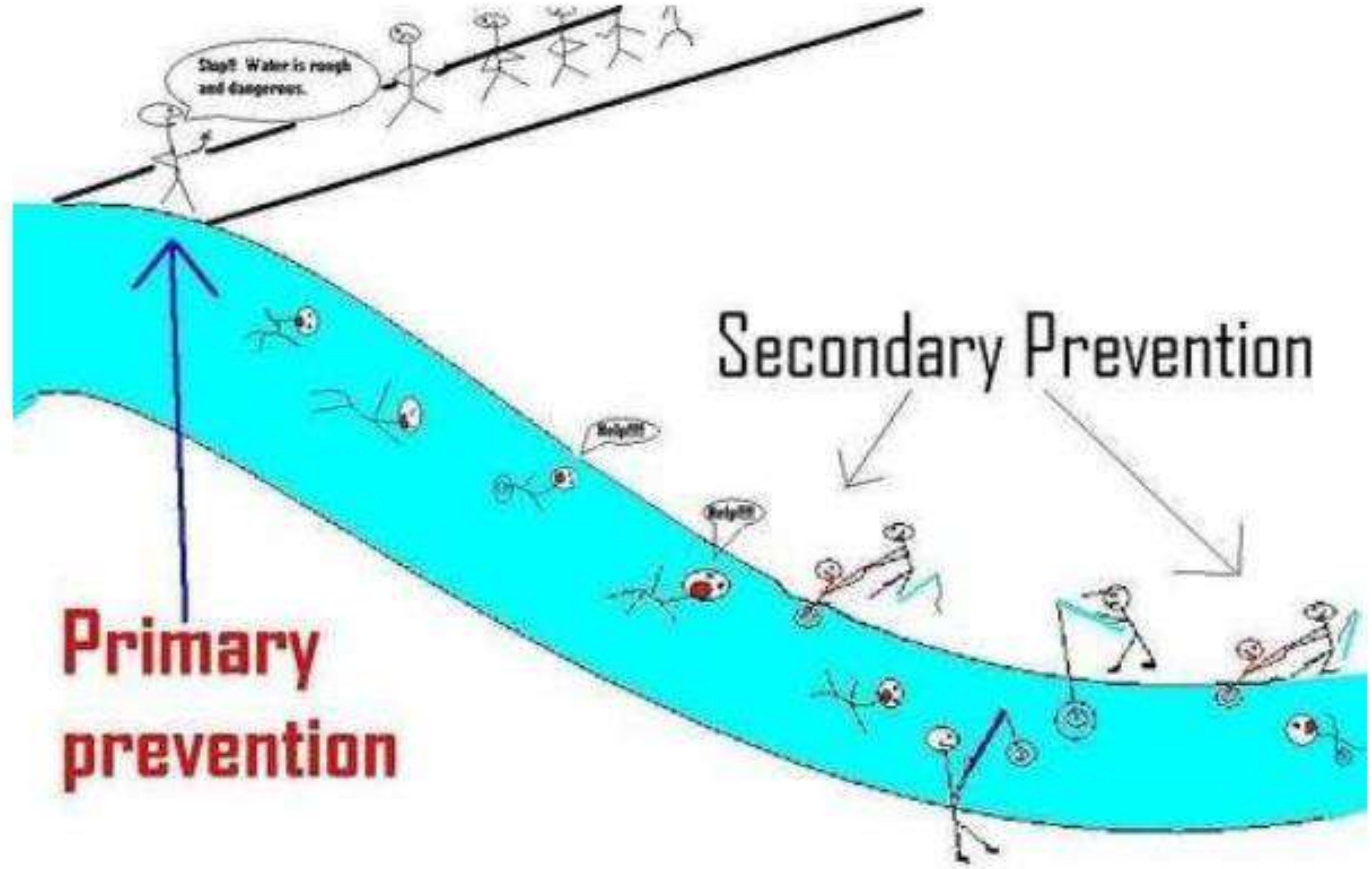
SECONDARY PREVENTION

- It is defined as " An Action which halts the progress of a disease at its incipient stage and prevents complications."
- Target population: healthy-appearing individuals with subclinical forms of the disease
- The specific interventions are:

(i) early diagnosis (e.g. screening tests, breast self-examination, pap smear test, radiographic examinations etc.)& Treatment
(ii) Referral

SECONDARY PREVENTION

- Secondary prevention attempts to arrest the disease process, restore health by seeking out unrecognized disease and treating it before irreversible pathological changes take place, and reverse communicability of infectious diseases.
- It protects others in the community from acquiring the infection and thus provide at once secondary prevention for the infected ones and primary prevention for their potential contacts.



Stop!! Water is rough and dangerous.
Secondary Prevention
Primary prevention

OBJECTIVES OF SECONDARY PREVENTION

- Complete cure and prevent the progression of disease process.
- To prevent the spreads of disease by curing all the known cases.
- To prevent the complications of disease.
- To shorten the period of disability

(I) EARLY DIAGNOSIS

- The Disease complications can be prevented & health can be restored by diagnosing the disease at its early stages & by providing the adequate treatment according to the health problem. Includes :
  - Arrests/Stops the Disease Process
  - Restore the Health
  - Treat the Disease before Irreversible pathological changes occur.
  - Reverse the Communicability of infectious Disease.

INTERVENTIONS

- **Individual and mass case-finding measures.**
- **Screening surveys(urine examination for Diabetes , etc.,)**
- **Selective examination**

TERTIARY PREVENTION

- It is defined as "all the measures available to reduce or limit impairments and disabilities, and to promote the patients' adjustment to irremediable conditions."

Targets symptomatic patients at both the clinical and outcome stages of a disease

Aims to reduce the severity of the disease as well as any associated sequelae

- Interventions that should be accomplished in the stage of tertiary prevention are disability limitation and rehabilitation.

TERTIARY PREVENTION

- **Intervention in Late Pathogenesis Phase**
- Sick person with complications, very high cost, may loss for instant job.
- Permanent damage.

MODES OF PREVENTION

I) Disability limitation
II) Rehabilitation

DISABILITY LIMITATION

- To prevent or halt the transition of disease process from Impairment & Handicap.
- **Impairment:** any loss or abnormality of psychological, physiological or anatomic structure or function.
- **Disability:** any restriction or lack of ability to perform an activity in the manner considered normal for a human being.
- **Handicap:** disadvantage for a given individual, resulting from impairment or disability, that limits or prevents the fulfillment of a role that is normal for that individual

Differences between Impairment, Disability and Handicap

Disease

↓

Impairment

↓

Disability

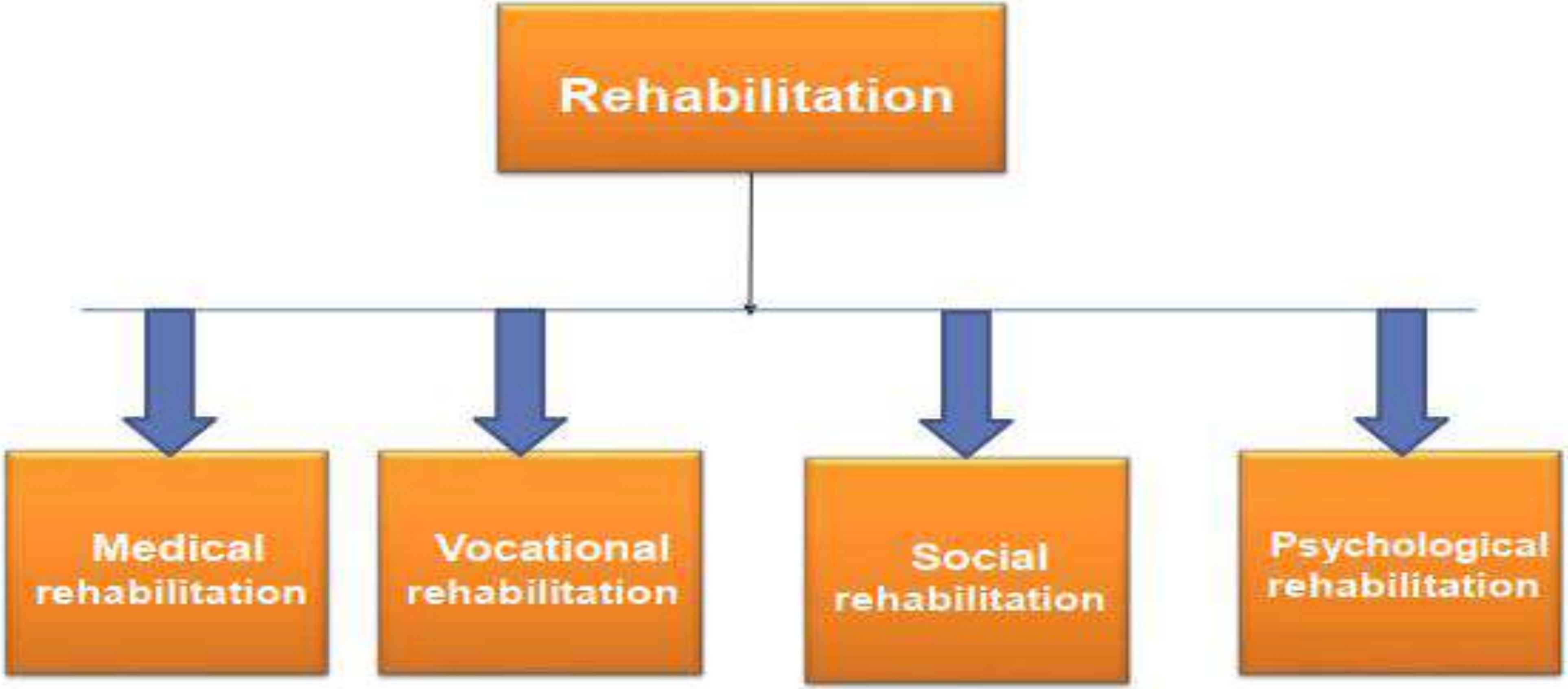
↓

Handicap

REHABILITATION

- **Rehabilitation is " the combined and coordinated use of medical, social, educational, and vocational measures for training and retraining the individual to the highest possible level of functional ability."**
- **Requires cooperation from different sections of society**

Types of Rehabilitation



REHABILITATION

- **Medical rehabilitation: (restoration of Bodily Function).**
- **Vocational rehabilitation:(restoration of the capacity to earn a livelihood)**
- **Social rehabilitation: (restoration of family and social relationship).**
- **Psychological rehabilitation: (Restoration of personal dignity and confidence)**

Key To Remember

Primary = **P**revention

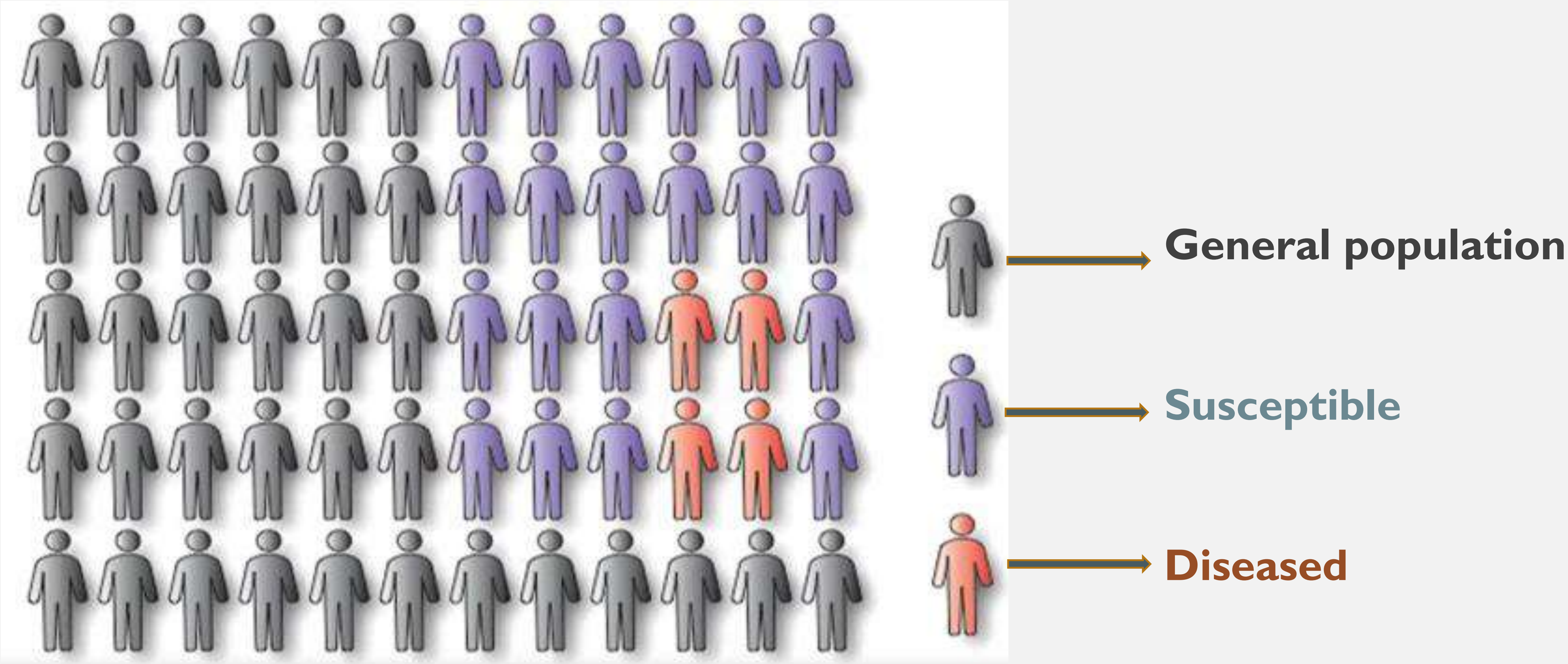
Secondary = **S**creening

Tertiary = **T**reatment

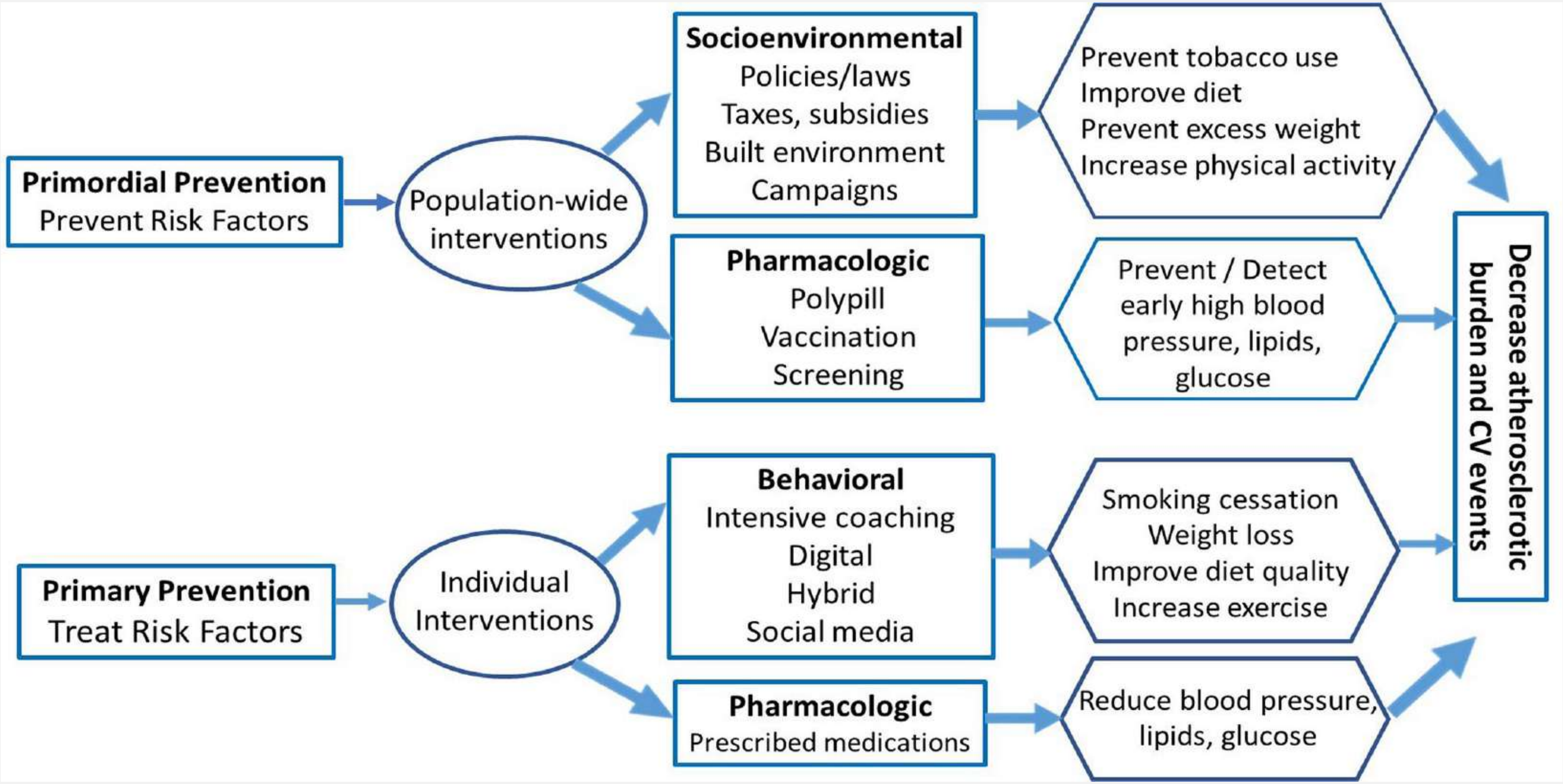
LEVELS OF PREVENTION

Stage of disease	Level of prevention	Type of response
Pre-disease	Primary Prevention	Health promotion and Specific protection
Latent Disease	Secondary prevention	Pre-symptomatic Diagnosis and treatment
Symptomatic Disease	Tertiary prevention	•Disability limitation for early symptomatic disease •Rehabilitation for late Symptomatic disease

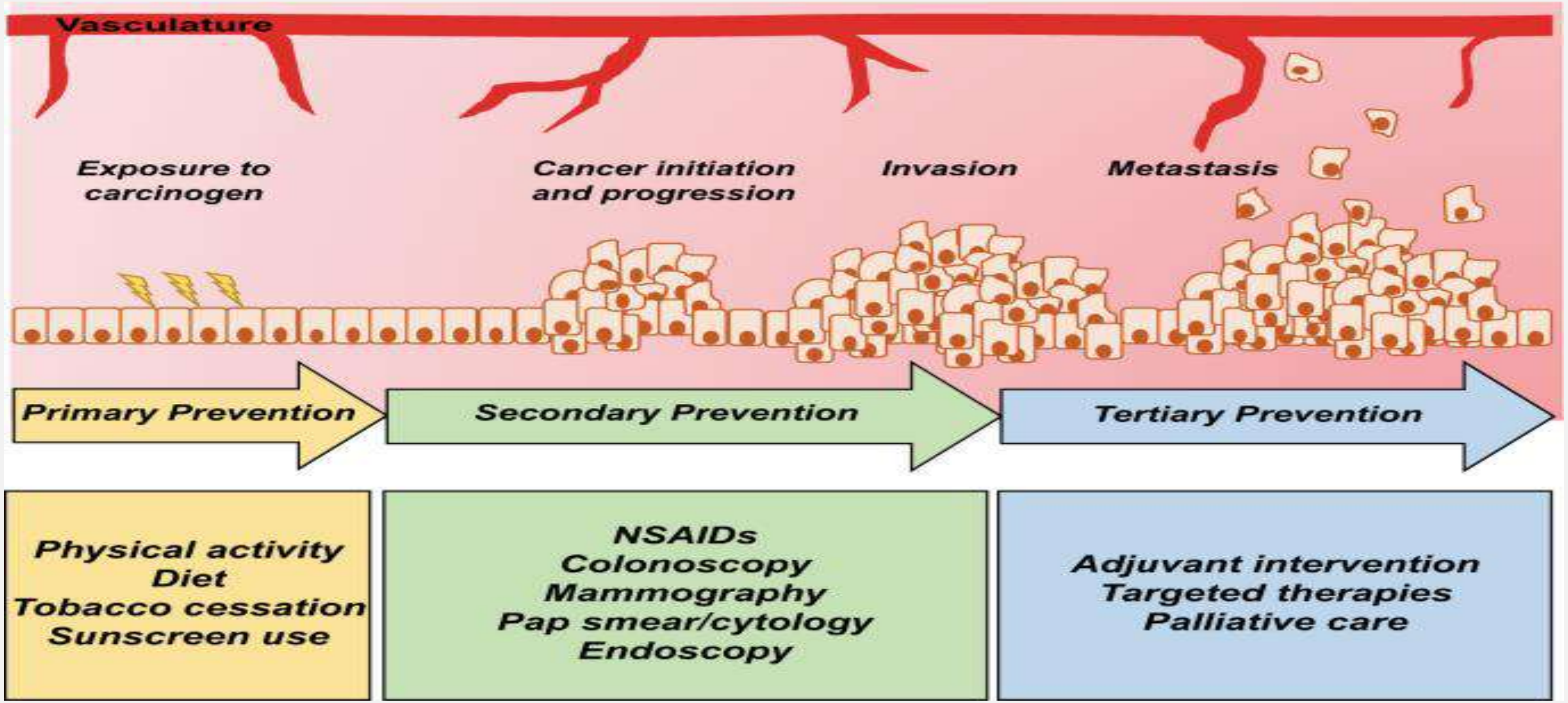
LEVELS OF PREVENTION



PREVENTION OF CVDS

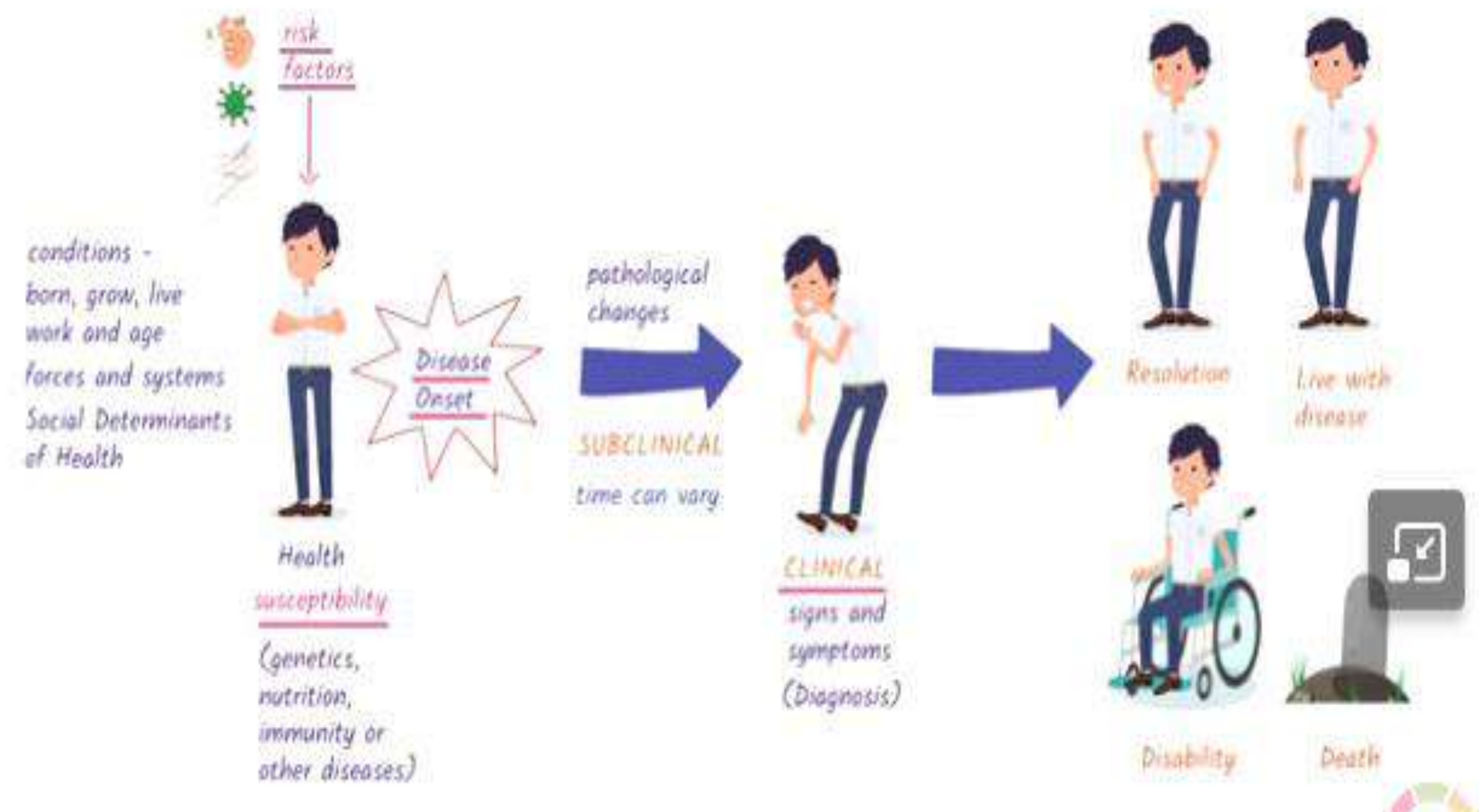


PREVENTION OF CANCER

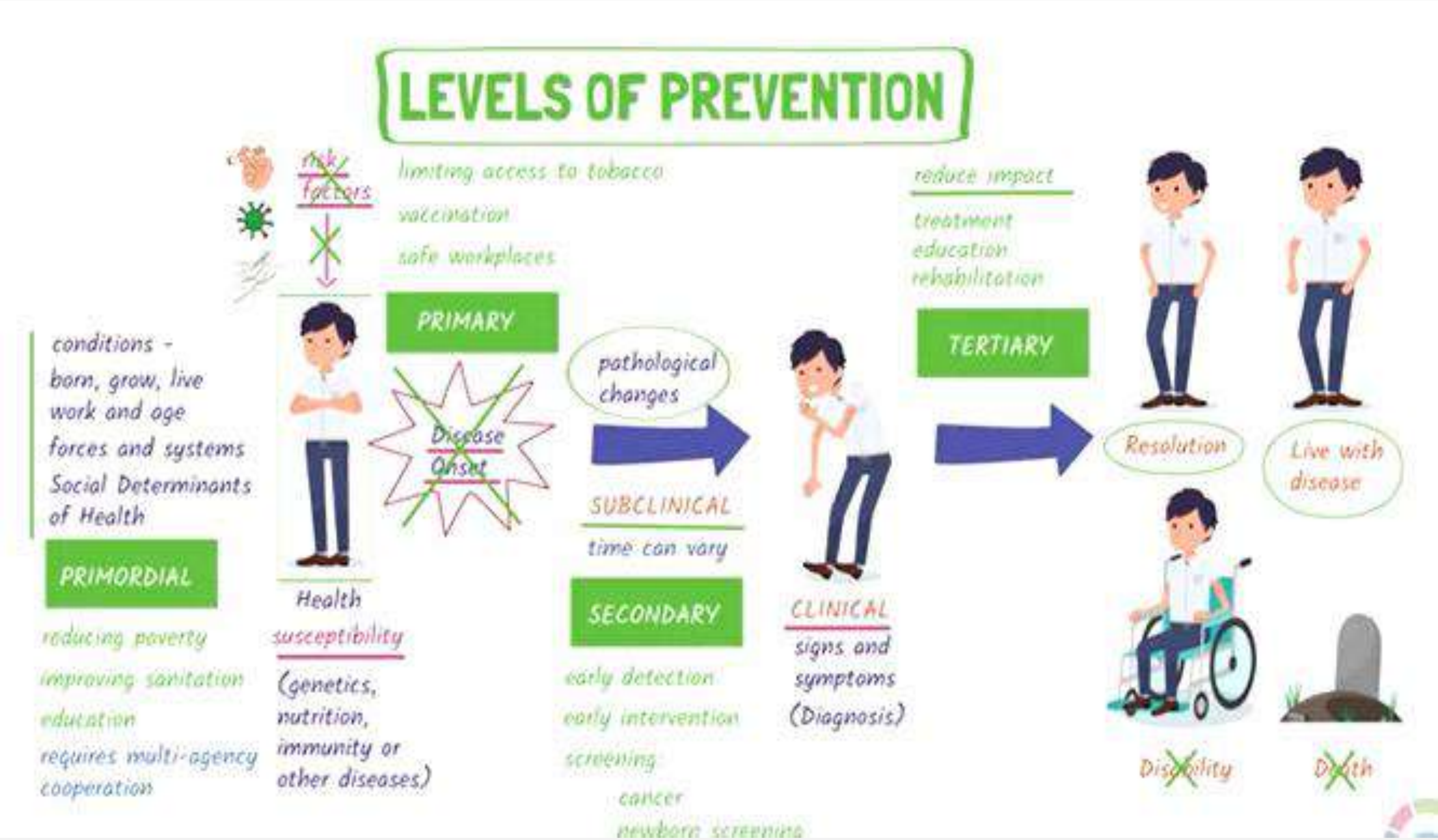


PREVENTION SCREENING

Dr .Ayda Ahmad Helles

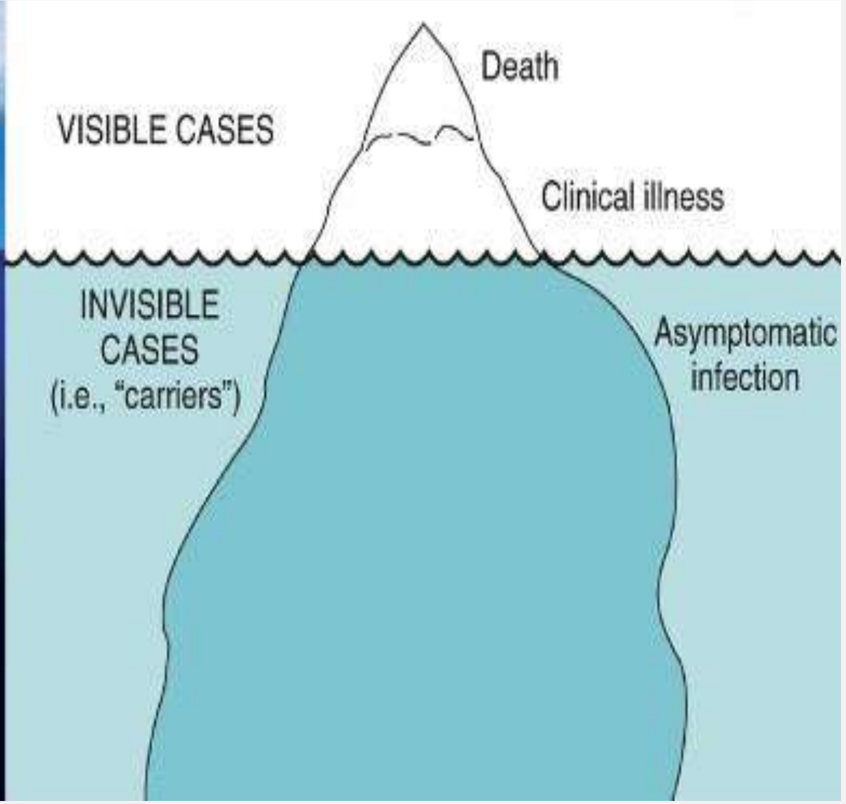


risk
factors
conditions -
born, grow, live
work and age
forces and systems
Social Determinants
of Health
Health
susceptibility
(genetics,
nutrition,
immunity or
other diseases)
Disease
Onset
pathological
changes
SUBCLINICAL
time can vary
CLINICAL
signs and
symptoms
(Diagnosis)
Resolution
Live with
disease
Disability
Death



LEVELS OF PREVENTION
risk factors
limiting access to tobacco
vaccination
safe workplaces
PRIMARY
reduce impact
treatment
education
rehabilitation
TERTIARY
conditions -
born, grow, live
work and age
forces and systems
Social Determinants
of Health
PRIMORDIAL
reducing poverty
improving sanitation
education
requires multi-agency
cooperation
Health
susceptibility
(genetics,
nutrition,
immunity or
other diseases)
Disease
Onset
pathological
changes
SUBCLINICAL
time can vary
SECONDARY
early detection
early intervention
screening
cancer
newborn screening
CLINICAL
signs and
symptoms
(Diagnosis)
Resolution
Live with
disease
Disability
Death

SCREENING


Death
VISIBLE CASES
Clinical illness
INVISIBLE CASES (i.e., "carriers")
Asymptomatic infection

SCREENING TEST

Screening is the search for unrecognized disease or defect using rapidly applied tests, examinations in apparently healthy individuals."

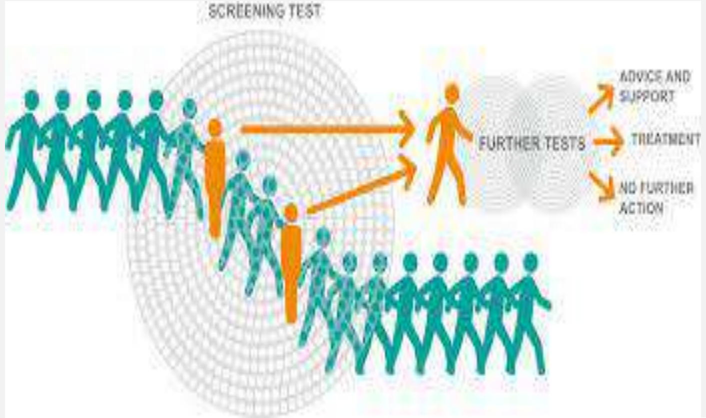
The goal of this program is to discover conditions in their earliest and most treatable stages.

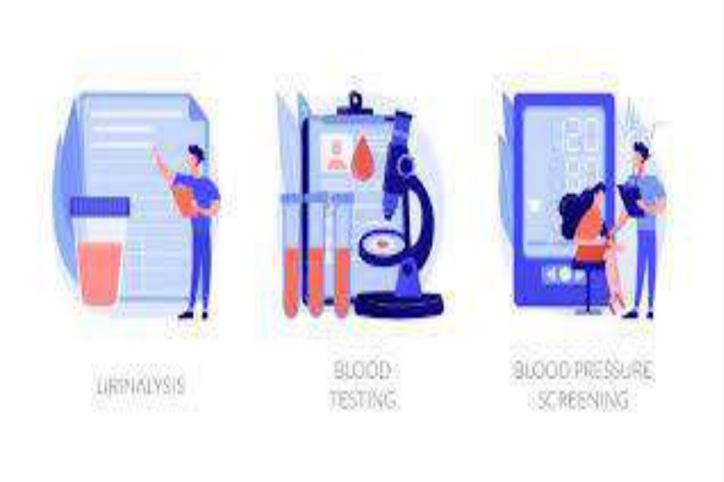
The concept of natural history of disease is central to population screening

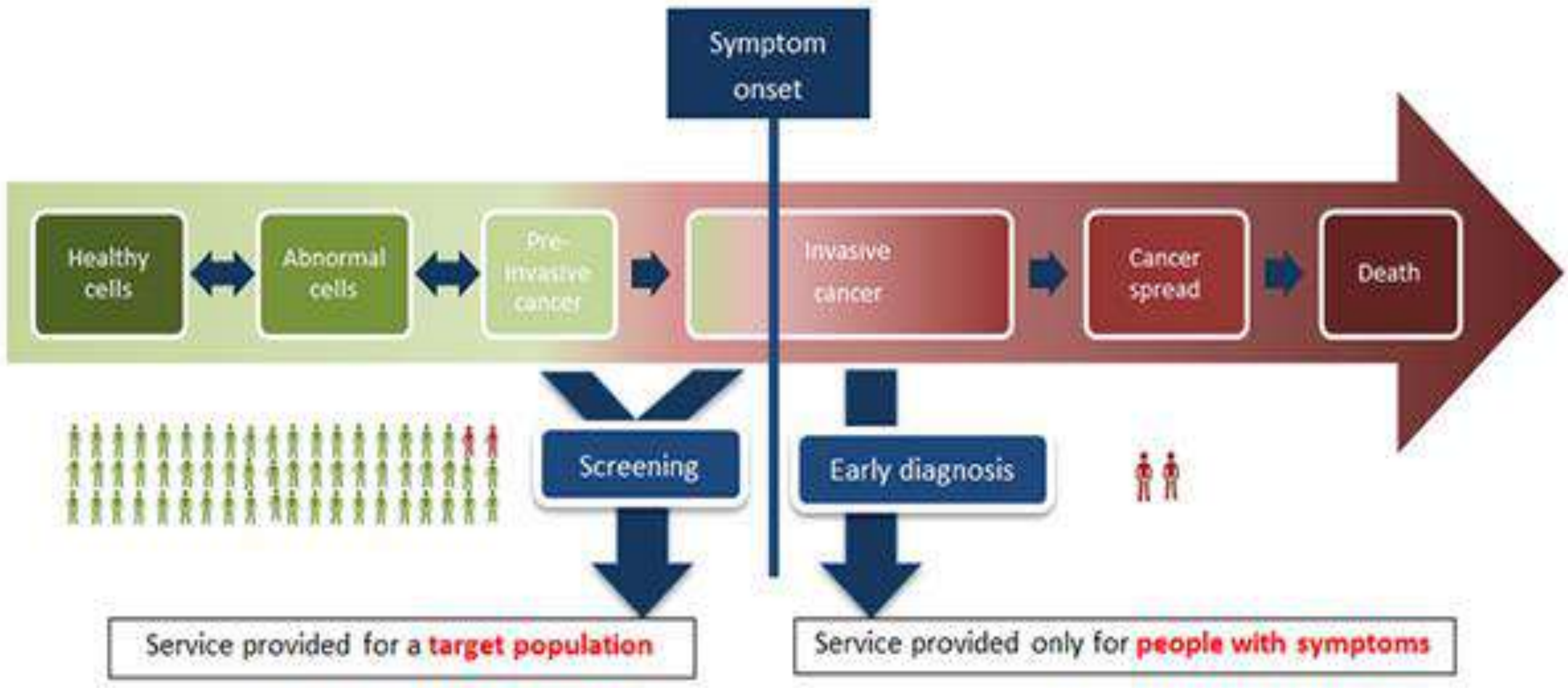
WILSON AND JUNGNER (W&J) PRINCIPLES

The screening principles fall into 5 major dimensions:

1. An Important Health Problem
2. Availability of good screening test
3. Be able to handle cases identified appropriately
4. Harms much less than benefits
5. Cost-Effectiveness is appropriate for health system







Symptom onset
Healthy cells
Abnormal cells
Pre-invasive cancer
Invasive cancer
Cancer spread
Death
Screening
Early diagnosis
Service provided for a target population
Service provided only for people with symptoms

EVALUATION OF SCREENING TESTS

- **Reliability** – get the same result each time

Repeatability: get the same result

Each time

From each instrument

From each rater

- **Validity** – get the correct result

Sensitivity: correctly classify cases

Specificity: correctly classify non-cases

- Positive predictive value
- Negative predictive value

SENSITIVITY AND SPECIFICITY

		"TRUTH"	
		Dis^+	Dis^-
TEST RESULT	Dis^+	**T**rue **P**ositive have disease and test positive	**F**alse **P**ositive disease-free but test positive
	Dis^-	**F**alse **N**egative have disease but test negative	**T**rue **N**egative disease-free & test negative

MEASURES OF CRITERIA VALIDITY

Sensitivity: proportion of true positives among all diseased individuals

Specificity: proportion of true negatives among all non-diseased individuals

Positive Predictive Value: proportion of true positives among all those with a positive screening test

Negative Predictive Value: proportion of true negatives among all those with a negative screening test

MEASURES OF CRITERIA VALIDITY

Sensitivity: proportion of true positives among all diseased individuals

Sensitivity	TP / TP+FN
False Negative Rate	FN / TP+FN

		Truth		
		Dis+	Dis-	
Test Result	Dis+	**TP**	FP	TP+FP
	Dis-	FN	TN	FN+TN
		TP+FN	FP+TN	

MEASURES OF CRITERIA VALIDITY

Specificity: proportion of <u>true negatives among all non-diseased</u> individuals

Specificity	TN / TN+FP
False Positive Rate	FP / TN+FP

		Truth		
		Dis+	**Dis-**	
Test Result	Dis+	TP	FP	TP+FP
	Dis-	FN	**TN**	FN+TN
		TP+FN	**FP+TN**	

- Example
- If a test is 95% sensitive and 98% specific, then 5% of the diseased individuals will have negative test results (the test is incorrectly classifying 5% of the diseased individuals), and 2% of the disease-free individuals tested will have positive test results (the test is incorrectly classifying 2% of the disease-free individuals).

MEASURES OF CRITERIA VALIDITY

Positive Predictive Value: proportion of <u>true positives among all those with a positive screening test</u>

Positive Predictive Value TP / TP+FP

		Truth		
		Dis+	**Dis-**	
Test Result	Dis+	**TP**	FP	**TP+FP**
	Dis-	FN	TN	FN+TN
		TP+FN	FP+TN	

MEASURES OF CRITERIA VALIDITY

Negative Predictive Value: proportion of true negatives among all those with a negative screening test

Negative Predictive Value TN / TN+FN

		Truth		
		Dis+	**Dis-**	
Test Result	Dis+	TP	FP	TP+FP
	Dis-	FN	**TN**	**FN+TN**
		TP+FN	FP+TN	

- Example

A certain test, e.g. a stress ECG, which has a PPV of 90% and a NPV of 95% is used to screen 5,000 people for coronary heart disease. Forty percent of the individuals (2,000 people) have positive test results and 60% (3,000 people) have negative test results.

But the gold standard (The most definitive diagnostic procedure to detect disease) for CHD found that 1,800 of those who tested positive (90% of 2,000) truly have CHD, and 2,850 of those who tested negative (95% of 3,000) are truly non-cases.

		Heart Disease		
		+	-	
ECG	+	55	7	62
	-	49	84	133
		104	91	195

		Heart Disease		
		+	-	
ECG	+	55	7	62
	-	49	84	133
		104	91	195

Disease Prevalence: 104/195 = 0.53

		Heart Disease		
		+	-	
ECG	+	55	7	62
	-	49	84	133
		104	91	195

Sensitivity:	**55/104 = 0.53**
Specificity:	**84/91 = 0.92**
Positive PV:	**55/62 = 0.89**
Negative PV:	**84/133 = 0.63**

		Heart Disease		
		+	-	
ECG	+	55	42	97
	-	49	546	595
		104	588	692

Disease Prevalence: 104/692 = 0.15

		Heart Disease		
		+	-	
ECG	+	55	42	97
	-	49	546	595
		104	588	692

Sensitivity: 55/104 = 0.53

Specificity: 546/588 = 0.92

Positive PV: 55/97 = 0.57

Negative PV: 546/595 = 0.92

SENSITIVITY AND SPECIFICITY

- A test with high sensitivity will identify a high percentage of the cases with the outcome

- A test with high specificity will generally be negative for healthy individuals

- Usually, there is a trade-off between sensitivity and specificity

- If a disease is not life-threatening if left untreated, the costs of treatment are high, and invasive surgery is required, then a very specific diagnostic test is preferred over a more sensitive test.

- If the disease under study is life-threatening if left untreated, and the survival rate is improved with immediate treatment, then the sensitivity of a diagnostic test is of greater importance than its specificity.

MEASURES FOR SCREENING

		Disease		**Total**
		Yes	No	
Screening test	Positive	300	30	**130**
	Negative	20	3000	**3020**
Total		**320**	**3030**	**3350**

Sensitivity =

Specificity =

PPV =

NPV =

Disease prevalence =

MEASURES FOR SCREENING

Practice Questions.

A test is used to screen people for hepatitis B. The sensitivity of the test is 95% and the specificity of the test is 90%. Assume that the total number of persons being tested for hepatitis B is 50,000. Assume that the true prevalence of hepatitis B in the population is 100 per 50,000.

	Disease present	Disease absent
Positive test	a= true positive	b= false positive
Negative test	c= false negative	d= true negative

1) Calculate the number of true positives

2) Calculate the number of false positives

ASSOCIATION

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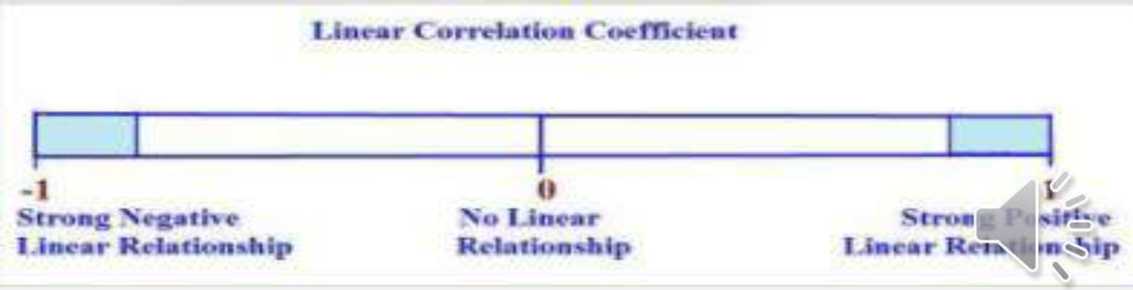
ASSOCIATION

Association is the occurrence of two variables more often, than would be expected by chance

Association explains the relationships between two variables one of them is defined as "Dependent" and the second is defined as "independent".

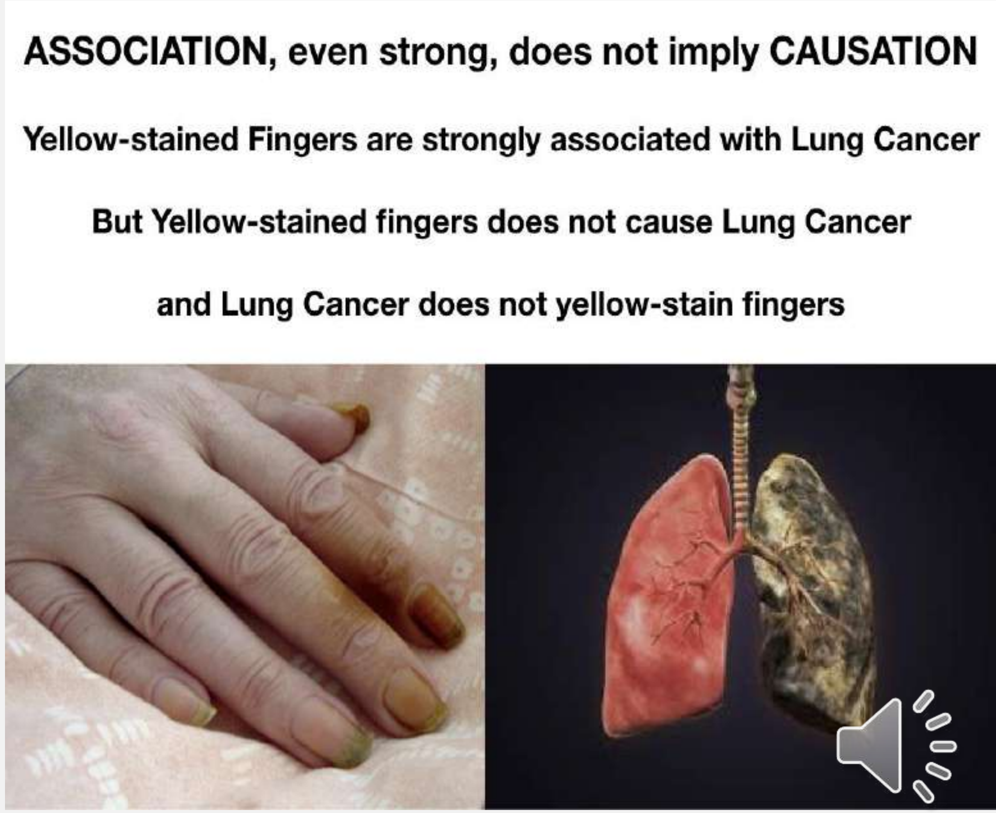
Association is present when dependent variable changes as a response to change in the independent variable.

Correlation indicates the degree of association



CAUSATION AND ASSOCIATION

- Epidemiology doesn't determine the cause of a disease in a given individual
- Instead we determine the relationship or association between a given exposure and frequency of disease in populations
- Association doesn't imply causation
- Causation implies that there is a true mechanism that leads from exposure to disease



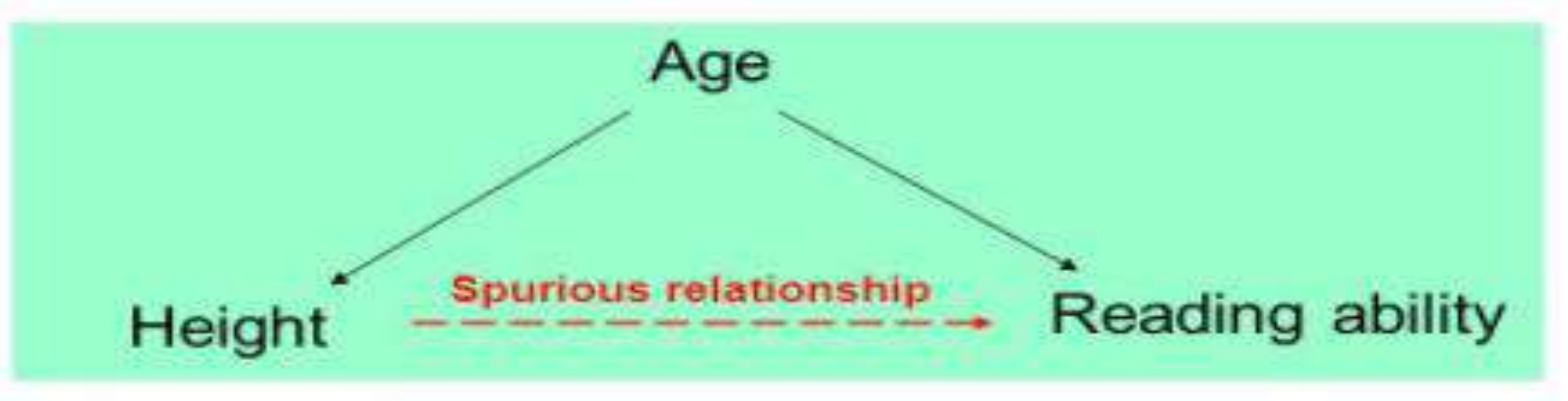
TYPES OF ASSOCIATION

1. Spurious association
2. Indirect association
3. Direct association

- One to one causal relationship
- Multi factorial causation

SPURIOUS ASSOCIATION

- Spurious= not real
- Some observed association between a suspected factor and disease may not be real
- This fallacy of presumption arises when two variables are improperly compared
- The relation exists where two variables are not related but a relationship between them is generated by their relationship with the third variable.



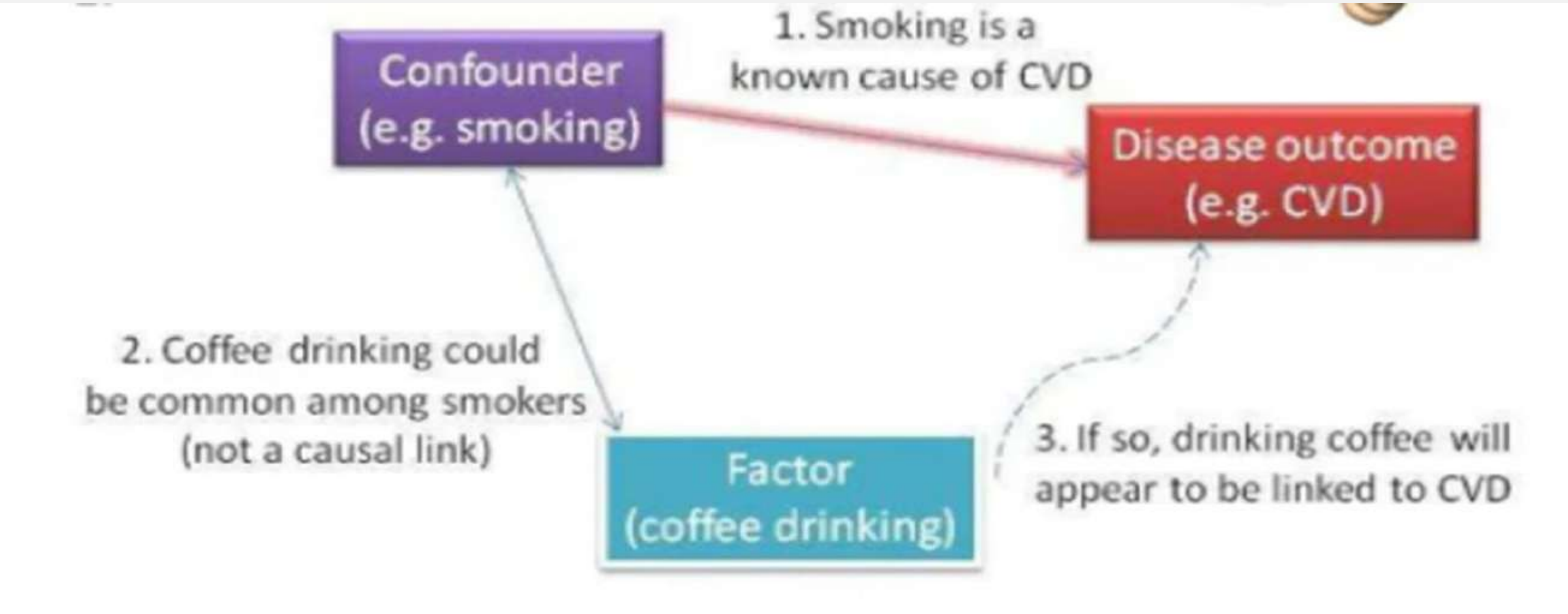
SPURIOUS ASSOCIATION

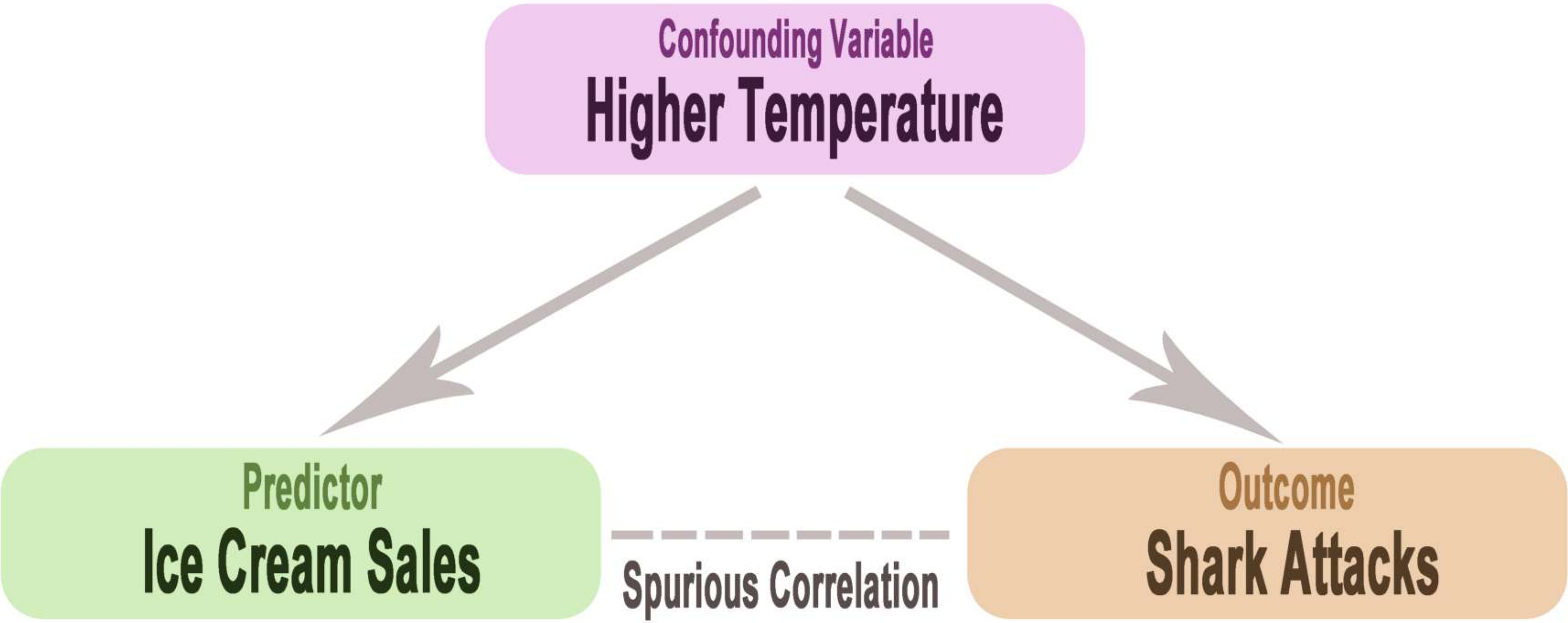
Spurious Association

- ✓ Sometimes an observed association between a disease and suspected factor may not be real.
- e.g. A study was conducted between births at home and births in hospital.
- Apparently Perinatal Mortality was higher in hospital births than in home birth.
- It may be concluded that home deliveries are safer than hospital deliveries.
- Such a conclusion is spurious because in general, hospitals attract women at high risk for delivery because of their special equipment and expertise.

INDIRECT ASSOCIATION

- It is a statistical association between a characteristic of interest and disease due to the presence of another factor i.e. common factor (confounding variable)





Confounding Variable
Higher Temperature
Predictor
Ice Cream Sales
Spurious Correlation
Outcome
Shark Attacks

WHAT IS A CONFOUNDING VARIABLE?

- A confounding variable is an "extra" variable that was not accounted for.
- They can ruin an experiment and give useless results.
- That's why it's important to know what one is, and how to avoid getting them into your experiment in the first place.
- A confounding variable can have a hidden effect on experiment's outcome.

DIRECT ASSOCIATION

The association between the two attributes is not through the third attributes.

When the study reveals it is not a spurious association.

When the disease is present, the factor must also be present.

DIRECT ASSOCIATION

A. One-to-one causal relationship:

This model suggests that two factors (A & B) exhibit one to one relationship, if- change in A followed by change in B

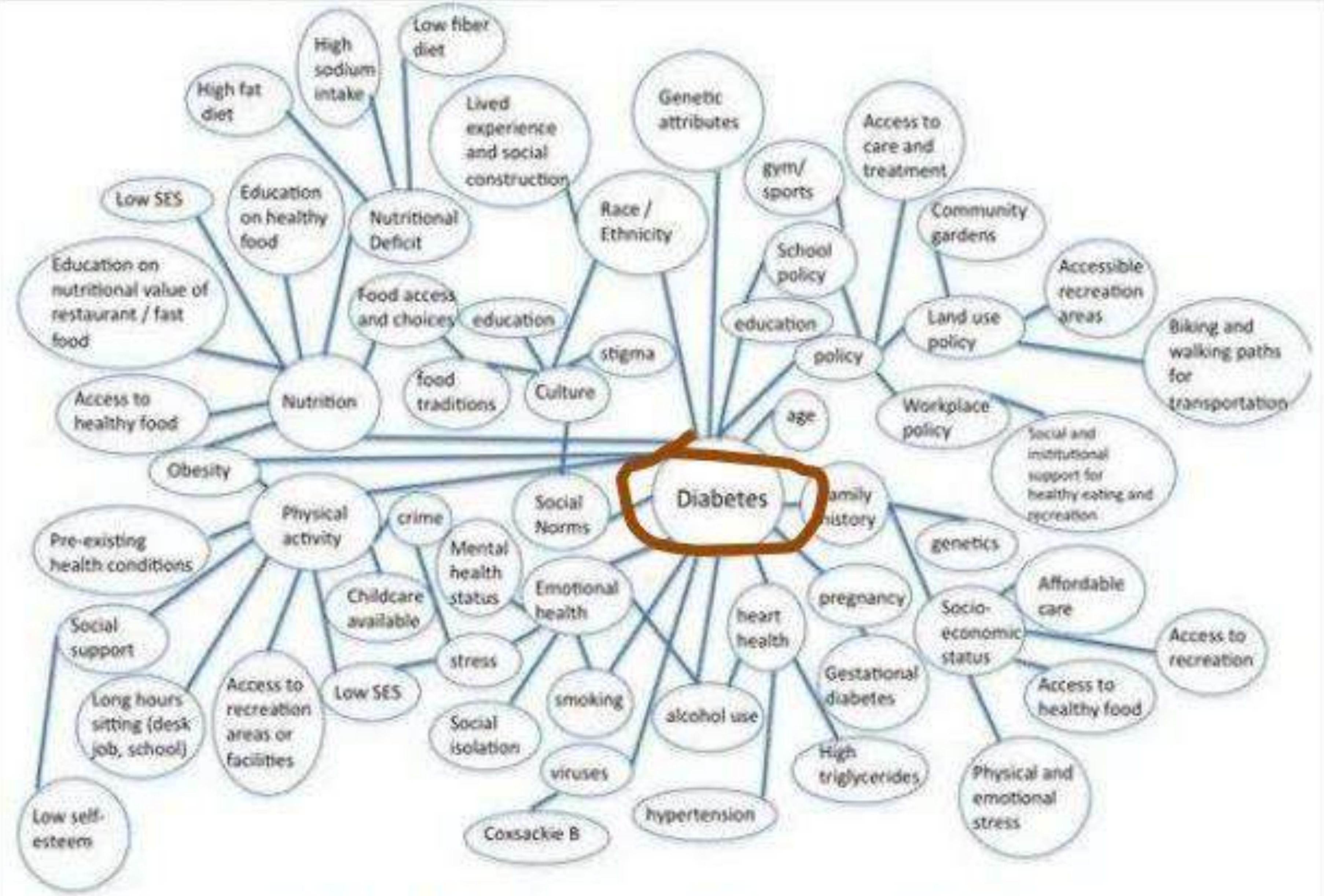
DIRECT ASSOCIATION

B. Multifactorial association:

- In several modern (degenerative) diseases, more than one factor is implicated in the web of causation.

- E.g.: Both asbestos and smoking cause lung cancer independently

- As our knowledge on disease increases, we may discover biomedical event, which can altered by each of these factors.



Web of Causation of Diabetes Mellitus

ASSOCIATION

1. Dependent and independent variable
2. Is there an association?
3. Is it positive or negative?
4. Is it strong or weak association?
5. Is it statistically significance?
6. Is it due error?

ASSOCIATION

1. Dependent or independent variable:

The first step is to examine an association is to identify both the dependent and the independent variable:

Dependent variable: is the outcome variable (s) or the variable of interest or concern or variable(s) whose values are a function of other variable(s) (called independent variable(s) in the relationship under the study).

Independent variable: An exposure, risk factor, or other characteristic being observed or measured that is hypothesized to influence an event or manifestation (the dependent variable)

ASSOCIATION

2. Is there an association?

The easiest way to examine presence or absence of an association is to check difference between groups. If one variable change (independent) and the second (Dependent) increase or decrease due to this changes, we can say: there is association.

3. Positive or negative association:

Positive and negative association are referred to the changes in the relationship between dependent and independent variable. If the change is in the same direction it is positive association. If one increase and the other decrease it is a negative association.

ASSOCIATION

4. Strong or weak association:

Strength of the association is measured by Relative Risk (RR) or by calculation of Odd's Ratio (OR).

There is a wide range for values of OR and RR, but in all cases the value (one) means the absence of the association.

All values less than one means negative association and all values higher than one mean a positive association.

Strong association is leading towards causality more than weak one.

ASSOCIATION

5. Is it statistically significant?

It is not essential for each association to reach a statical significance level.

Investigators has to state whether there is an association or not, then they have to state whether the hypothesized differences are statistically different.

This is measured by statistical test and measuring the "P" value. Calculation of confidence interval is a second method to measure the statistical significance.

CAUSATION IN EPIDEMIOLOGY

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CAUSATION

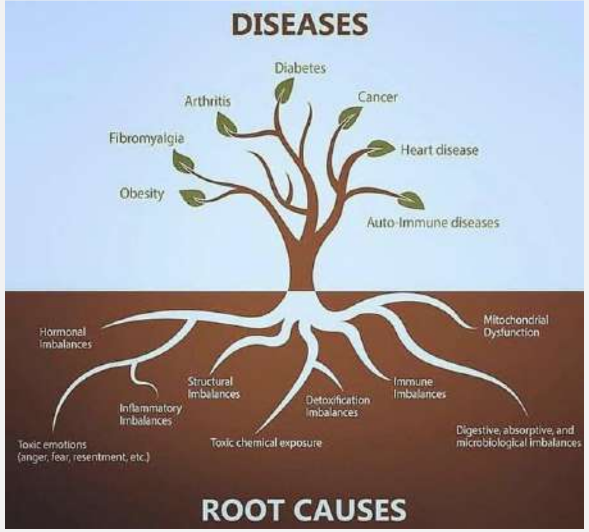
Epidemiological principles stand on two basic assumptions

- Human disease **does not occur at random**
- The disease and its **causal as well as preventive factors** can be identified by a thorough investigation of population
- Hence, identification of causal relationship between a disease and suspected risk factors forms part of epidemiological research.

CAUSE

"an event, condition, or characteristic that preceded the disease event and without which the disease event either would not have occurred at all or would have not have occurred until some time later"

– Rothman & Greenland



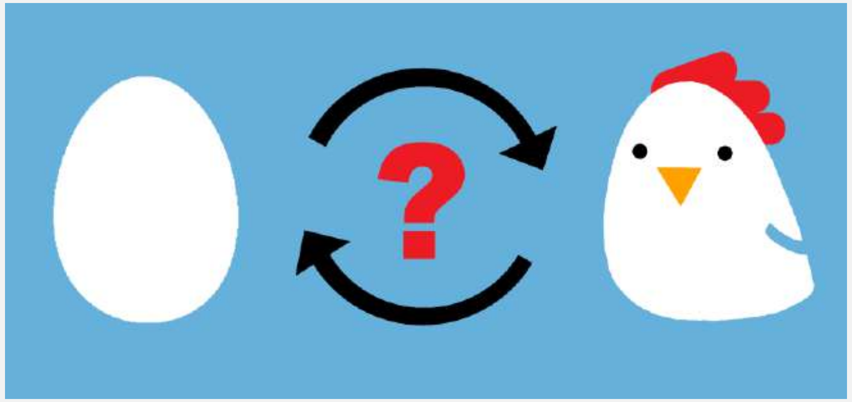
CAUSATION

- A major goal of epidemiology is to assist in the prevention and control of disease and in the promotion of health by discovering the causes of disease and the ways in which they can be modified

CAUSE

"that which produces an effect or result"

– Webster's



ASSOCIATION VS. CAUSATION

- Association is an identifiable relationship between an exposure and disease
- Association implies that exposure might cause disease
- Finding an association doesn't make it causal
- We infer (assume) causation based upon association and several other criteria

HILL'S CRITERIA FOR CAUSAL RELATIONSHIP

- Strength of association
- Consistency of findings
- Specificity of association
- Temporal sequence
- Biological gradient (dose- response)
- Biological plausibility
- Coherence and established facts
- Experimental evidence

STRENGTH OF ASSOCIATION

- Does exposure to the cause change disease incidence?
- The strength of the association is measured by the relative risk
- The stronger the association, the higher the likelihood of a causal relationship
- Strong associations are less likely to be caused by chance or bias

CONSISTENCY FINDINGS

- Consistency refers to the repeated observation of an association in different populations under different circumstances
- Causality is more likely when the association is repeated by other investigations conducted by different persons in different places, circumstances and time frames, and using different research designs.

SPECIFICITY OF ASSOCIATION

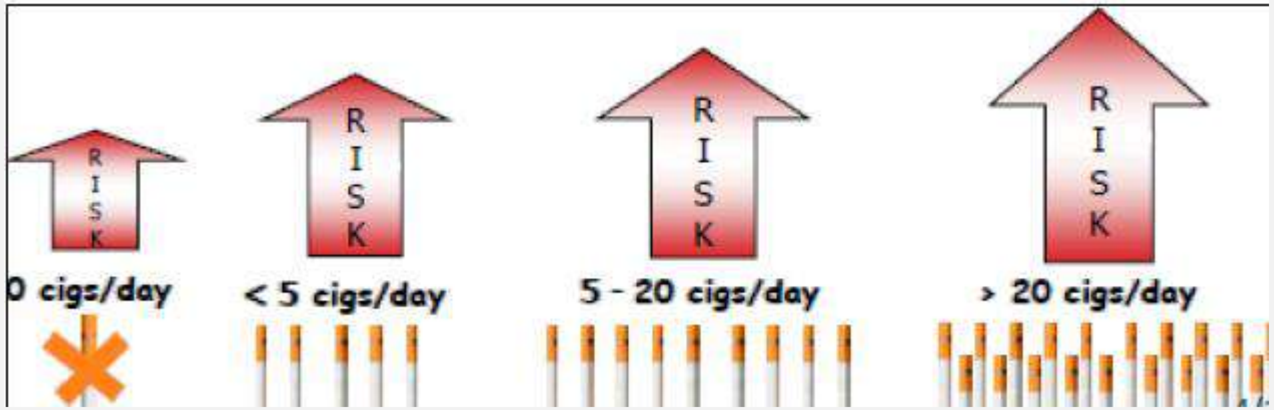
- It means that an exposure leads to a single characteristic effect or affects people with specific susceptibility
- Easier to support causation when association are specific but
- This may not always be the case as many exposures cause multiple diseases
- This is more feasible in infectious diseases than in non infectious diseases, which can result from different risk agents

TEMPORAL SEQUENCE (TEMPORALITY)

- Did the cause precede the effect?
- Temporality refers to the necessity that the cause must precede the disease in time
- This is the only absolutely essential criterion
- It is easier to establish temporality in experimental and cohort studies that in case- control and cross sectional studies

BIOLOGICAL GRADIENT
(dose- response relationship)

- Does the disease incidence vary with the level of exposure? (dose- response relationship)
- A dose- response relationship (if present) can increase the likelihood of a causal association



BIOLOGICAL GRADIENT

	Standardized Mortality Ratios (Lung Ca)		
Dose (cigs/day)	Study 1	Study 2	Study 3
<10	1.3	1.8	1.4
10-20	2.8	2.3	2.4
>40	4.7	3.7	6.3

BIOLOGICAL PLAUSIBILITY

- Is there a logical mechanism by which the supposed cause can induce the effect?
- Findings should not disagree with established understanding of biological processes

COHERENCE

- Coherence implies that cause and effect interpretation for an association
- Does not conflict with what is known of the natural history and biology of the disease

EXPERIMENTAL EVIDENCE

- It refers to evidence from laboratory experiments on animal or to evidence from human experiments
- Causal understanding can be greatly advanced by laboratory and experimental observations

HILL`S CRITERIA

- Cases of stomach cancer tend to be diagnosed 20 years after initial asbestos exposure.
- Seven previously published epi studies concluded that smoking is a risk factor for lung cancer.
- The odds ratio for association between liver CA and Hepatitis B is 0.8.
- There's a progressively higher RR of anemia with increased no tea drinking.

TYPE OF STUDY AND CAUSATION

Type of study	Ability to " prove" causation
Randomized controlled trials	Strong
Cohort studies	Moderate
Case-control studies	Moderate
Cross-sectional studies	Weak
Ecological studies	Weak

JUDGING THE CAUSAL BASIS OF THE ASSOCIATION

- No single study is sufficient for the causal inference
- It always necessary to consider multiple alternate explanations before making conclusions about the causal relationship between only two items under investigation
- Causal inference is not a simple process

- Consider weight of evidence
- Requires judgement and interpretation

CAUSAL RELATIONSHIP

- If a relationship is causal, four types of causal relationships are possible:

1. Necessary and sufficient
2. Necessary but not sufficient
3. Sufficient but not necessary
4. Neither necessary nor sufficient

NECESSARY AND SUFFICIENT

- A factor is both necessary and sufficient for producing a disease.
- Without that factor, the disease never develops (the factor is necessary), and the presence of that factor, the disease always develops (the factor is sufficient)

NECESSARY AND SUFFICIENT

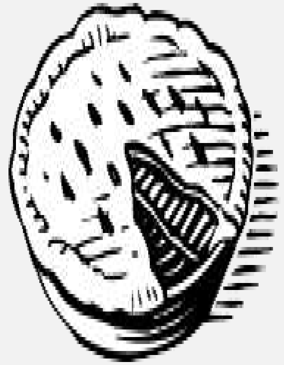
- A necessary cause is a causal factor whose presence is required for the occurrence of the effect. If disease does not develop without the factor being present, then we term the causative factor "necessary". E.g.: Agent in Malaria, Plasmodium Falciparum parasite is necessary factor (always present)
- Sufficient cause is " a minimum set of conditions, factors or events needed to produce a given outcome". Rabies is both necessary and sufficient.

EXAMPLE

- The tubercle bacillus is required to cause tuberculosis but, alone, does not always cause it
- So tubercle bacillus is a necessary, not a sufficient cause

ROTHMAN'S COMPONENT CAUSES AND CAUSAL PIES MODEL

- Rothman's model has emphasized that the cause of disease comprise a collection of factors
- These factors represent pieces of a pie, the whole pie (combination of factors) are the sufficient causes for a disease
- It shows that a disease may have more than one sufficient cause, with each sufficient cause being composed of several factors



ROTHMAN'S COMPONENT OF CAUSE AND CAUSAL PIES

- The factors represented by the pieces of the pie in this model are called component causes
- Each single component cause is rarely a sufficient cause by itself, but may be necessary cause.
- Control of the disease could be achieved by removing one of the components in each "pie" and if there were a factor common to all "pies" (necessary cause) the disease would be eliminated by removing that alone.

EXERCISE

- Some of the risk factors for heart disease are: smoking, hypertension, obesity, diabetes, high cholesterol, inactivity, stress and type A personality

- Are these factors necessary causes, sufficient causes, or component causes?

EXERCISE

- If a particular disease is caused by any of the three sufficient causes in the diagram. Which components if any are a necessary cause? (circle all that apply)

A. A

B. B

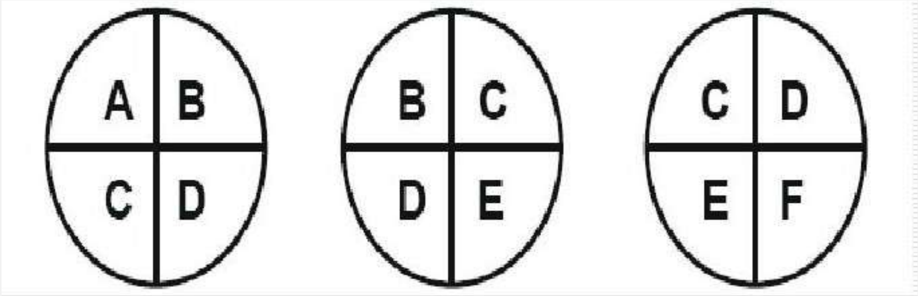
C. C

D. D

E. E

F. F

G. None



RISK AND RISK MEASUREMENT

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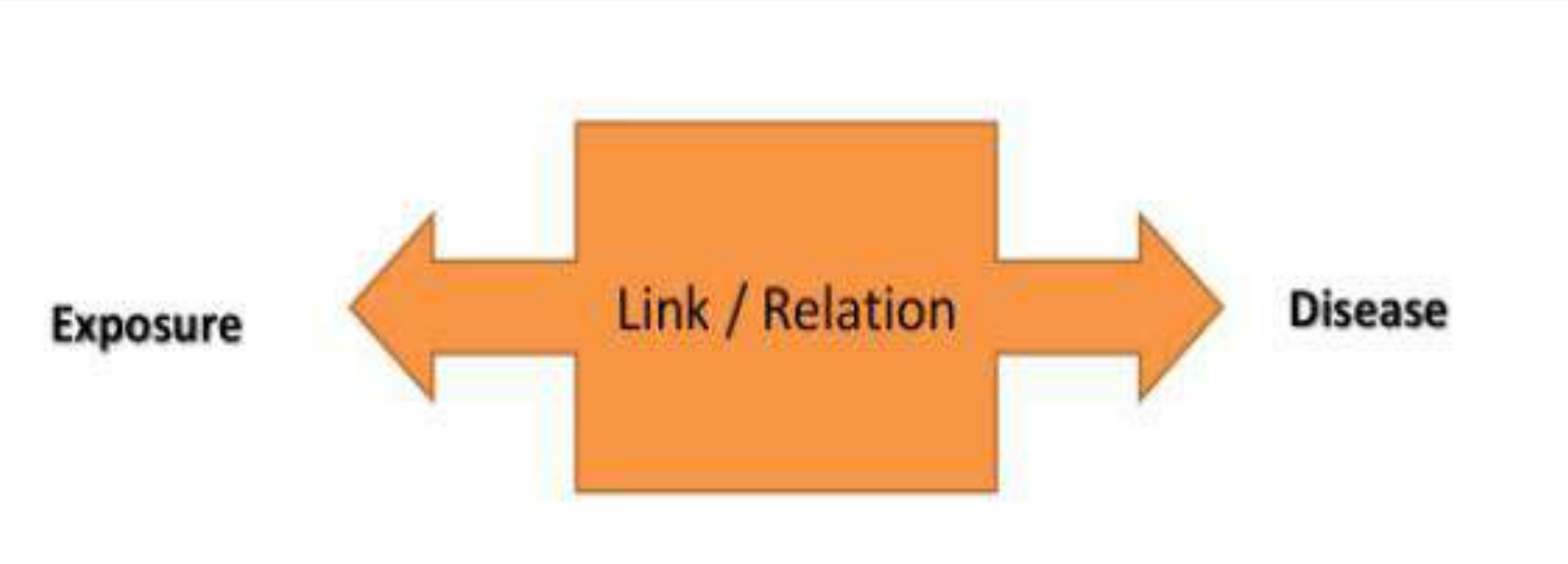
MEASURING OF RISK

Is there an association between Exposure and Disease ?
Do persons with exposure have higher level of disease than persons without exposure?
Is the association real? (Causal)



RISK AND MEASUREMENT OF RISK

Risk: the probability that an event will occurs, e.g. that an individual will become ill or die within a stated period of time or age.

The term is usually reference to unfavorable event.

Quantitative estimate of risk helps us provide the evidence to make public health choices

MEASUREMENT OF RISK

How can we measure the risk of event due to specific exposure?

Some measures are used. These measures depend on comparison between the incidence of the event among those who are exposed to specific exposure and those who are not.

Measurement of risk is an important tool in epidemiology. It is essential to identify the risk under observation among different groups.

Comparison of the risk among group could reveal the magnitude of the risk.

Measurement of the risk could be:

for one group (absolute risk)

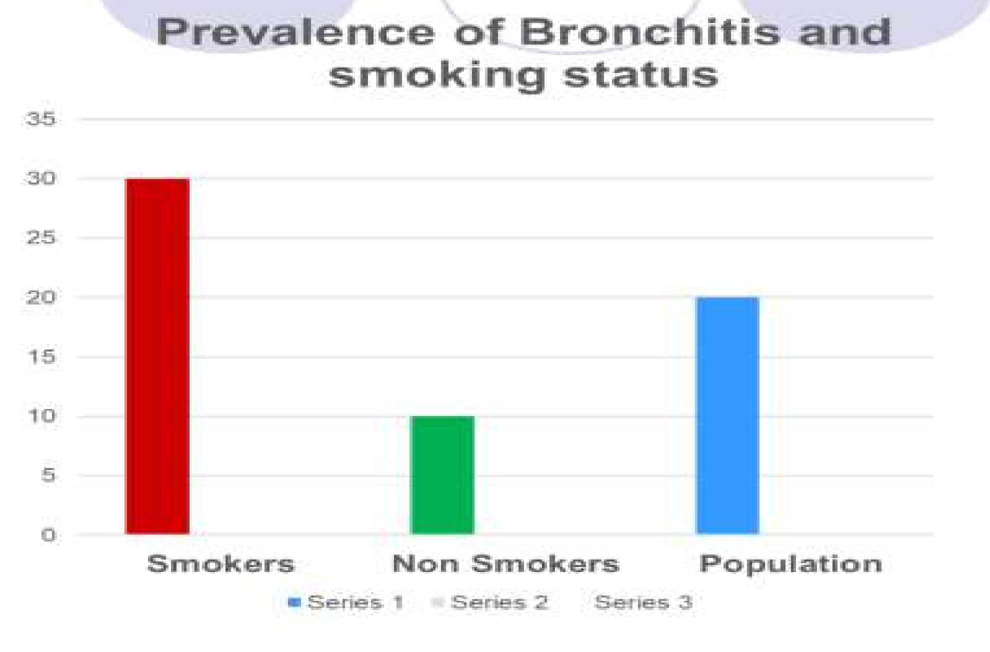
for comparing more than one group (Attributable risk and relative risk)

MEASUREMENT OF RISK

How much of the disease is present in certain group?

Absolute risk: Absolute risk is measured by the incidence of an event (disease) in a group or a population.

This can indicate the magnitude of the risk associated with certain exposure.



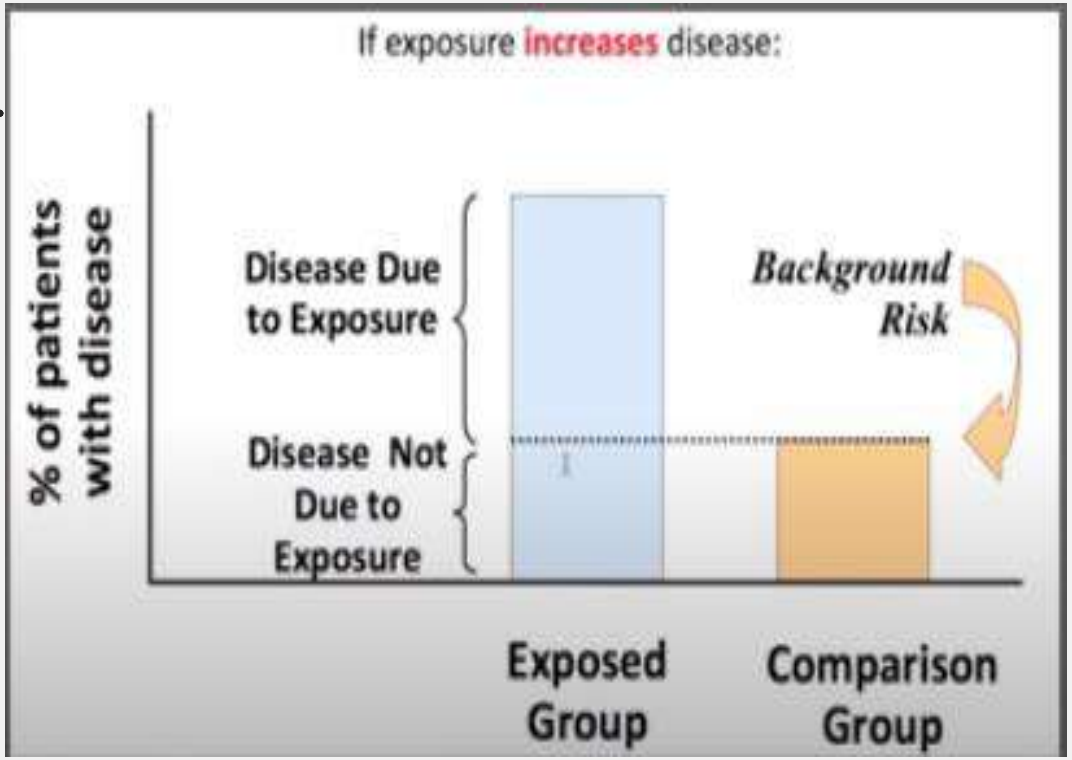
Ex: prevalence of bronchitis and smoking status

- Absolute risk in the population is 20%
- Absolute risk in smokers 30%
- Absolute risk in non-smokers 10%

ATTRIBUTABLE RISK

How much of the disease can be attributed to a certain exposure?

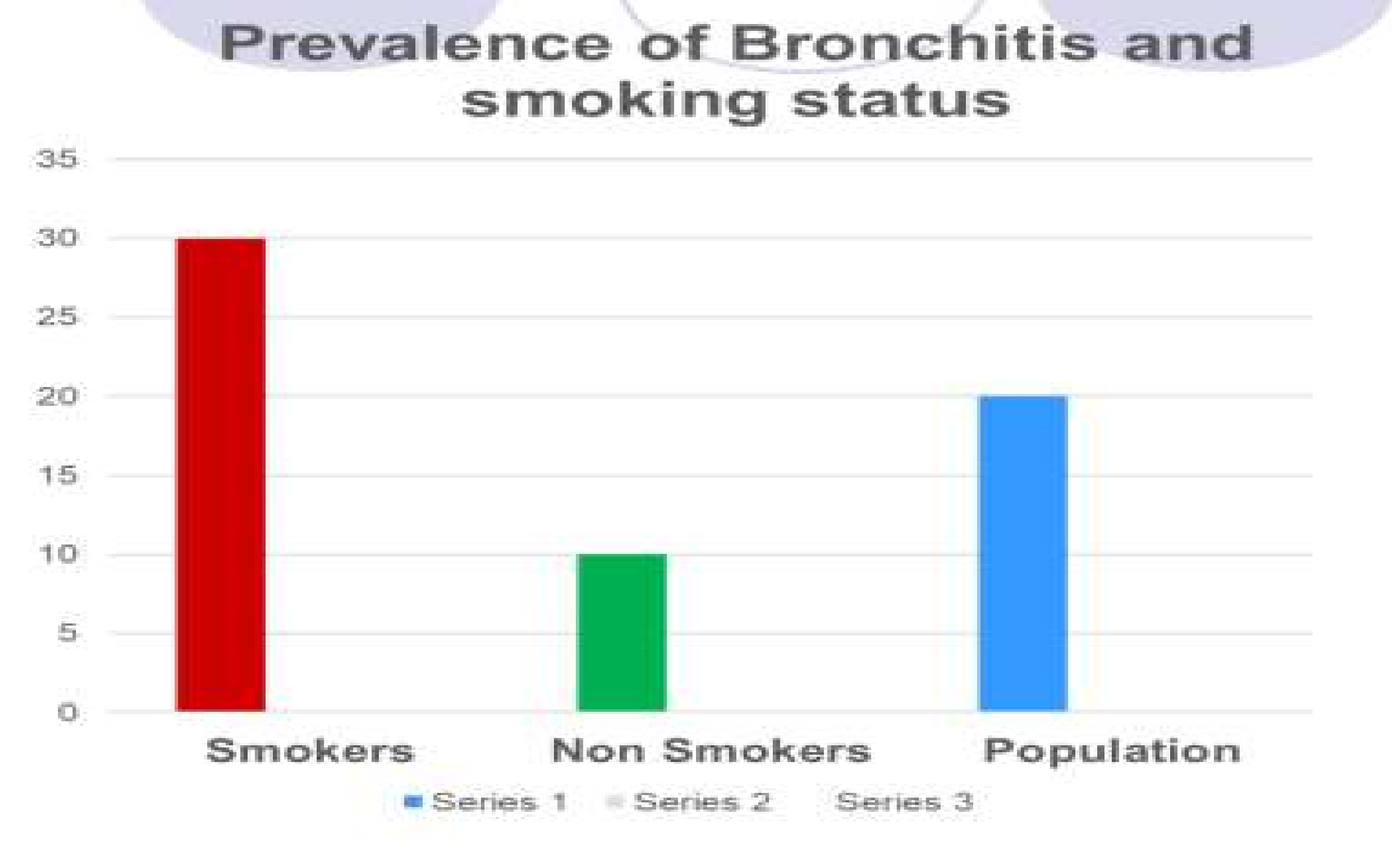
Attributable risk is the proportion of disease incidence that can be attributed to specific exposure.



Attributable risk is the risk of an event that is specifically due to the risk factor of interest.

Attributable risk =

(Incidence in exposed – Incidence in non exposed)



Attributable risk = (Incidence in exposed – Incidence in non exposed)]

= 30% - 10% = 20%

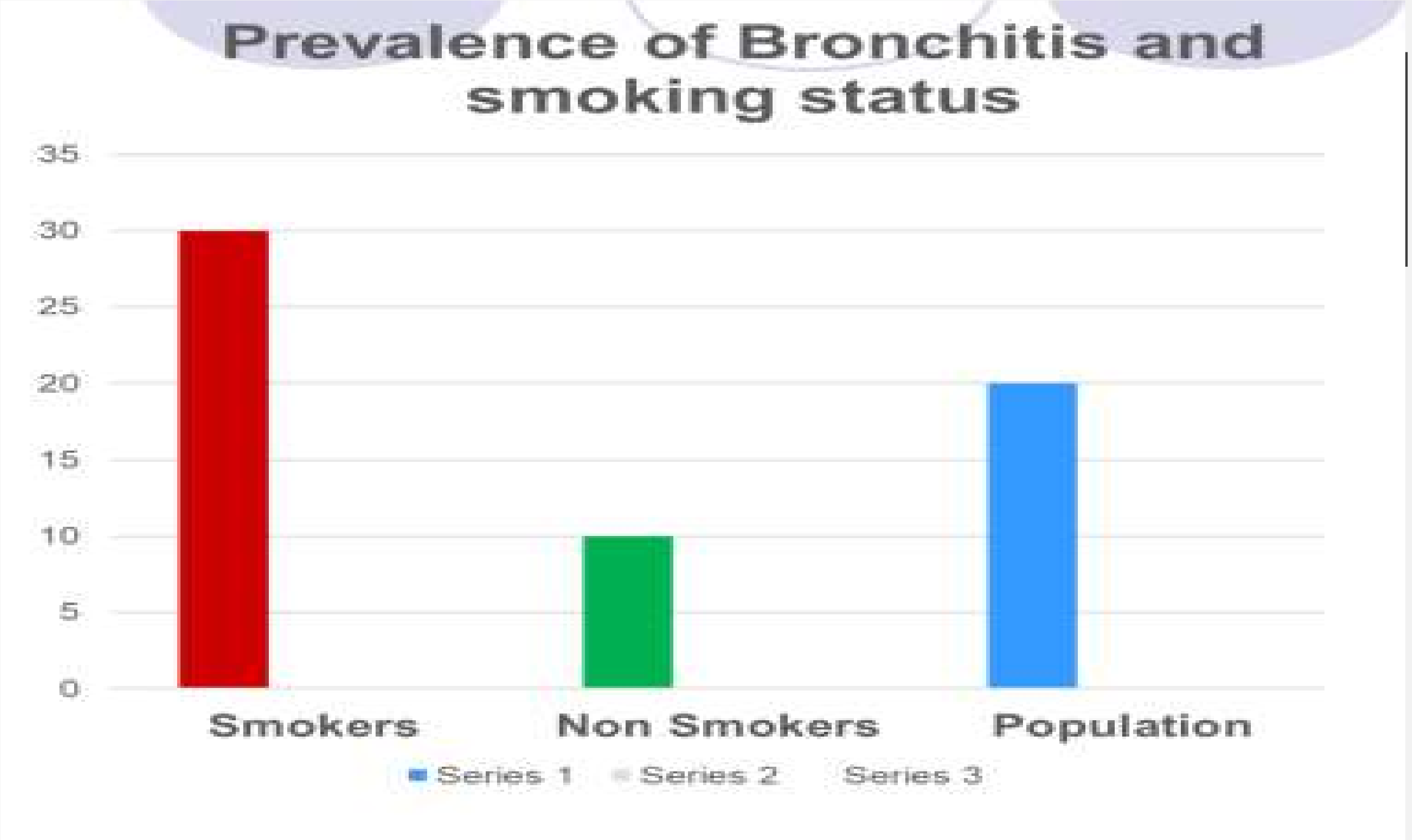
MEASUREMENT OF RISK

- 30% of smokers will have bronchitis
- 20 % of the bronchitis is attributable to smoking; while for the remaining 10 %, other causes are probably responsible

PROPORTIONAL ATTRIBUTABLE RISK

- Also called attributable risk percent
- It is a measure of public health impact of a causative factor
- It assumes that if the risk of disease in the exposed group is higher than the risk of the unexposed group, the difference can be attributed to the exposure,
- Proportion of the total incidence in the exposed group that is attributable to the exposure can be calculated by:

Proportion AR = (I. Exp. – I. Non Exp.)/ I. Exp.



Proportion AR = (I. Exp. – I. Non Exp.)/ I. Exp.

= 20% - 10% / 20% = 66.6%

PROPORTIONAL ATTRIBUTABLE RISK

- 66.6% of bronchitis among smokers, may be attributed to their smoking

PROPORTIONAL ATTRIBUTABLE RISK

Example

A study of smoking and lung cancer, the lung cancer mortality rate among nonsmokers was 0.07 per 1,000 persons per year. The lung cancer mortality rate among who smoked 1-14 cigarettes per day was 0.57 lung cancer deaths per 1,000 persons per year. Calculate the attributable proportion?

PROPORTIONAL ATTRIBUTABLE RISK

Measures of association: Attributable proportion

Attributable proportion = (0.57 – 0.07) / 0.57X 100%= 87.7%

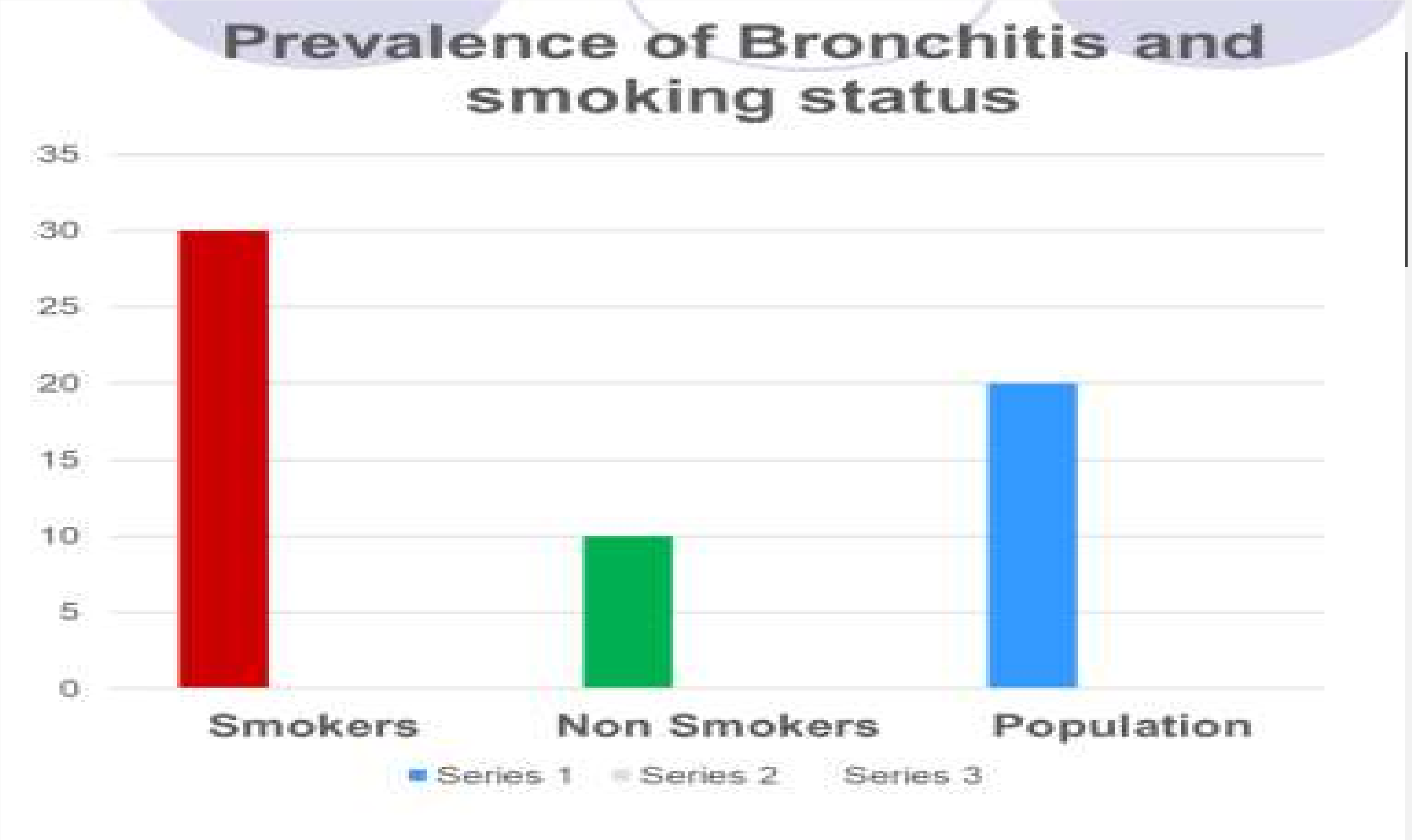
About 88% of the lung cancer among smokers of 1-14 cigarettes per day might be attributable to their smoking.

MEASUREMENT OF RISK

Relative Risk (Risk Ratio):

Relative Risk is the ratio of the incidence of event in exposed individuals to the incidence of event in non- exposed individuals.

Relative Risk (RR)= (I. in exposed population/ I. in non exposed population)



Proportion AR = I. Exp. / I. Non Exp

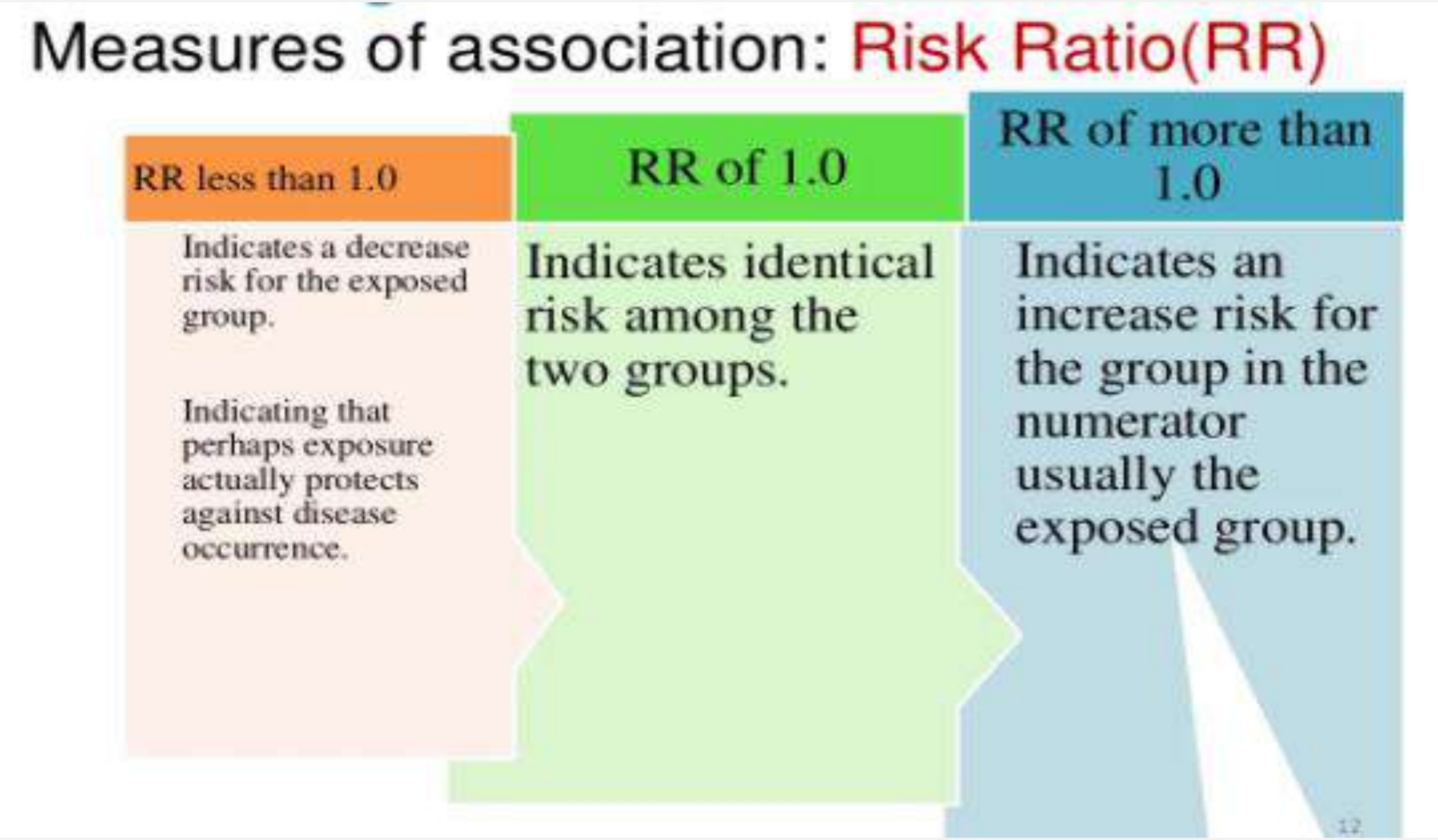
= 20% / 10% = 2

RELATIVE RISK

What is the meaning of RR = 1 , RR > 1, RR< 1?

- When Relative Risk equals one, the incidence among the exposed and non exposed is equal and therefore will be no association between the suspected risk factor and the disease.
- When Relative Risk is higher than one, the chance of the disease among the exposed is higher than the chance of the disease among non exposed and this indicates positive association.
- When Relative Risk is lower than one the incidence among the exposed is lower than the non exposed and the association is negative.

What is the meaning of RR = 1 , RR > 1, RR< 1?



RELATIVE RISK

- Incidence of Rickets is lower among children who are exposed to sunlight. There is negative association between exposure to sunlight and occurrence of rickets.
- Other example is the lower incidence of diseases among children who are exposed to vaccine.

MEASUREMENT OF RISK

Absolute risk = I. Exp. or I. Non-Exp or I. Population

Attributable risk = I. Exp. - I. Non-Exp

Proportionate attributable risk = I. Exp. - I. Non-Exp / I. Exp

Relative risk = I. Exp / I. Non-Exp

2x2 Contingency Table (Crosstab)

	Outcome +	Outcome -
Exposure +	a	b
Exposure -	c	d

This order is important!!

MEASUREMENT OF RISK

Factors	Incidence		Total
	Yes	No	
Exposed group	A	B	A+B
Non-exposed group	C	D	C+D

Incidence in exposed = A / A + B

Incidence in non exposed = C / C + D

Relative risk calculation

$$RR = \frac{a / (a + b)}{c / (c + d)}$$

where

Exposure	Cancer ✓	Cancer ✗
✓	a	b
✗	c	d

Example

$$RR = \frac{354 / (354 + 143)}{293 / (293 + 511)}$$

where

Exposure	Cancer ✓	Cancer ✗
✓	354	143
✗	293	511

$$RR = 2.54$$

RISK RATIO

Measures of association: Risk Ratio(RR)

Example

In an outbreak of varicella in Oregon in 2002, varicella was diagnosed in 18 of 152 vaccinated children compared with 3 of 7 unvaccinated children. Calculate the risk ratio..?

RISK RATIO

	Varicella +	Varicella -	Total
Vaccinated	18	134	152
Unvaccinated	3	4	7
Total	21	138	159

Risk of varicella among vaccinated children= 18/152 X100=11.8%
Risk of varicella among unvaccinated children= 3/7X100= 42.9%
RR=11.8/42.9=0.28

The vaccinated children were only approximately as one fourth to develop varicella as were unvaccinated children.

Example

In outbreak of T.B among prison inmates in South Carolina in 1999, 28 of 157 inmates residing on the east wing of the dormitory developed T.B, compared with 4 of 137 inmates residing on the west wing.

RELATIVE RISK (RR)

Relative Risk used in Cohort studies, also can be used in cross sectional as well as clinical trials

ODDS RATIO

The odds of an event can be defined as the ratio of the number of ways the event can occur to the number of ways the event can occur (p/1-p).

It is another measurement that quantifies the relationship between an exposure with two categories and health problem

	Diseased	**Healthy**
Exposed	A	B
Non exposed	C	D

OR = (A/B) / (C/D) = AD/CB

ODDS RATIO

- Try to calculate for case control study and for prospective study.
- **In cohort studies:** we compare the disease between exposed and non exposed population
- Odds ratio is the ratio of the odds of exposed people developing the disease to the odds of non exposed people developing the disease.

- **In case control retrospective studies:** we compare exposure between the diseased and the non diseased
- Odds ratio is the ratio of the odds of the cases having been exposed to the odds of controls having been exposed.

Odds ratio

	Disease CASES	No disease CONTROLS
Exposed	a	b
unexposed	c	d

$$\text{Odds of exposure in cases} = \frac{\#\text{ cases with exposure}}{\#\text{ cases without exposure}} = \frac{a}{c}$$

$$\text{Odds of exposure in controls} = \frac{\#\text{ controls with exposure}}{\#\text{ controls without exposure}} = \frac{b}{d}$$

$$\frac{\text{odds of exposure in cases}}{\text{odds of exposure in controls}} = \frac{a/c}{b/d} = \frac{ad}{bc} = \text{OR}$$

Odds Ratios in Case-Control and Cohort Studies

Cohort	Develop disease	Do not develop disease
Exposed	a	b
Not exposed	c	d

Odds ratio=

$$\frac{\text{Odds that an exposed person Develops disease}}{\text{Odds that a non-exposed Person develops disease}}$$

$$= \frac{a/b}{c/d}$$

$$= \frac{ad}{bc}$$

Case-control	Cases	Controls
History of exposure	a	b
No history of exposure	c	d

Odds ratio =

$$\frac{\text{Odds that a case was exposed}}{\text{Odds that a control was exposed}}$$

$$= \frac{a/c}{b/d}$$

$$= \frac{ad}{bc}$$

Case-control studies

A) Odds ratio of exposure and odds ratio of disease

Hypothetical cohort **study** of the one-year incidence of acute myocardial infarction for individuals with severe systolic hypertension (HTN, ≥180 mm Hg) and normal systolic blood pressure (<120 mm Hg).

Severe Systolic HTN	Number	Myocardial infarction	
		Present	Absent
Yes	10000	180	9820
No	10000	30	9970

$$OR_{dis} = \frac{Odds_{dis\ exp}}{Odds_{dis\ non\text{-}exp}} = \frac{\frac{180}{9820}}{\frac{30}{9970}} = 6.09$$

same

Hypothetical case-control **study** assuming that all members of the cohort (cases and non cases) were identified*

Severe Syst HTN	Cases	Controls
Yes	180	9820
No	30	9970

$$OR_{exp} = \frac{Odds_{exp\ cases}}{Odds_{exp\ non\text{-}cases}} = \frac{\frac{180}{30}}{\frac{9820}{9970}} = 6.09$$

INTERPRETATION

- The **odds** of a case having had exposure(HTN) are **6.09** times the **odds** of its having the normal HTN exposure.
- The **odds** of exposed people to develop the disease are **6.09** times the **odds** of non exposed people to develop the disease.

ODDS RATIO

Measures of association: Odds Ratio(OD)

Example

	Disease+	Disease-	Total
Exposed	100	1900	2000
Not Exposed	80	7920	8000
Total	180	9820	10000

OD= 100X7920 / 1900X80 = 5.2

ODDS RATIO

Example

A case control study was conducted in Hamad Hospital to compare 35 lung cancer cases to controls to determine the associated factors related to lung cancer. Out of 117 subjects in the sample, 88 were daily smokers. Only two cases were found to be nonsmokers.

Calculate the Odds Ratio and interpret it. ?

ODDS RATIO

	Cases Lung Cancer	Controls Without Lung Cancer	Total
Daily Smokers	33	55	88
Nonsmokers	2	27	29
Total	35	82	117

Odds Ratio = 33X 27 / 2X55 = 8.1

Daily Smokers showed risk of having lung cancer 8.1 times that of nonsmokers.

ODDS RATIO

The odds ratio can be calculated in cohort and case-control studies

ANY RELATION BETWEEN RELATIVE RISK AND ODDS RATIO ??

Relative Risk	Odds Ratio
• Needs incidence of the disease.	• Incidence not for its calculation.
• Usually in Prospective, cross sectional and clinical trail Studies.	• Retrospective studies and in cross sectional.
• demonstrates temporality.	• Good estimate for RR in case of low frequency disease.
	• OR can overestimate risk, in rare disease.

TO SUMMARIZE

- Relative risk and odds ratio are important as measures of the strength of association
  - Important for deriving causal inference.

- Attributable risk is a measure of how much disease risk is attributed to a certain exposure
  - Useful in determining how much disease can be prevented.

TO SUMMARIZE

Relative risk is valuable in etiologic studies of disease.

Attributable risk is useful for Public Health guidelines and planning.

HEALTH INDICATORS

Dr .Ayda Ahmad Helles

Measuring the health of a population

When we measure we know better

“CDC”

“Not everything that can be counted counts, and not everything that counts can be counted”

- Albert Einstein

HEALTH INDICATORS

- The measure of health and disease is fundamental to the practice of epidemiology.
- A variety of measures are used to characterize the overall health of populations.
- Population health status is not fully measured in many parts of the world, and this lack of information poses a major challenge for epidemiologists

USES OF HEALTH INDICATORS

- Measurement of the health of the community.
- Compare health status of one community with another whether in the same continent or globally.
- Assessment of health care needs.
- Proper allocation of human and non-human resources according to the needs.
- Monitoring and evaluation of health services, activities, and programs.
- Compare health status of different areas or groups of people over time.

CHARACTERISTICS OF INDICATORS

1. Valid: They should actually measure what they are supposed to measure, e.g., using the case fatality rate to measure the severity of a disease.

2. Reliable: give similar results when the measure is used for the same person in different times with similar circumstances.

3. Objective: does not depend on subjective feelings of the persons, but depends on defined standards.

4. Sensitive: they should be sensitive to the changes in the measured condition

CHARACTERISTICS OF INDICATORS

5. Specific: only reflects the changes in the measured condition.

6. Feasible: they should have the ability to obtain data needed.

7. Relevant: they should contribute to the understanding of the phenomenon of interest.

HEALTH INDICATOR

- Health indicator: A measure that reflects or indicates the state of health of persons in a defined population"
- Basic statistics: Most indicators are calculated as a rate, there are three different ways to calculate the statistics as: Ratio, proportion and rate.
- Ratio: relationship between two figures: 4M, 6F . So the ratio of male to female is 2:3
- Proportion: is a specific type of ratios in which the numerator is included in the denominator. (Proportion of males in the class is 4/10 and the proportion of females is 6/10)

HEALTH INDICATOR

- Rate: A rate measures the probability of occurrence of some particular event. A rate is in the form of: (x/y) X k
- Rate: (Number of events in a specific period/ Specified population at risk of these events) X k
- K= 10x
- X= number of times at event has occurred during a specific interval of time.
- Y= number of persons exposed to the risk of events during same interval
- K= some round number (100; 1000; 100000; etc…..)

HEALTH INDICATOR

A. Natality rates:

Measures the frequency of births (Crude Birth Rate) and the probability of births (Fertility Rates)

Crude Birth Rate:

Definition: The number of live births in a calendar year per the number of mid year population during the same period, multiplied by 1000

- Therefore, the formula for crude birth rate is

$$\text{The crude birth rate} = \frac{\text{number of births per year}}{\text{Total population}} \times 1000$$

Example.

In 2007, there were 3,250 births in a city with population of 223,000. Therefore:

$$CBR = \frac{3{,}250}{223{,}000} \times 1000$$

$$CBR = 14.57$$

So, there were 14.57 births for every 1,000 people in the city.

- Birth rates (BR) and Infant mortality rates (IMR) per 1000 in selected countries (WHO-1996)

Country	BR	IMR
Afghanistan	53.4	154.4
Uganda	51.1	112.8
Somalia	50.0	111.9
Jordan	37.5	29.7
Egypt	26.1	54.4
Turkey	21.9	43.7
England	11.9	6.1
Sweden	10.9	5.1

- In this table compare between the 3 groups:

Group 1: Afghanistan- Uganda- Somalia

Group 2: Jordan- Egypt- Turkey

Group3: England- Sweden

- What is the common for each group?

HEALTH INDICATORS

B. Morbidity:

- Incidence: measures the rapidity with which a disease occurs or the frequency of addition of new cases of disease. Incidence always calculated for a given period of time for a defined geographical area.

Incidence calculation:

$$\text{Incidence: } \frac{\text{New cases in defined population}}{\text{Total population at risk over a specific period of time}} \times 10^n$$

HEALTH INDICATORS

- For example,

If there had been 500 new cases of an illness in a population of 30.000 in a year, the incidence rate would be:

500/30000 x 1000 = 16.7 per 1000 population per a year

HEALTH INDICATORS

- In 2016 the incidence of diabetes mellitus in Palestine was 174.6 cases per 100.000 population.
- In 2016, the incidence rate of cancer in West Bank was 86.4 new cases per 100,000 populations

Incidence Rate Calculation (IWHS Data)

$$\text{Incidence rate} = \frac{\text{Number of new cases over a time period}}{\text{Total population at risk during the same time period}} \text{ X multiplier (e.g., 100,000)}$$

Number of new cases = 1,085
Population at risk = 37,105

$$\text{Incidence rate} = \frac{1{,}085}{37{,}105} = 0.02924/8 = 0.003655 \times 100{,}000$$

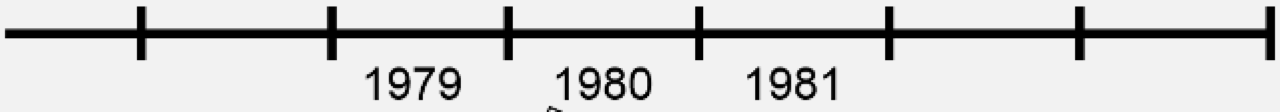
$$= 365.5 \text{ cases per 100,000 women per year}$$

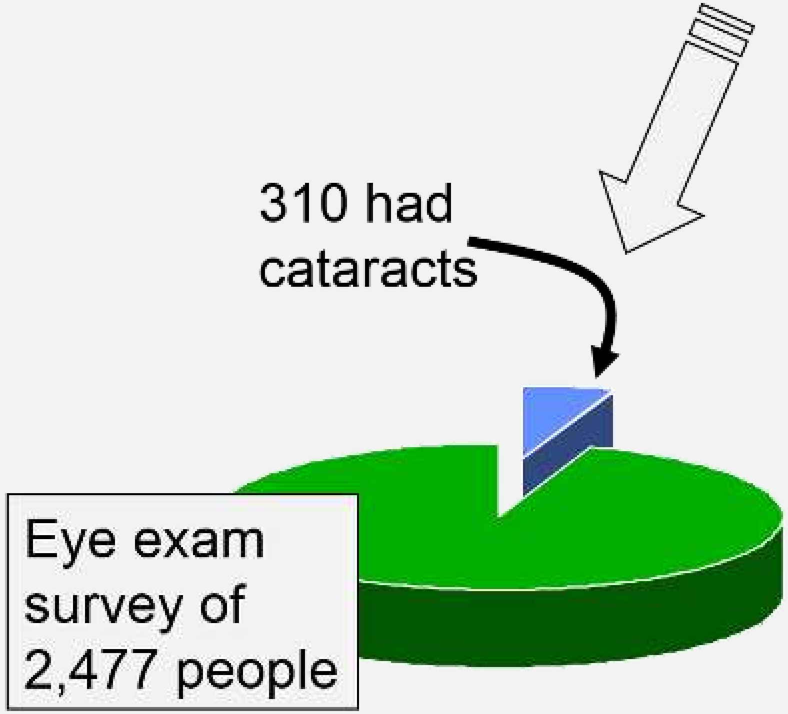
HEALTH INDICATORS

- Prevalence: measures the frequency of all current cases of disease (old and new) and is in two types:

(1) Point prevalence: measures the frequency of all current cases of a disease (old and new) at a given instant in time

(2) Period prevalence: measures the frequency of all current cases of disease (old and new) for a prescribed period of time



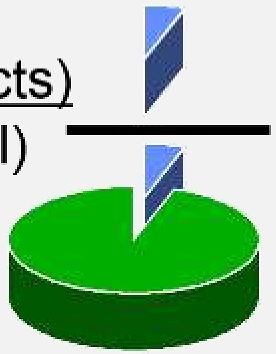


Prevalence

$$= \frac{310 \text{ (cataracts)}}{2{,}477 \text{ (total)}}$$

$= 0.125$

$= 12.5\%$



Example

Suppose we followed a population of 150 persons for one year, and 25 had a disease of interest at the start of follow-up and another 15 new cases developed during the year.

1) What is the period prevalence for the year?

$$PP = (25 + 15) / 150 = 0.27 \text{ or } 27\%$$

2) What is the point prevalence at the start of the period?

$$P = 25/150 = 0.17 = 17\%$$

HEALTH INDICATORS

- Attack rate: Incidence rate usually expressed as a percent, used for particular populations, and observed for limited periods of time, as in an epidemic. Attack rate is applied include food born outbreak in restaurants or schools.

Attack rate: (Number of new cases/ Population at Risk) X 100

- Secondary attack rate: It is a measure of the frequency of new of a disease among the contacts of a known case.

Secondary attack rate: (Number of cases among contacts of primary cases/ Total number of contacts) X 100

HEALTH INDICATORS

- Examples:

Thirty cases of measles occurred among 600 primary school children. All the children contacts of the thirty cases were followed up. The total number of the children was 120. Nine children new cases reported during the follow up.

Attack Rate: 30/600 x 100 = 5%

Secondary attack rate: 9/(120-30)x100

=9/90x100=10%

Attack Rate

- To calculate a food specific attack rate:
  - $\frac{\text{Number of people who ate a particular food and got sick}}{\text{Total number of people who ate that particular food}} \times 100\%$
  - Example - $\frac{\text{\# of people who ate fish and got sick}}{\text{Total \# of people who ate fish}} \times 100\%$

7 people/10 people x 100% = 70% attack rate

HEALTH INDICTOR

D. Mortality:

Mortality rates measure the frequency of deaths within a specific populations and are calculated for a given time interval and place.

Causes of death: the underlying cause of the death as indicated in the death certificate.

It is defined as:

a) The disease or injury which initiated the train of morbid events leading directly to death
b) The circumstances of the accident or violence which produced the fatal injury

HEALTH INDICATOR

- General mortality rate (Crude Death Rate)
- Specific mortality rates:
- Infant mortality rate
- Neonatal mortality rate
- Post neonatal mortality rate
- Maternal mortality rate

CRUDE DEATH RATE

- The number of all deaths occurring in a calendar year per the number of mid year population during the same period multiplied by 1000

- CDR = (Total number of deaths/ mid year population) X 1000

How to calculate Crude Death Rate?

$$\text{The crude death rate} = \frac{\text{number of death per year}}{\text{Total population}} \times 1000$$

Example.

In 2007, there were 4,000 death in a city with population of 2,000,000. Therefore:

$$\text{CBR} = \frac{4{,}000}{2{,}000{,}000} \times 1000$$

CDR =2

So, there were 2 death for every 1,000 people in the city.

HEALTH INDICATORS

- Cause Specific Death Rate: This is defined as the mortality rate from a specified cause for a population.

- Cause specific death = (Deaths attributed to a specific disease/ mid year population) X 100.000

- Palestinian MOH published in 2005: deaths due to accidents: 9.1 per 100.000 in 1995 to 14.5 per 100.000 in 2005. For diabetes it has been increased from 7.9 per 100.000 in 1995 to 8.6 per 100.000 in 2005

Question 3

- In the year 2000, City A had a population of 200,000. 200 existing cases of colon cancer were reported, 80 of which were diagnosed in 2000. 50 deaths were attributed to colon cancer.

What measure would you use to estimate:

- death rate for colon cancer?
  - Cause-specific mortality rate = 50 / 200,000 = 0.00025 x 100,000 = 25 per 100,000 population

HEALTH INDICATORS

- Case Fatality Rate: the proportion of persons with a particular condition who die from that condition.
- Case Fatality Rate = (Number of deaths among specific disease/ Number of reported cases of the same disease) X K
- Case fatality of Rabies is 100%, while in flue it does not reach one percent.

Question 4

- In the year 2000, City A had a population of 200,000. 200 existing cases of colon cancer were reported, 80 of which were diagnosed in 2000. 50 deaths were attributed to colon cancer.

What measure would you use to estimate:

- the proportion of colon cancers that are fatal?
  - Case fatality rate = 50 / 200 = 0.25 x 100 = 25%

HEALTH INDICATORS

- Proportionate mortality: It is the proportion of deaths in a specified population over a period of time attribute to different causes.
- Proportionate mortality= (Deaths due to specific disease/ total deaths during the same period)

Example:

Assume a population of 1,00,000 of whom, 20 are sick with the disease X and in that year 18 die from the disease X and total deaths from all causes is 36.

Crude Death rate = 36 per 1 lakh population

Case fatality rate = 18/20 X 100 = 90%

Proportional mortality rate = 18/36 x 100= 50%

HEALTH INDICATOR

- Infant mortality:

The death of live-born infants before his first birthday. Infant mortality rate: The number of infant deaths occurring in a calendar year per the number of live births occurring in the same period multiplied by 1000.

- Neonatal death rate:

The number of death of a live born infant from birth to less than 28 days of life occurring during the same period, multiplied by 1000.

The first 7 days is called the early neonatal period and the following 21 days is known as late neonatal period.

$$IMR = \frac{\text{No.of deaths among infants in the year}}{\text{No.of live births occurring in the year}} \times 1000$$

$$= \frac{350}{6500} \times 1000 = 53.8461$$

$$NMR = \frac{\text{Total number of deaths of neo-natal babies in a year}}{\text{Total number of live births occuring in the year}} \times 1000$$

$$= \frac{18}{6500} \times 1000 = 2.7692.$$

HEALTH INDICTOR

- **Post neonatal death rate:** The number of deaths of a live born infant after 28 days of life and before his first birthday occurring in a calendar year per the number of live births occurring during the same period multiplied by 1000.
- **Fetal death:** Death prior to the complete expulsion or extraction from it's mother as a product conception, irrespective of the duration of pregnancy.
- **Fetal mortality rate:** The number of fetal deaths divided by the sum of the number of live births plus the number of fetal deaths in a specified period of time period multiplied by 1000

FETAL MORTALITY RATE

3. Examples:

820 fetal deaths in 2008 among state residents

130,000 live births in 2008 to state residents

820/(130,000+820) x 1,000 = **<u>6.3</u>** fetal deaths per 1,000 live births plus fetal deaths in 2008 among state residents

POST NEONATAL MORTALITY RATE

3. Examples:

300 = postneonatal deaths in 2008 among state residents

150,000 = live births in 2008 to state residents

(300/150,000) x 1,000 = **2.0** postneonatal deaths per 1,000 live births in 2008 among state residents

HEALTH INDICATOR

- Perinatal mortality rate:

Perinatal period is the period around the time of delivery so it includes the early neonatal period and stillbirths. It is defined as the rate of deaths occur after 28 week of gestation till the 7^{th} day after birth.

PMR = (Deaths from 28^{th} week of gestation till the 7^{th} day after birth/ (No. of still births+ No. of live births)) X 1000

PERINATAL MORTALITY RATE

3. Examples:

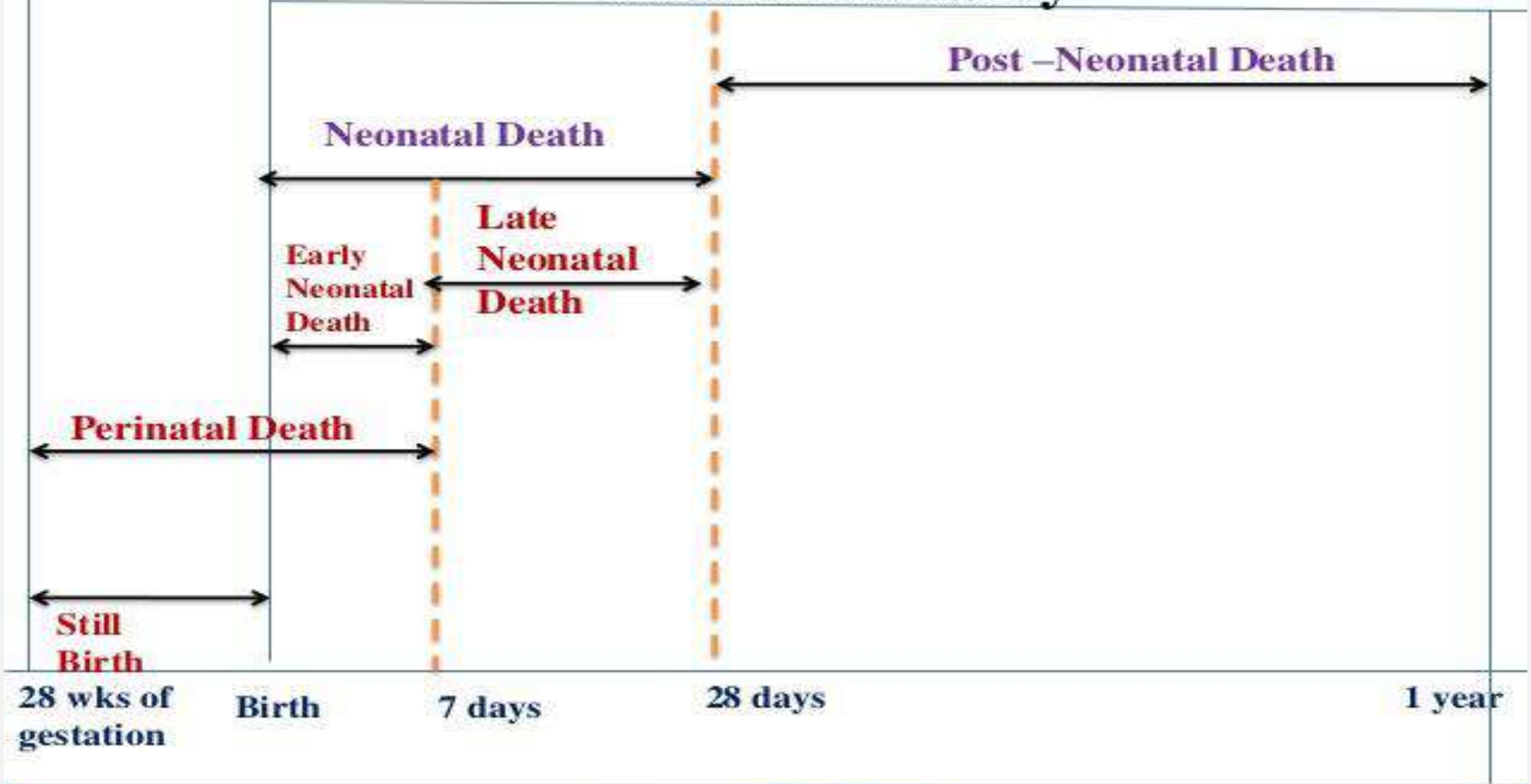
700 fetal deaths of 28 or more weeks gestation in 2008 among state residents

300 newborns dying under 7 days of age in 2008 among state residents

150,000 live births in 2005 among state residents

[(700 + 300) / (150,000 + 700)] x 1,000 = **6.6** perinatal deaths per 1,000 live births and fetal deaths of 28 or more weeks gestation in 2008 among state residents

Infant Mortality



Source: K Park, PSM

HEALTH INDICATOR

- Maternal death:

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but no accidental or incidental causes.

- Measurement of maternal mortality:

- Maternal mortality ratio
- Maternal mortality rate

HEALTH INDICATOR

- Maternal mortality ratio:

Is defined as the number of maternal deaths during a given time period per 100.000 live births during a given time period. It is calculated as the following:

MM Ratio = (Maternal deaths/ Total live births) X 100.000

- Maternal mortality rate:

Is defined as the number of maternal deaths in a given period per 100.000 women of reproductive age during the same time period

MM Rate = (Maternal deaths/ Women of reproductive age) X 100.000

MATERNAL MORTALITY RATIO

3. Examples:

84 maternal deaths in 2008 among state residents
130,000 live births in 2008 to state residents

84/130,000 x 100,000 = **64.6** maternal deaths per 100,000 live births in 2008 among state residents


THANK
YOU

COMMUNICABLE DISEASES

Dr .Ayda Ahmad Helles

EPIDEMIOLOGIC TRANSITION

Past

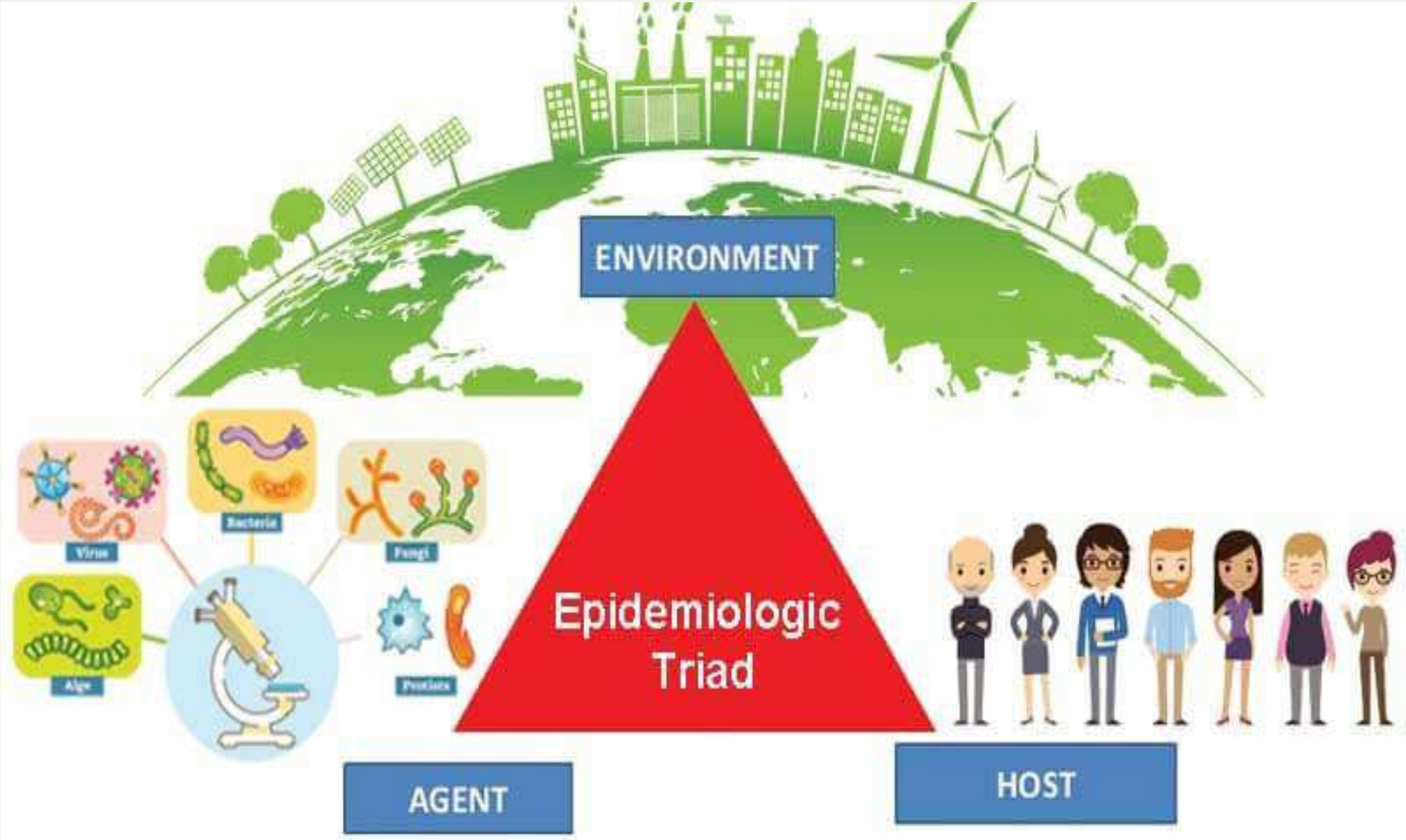
1. Deficiency diseases
2. Infectious diseases

Short latent period, single cause

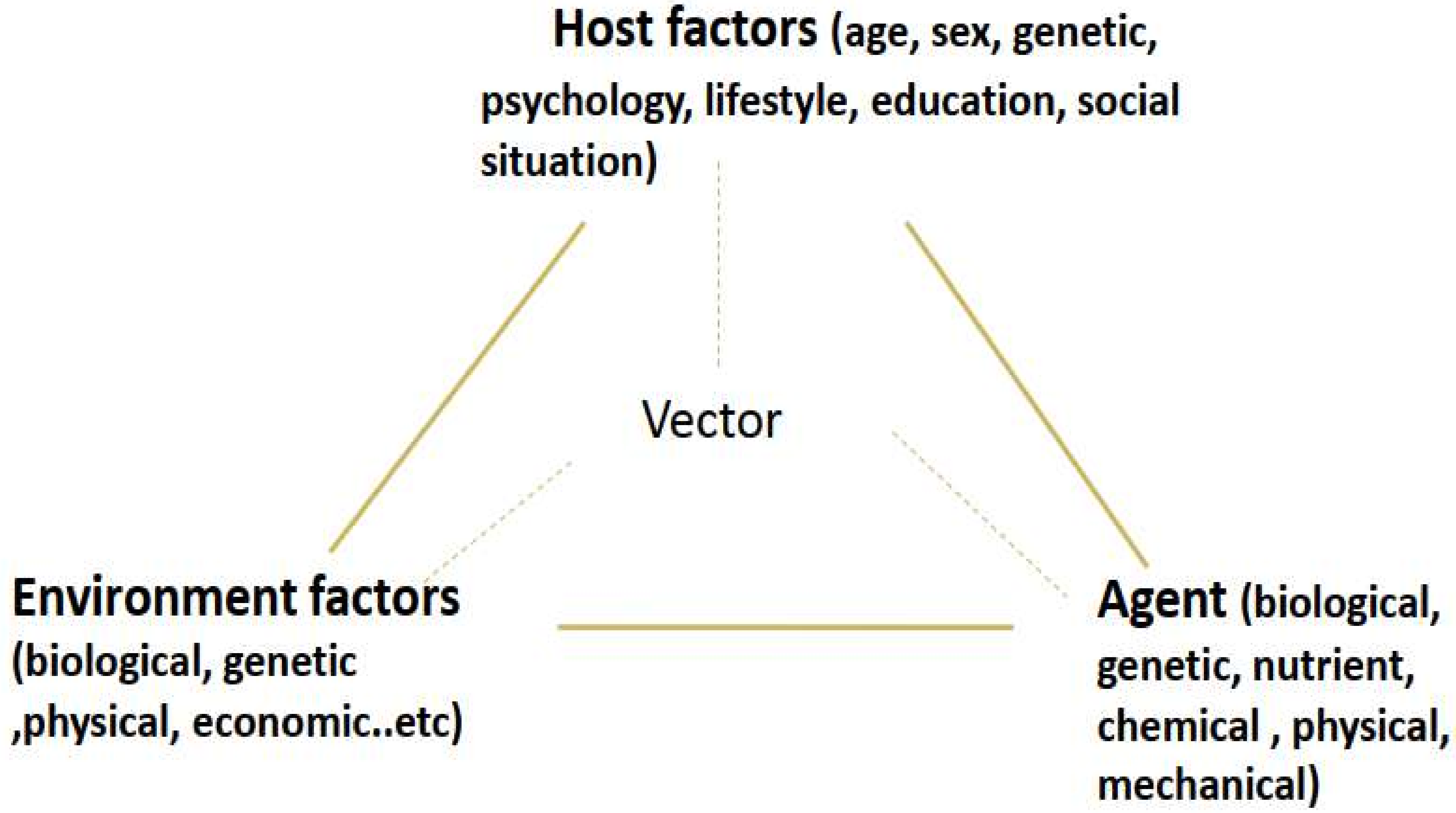
Present

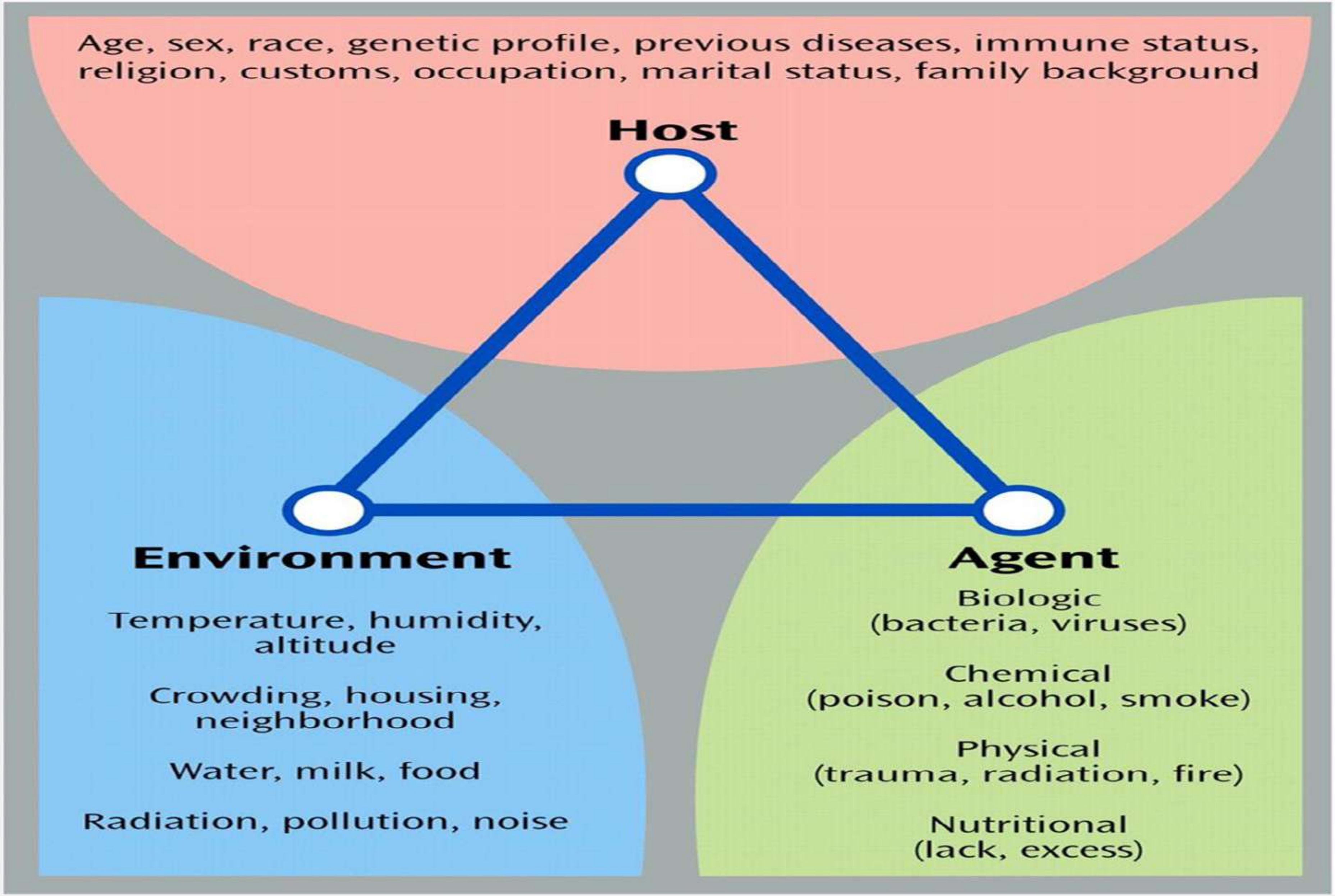
1. Chronic diseases
2. Cancer, CVD, diabetes

Long latent period, multiple causes



ENVIRONMENT
Epidemiologic Triad
Virus
Bacteria
Fungi
Alge
Protista
AGENT
HOST


Host factors (age, sex, genetic, psychology, lifestyle, education, social situation)
Vector
Environment factors (biological, genetic ,physical, economic..etc)
Agent (biological, genetic, nutrient, chemical , physical, mechanical)


Age, sex, race, genetic profile, previous diseases, immune status, religion, customs, occupation, marital status, family background
Host
Environment
Temperature, humidity, altitude
Crowding, housing, neighborhood
Water, milk, food
Radiation, pollution, noise
Agent
Biologic (bacteria, viruses)
Chemical (poison, alcohol, smoke)
Physical (trauma, radiation, fire)
Nutritional (lack, excess)

INFECTIOUS DISEASES (HISTORICAL PERSPECTIVES)

- 1950s, widespread use of penicillin, the development of polio vaccines, and the discovery of drugs for tuberculosis
- 1967, the US Surgeon General stated that "the war against infectious diseases has been won"

FACTORS CONTRIBUTING TO THE EMERGENCE OF COMMUNICABLE DISEASES

1. Human behaviors – high risk e.g. Drug use, unhealthy diet creates susceptible host
2. International travel, migration
3. Urbanization
4. Widespread use of antibiotics – leading to drug resistance
5. Environmental changes

DEFINITIONS

- Communicable disease: an illness due to a specific infectious agent or its toxins that arises through transmission from an infected person, animal, or inanimate reservoir to a susceptible host; either directly or indirect

- Infection: entry, development &/or multiplication of the infectious agent in the body of man or animal.

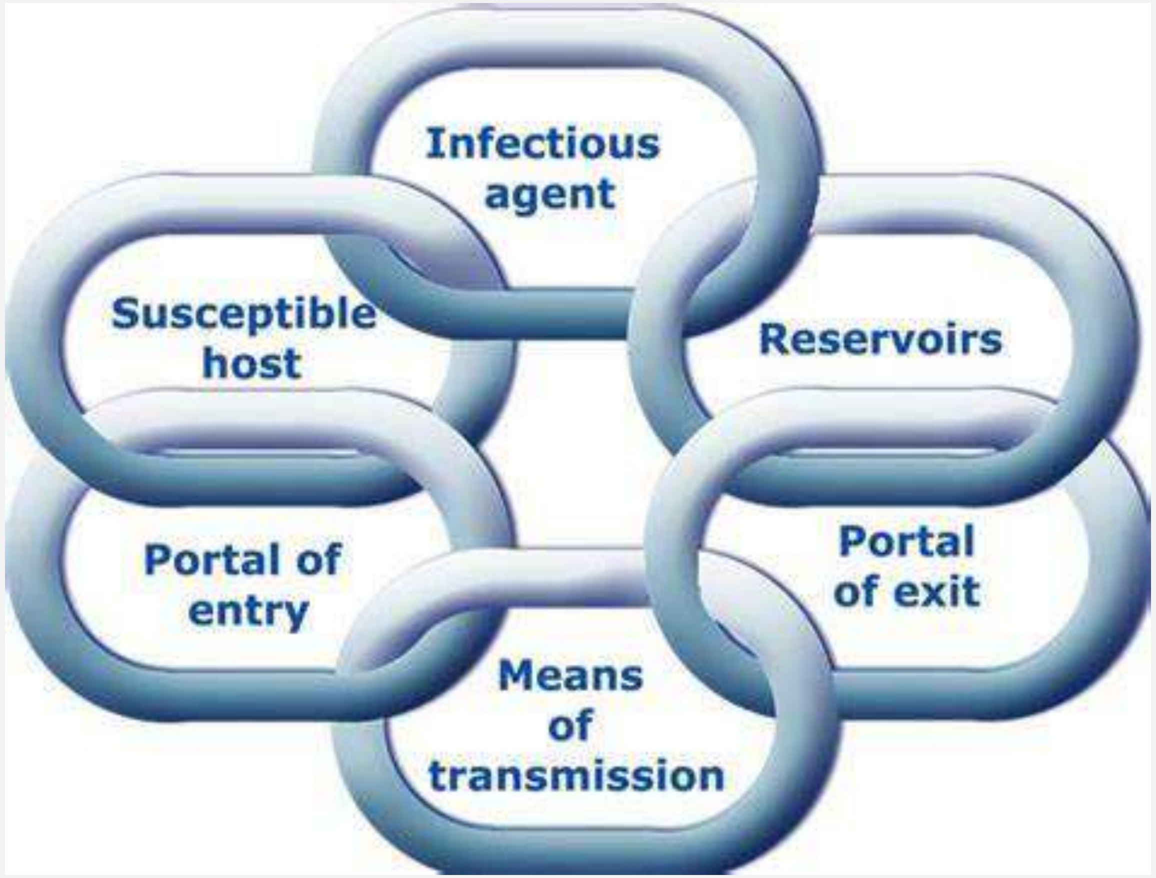
- Contamination: means the presence of an infectious agent on a body surface, in clothes, bedding, toys, surgical instruments, or other inanimate articles or substances including water and food.

SOME DEFINITIONS

- **Endemic** = disease that is present or usually prevalent in a population at all times.
- **Epidemic** = An unusually high occurrence of a disease or illness in a population or area .
- **Outbreak** = is used to describe a small, localized epidemic, often contained to a village or a small town.
- **Pandemic** = is an epidemic (an outbreak of an infectious disease) that spreads worldwide, or at least across a large region.
- **Sporadic** =infrequent and irregular occurrence of a disease (without common source of infection).

THE CHAIN OF INFECTION

- A chain of factors necessary for the development & maintenance of any infectious disease in the community.
- Knowledge of this cycle is essential to understand how infection can occur.
- All precautions and measures taken to prevent and control infection are based on interrupting this cycle.



1. INFECTIOUS AGENT

The infectious agent:

is an organism (virus, bacteria, fungus, protozoa, or helminth) that is capable of producing infection or infectious disease.

1. Infectivity: the ability of the agent to enter, multiply to an infectious dose and produce infection in the host.
2. pathogenicity: the ability of the agent to produce disease. pathogenicity= number of persons developing clinical illness / the number exposed to infection.
3. Virulence: a measure of the severity of disease, a term refers to the severity of the infection. A highly virulent strain of a disease agent will most always produce severe cases or death

1. INFECTIOUS AGENT

4. Toxigenicity: This term refers to the ability of the agent to produce a toxin. The resulting illness or disease is from the toxin produced by the organism/ agent and not microorganism itself

5. Resistance: This term refers to the ability of the agent to survive under adverse environmental conditions. It also a measure of the agents fragility

6. Antigenicity: This term refers to the ability of the agent to induce antibody production in the host

7. Invasiveness: The ability to penetrate and spread throughout the tissue

11. RESERVOIR

- Reservoir: It is the habitat where the infective agent survives, grows and multiplies in such a manner that it can be transmitted to a susceptible host.

- Reservoir of infection can be:
  - Human => case or carrier

  Carrier= person with an unapparent infection that transmits the disease to others
  - Animal => case or carrier
  - Environmental reservoir:
    - Water => e.g. legionnaire's disease
    - Soil => e.g. Botulism, Tetanus,
  - Combination of these types

III. TRANSMISSION

- Transmission: the second link in the chain of infection. It is the spread of an infectious agent through the environment or to another person.

1. Horizontal transmission: is the transport of infectious agent from person to person
2. Vertical transmission: is the passing of the infection from parents to offspring via sperm, placenta, milk or contact through vaginal canal transmission of HIV or syphilis

- Transmission between hosts could be by direct contact or indirect contact

TRANSMISSION

1. Direct transmission: is the immediate transfer of disease from the infected host to the susceptible host, transmission of STI, needle skin injury
2. Indirect transmission: Occurs when the human host comes in contact with vehicles or vectors that support and transport the infectious agent e.g. fleas transporting bubonic plague from infected rats to human hosts

TRANSMISSION

Indirect transmission may be vehicle –borne,

- Airborne transmission
- Vehicle –borne- contaminated materials- such as food, clothes, cooking utensils.
- Vector borne- the agent is carried by an insect or animal.
- The distinction between types of transmission is important when methods for control of communicable diseases are being selected.

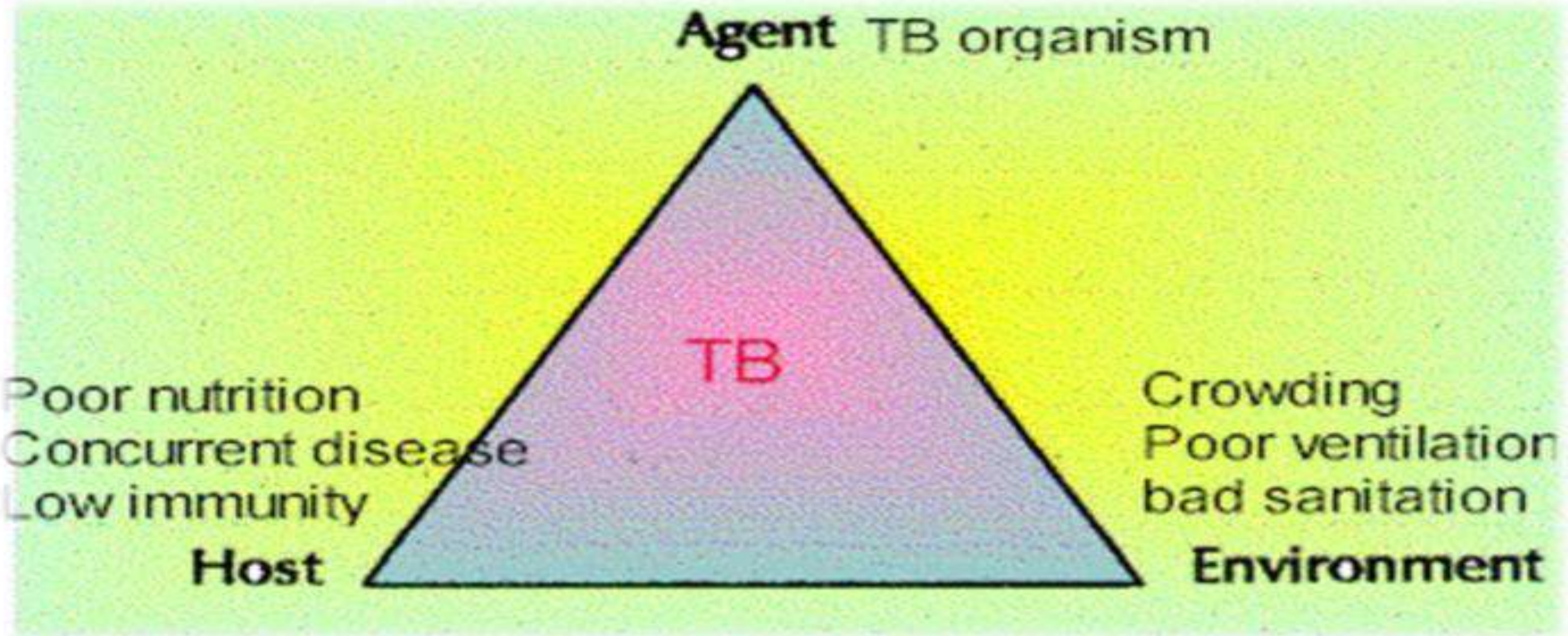
IV. HOST

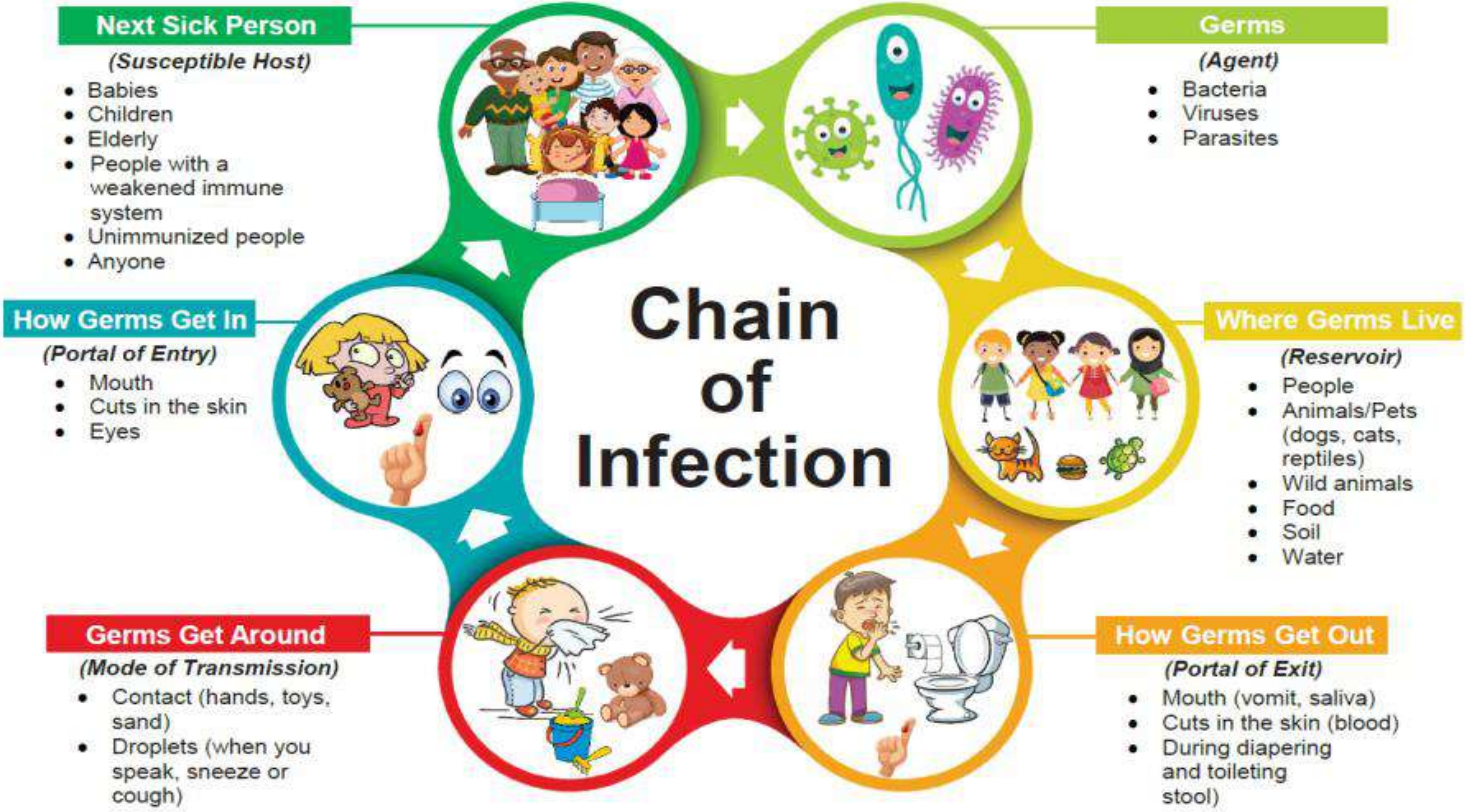
- Host: is the third link in the chain of infection.
- Is the person or animal that provides a suitable place for an infectious agent to grow and multiply under natural conditions.
- Environment: plays a critical role in the development of communicable diseases
- General sanitation, temperature, air pollution, water quality, are among the factors that influence all stages in the chain of infection.

V. PORTAL OF ENTRY, VI. PORTAL OF EXIT

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

For TB: In this model the agent is the TB bacterium; host factors include non-immune, weakened resistance, poor nutrition; and environmental factors include crowded conditions, poor ventilation, and bad sanitation.




Chain of Infection
Germs
(Agent)
• Bacteria
• Viruses
• Parasites
Where Germs Live
(Reservoir)
• People
• Animals/Pets (dogs, cats, reptiles)
• Wild animals
• Food
• Soil
• Water
How Germs Get Out
(Portal of Exit)
• Mouth (vomit, saliva)
• Cuts in the skin (blood)
• During diapering and toileting stool)
Germs Get Around
(Mode of Transmission)
• Contact (hands, toys, sand)
• Droplets (when you speak, sneeze or cough)
How Germs Get In
(Portal of Entry)
• Mouth
• Cuts in the skin
• Eyes
Next Sick Person
(Susceptible Host)
• Babies
• Children
• Elderly
• People with a weakened immune system
• Unimmunized people
• Anyone

for each of the following situations, identify what it reflects? (sporadic, endemic, pandemic, outbreak)

A) 22 cases of legionellosis occurred within 3 weeks among residents of a particular neighborhood (usually 0 or 1 per year).

B) Over 20 million people worldwide died from influenza in 1918–1919.

C) Single case of histoplasmosis was diagnosed in a community.

D) About 60 cases of gonorrhea are usually reported in this region per week, slightly less than the national average.

DEFINITIONS, EPIDEMIC DISEASES

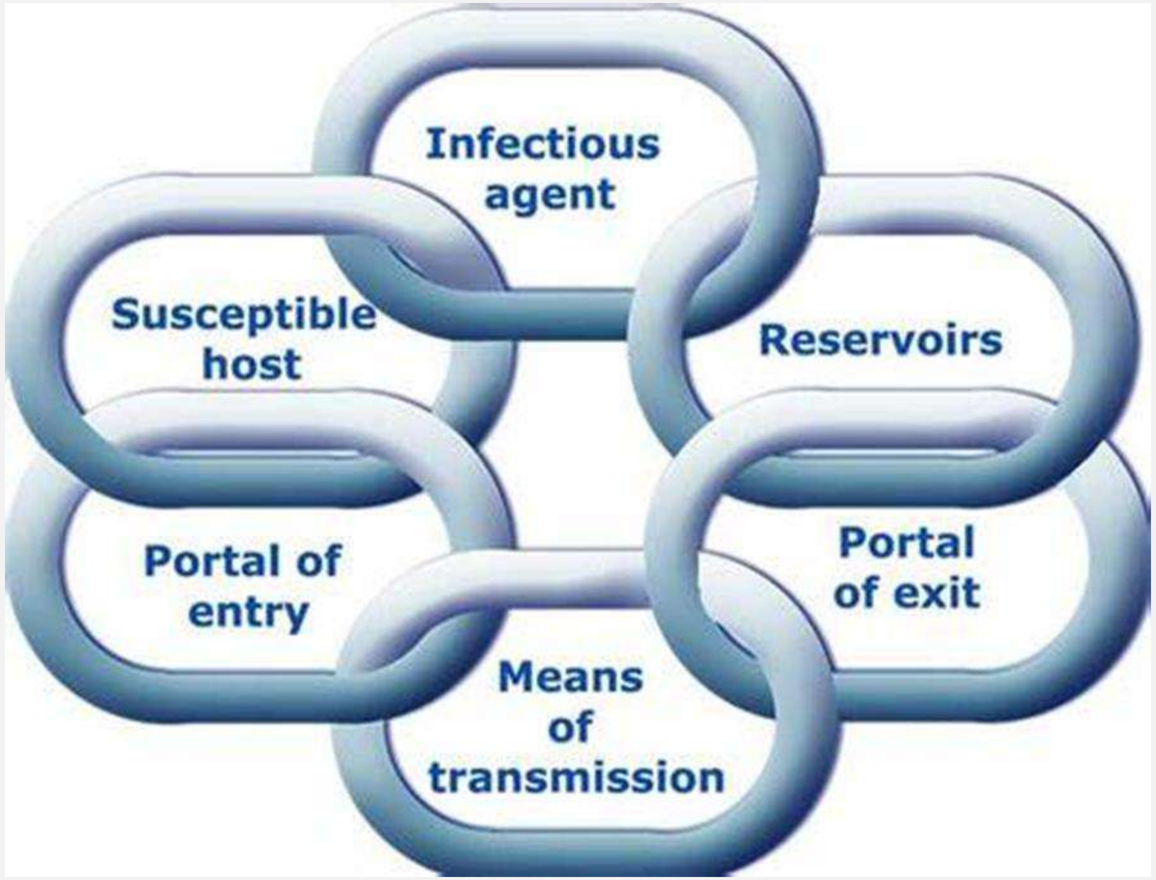
- An epidemic is the occurrence in a community or region of a number of cases of a disease that is unusually large or unexpected for the given place and time.
- Epidemics are either point-source or contagious in origin.
- In a point source epidemic, susceptible individuals are exposed more or less simultaneously to one source of infection.
- In contagious epidemic the disease is passed from person to person and the initial rise in number of cases is slower.

PREVENTION AND CONTROL

Any action that a person can take to prevent a pathogen from entering the body and causing disease

Control= Breaking the Chain

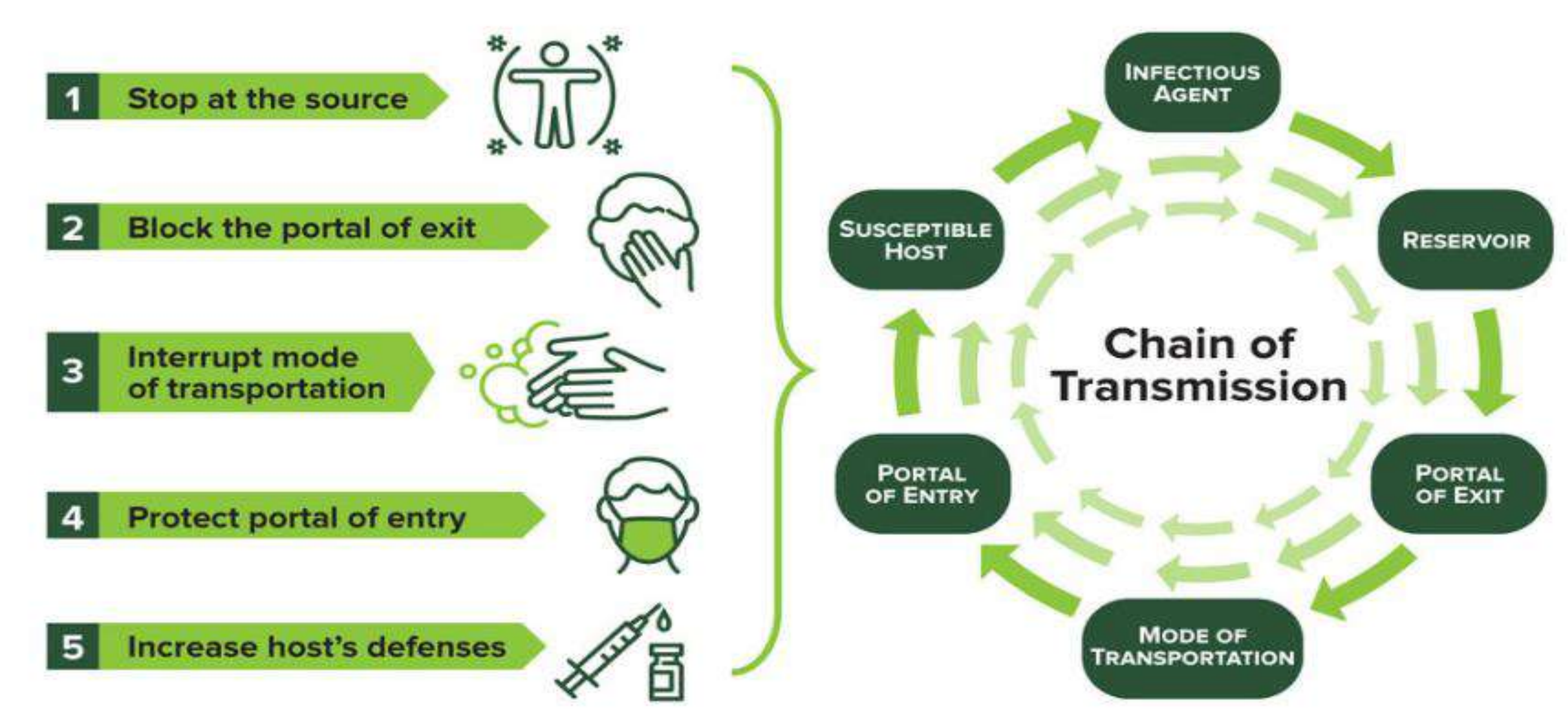
All precautions and measures taken to prevent and control infection are based on interrupting this cycle.



CONTROL

- **Eradication:** Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed.
- **Elimination of Infection:** Reduction to zero of the incidence of infection caused by a specific agent in a defined geographic area as a result of deliberate efforts; continued measures to prevent reestablishment of transmission are required.
- **Control:** Reduced incidence or prevalence of a disease or condition; control measures are still required.

PREVENTION AND CONTROL



CONTROL METHODS

- VACCINATION

- ENVIRONMENTAL CONTROL

a) Personal Hygiene →

b) Protection of food →

c) Water Supplies →

d) Sanitation →

e) Vector control →


CONTROL STRATEGY
Host
Agent
viral
bacterial
protozoal
helminths
Vector
Air;
Food; Water;
Person-
person;
Insect;
Fomites

CONTROL STRATEGY

- Identify the cause (diagnosis)
- Notification (reporting)
- Treatment of cases
- Interrupt transmission (protect contacts)
- Prevent recurrence
- Analysis and reporting
- Surveillance

IDENTIFY THE CAUSE

- Confirm Diagnosis - a) clinical b) laboratory
- Extent of infected cases – endemic or an outbreak?
- Is this the first case or have there been others over an extended period of time?
- Where did the infected person come from - local or imported?
- Epidemiology - common events (e.g. all went to a wedding)
- Are there exceptions? (e.g. no cases in center of village)
- Population at risk - (e.g. only forest worker)
- Changes in the environment (e.g. climate change)
- Route of transmission

TREATMENT OF CASES

- Emergency treatment center
- Mobilization of staff, medicines and equipment
- Formulation of standard treatment schedule
- Rules for quarantine; management of contacts;
- prevention of carriers; disposal of the dead

PREVENT RECURRENCE

- Vaccinate where possible
- Interrupt the transmission route –
- Supply clean Water - purification
- Health Education

ANALYSIS AND REPORTING

- Inform the authorities
- Notify other workers in similar situations (mini-conference)
- Make a full record for the future
- Elicit funds for further preventive measures

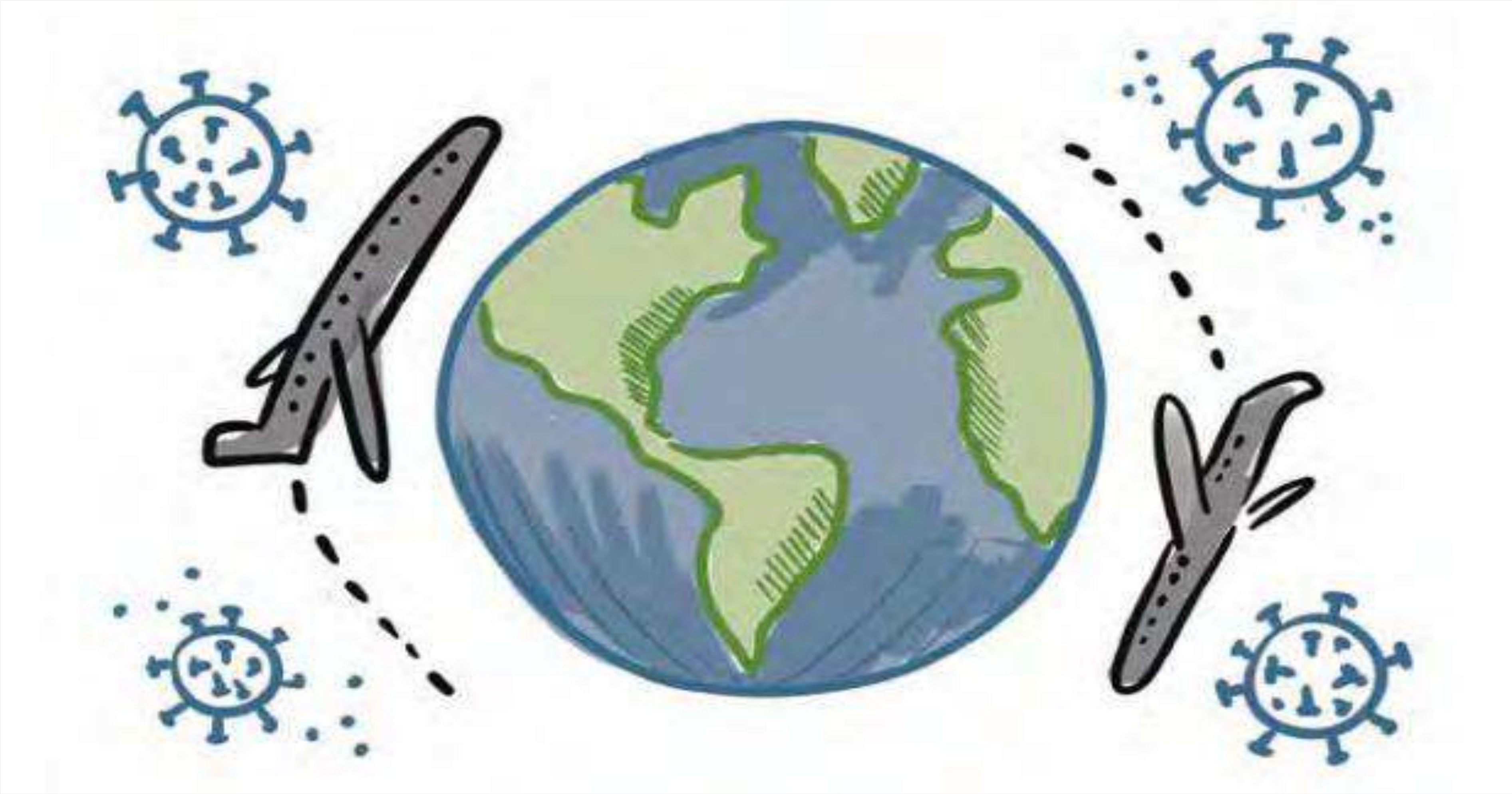
COMMUNICABLE DISEASES

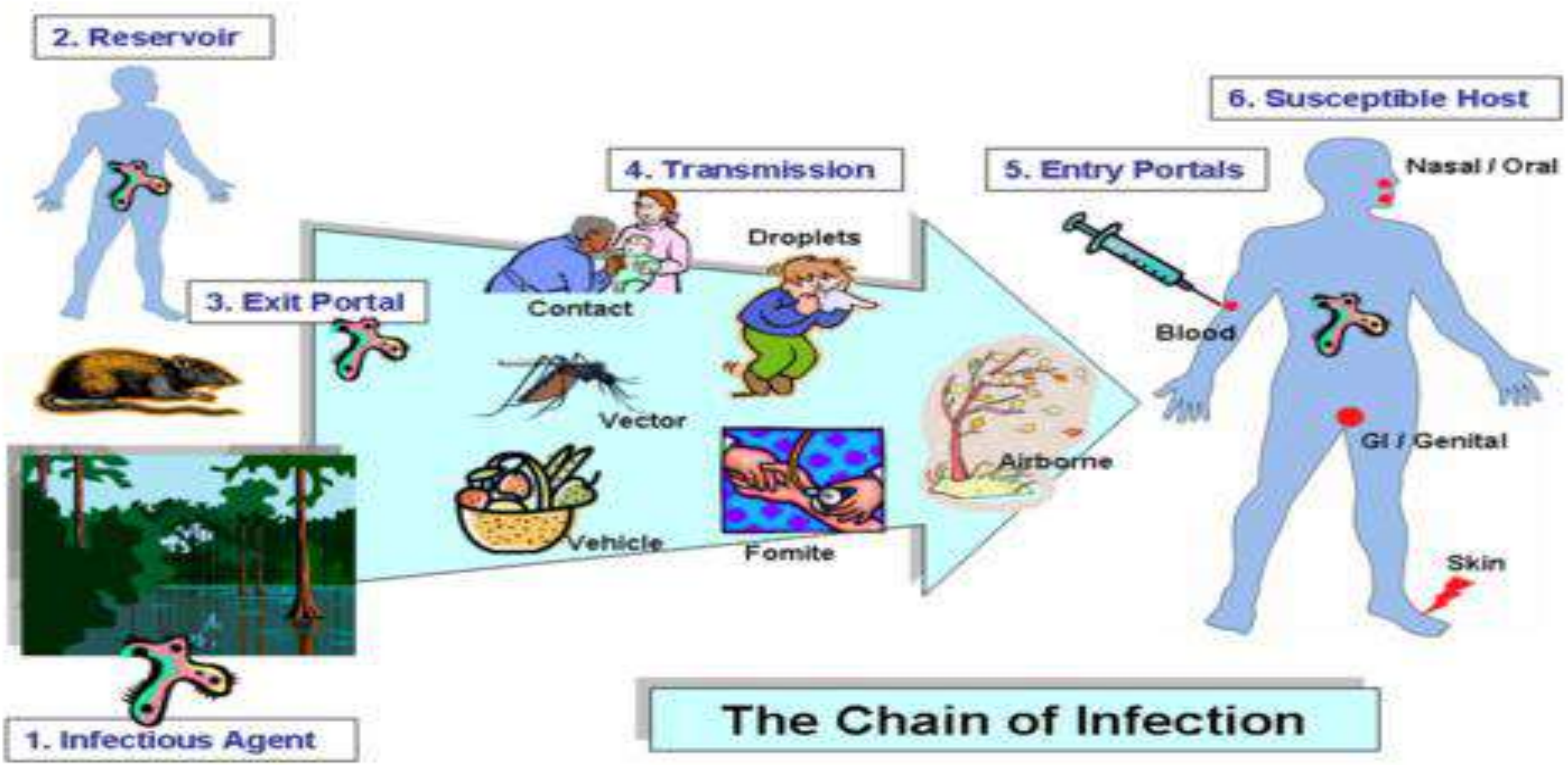
- A communicable disease requires an agent and a means of transmitting the infection to a susceptible host within an amenable environment.
- The agent needs to be able to multiply and survive if it is to have an effect on the host.
- Transmission can be direct, via an intermediate host or by a vector.
- The host's susceptibility is influenced by age, sex, defence mechanisms and immunity.
- The social environment is modified by education and resources and altered by movements of communities or individuals.
- The physical environment is affected by the nature of the surroundings, seasonality and climate change.

COMMUNICABLE DISEASES

Dr .Ayda Ahmad Helles

COMMUNICABLE DISEASES

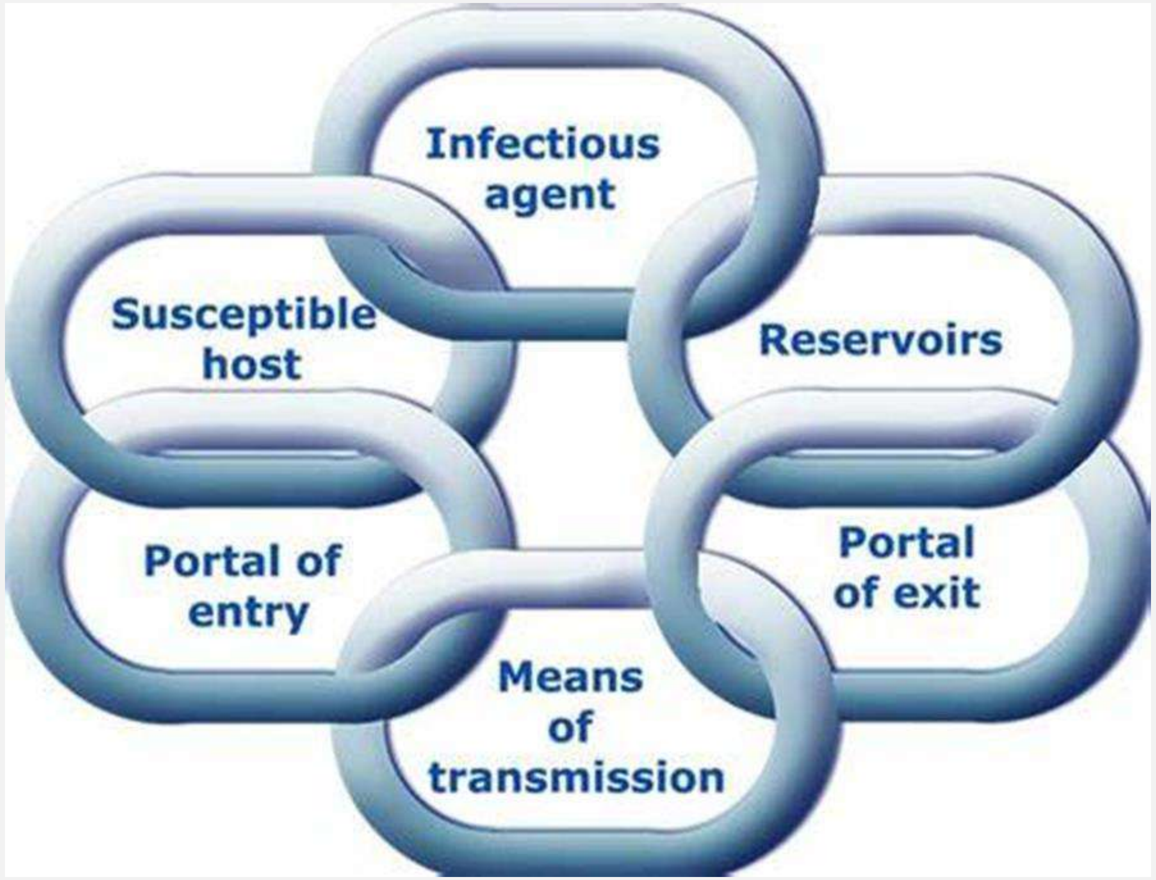



2. Reservoir
3. Exit Portal
4. Transmission
Contact
Droplets
Vector
Vehicle
Fomite
Airborne
5. Entry Portals
Blood
6. Susceptible Host
Nasal / Oral
GI / Genital
Skin
1. Infectious Agent
The Chain of Infection

PREVENTION AND CONTROL

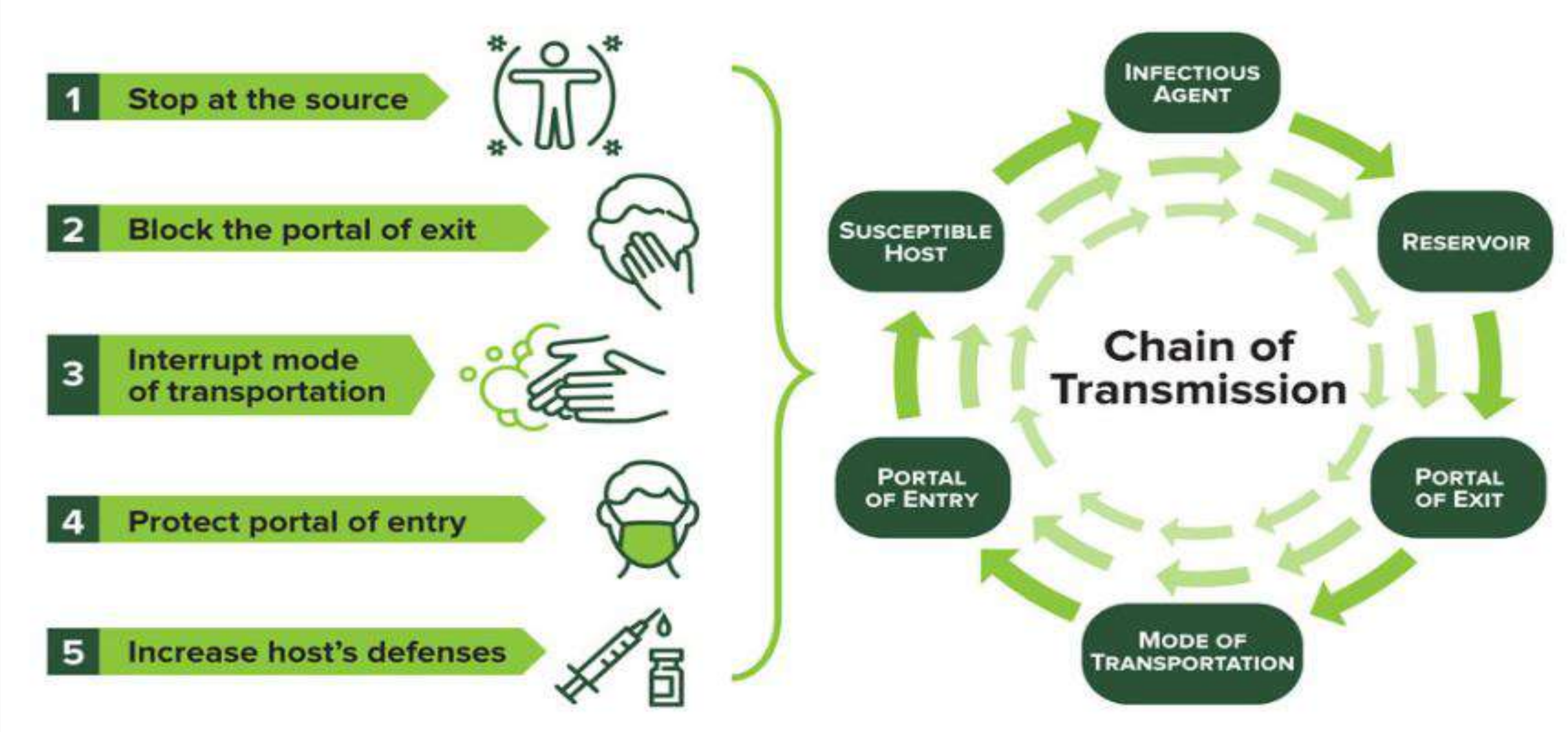
Any action taken to prevent a pathogen from entering the body and causing disease

All precautions and measures taken to prevent and control infection are based on interrupting this cycle.



Control = Breaking the Chain

PREVENTION AND CONTROL



PREVENTION AND CONTROL

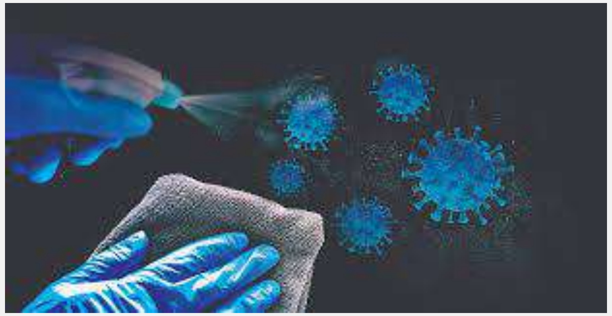
- **Control:** Reduced incidence or prevalence of a disease or condition; control measures are still required.

- **Elimination of Infection:** Reduction to zero of the incidence of infection caused by a specific agent in a **defined geographic area** due to deliberate efforts; continued measures to prevent re-establishment of transmission are required.

- **Eradication:** Permanent reduction to zero **of the worldwide** incidence of infection caused by a specific agent due to deliberate efforts; intervention measures are no longer needed. Ex, smallpox.

MEASURES DIRECTED TO THE AGENT

- Disinfection
- Germ reduction- killing most microorganisms
- Human skin, surfaces, and instruments



- Sterilization
- killing all microorganisms
- Medical instruments and laboratory components

- Proper treatment

Of infected individuals to kill the agent at its source

MEASURES DIRECTED TO THE RESERVOIR

- Cases:
  - Case finding
  - Reporting to the local health authority to apply the appropriate control measures.
  - Isolation for the whole period of communicability and treatment.
  - Surveillance for the longest incubation period.

(Surveillance: the continuous, systematic collection, monitoring, analysis, and interpretation of data related to communicable diseases. It is needed for the detection of epidemics, adequate response, planning, implementation, and evaluation of public health practice.

MEASURES DIRECTED TO THE RESERVOIR

- **Carriers:**
  - Identification of carriers in the community
  - Treatment.
  - Exclusion from work till the organism is eliminated
- **Animal reservoir:**
  - Immunization of animals (if vaccine is available)
  - Treatment of infected animals (sometimes killing if treatment is not feasible).

MEASURES DIRECTED TOWARDS BREAKING TRANSMISSION

- **Isolation:** if indicated to interrupt direct transmission

- **Decontaminating of fomites:** vehicle transmission

HIV, Hepatitis

- **Control vector:** control vector-borne transmission

Malaria, Yellow fever

- **Promote handwashing:** prevent feco-oral transmission

E choli, cholera

- **Modify ventilation and air pressure:** prevent airborne transmission

Common cold (rhinovirus), COVID-19 (coronavirus), Flu (influenza) ,Whooping cough (pertussis)

- **Environment**: sanitation of water, food, proper sewage handling

MEASURES DIRECTED TOWARDS PROTECTING PORTAL OF ENTRY- EXIT

- Using bed-nets
- Wearing masks and gowns
- Covering skin and using insect repellents

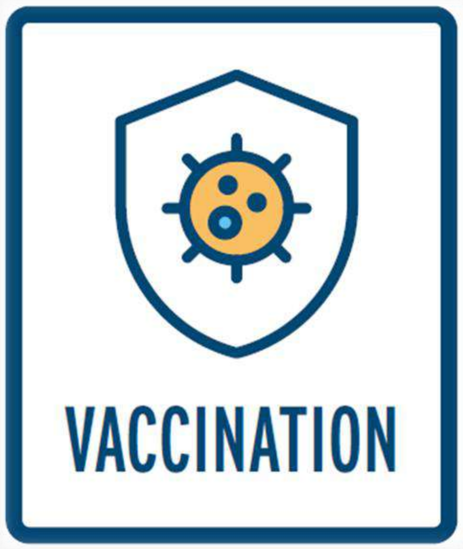
MEASURES DIRECTED TO THE HOST

- Health education
- Adequate personal hygiene
- Sound nutrition
- Immunization
- Chemoprophylaxis

INFECTION PREVENTION

- The single most effective way to prevent the spread of infections.

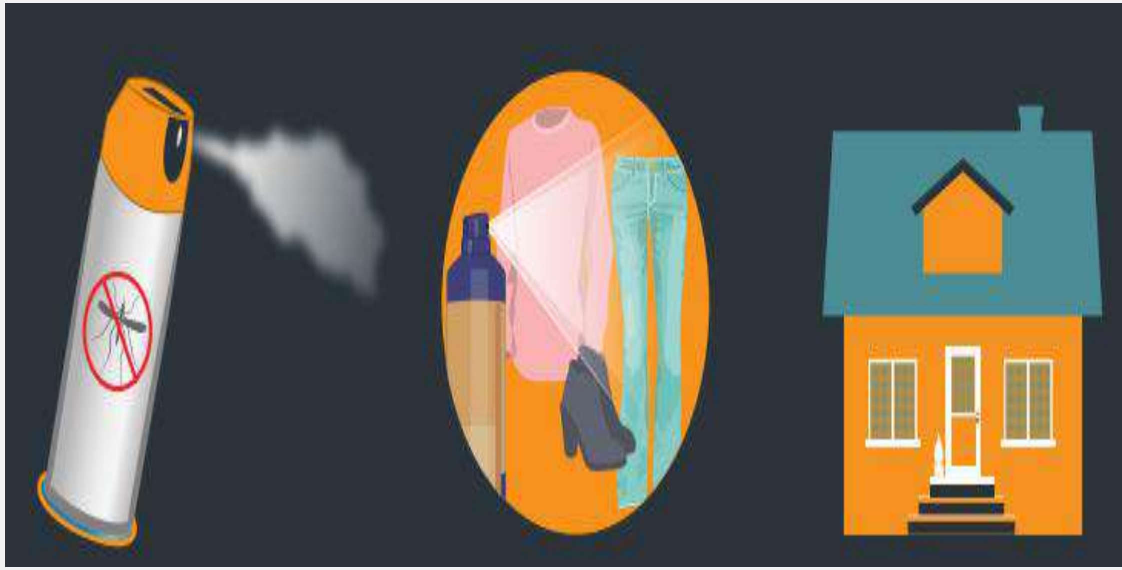
INFECTION PREVENTION



- Vaccination protects the people who receive them and also those around them.
- It may still be possible to get an infectious disease even after being vaccinated for it.
- Vaccines can decrease the severity of illness and the likelihood of hospitalization and death from the illness.

VECTOR-BORNE TRANSMISSION

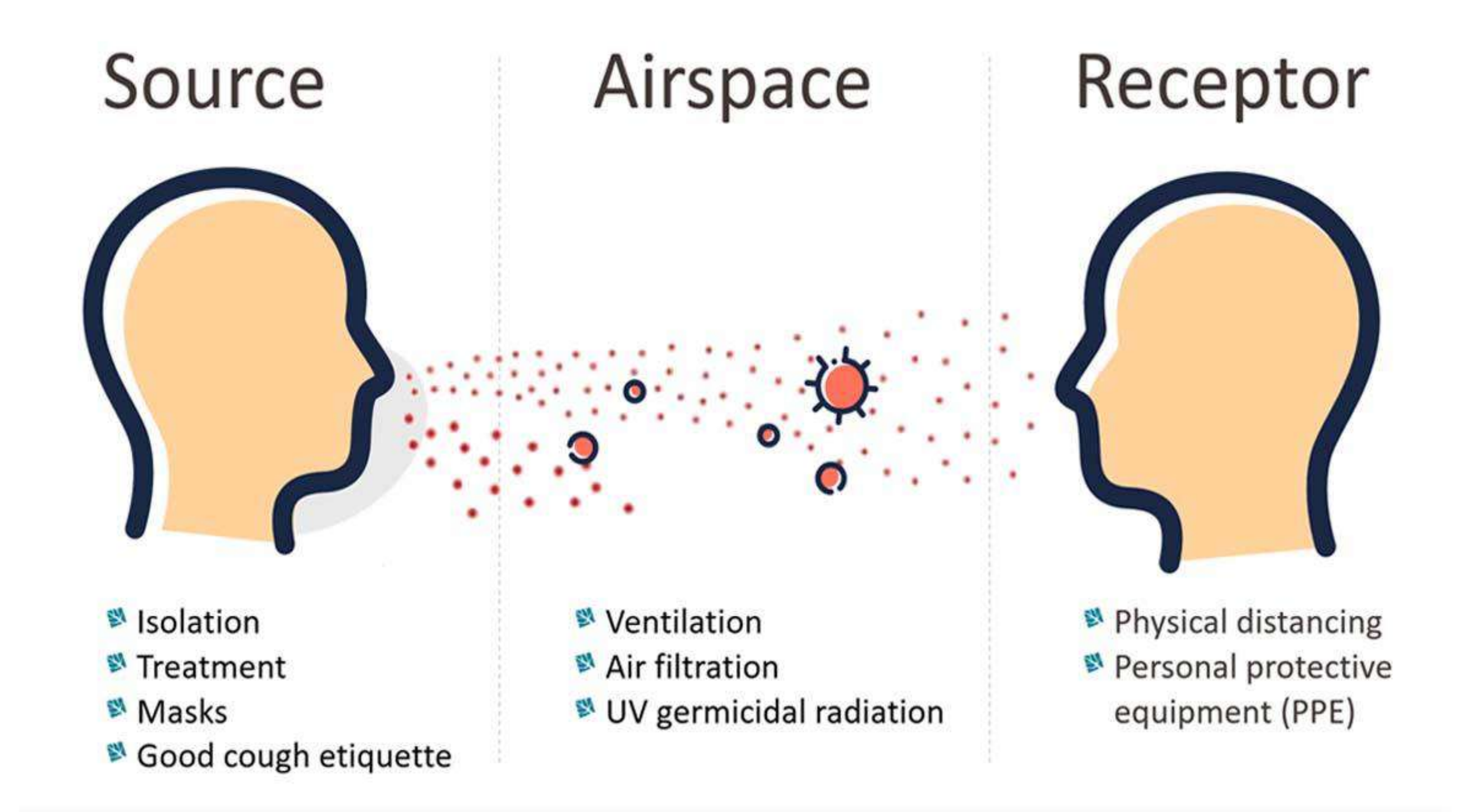
Vector	Disease	Pathogen
Mosquito	Malaria	Parasite
Mosquito	Dengue, Yellow Fever	Virus
Fleas	Plague	Bacteria
Ticks	Relapsing fever	Bacteria
Lice	Typhus	Bacteria



AIRBORNE TRANSMISSION

Airborne infections:

- Common cold (rhinovirus)
- COVID-19 (coronavirus)
- Flu (influenza)
- Whooping cough (pertussis)



CONTROL OF INFECTIONS

Polio

- In 1955 Jonas Salk's injectable vaccine was announced safe to use. Salk's vaccine is called "an inactivated polio vaccine" (IPV).
- In 1962, an oral polio vaccine (OPV) was developed by researcher Albert Sabin, using an attenuated – or weakened – live polio virus.
- In 1994, the Region of the Americas was the first in the world to be certified polio-free by the WHO.
- 2024 Gaza

Smallpox

- In1796, smallpox vaccine
- In 1980, the World Health Organization declared smallpox eradicated.

NON-COMMUNICABLE DISEASES

NONCOMMUNICABLE DISEASES (NCDS)

- Chronic conditions that do not result from an (acute) infectious process and hence are "not communicable."

- A disease that has a prolonged course, that does not resolve spontaneously, and for which a complete cure is rarely achieved.

McKenna, et al, 1998

NON- COMMUNICABLE DISEASES INCLUDE:

1. Cardiovascular diseases (hypertension, coronary disease, stroke)
2. Cancer
3. Diabetes
4. Respiratory (asthma, emphysema, bronchitis)
5. Obesity
6. Renal (nephritis, nephrotic syndrome)
7. Nervous and mental (mania, depression)
8. Musculoskeletal (arthritis)

CHARACTERISTICS OF NCDS

- Complex etiology (causes)
- Multiple risk factors
- Long latency period
- Non-contagious origin (noncommunicable)
- Prolonged course of illness
- Functional impairment or disability

CHARACTERISTICS OF NCDS

Non-communicable diseases (NCDs) is a combination of

- **Genetic,**
- **Physiological,**
- **Environmental and**
- **Behavioral factors.**

GLOBAL MORTALITY OF NCDS/2021

- NCDs kill 41 million people each year
- 71% of all deaths globally
- >15 million/year death 30 - 69 years
- 85% of these "premature" deaths occur in low- and middle-income countries.
- 77% of all NCD deaths are in low- and middle-income countries.

(WHO, 2021)

RISK FACTORS

☐ **Risk factors** are defined as any attribute, characteristic, or exposure of an individual, which increases the likelihood of developing a disease or injury.

Non-Modifiable risk factors

These factors can't be changed. However, it is important to identify high-risk groups.

1. **Age:** The risk ↑among: - Males > 45 years & females 55 >years of age.
2. **Sex:** Osteoporosis: more in Female sex.
3. **Family history:** Higher risk in individuals with a history of CHD and DM
4. **Genetic factors:** play a role in dyslipidemia.

MODIFIABLE RISK FACTORS

1. **Smoking:** Tobacco accounts for over 7.2 million deaths every year (including from the effects of exposure to second-hand smoke), and is projected to increase markedly over the coming years *(1)*.

2. **Diet:** 4.1 million annual deaths have been attributed to excess salt/sodium intake.

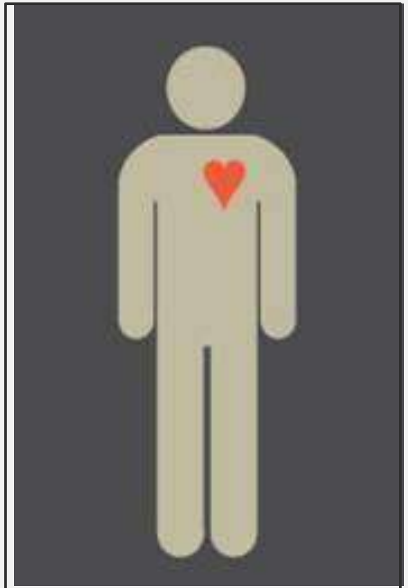
3. **Alcohol:** More than half of the 3.3 million annual deaths attributable to alcohol use are from NCDs, including cancer.

4. **Physical inactivity:** 1.6 million deaths annually can be attributed to insufficient physical activity.

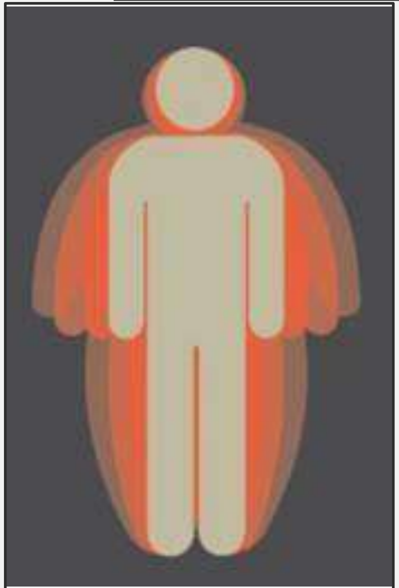
METABOLIC RISK FACTORS

1. Raised blood pressure;
2. Hyperglycemia (high blood glucose levels); and
3. Hyperlipidemia (high levels of fat in the blood)
4. Overweight and obesity and raised blood glucose

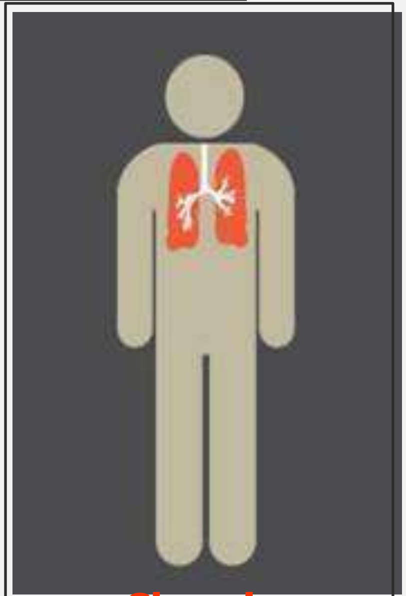
BIG FOUR NCDS



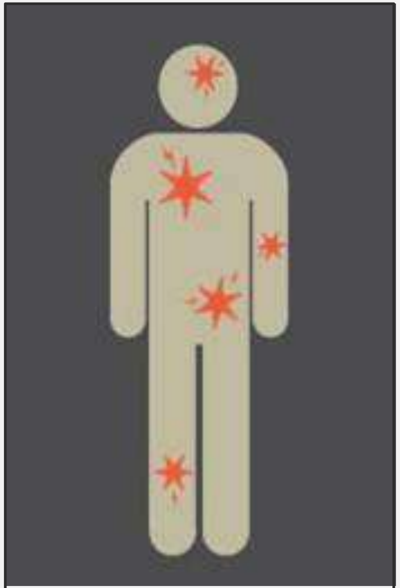
Cardiovascular Diseases



Type 2 Diabetes



Chronic Respiratory Diseases



Cancer

4 Chronic Diseases result in 50% percent of deaths (WHO)

CARDIOVASCULAR DISEASES

WHAT ARE CARDIOVASCULAR DISEASES?

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include:

- Coronary heart disease
- Cerebrovascular disease
- Peripheral arterial disease
- Rheumatic heart disease
- Congenital heart disease
- Deep vein thrombosis and pulmonary embolism.

BURDEN OF CARDIOVASCULAR DISEASE

- Cardiovascular disease consider the first leading cause of death around world.
- CVDs consider the first leading cause of death in Palestine.
- At least three quarters of the world's deaths from CVDs occur in low- and middle-income countries.

HYPERTENSION

Other Broad name for hypertension:

1. Rapid killer
2. Silent killer
3. Black killer
4. Sad killer

Is defined as a systolic blood pressure of 140 mmHg or greater and/or diastolic pressure of 90 mmHg or greater under satisfactory conditions of measurement.

KEY FACTS ON HYPERTENSION

- Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about **12.8%** of the total of all deaths.
- Raised blood pressure is a major risk factor for **coronary** heart disease and ischemic as well as hemorrhagic **stroke.**
- In some age groups, the risk of cardiovascular disease doubles for each increment of **20/10** mmHg of blood pressure.
- Globally, the overall prevalence of raised blood pressure in adults aged 25 and over was around **40%** in 2008

Early detection of hypertension should be focused of the following risk groups :

A. Individuals of 40 years or above.

- Obese (BMI 30 or more).
- Patients with diabetes mellitus.
- Family history of hypertension, CVD, cerebrovascular disease.

B. Age group 20/40 if they have one of:

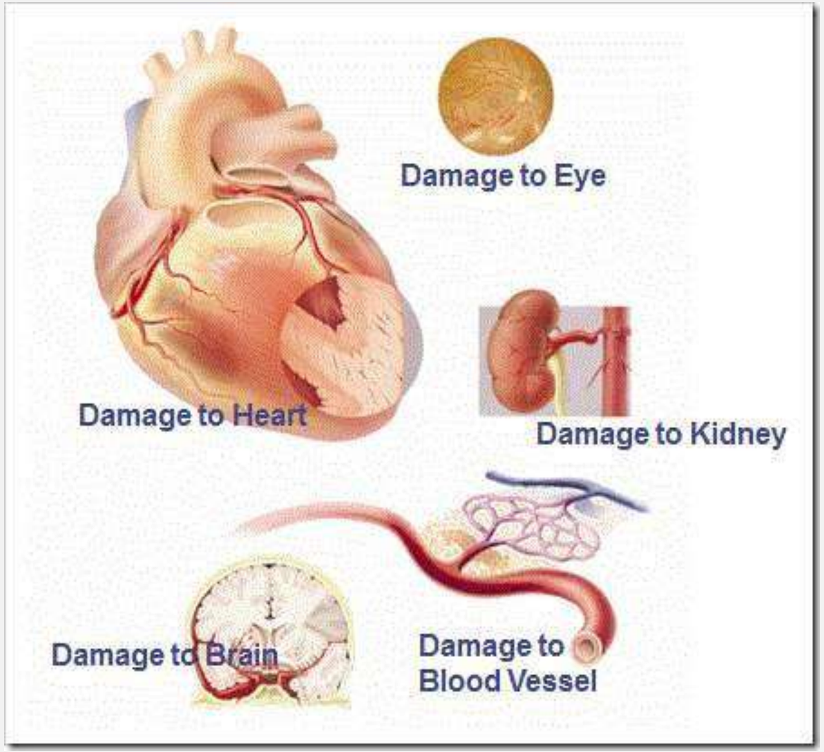
(Family history of hypertension, DM, CVD, obese, Smoking and Inactivity)

2. DIABETES MELLITUS

Diagnosis

Test	Value
Fasting plasma glucose	≥ 126 mg/dl (7.0 mmol/L)
2-h plasma glucose	≥ 200 mg/dl (11.1 mmol/L)
HbA1c	≥ 6.5%

DIABETES AND TISSUE ORGAN DAMAGE (TOD)



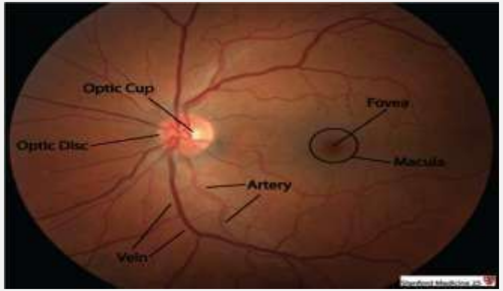


Figure 4. Fundus photograph and accompanying fluorescein angiogram in the early to mid phase in a patient with more advanced (high risk) proliferative retinopathy.

3. RESPIRATORY DISEASES

- RDs ranked the sixth with 6.3% of the total death(MOH 2016).
- RDs causes death in all regions of the globe and in all social classes, certain people are more vulnerable to environmental exposures than others.
- WHO predicts that COPD will become the third leading cause of death worldwide by 2030.

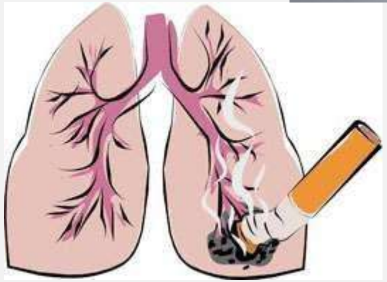
COPD

The most common types:

- Chronic obstructive pulmonary diseases (COPD).
- Asthma.
- Occupational lung diseases.
- Pulmonary hypertension.
- respiratory allergy.

MAIN RISK FACTORS FOR CRD

- Tobacco smoking
- Indoor air pollution
- Outdoor pollution
- Allergens
- Occupational risks and vulnerability



CHRONIC RESPIRATORY DISEASES IN PALESTINE

- **There is limited data**
- no data about prevalence and incidence also the data does not differentiate between chronic diseases and other respiratory causes(acute).

- At UNRWA: there are No data, chronic respiratory diseases are not mentioned at UNRWA 2016 reports.

4. CANCER

Cancer Registry

Oncology Departments

Histopathology Report

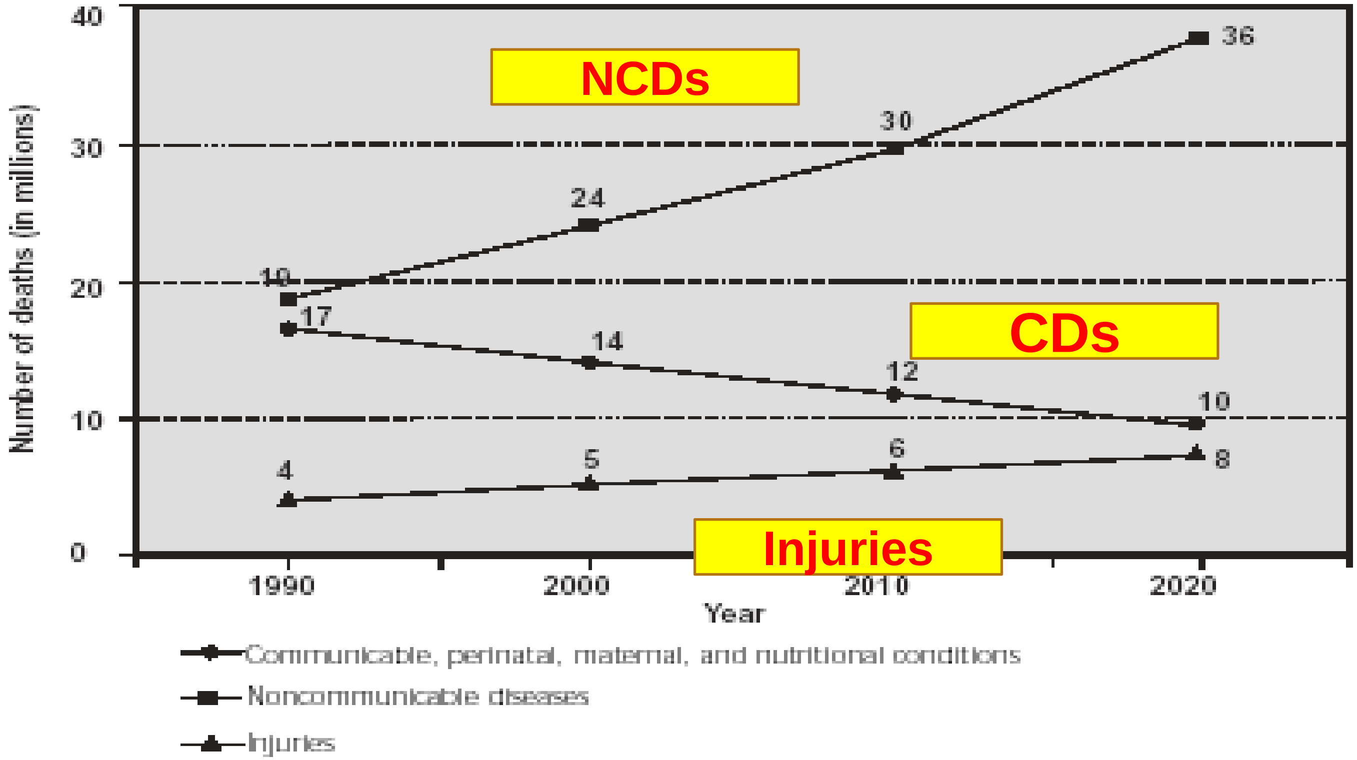
Screening

Referral abroad

Death certificate

Non Communicable Diseases in Palestine From Epidemiological Transition to Policy interventions – 2022

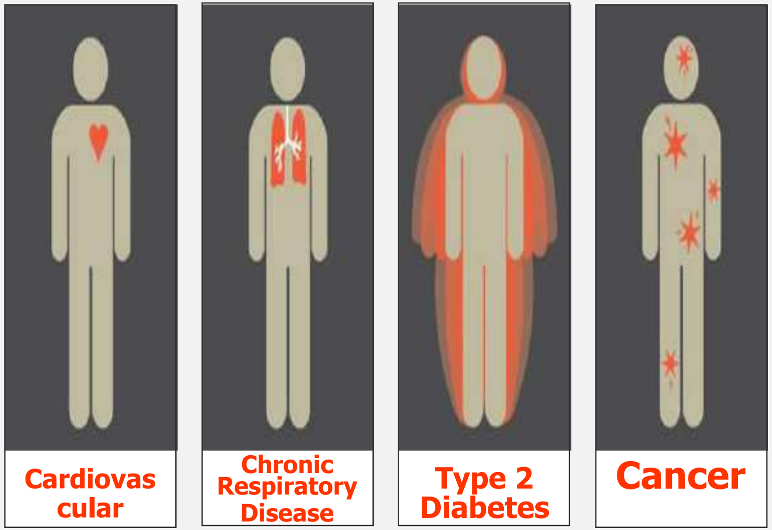
Figure 1.1: Projected trends in the number of deaths by broad cause group in developing regions



MAJOR CURRENT HEALTH HAZARDS IN PALESTINE

4 Chronic Diseases result in 50% percent of deaths (WHO)

1. **Non communicable Diseases**
   - Diabetes Mellitus
   - Cardio vascular Diseases & Hypertension
   - Cancer
   - Chronic Respiratory Diseases
2. **Accidents**
3. **Psychological disturbance**



NCDS RISK FACTORS IN PALESTINE

Behavioral risk factors:

- **Tobacco use.**
- **Unhealthy diet.**
- **Physical inactivity.**

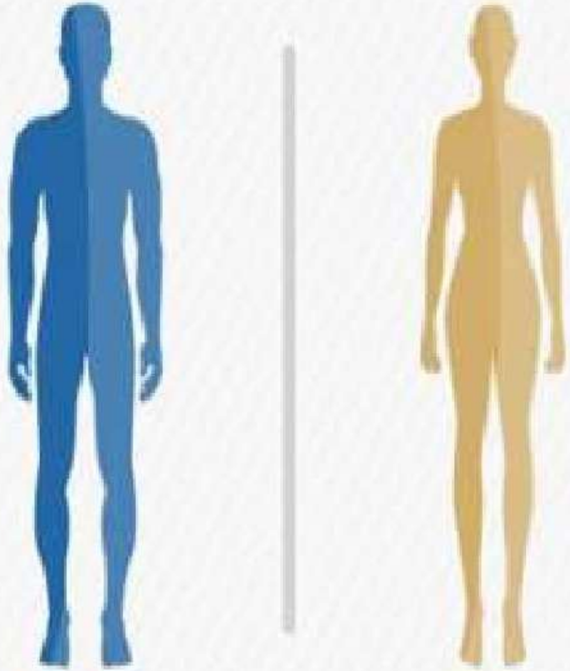
Metabolic Risk Factors

- **Overweight and obesity**
- **Blood hypertension**
- **Dyslipidemia**
- **Raised blood glucose**

Proportional distribution of cancer by gender

46%
Male

54%
Female



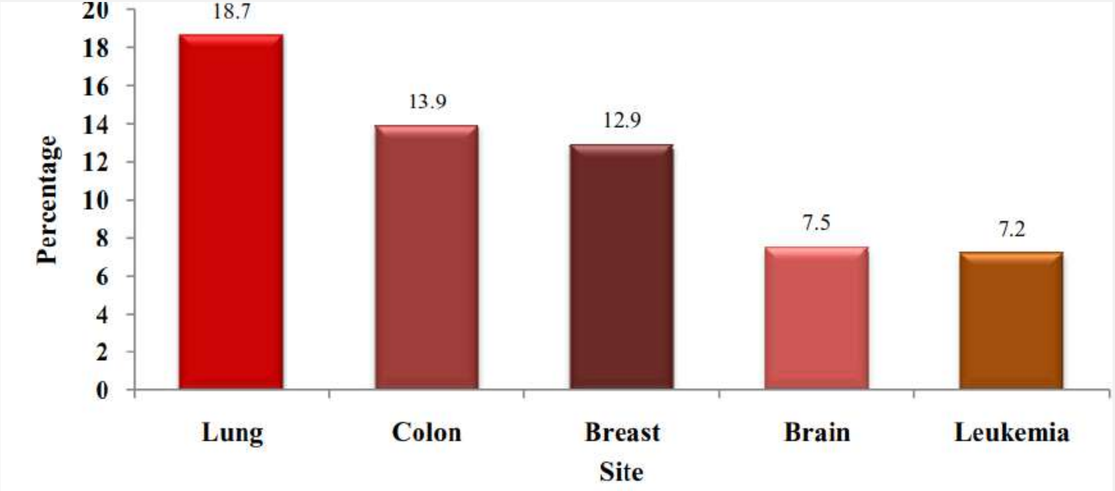
Percentage of the most common male cancers

Colorectal	14.0%
Lung	11.5%
Leukemia	9.2%
Lymphoma	8%
Prostate	8%

Percentage of the most common Female cancers

Breast	33%
Colorectal	11.8%
Thyorid	8.4%
Leukemia	8.2%
Lymphoma	6.4%

PROPORTIONAL DISTRIBUTION OF THE MOST REPORTED CANCER DEATHS, PALESTINE 2020



COLORECTAL CANCER

Colon cancer represents 12.9% of all cancers, 14% of men's cancers, and 11.8% of women's cancers.

Age-specific incidence rate of Colorectal cancer by gender/100.000

Age group	Male	Female
0-4	0.0	0.0
5-9	0.0	0.0
10-14	0.0	0.0
15-24	1.4	1.0
25-34	4.8	4.9
35-44	16.5	15.3
45-54	38	47.6
55-64	82.4	63
65-74	164	105
75+	145	99

BREAST CANCER

Breast cancer represents 18% of all cancers, and 33% of women's cancers.

Age specific incidence rate of Breast cancer/100.000

Age group	ASR
0-14	0
15-24	1.8
25-34	11.6
35-44	50
45-54	139.9
55-64	201
65-74	312
75+	199

NON-COMMUNICABLE DISEASES (NCDS): WORLD VIEW

Prevention and control of NCDs require:

- Effective, cost-effective, affordable, and feasible interventions
- National policies framed within these interventions and in line with NCD and risk factor indicators

↓

- ✓ Improving equity in healthcare
- ✓ Targeting population for improved health outcomes

Priority NCDs :
Cardiovascular disease (CVD), diabetes, asthma/COPD and Cancer

CHALLENGES FOR THE PREVENTION OF NCD

1. The demographic transition:

Decreased mortality result in increased life expectancy and proportion of the elderly.

Non-communicable diseases are usually associated with aging.

2. The epidemiologic transition :

There is shift from mortality from communicable diseases (due to the use immunizations and antibiotics etc.,) to non-communicable diseases

3. Nutrition Transition:

Large shift in the pattern of nutrition to a diet high in total fat, sugar and other refined carbohydrates and low in polyunsaturated fatty acids and fibers, and often accompanied by increasing sedentary life.

CHALLENGES FOR THE PREVENTION OF NCD

4. The multi-factorial nature of the risk factors for NCDs.

The multiplicity of the risk factors associated with specific diseases limits the opportunities to have particular interventions for prevention and control. The types of risk factors are difficult to control by technology (in communicable diseases immunizations and antibiotics are of the technologies that are used to prevent the diseases).

The risk factors are related to genetics, environment, culture, and behavior which represent a challenging issue for public health programs.

5. Migration of population across different cultures, 6-International communication:

The individuals who migrate from low-risk culture (e.g. rural areas) to high-risk culture (e.g. urban areas) will follow the lifestyle of the new culture and demonstrate increased risk for non-communicable diseases. Due to the progressive increase in urbanization, non-communicable diseases have shown an increase in prevalence.

PACKAGE OF 16 "BEST BUY" , WHO

- Interventions that are cost-effective, affordable, feasible and scalable in all settings

- Implementing 2018 and 2025 would avoid 9.6 million premature deaths, thus moving countries appreciably towards the NCD mortality reduction targets.

NCD BEST BUYS

EVIDENCE - BASED COST- EFFECTIVE PUBLIC HEALTH INTERVENTIONS TO PREVENT AND CONTROL NCDs

Prevention and control of noncommunicable diseases (NCDs) requires policy and health service interventions to address the four main diseases and their underlying risk factors. This is a summary of the WHO cost-effective interventions, which provides a menu of evidence-based options to guide policy decisions.[1]

REDUCE TOBACCO USE

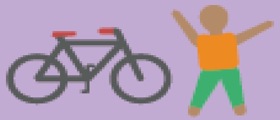
- Increase excise **taxes and prices** on tobacco products
- Implement **plain packaging** and/or large graphic health warnings on tobacco packages
- **Ban tobacco advertising, promotion and sponsorship**
- **Ban smoking** in all indoor workplaces, public places, and on public transport
- **Warn about the harms of** smoking/tobacco use and second hand smoke through mass media campaigns
- Provide tobacco **cessation programs**

REDUCE HARMFUL USE OF ALCOHOL

- Increase excise **taxes** on alcoholic beverages
- **Ban or restrict alcohol advertising**.
- **Restrict the physical availability** of retailed alcohol
- Enact and enforce **drink-driving laws** and blood alcohol concentration limits
- Provide **psychosocial intervention** for persons with hazardous and harmful alcohol use

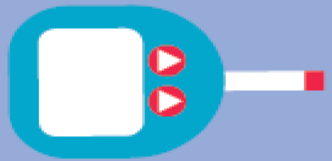
PROMOTE HEALTHY DIET

- **Reduce salt intake** by:
  - product reformulation and setting targets for the amount of salt in foods and meals
  - providing lower sodium options in public institutions
  - promoting behavior change through mass media campaigns
  - implementing front-of-pack labeling
- **Ban trans-fats** in the food chain
- Raise **taxes on sugar-sweetened beverages** to reduce sugar consumption



PROMOTE PHYSICAL ACTIVITY

- **Promote physical activity** with mass media campaigns and other community based education, motivational and environmental programs
- Provide **physical activity counselling** and referral as part of routine primary health care



DIABETES

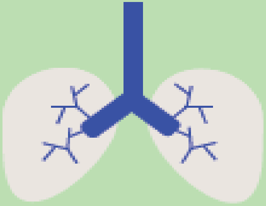
- Offer **glycemic control** for people with diabetes
- Provide **preventive foot care** for people with diabetes
- Screen diabetes patients for retinopathy and provide laser photocoagulation to **prevent blindness**

CARDIOVASCULAR DISEASE

- Provide **drug therapy and counselling** for eligible persons at high risk to prevent heart attacks and strokes
- **Treat** new cases of acute myocardial infarction with either acetylsalicylic acid and clopidogrel, or thrombolysis, or primary percutaneous coronary interventions
- **Treat acute ischemic stroke** with intravenous thrombolytic therapy
- **Prevent rheumatic fever** and rheumatic heart disease by increasing treatment of streptococcal pharyngitis at primary care level and developing a register of patients who receive regular prophylactic penicillin

CANCER

- **Prevent cervical cancer** by:
  - — vaccinating girls aged 9–13 years against human papillomavirus
  - — screening women aged 30–49 years, with the Pap smear, or human papillomavirus test, or visual inspection with acetic acid
- Provide **breast cancer screening** for women aged 50-69 years, with mammography linked to timely diagnosis and treatment
- Provide **surgery, chemotherapy and radiotherapy** treatment for cancer
- Provide home-based and hospital-based **palliative care** services



CHRONIC RESPIRATORY DISEASE

- Provide **symptom relief** for patients with asthma, and for patients with chronic obstructive pulmonary disease, with inhaled salbutamol
- Provide **treatment** for patients with asthma, using low dose inhaled beclometasone and short acting beta agonist

[1]Source: World Health Organization, 2017. Updated Appendix 3 to the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. Available at: https://goo.gl/tyULjS

Note: The source document includes a comprehensive listing of 88 interventions that are categorized as overarching/enabling policy actions, the most cost-effective interventions, and other effective interventions. This document presents a short summary of the main evidence based NCD interventions.

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