



My reservoir is like the distance between Aden and Amman in al-Balqa

Al-Balqa Applied University



Faculty of Medicine

Epidemiology and Biostatistics

الوبائيات والإحصاء الحيوي (31505204)

Lecture 21

**Chronic Non-Communicable Diseases
Epidemiology, Risk factors of NCD**

By

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What is the difference between communicable and noncommunicable disease?

- ❑ **Communicable diseases (CDs)** are the diseases which passes from one individual to another individual.
 - They are generally **caused** by some bacteria, viruses or any other pathogens. **For example**, malaria, AIDS etc.
- ❑ **Non-communicable diseases (NCDs)** are the diseases which does not spread from one person to another person.



Non-Communicable Disease (NCD): Definition

- Chronic conditions are characterized by the following:
 - **Do not result from an (acute) infectious process.**
 - **Are “not communicable”.**
 - **Cause premature morbidity, dysfunction, and reduced quality of life.**
 - **Usually develop and progress over long periods**
 - **Often initially insidious (unnoticed).**
 - **NCDs are diseases of long duration and generally slow progression.**



Non-Communicable Disease (NCD): Extended Definition

- In some definitions, NCDs also include:**
 - Chronic mental illness.**
 - Injuries, which have an acute onset, but may be followed by prolonged convalescence and impaired function.**

Facts (NCDs)

- NCDs, primarily cardiovascular diseases, cancers, chronic respiratory diseases and diabetes, are responsible for **63% of all deaths** worldwide (36 million out 57 million global deaths).
- **80%** of NCDs deaths occur in **low- and middle-income** countries.
- More than **9 million of all deaths** attributed to NCDs occur **before the age of 60**.

Facts (NCDs)

- **NCDs** are preventable through effective interventions that tackle shared risk factors, namely: tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol.
- **1.5 billion adults**, 20 and older, were **overweight** in 2008.
- Nearly **43 million children under 5 years** old were overweight in 2010.
- Tobacco use kills nearly **6 million people a year**. By 2020, this number will increase to 7.5 million, accounting for 10% of all deaths.



Types of NCDs

- **Cardiovascular disease** (Coronary heart disease, Stroke).
- **Cancer.**
- **Chronic respiratory diseases** (Chronic lung disease) (such as chronic obstructed pulmonary disease (COPD) and asthma).
- **Diabetes.**
- **Chronic neurologic disorders** (Alzheimer's, dementias).
- **Arthritis/Musculoskeletal diseases.**



Classifying deaths and diseases (WHO)

- **Communicable diseases [Group I]**
 - Those where death is directly due to the action of a communicable agent.

- **Non-communicable diseases**
 - Diseases **[Group II]**
 - ◆ **Cancer, diseases of various organ systems (eg respiratory, cardiovascular etc.), diabetes, mental health etc.**

 - **External causes (injuries, poisonings and violence)**
[Group III]



Leading Causes of Attributable Global Mortality and Burden of Disease, 2004

Attributable Mortality Attributable DALYs

	%
1. High blood pressure	12.8
2. Tobacco use	8.7
3. High blood glucose	5.8
4. Physical inactivity	5.5
5. Overweight and obesity	4.8
6. High cholesterol	4.5
7. Unsafe sex	4.0
8. Alcohol use	3.8
9. Childhood underweight	3.8
10. Indoor smoke from solid fuels	3.3

59 million total global deaths in 2004

	%
1. Childhood underweight	7.8
2. High blood pressure	7.5
3. Unsafe sex	6.6
4. Unsafe water, sanitation, hygiene	6.1
5. High blood glucose	4.9
6. Indoor smoke from solid fuels	4.8
7. Tobacco use	3.9
8. Physical inactivity	3.8
9. Suboptimal breastfeeding	3.7
10. High cholesterol	3.3

1.5 billion total global DALYs in 2004



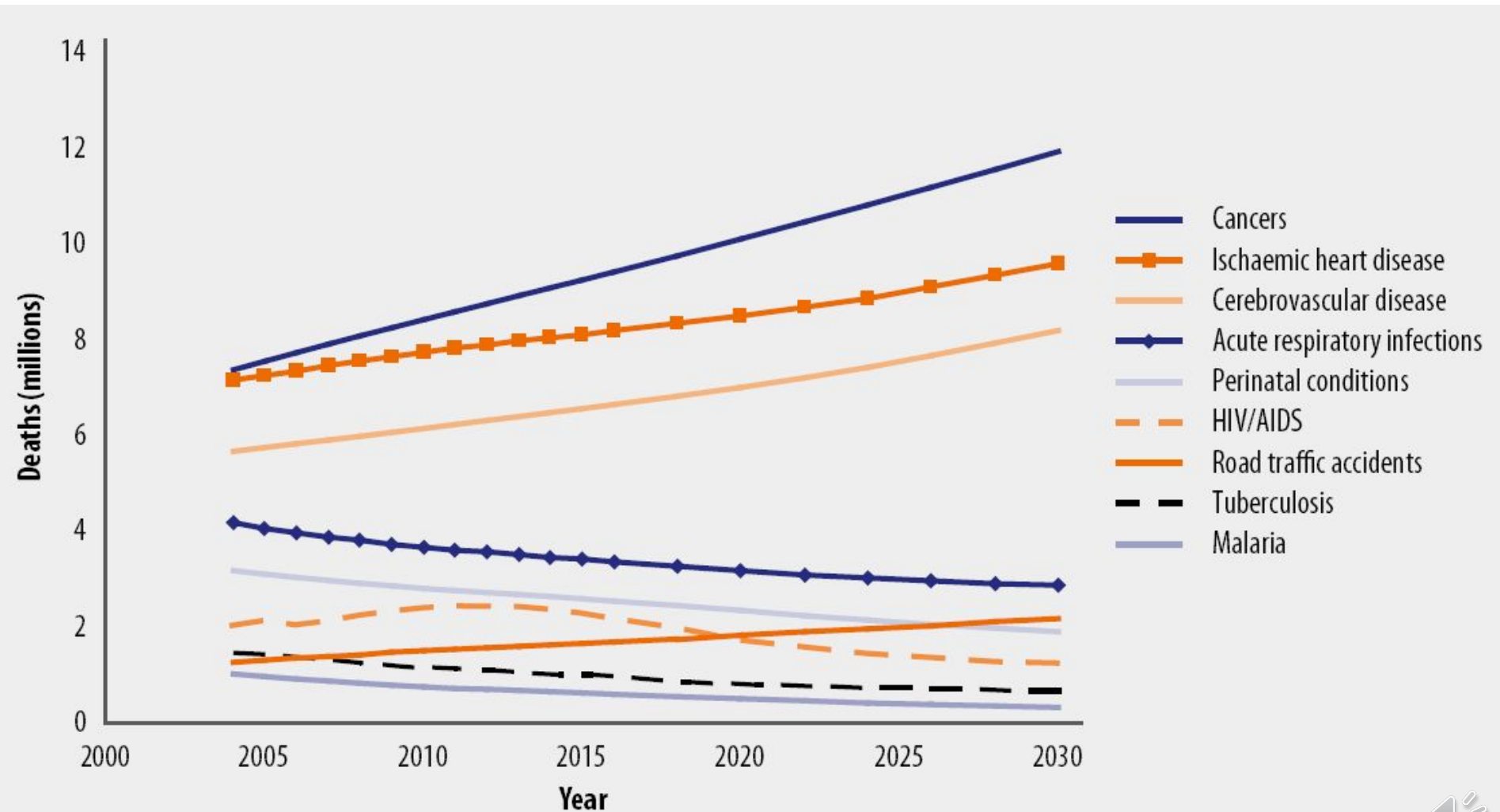
LEADING CAUSES OF DEATH, 2004 AND 2030 COMPARED

2004				2030			
Disease or injury	Deaths (%)	Rank		Rank	Deaths (%)	Disease or injury	
Ischaemic heart disease	12.2	1	→	1	14.2	Ischaemic heart disease	
Cerebrovascular disease	9.7	2	→	2	12.1	Cerebrovascular disease	
Lower respiratory infections	7.0	3	→	3	8.6	Chronic obstructive pulmonary disease	
Chronic obstructive pulmonary disease	5.1	4	→	4	3.8	Lower respiratory infections	
Diarrhoeal diseases	3.6	5	→	5	3.6	Road traffic accidents	
HIV/AIDS	3.5	6	→	6	3.4	Trachea, bronchus, lung cancers	
Tuberculosis	2.5	7	→	7	3.3	Diabetes mellitus	
Trachea, bronchus, lung cancers	2.3	8	→	8	2.1	Hypertensive heart disease	
Road traffic accidents	2.2	9	→	9	1.9	Stomach cancer	
Prematurity and low birth weight	2.0	10	→	10	1.8	HIV/AIDS	
Neonatal infections and other*	1.9	11	→	11	1.6	Nephritis and nephrosis	
Diabetes mellitus	1.9	12	→	12	1.5	Self-inflicted injuries	
Malaria	1.7	13	→	13	1.4	Liver cancer	
Hypertensive heart disease	1.7	14	→	14	1.4	Colon and rectum cancers	
Birth asphyxia and birth trauma	1.5	15	→	15	1.3	Oesophagus cancer	
Self-inflicted injuries	1.4	16	→	16	1.2	Violence	
Stomach cancer	1.4	17	→	17	1.2	Alzheimer and other dementias	
Cirrhosis of the liver	1.3	18	→	18	1.2	Cirrhosis of the liver	
Nephritis and nephrosis	1.3	19	→	19	1.1	Breast cancer	
Colon and rectum cancers	1.1	20	→	20	1.0	Tuberculosis	
Violence	1.0	22	→	21	1.0	Neonatal infections and other*	
Breast cancer	0.9	23	→	22	0.9	Prematurity and low birth weight	
Oesophagus cancer	0.9	24	→	23	0.9	Diarrhoeal diseases	
Alzheimer and other dementias	0.8	25	→	29	0.7	Birth asphyxia and birth trauma	
				41	0.4	Malaria	

* Comprises severe neonatal infections and other, noninfectious causes arising in the perinatal period.



Projected global deaths for selected causes, 2004–2030



What are the main noncommunicable diseases?

Heart disease and stroke



Cancer



Diabetes



Chronic respiratory disease



Characteristics of NCDs

- Complex etiology (causes)
- **Multiple risk factors**
- **Long latency period**
- Prolonged course of illness
- Functional impairment or disability
- **Incurability**
- Insidious onset





RISK FACTORS



Risk Factor

- **“An aspect of personal behavior or lifestyle, an environmental exposure, or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, injury, or other health condition.”**



Why Risk Factors?

- Surveillance for non-communicable disease can be **difficult because of:**
 - **Lag time between exposure and health condition,**
 - **More than one exposure for a health condition, and**
 - **Exposure linked to more than one health condition.**
- Interventions that target risk factors are needed to prevent disease.

Modifiable Risk Factor

- ❑ A risk factor that **can** be *reduced or controlled* by intervention, thereby reducing the probability of disease.

- ❑ The WHO has prioritized the following four:
 - **Physical inactivity**
 - **Tobacco use**
 - **Alcohol use**
 - **Unhealthy diets**



Non-Modifiable Risk Factor

- A risk factor that **cannot** be **reduced or controlled** by intervention, for example:
 - **Age**
 - **Gender**
 - **Race**
 - **Family history (genetics)**

Common Risk Factors

Noncommunicable Diseases 4 Diseases, 4 Modifiable Shared Risk Factors

	Tobacco Use	Unhealthy diets	Physical Inactivity	Harmful Use of Alcohol
Cardio-vascular				
Diabetes				
Cancer				
Chronic Respiratory				



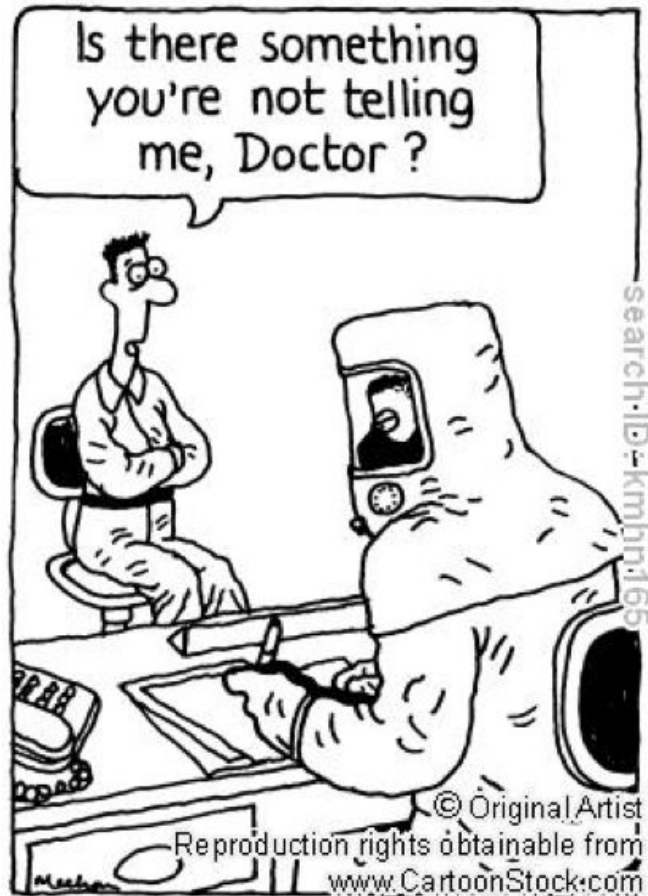
Noncommunicable Diseases
World Health Organization
ECOSOC High-level Segment



World Health Organization

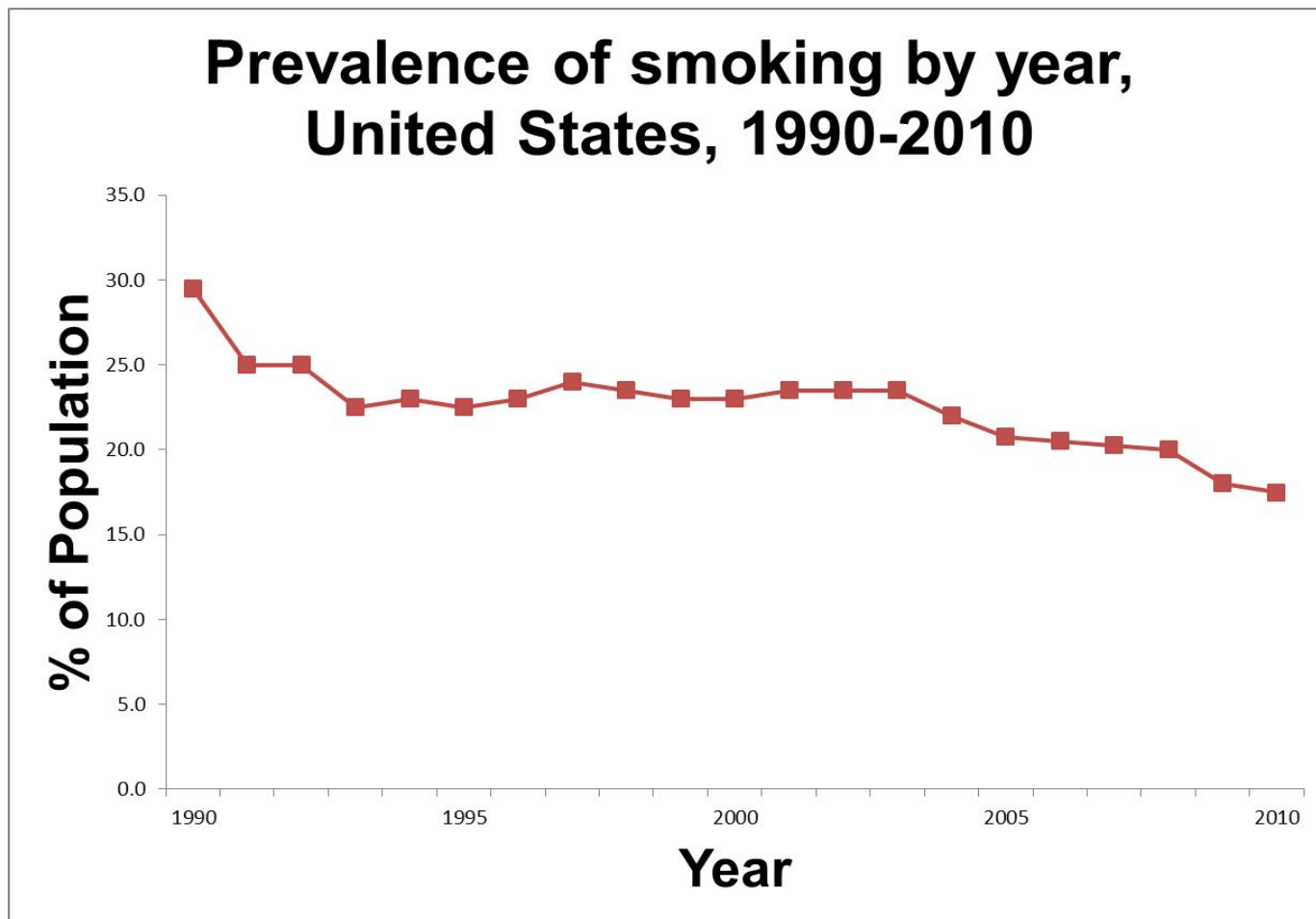


Non-Communicable Diseases vs. Communicable Diseases



- How do they differ regarding:
 - Infectiousness?
 - Risk of Disease?

Public Health Surveillance



Answers 1-2

1. Name at least four **types of NCDs**.

□ *Cardiovascular disease , Cancer, Chronic respiratory diseases and Diabetes.*

2. Name at least four **characteristics of NCDs**:

□ *Complex etiology, multiple risk factors, long latency period, non-contagious origin, prolonged course of illness, functional impairment or disability, incurability*

Answers 3-4

3. What are at least three examples of **modifiable risk factors**?

□ *Alcohol use, smoking, poor diet, physical inactivity, high blood pressure, high blood glucose.*

4. What are at least three examples of **non-modifiable risk factors**?

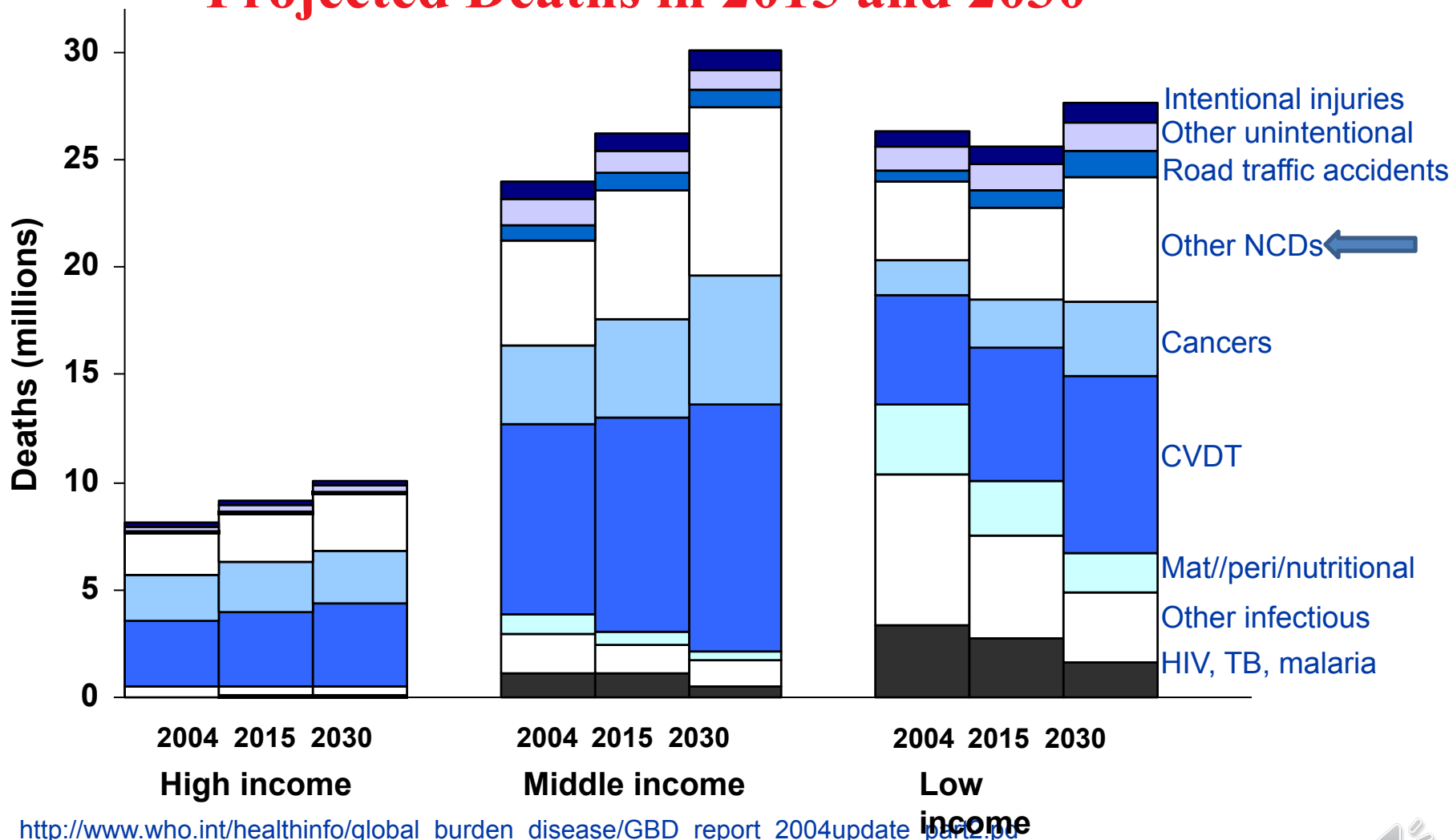
□ *age, race, gender, family history*

Answer 5

5. How do **NCDs and communicable diseases** differ?
- a. **Communicable disease** occurrence depends upon the **presence / absence** of disease already occurring in that population; For **NCDs**, all disease events **are generally independent of one another**.
 - b. For **NCDs**, the risk of disease **largely depends on population characteristics and other health behaviors**; **Communicable disease** can also be influenced by these characteristics, but they have properties that contribute to whether an exposed individual will become infected.

Global Trends Causes of Deaths

Projected Deaths in 2015 and 2030



http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_part2.pdf

Metabolic Risk

Factors

- ❑ “Metabolic” refers to **the biochemical processes involved in the body's normal functioning.**

- ❑ Behaviors (modifiable risk factors) *can lead to* **metabolic/physiologic changes.**

- ❑ WHO *has prioritized* the following **four metabolic risk factors:**
 - **Raised blood pressure**
 - **Raised total cholesterol**
 - **Elevated glucose**
 - **Overweight and obesity**

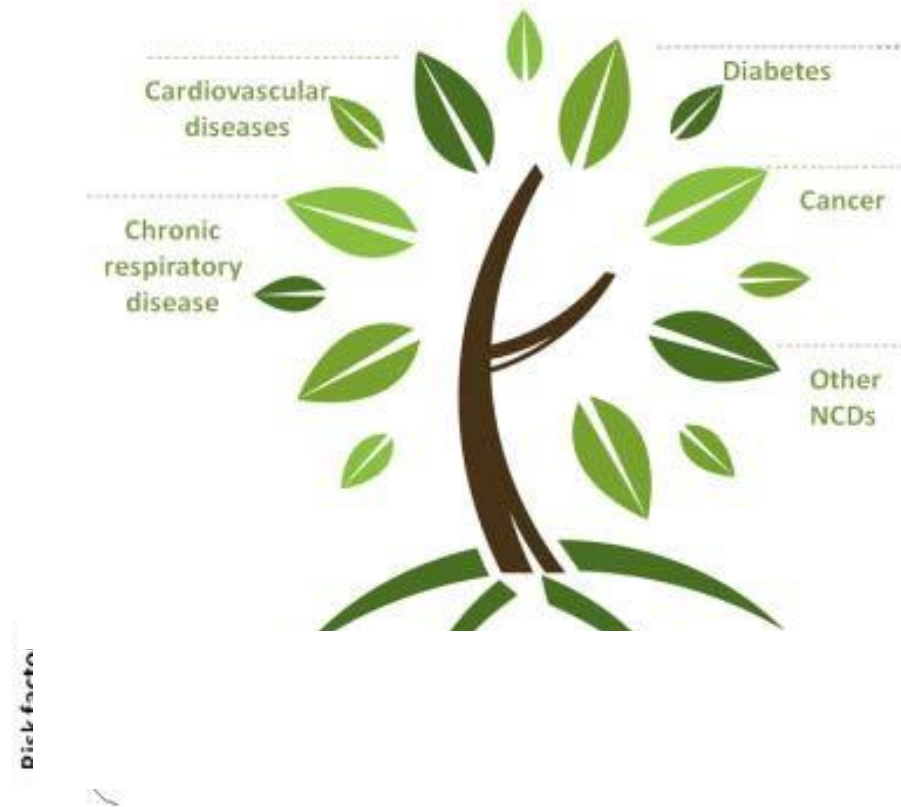
http://www.who.int/nmh/events/2012/discussion_paper3.pdf





Knowledge Check

1. What are the 4 main NCDs that are the focus of WHO?
2. Which NCD is projected to cause the most deaths by 2030?
3. How would you describe the difference between modifiable and non-modifiable risk factors?
4. What are the 4 modifiable shared risk factors?
5. What are the 4 priority metabolic risk factors?



FOUR LEADING NCDs

1- Cardiovascular Disease: Definition

- ❑ Cardiovascular disease (CVD) is a group of **disorders** of the heart and blood vessels, and may include:

▪ Coronary heart disease	▪ Disease of the blood vessels supplying the heart muscle.
▪ Cerebrovascular disease (Stroke)	▪ Disease of the blood vessels supplying the brain.
▪ Peripheral arterial disease	▪ Disease of blood vessels supplying the arms and legs.
▪ Congenital heart disease	▪ Malformations of heart structure existing at birth.

Cardiovascular Disease: Risk Factors

<p><i>Major modifiable risk factors</i></p> <ul style="list-style-type: none">- High blood pressure- Abnormal blood lipids- Tobacco use- Physical inactivity- Obesity- Unhealthy diet (salt)- Diabetes	<p><i>Other modifiable risk factors</i></p> <ul style="list-style-type: none">- Low socioeconomic status- Mental ill health (depression)- Psychosocial stress- Heavy alcohol use- Use of certain medication- Lipoprotein(a)
<p><i>Non-modifiable risk factors</i></p> <ul style="list-style-type: none">- Age- Heredity or family history- Gender- Ethnicity or race	<p><i>“Novel” risk factors</i></p> <ul style="list-style-type: none">- Excess homocysteine in blood- Inflammatory markers (C-reactive protein)- Abnormal blood coagulation (elevated blood levels of fibrinogen)

2- Diabetes: Risk Factors

<p><i>Major modifiable Risk Factors</i></p> <ul style="list-style-type: none">- Unhealthy diets- Physical Inactivity- Obesity or Overweight- High Blood Pressure- High Cholesterol	<p><i>Other Modifiable Risk Factors</i></p> <ul style="list-style-type: none">- Low socioeconomic status- Heavy alcohol use- Psychological stress- High consumption of sugar-sweetened beverages- Low consumption of fiber
<p><i>Non-modifiable Risk Factors</i></p> <ul style="list-style-type: none">- Increased age- Family history/genetics- Race- Distribution of fat	<p><i>Other Risk Factors</i></p> <ul style="list-style-type: none">- Low birth weight- Presence of autoantibodies

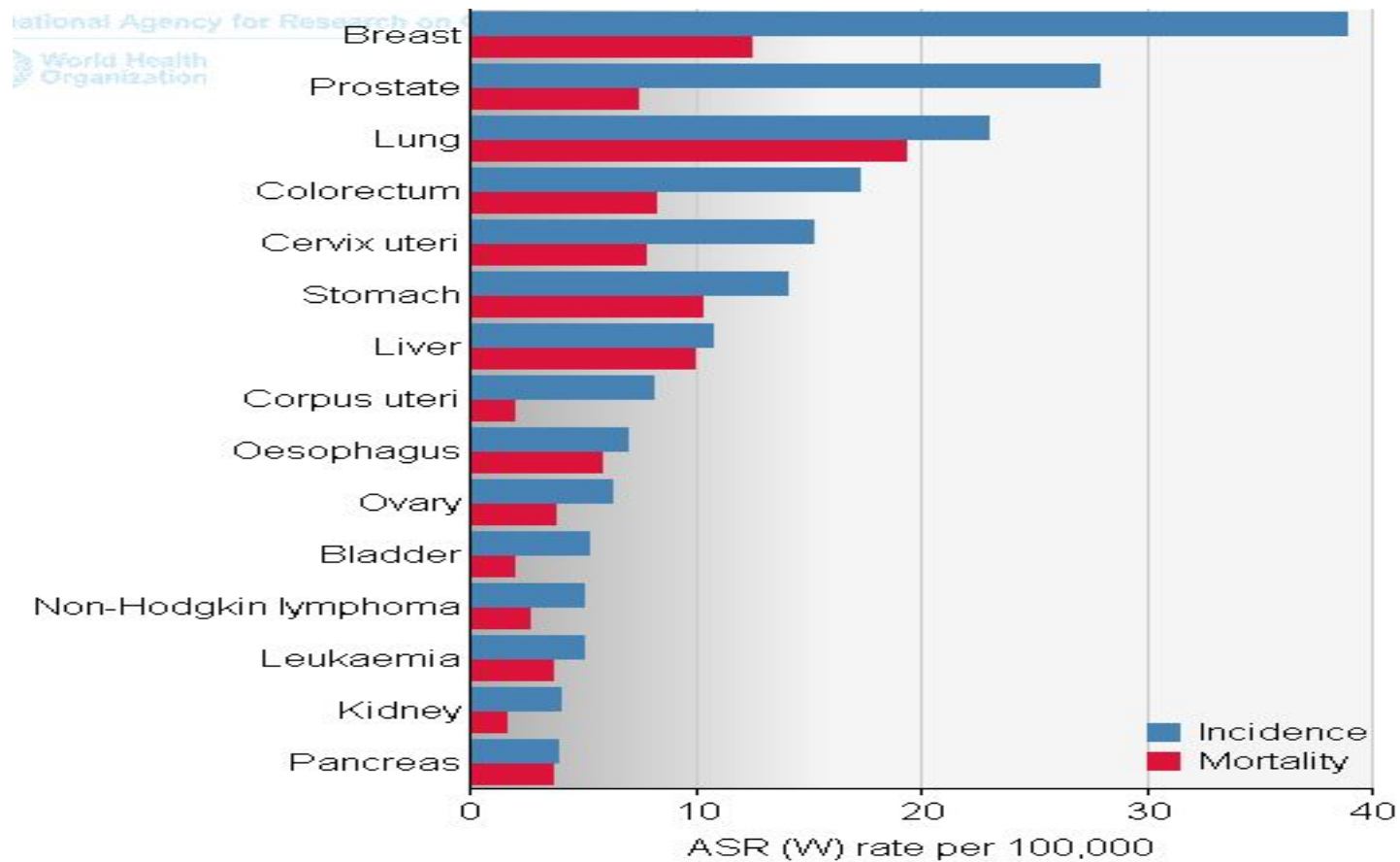
3- Cancer: Definition

- ❑ Generic term for a large group of diseases that can affect any part of the body.
- ❑ **“Rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs”**
(WHO, 2012)
- ❑ Benign tumors
- ❑ Malignant tumors

Global Burden of Cancer

- **7.6 million** people died from cancer in 2008.
- 70% of all cancer deaths occur in low- and middle-income countries.
- **Deaths from cancer are estimated to reach 13.1 million by 2030.**
- **About 30% of cancers are attributable to behavior risk factors.**

Estimated age-standardised incidence and mortality rates: total population



<http://globocan.iarc.fr/>

8/11/2020



Cervical Cancer:

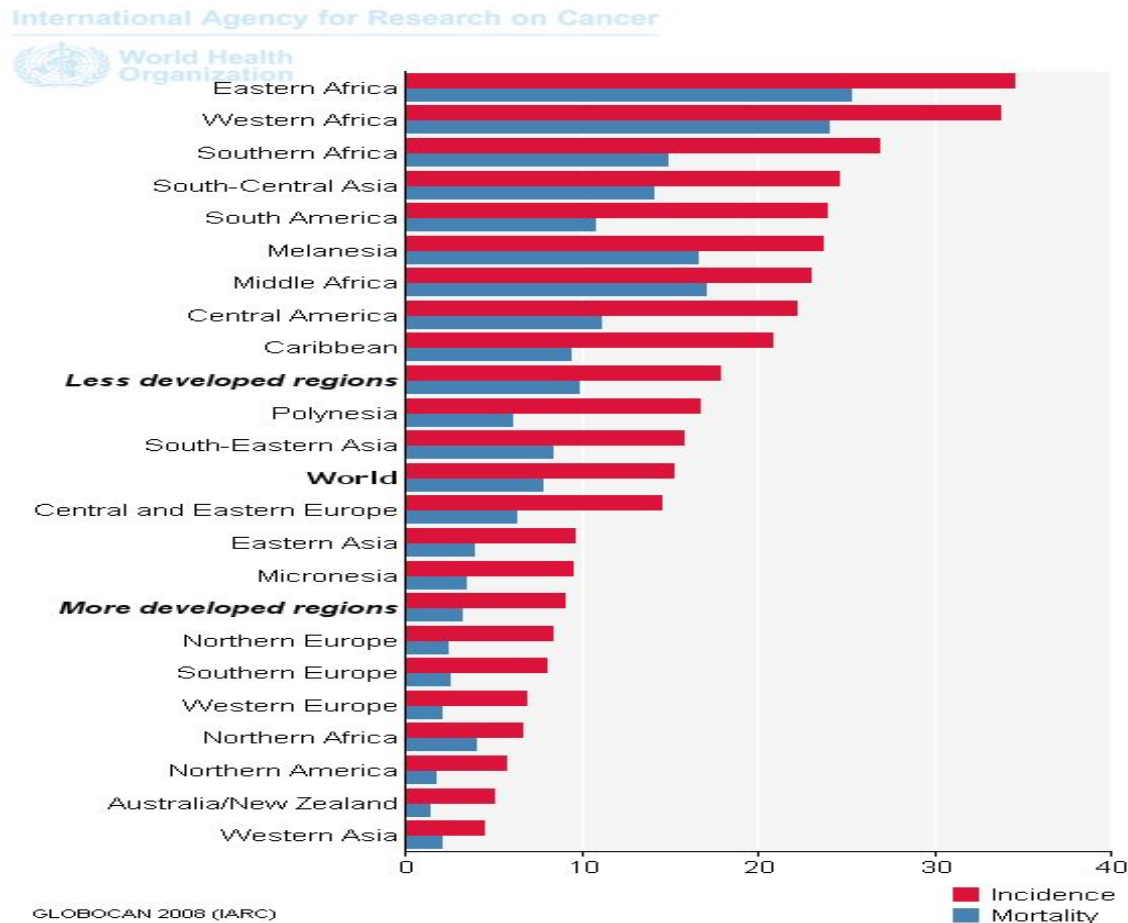
Definition

- ❑ **Cancer of the female reproductive system:**
 - Two cell types present (*squamous and glandular*).
 - Tend to occur where the two cell types meet.
 - **99% of cases linked to genital infection with human papillomavirus (HPV).**



Cervical Cancer

Estimated age-standardised rates (World) per 100,000



<http://globocan.iarc.fr/>

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Cervical Cancer: Risk Factors

- 1. Human papilloma virus infection (HPV)**
- 2. Smoking**
- 3. Immune Deficiencies**
- 4. Poverty**
- 5. No access to PAP screening**
- 6. Family history of cervical cancer**



Lung Cancer: Definition

- Cancer that forms in tissues of the lung, usually in the cells lining air passages.
- **Leading cause of cancer death globally, 1.37 million deaths in 2008.**
- **Affects more men than women.**
- **Two main types:**
 - Small cell lung cancer
 - Non-small cell lung cancer

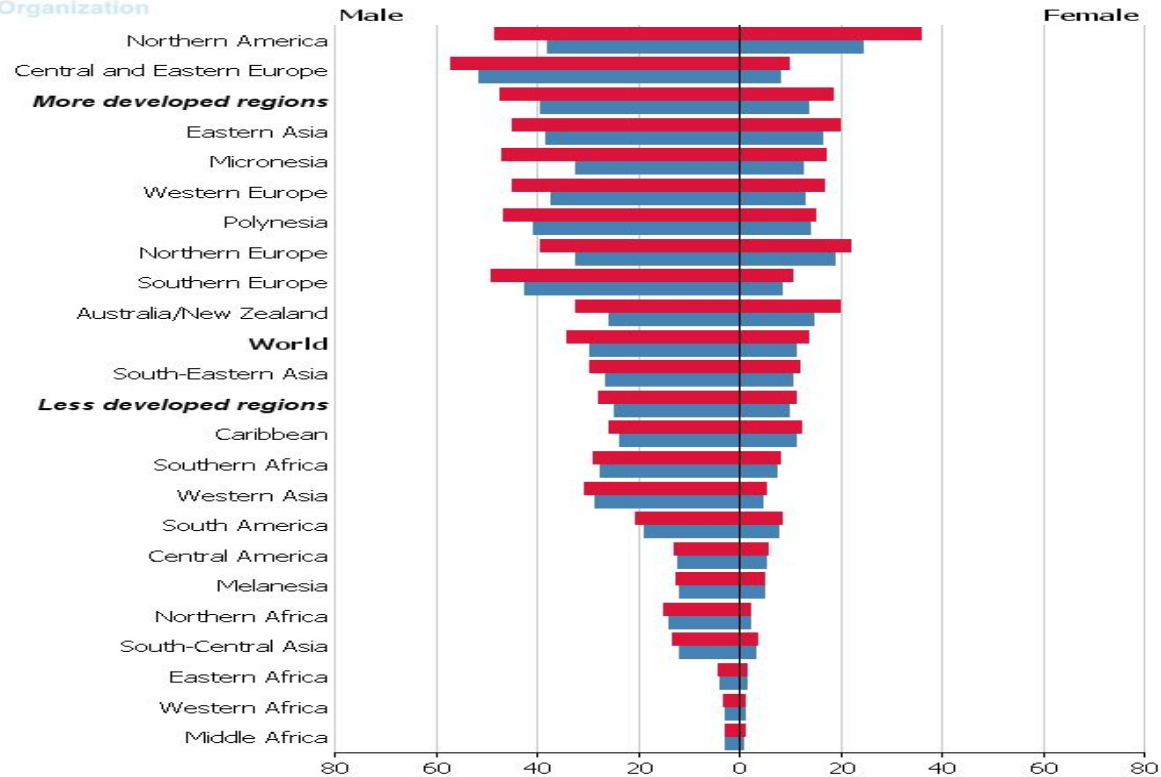
Lung Cancer

Incidence and Mortality in 2008: Both Sexes

International Agency for Research on Cancer



World Health Organization



GLOBOCAN 2008 (IARC)

■ Incidence
■ Mortality

Source: <http://globocan.iarc.fr/>

8/11/2020



Lung Cancer: Risk Factors

- 1. Smoking cigarettes, pipes, or cigars - now or in the past.**
- 2. Being exposed to second-hand smoke.**
- 3. Being treated with radiation therapy to the breast or chest.**
- 4. Being exposed to asbestos, radon, chromium, nickel, arsenic, soot, or tar.**
- 5. Living where there is air pollution.**

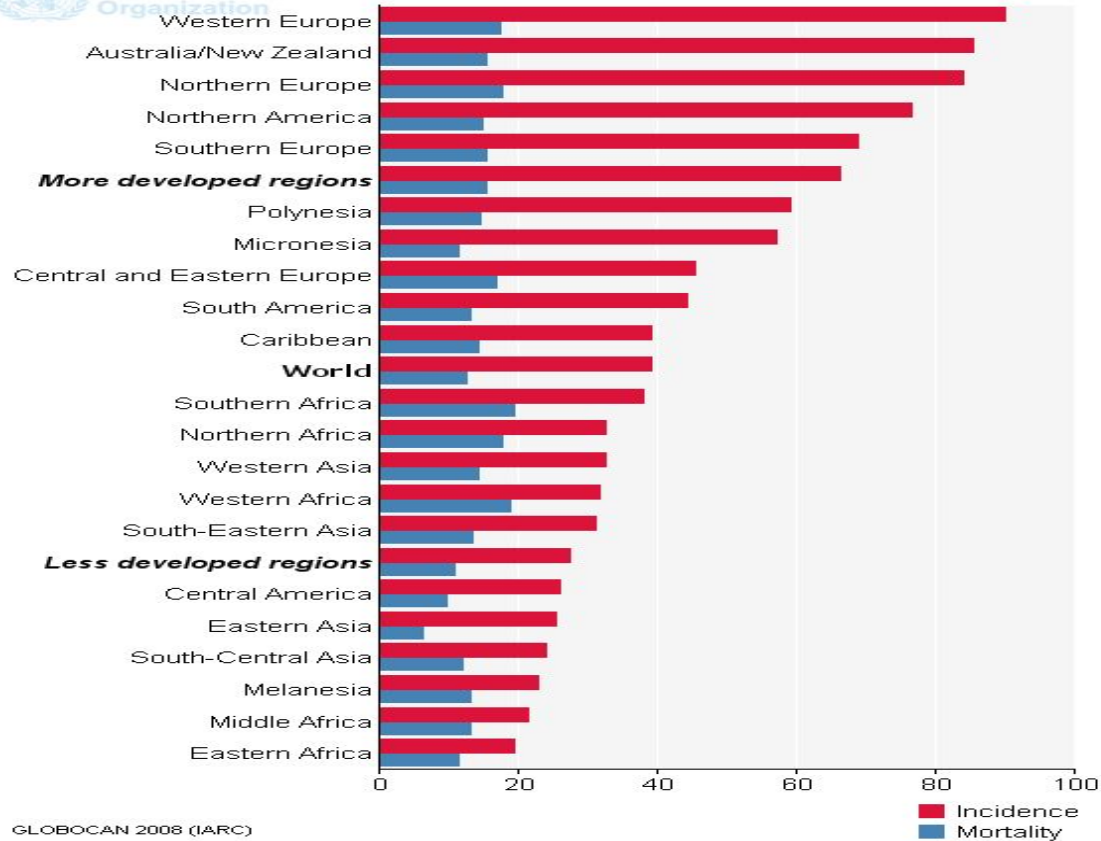
Breast Cancer: Definition

- Cancer that forms in the tissues of the breast, usually in the ducts or in the lobules.
- **Occurs commonly in women, rarely occurs in men**
- **1 of 8 women will be diagnosed with breast cancer in her lifetime.**

Breast Cancer

Incidence and Mortality in 2008

International Agency for Research on Cancer



GLOBOCAN 2008 (IARC)

<http://globocan.iarc.fr/>

8/11/2020

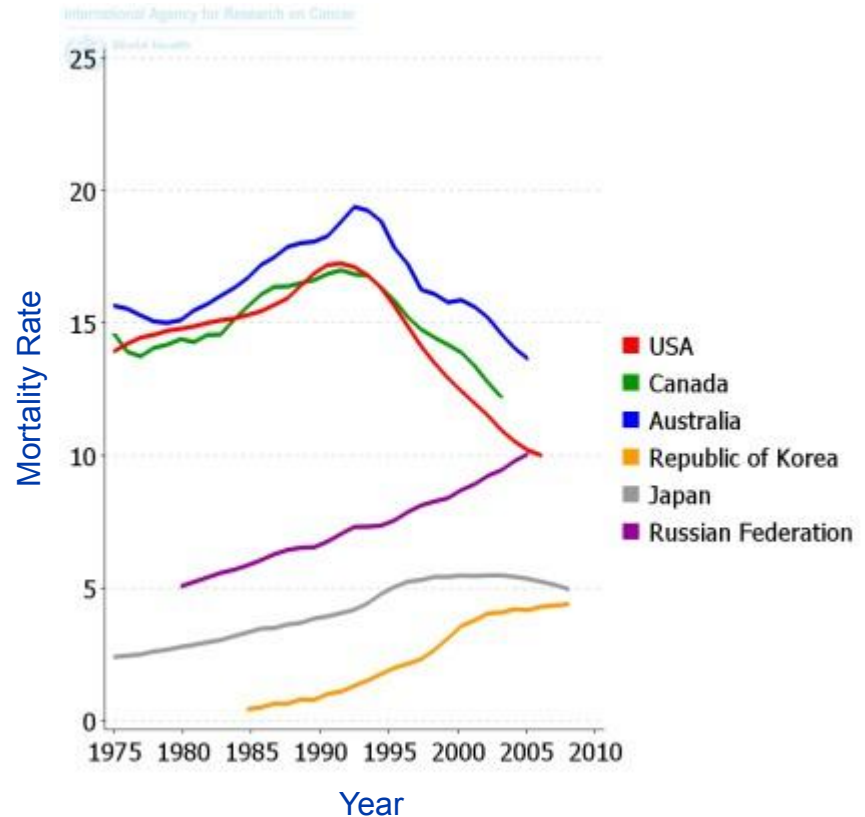


Breast Cancer: Risk Factors

- 1. Hormone therapies.**
- 2. Weight and physical activity.**
- 3. Race.**
- 4. Genetics or family history BRCA1 and BRCA2 genes.**
- 5. Age is the most reliable risk factor! Risk increases with age.**

Prostate Cancer

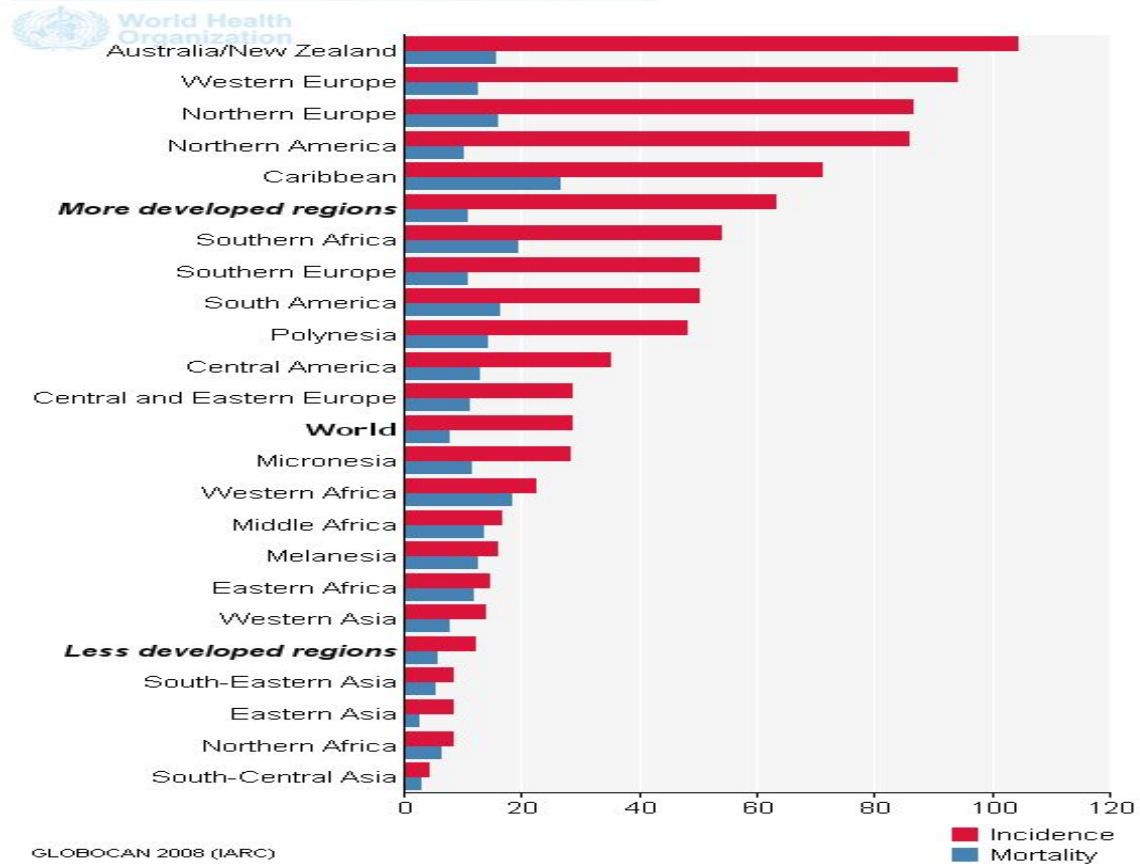
- **2nd most common cancer among men.**
- The cancer develops inside of the prostate gland.
- Risk factors: **age, race, obesity, weight gain**



Prostate Cancer

Incidence and Mortality in 2008: Total Population

International Agency for Research on Cancer



<http://globocan.iarc.fr/>

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Colorectal Cancer

- **3rd most common type of cancer.**
- Forms in the lower part of the digestive system (large intestine).
- **Risk Factors include:**
 - **Aging**
 - **Black race**
 - **Unhealthy diet and low exercise**
 - **Diabetes**
 - **Family history of colorectal cancer**



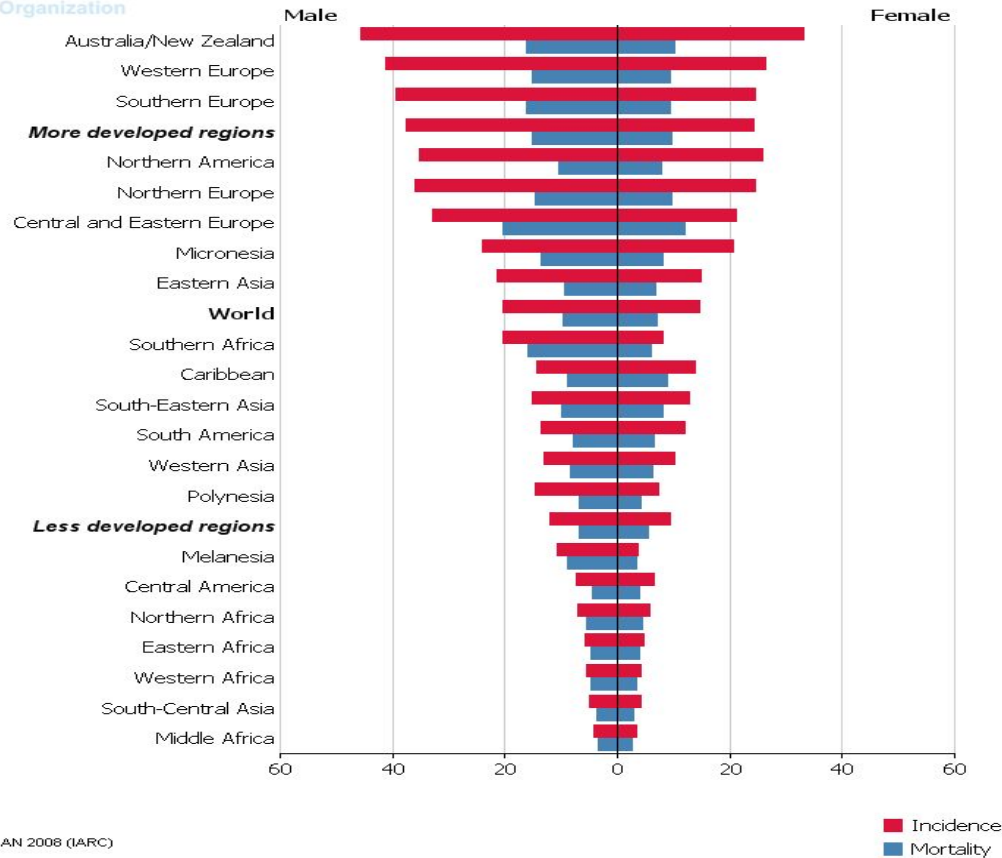
Colorectal Cancer

Incidence and Mortality in 2008: Both Sexes

International Agency for Research on Cancer



World Health Organization

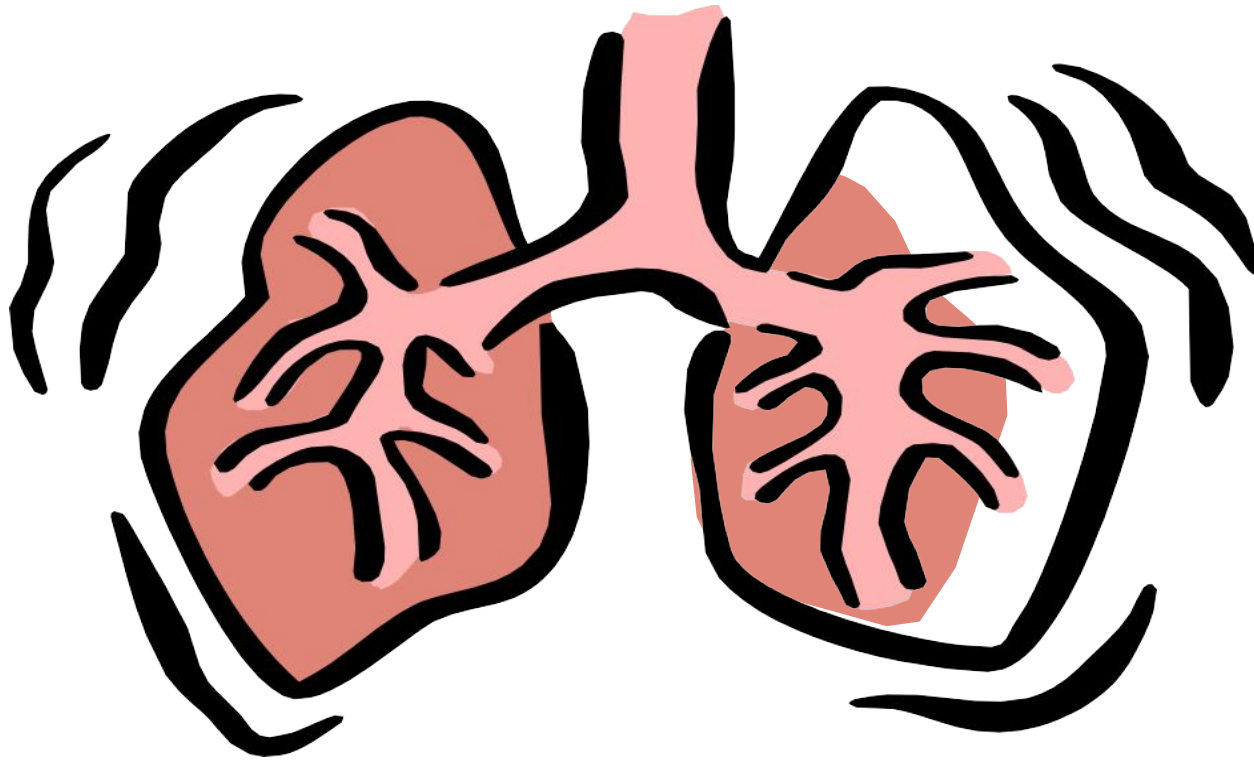


GLOBOCAN 2008 (IARC)

<http://globocan.iarc.fr/>

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4- CHRONIC RESPIRATORY DISEASES

Chronic respiratory diseases

- ❑ **Chronic respiratory diseases** are chronic diseases of the airways and other structures of the lung.

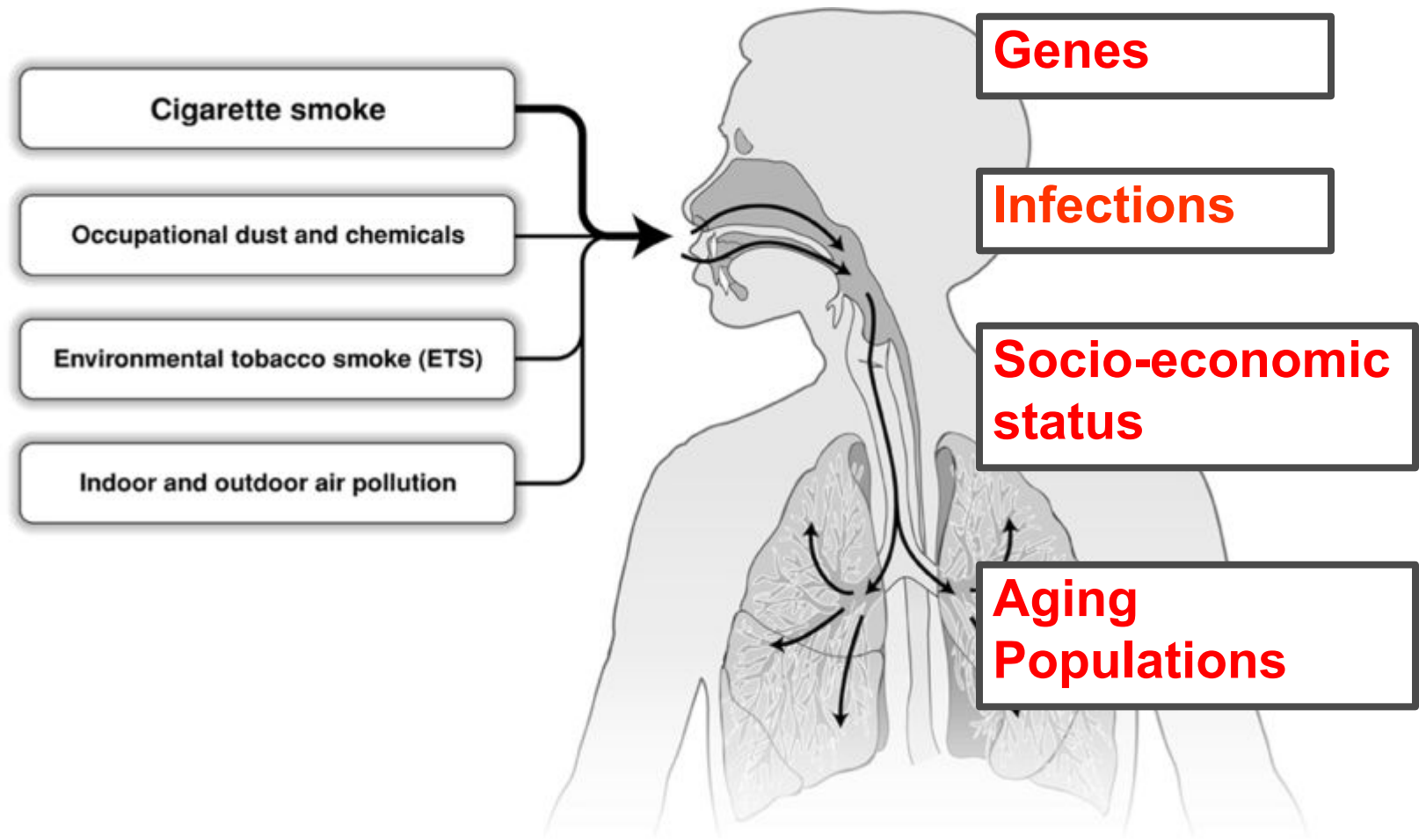
- ❑ **Some of the most common are:**
 - Asthma
 - Chronic obstructive pulmonary disease (COPD)
 - Respiratory allergiesetc.

- ❑ **Main risk factors**
 - Tobacco smoking
 - Indoor air pollution
 - Outdoor pollution
 - Allergens etc.

Global Burden of Chronic Respiratory Disease

- **A leading cause of death.**
- High under-diagnoses rates.
- 90% of deaths occur in low-income countries.

Chronic Respiratory Diseases: Shared Risk Factors



<http://www.goldcopd.org/other-resources-gold-teaching-slide-set.html>

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COPD: Definition

- **Chronic obstructive pulmonary disease** is a lung disease that is characterized by a persistent reduction of airflow.
- Chronic obstructive pulmonary disease **is a progressive life-threatening lung disease that causes breathlessness.**
- COPD – term used for lung diseases that prevent proper lung airflow.
- The more familiar terms: Chronic bronchitis, emphysema
- **The primary cause of COPD is exposure to tobacco smoke (either active smoking or secondhand smoke).**

COPD: Burden

- Accurate epidemiologic data on COPD prevalence, morbidity, and mortality are **difficult and expensive** to collect.
- **65 million** people worldwide have **moderate to severe COPD**.
- More than **3 million** people died of COPD in 2015 (**5%** of all deaths globally).
- Almost **90%** of COPD deaths occur in **low- and middle-income** countries.
- COPD is likely to **increase** in coming years due to **higher smoking prevalence** and **aging populations** in many countries.



Asthma

- **Asthma** is one of the major noncommunicable diseases. It is a chronic disease of the air passages of the lungs which **inflames and narrows** them.
- **235 million** people currently suffer from asthma. It is a **common** disease among **children**. Most **deaths** occur in **older adults**.
- Asthma is **under-diagnosed and under-treated**. It creates substantial burden to individuals and families and often restricts individuals' activities for a lifetime.
- Recurrent attacks of “**breathlessness and wheezing**” (WHO, 2012)
- A gradient of severity.
- Recurrent asthma symptoms frequently cause **sleeplessness, daytime fatigue, reduced activity levels ,etc.**
- Some cases of COPD are due to long-term asthma.
- Asthma has a relatively **low fatality rate** compared to other chronic diseases.