MEDICAL UNIVERSITY – PLEVEN
FACULTY OF PUBLIC HEALTH

DEPARTMENT OF PUBLIC HEALTH SCIENCES

DAY 3 INTERNSHIP

MORBIDITY – MEASUREMENT, SOURCES AND METHODS. ICD. TRENDS AND LEADING CAUSES OF MORBIDITY. DALY'S.

Prepared by:
Assoc. Prof. Dr. Mariela Kamburova, MD, PhD

Topics to be discussed:

1. What is public health? The concept of population health
2. Measuring morbidity – sources and methods
3. Disease recording systems
4. ICD
5. Trends of morbidity
6. What are DALYs?

Social Medicine as a science

- Subject – population health as a complex systemic object
- Methodology – health is a result of a complex interaction of biological and social factors, under the crucial influence of social ones
- The area of application of social medicine knowledge is public health

Public Health

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

Health indicators

- Population health is measured by a variety of indicators (health indicators)
- Health indicator is a variable that can by directly measured and reflects the population health status
- Health indicators are used to determine the health needs of communities and populations
- Health indicators help in planning of health services, distribution of resources and assessment of health care outcomes

Health indicators

The ideal health indicator has to be:

- **Valid –** to measure what it is supposed to measure
- **Reliable –** to give the same results if measured under the same circumstances
- **Sensitive –** to catch rapidly the change of the measured phenomenon
- **Specific –** to reflect specifically the changes in a particular situation
- **Feasible/measurable –** data can be collected or derived from accessible sources
- **Relevant –** to help understanding of the phenomenon

Health indicators

- Mortality indicators
- Morbidity indicators
- Disability indicators
- Nutritional status indicators
- Health care resources indicators
- Indicators of health services utilization
- Mental health indicators
- Ecological indicators
- Social-economic indicators
- Health policy indicators
- Quality of life indicators

Health indicators for operational assessment of population health

- Demographic indicators (vital statistics)
- Morbidity and disability indicators
- Physical development indicators

The most informative health indicators of population health

- Infant mortality, Under-5 mortality
- Maternal mortality
- Life expectancy, Healthy life expectancy

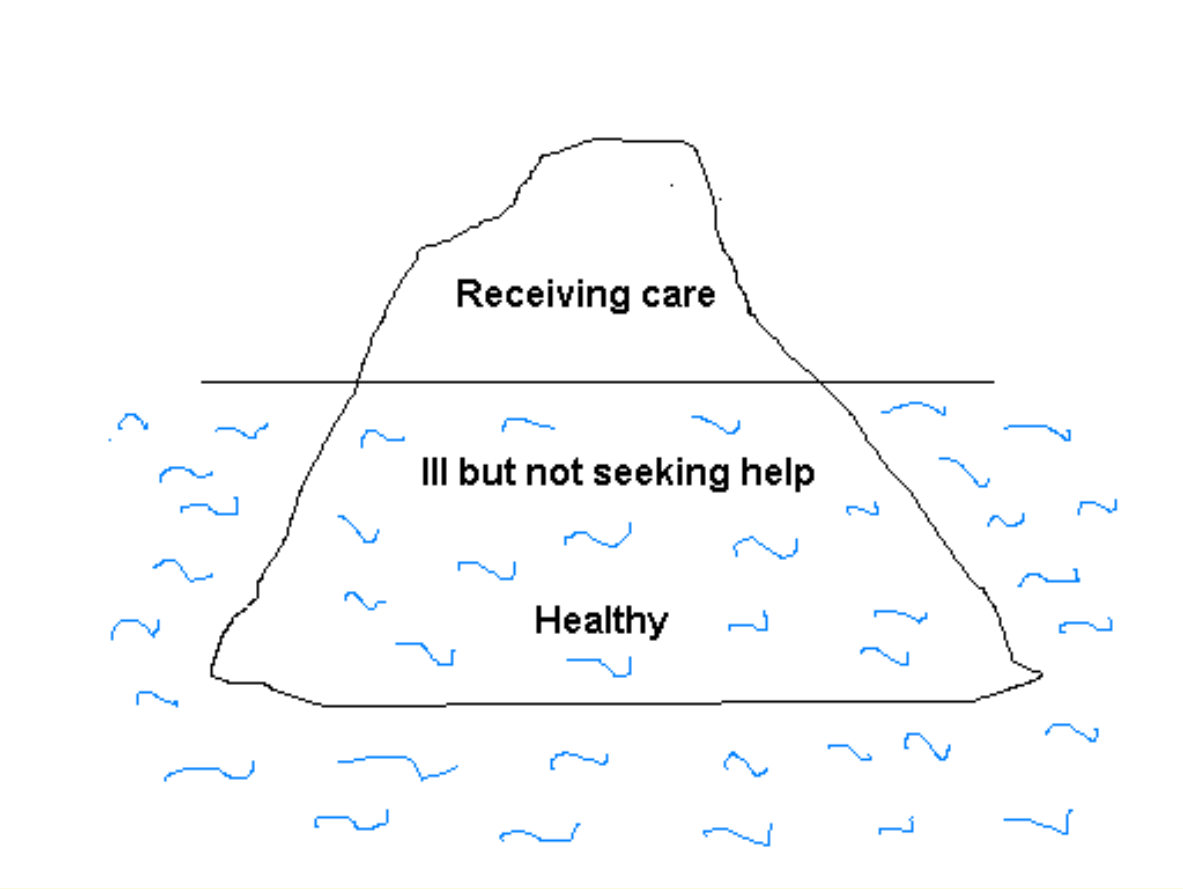
STUDYING MORBIDITY

- It is difficult to provide a comprehensive picture of the range of illness and disease among populations due to two problems:
- The completeness of morbidity data
- The validity of morbidity data

The information on morbidity is mainly collected from people who made contacts with health services

STUDYING MORBIDITY

The Iceberg concept of health care



STUDYING MORBIDITY

- The completeness of morbidity data depends on:
  - Self-reporting of illness and level of self-medication
  - Traditions of seeking medical attention
  - Availability and accessibility of health services
  - Diagnostic technologies available
  - Reporting practices of medical staff

STUDYING MORBIDITY

- The validity of morbidity data depends on:
  - The validity of diagnostic practices
  - The level of medical education
  - The system of payment for the services

Measurement of morbidity

- Incidence
- Point Prevalence
- Period prevalence
- Iceberg of morbidity

Incidence rate

Measures the number of new cases of disease that develop in a population during a specified time period.

$$\frac{\text{Number of new cases of a disease during a period}}{\text{Mid-year population during the period}} \times 10^{n}$$

Point prevalence

Measures the frequency of existing cases at one moment, in cross-sectional studies.

Often used to describe the population health.

$$\frac{\text{Number of existing cases at a given point in time}}{\text{Population at risk at the same moment}} \times 10^{n}$$

Period prevalence

Measures the number of cases at the beginning of the period plus the newly developed cases, divided by the population at risk during that period.

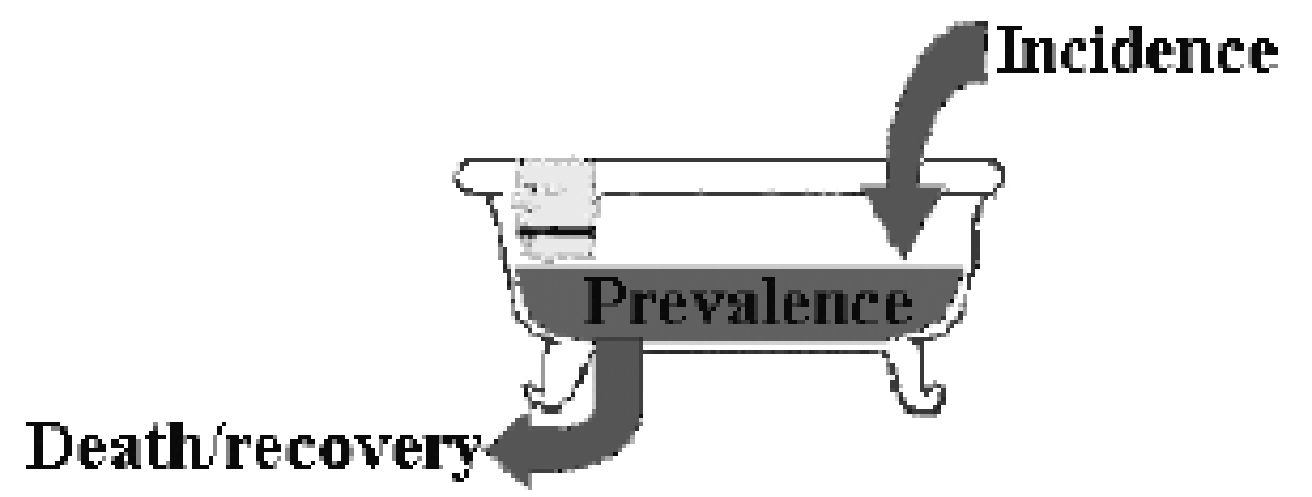
Describes the health-related problem in the population.

Useful measure in planning and distributing health resourses

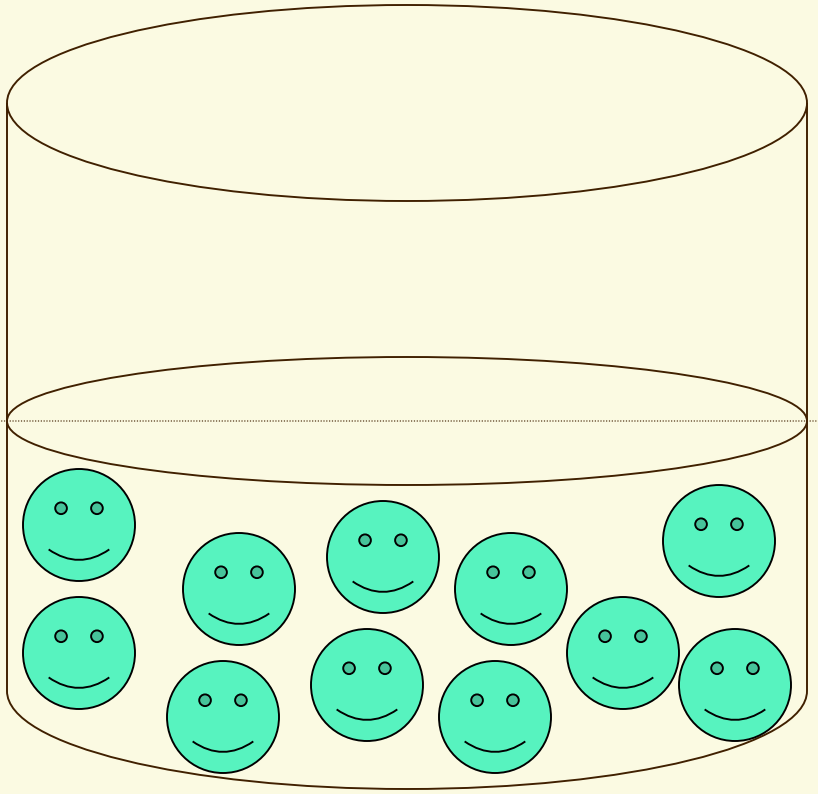
$$\frac{\text{Number of registered cases /old and new/ during a given period}}{\text{Mid-year population during the same period}} \times 10^n$$

Prevalence and Incidence

- Prevalence is a function of the incidence of disease and the duration of disease

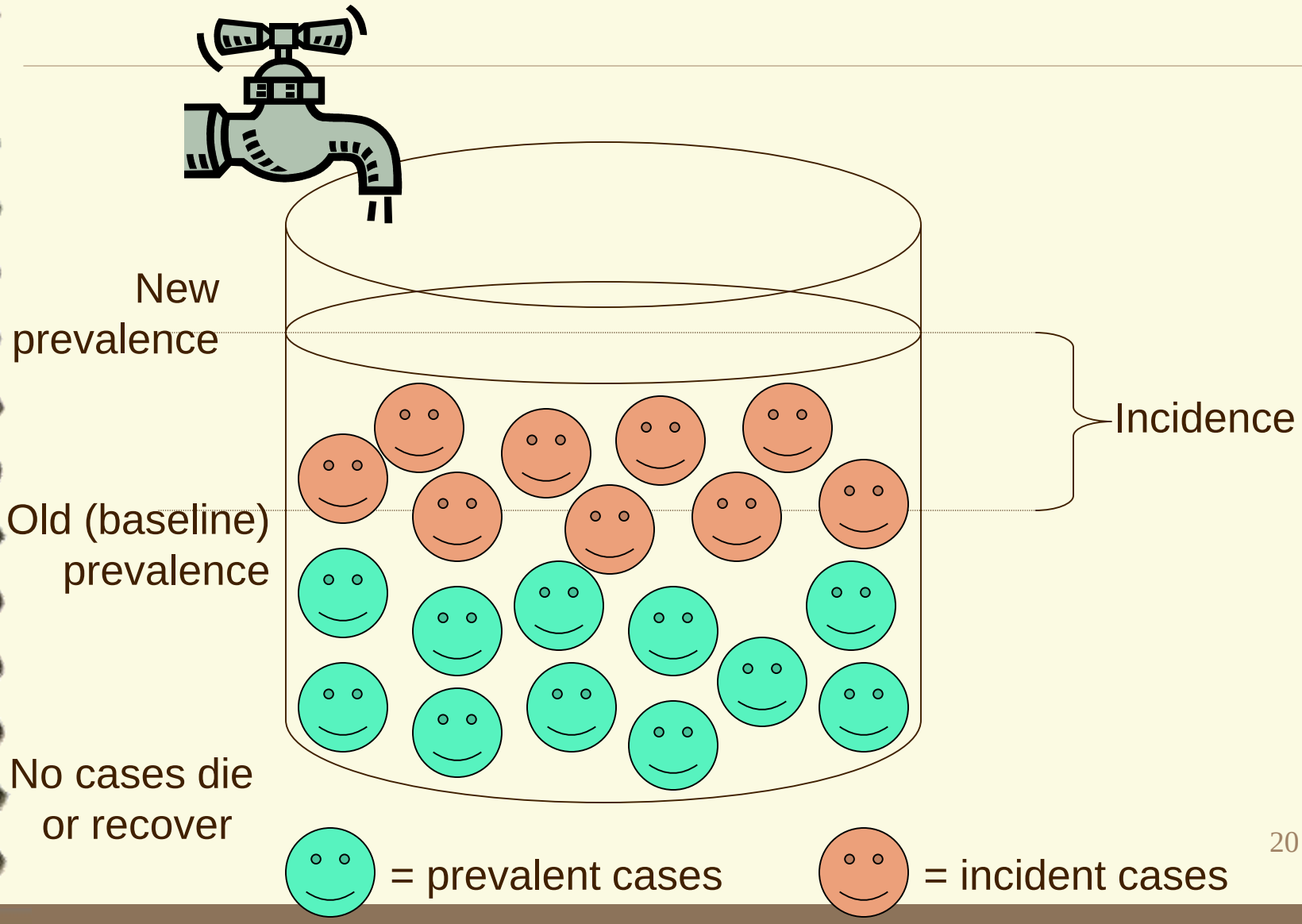


Prevalence and Incidence

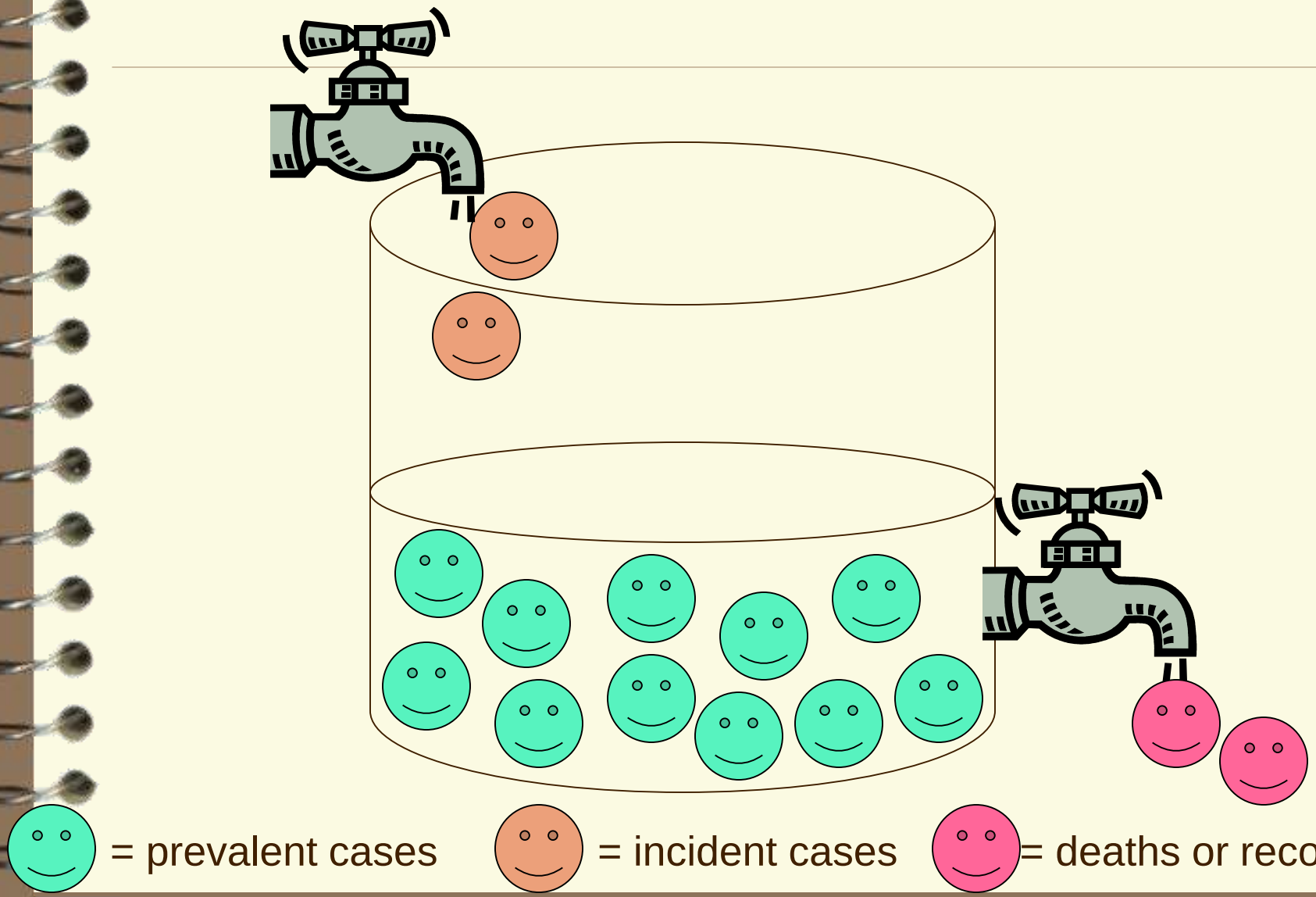


= prevalent cases

Prevalence and Incidence



Prevalence and Incidence



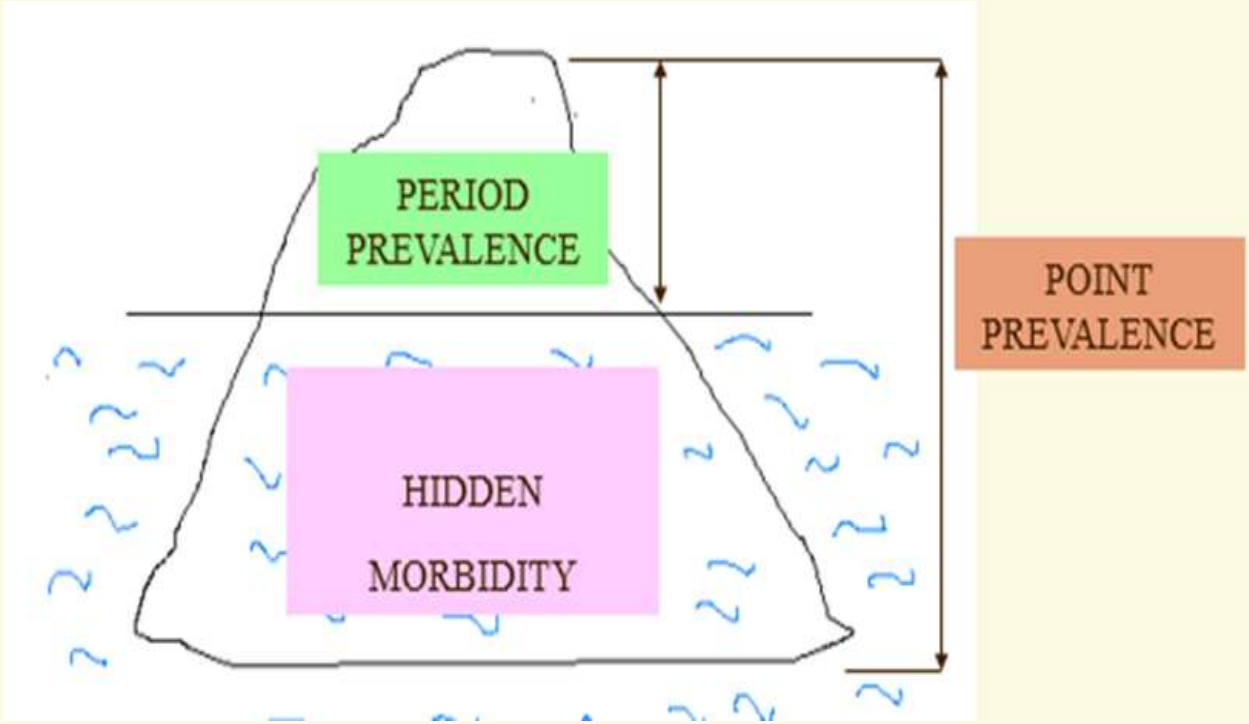
9th of April 2020

All | Europe | North America | Asia | South America | Africa | Oceania

Country, Other	Total Cases	New Cases	Total Deaths	New Deaths	Total Recovered	Active Cases	Serious, Critical	Tot Cases/ 1M pop	Deaths/ 1M pop	Total Tests	Tests/ 1M pop
World	1,603,652	+85,589	95,692	+7,234	356,352	1,151,608	49,158	206	12.3		
USA	468,566	+33,536	16,691	+1,900	25,928	425,947	10,011	1,416	50	2,353,096	7,109
Spain	153,222	+5,002	15,447	+655	52,165	85,610	7,371	3,277	330	355,000	7,593
Italy	143,626	+4,204	18,279	+610	28,470	96,877	3,605	2,375	302	853,369	14,114
Germany	118,235	+4,939	2,607	+258	52,407	63,221	4,895	1,411	31	1,317,887	15,730
France	117,749	+4,799	12,210	+1,341	23,206	82,333	7,066	1,804	187	333,807	5,114
China	81,865	+63	3,335	+2	77,370	1,160	176	57	2		
Iran	66,220	+1,634	4,110	+117	32,309	29,801	3,918	788	49	231,393	2,755
UK	65,077	+4,344	7,978	+881	135	56,964	1,559	959	118	298,169	4,392
Turkey	42,282	+4,056	908	+96	2,142	39,232	1,552	501	11	276,338	3,277
Belgium	24,983	+1,580	2,523	+283	5,164	17,296	1,285	2,156	218	84,248	7,269
Switzerland	24,051	+771	948	+53	10,600	12,503	386	2,779	110	178,500	20,625
Netherlands	21,762	+1,213	2,396	+148	250	19,116	1,424	1,270	140	101,534	5,926

ICEBERG OF MORBIDITY

ICEBERG OF MORBIDITY = Point Prevalence – Period Prevalence



Sources and methods of studying morbidity

- Morbidity recording in general practice
- Notification of some important diseases
- Registries
- Hospital morbidity systems - discharge statistics
- Some health service utilization statistics
- Health surveys

Sources and methods of studying morbidity

- **Morbidity recording in general practice**

GP records each consultation on a medical record. There is a standardized form of the record.

Information on variety of conditions ranging from less serious disorders to severe diseases

Sources and methods of studying morbidity

- **Notification of diseases:**
  - Infectious diseases of public health importance
  - Exotic infections
  - Venereal diseases
  - New cases of cancer
  - Certain occupational diseases

Sources and methods of studying morbidity

- **Registries**

Cancer

Birth defects

Substance abuse

Mental diseases

The register of a certain disease:

- Identifies affected individuals
- They have common characteristic of interest
- Longitudinal follow-up with updating the individual information in a defined systematic manner
- Based on geographically-defined population

Sources and methods of studying morbidity

- **Hospital morbidity systems**

Information on most severe cases of diseases for which hospital care is needed

Discharge information mainly

Driven by the contracts with National Health Insurance Fund – distortion of the information possible

Sources and methods of studying morbidity

- Health surveys – based on personal health information collected directly from the general population
- Variety of surveys, can be combined with examinations and collecting some biological samples

- Self-reported morbidity and disability
- Acute and long-standing illness
- Subjective nature of the information, inaccurate, but helps to produce a comprehensive picture of morbidity in the population

Methods of studying morbidity

1. Active methods:	2. Passive methods:
• Regular check-ups • Gathering information from the patient and the family	• By using data from medical examinations • By using data from causes of death

Sources of morbidity data

1. Health institutions with their documentations.
2. The patient and his/her family.
3. Mortality registries.

International Classification of Diseases, Tenth Revision (ICD-10)

- WHO produces “International Statistical Classification of Diseases and Health Related Problems” or ICD
- Principal means of classifying and coding both morbidity and mortality
- ICD-10 was published in 1992, replaced ICD-9
- ICD-10 groups diagnoses, signs and symptoms, causes and other factors in 21 chapters
- Alphanumeric codes A00.0 to Z99.9

International Classification of Diseases, Tenth Revision (ICD-10)

- ICD allows for greater precision and uniformity in medical diagnosis
- Uniform coding
- Letter U is reserved for additional codes and new diseases discovered between revisions of ICD

International Classification of Diseases, Tenth Revision (ICD-10)

I	Certain infectious and parasitic diseases	A00-B99
II	Neoplasms	C00-D48
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D50-D89
IV	Endocrine, nutritional and metabolic diseases	E00-E90
V	Mental and behavioural disorders	F00-F99
VI	Diseases of the nervous system	G00-G99
VII	Diseases of the eye and adnexa	H00-H59
VIII	Diseases of the ear and mastoid process	H60-H95
IX	Diseases of the circulatory system	I00-I99
X	Diseases of the respiratory system	J00-J99
XI	Diseases of the digestive system	K00-K93
XII	Diseases of the skin and subcutaneous tissues	L00-L99
XIII	Diseases of the musculo-skeletal system and connective tissue	M00-M99
XIV	Diseases of genito-urinary system	N00-N99
XV	Pregnancy, childbirth and the puerperium	O00-O99
XVI	Certain conditions originating in the perinatal period	P00-P95
XVII	Congenital malformations, deformations, and chromosomal abnormalities	Q00-Q99
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00-R99
XIX	Injury, poisoning and certain other consequences of external causes	S00-T98
XX	External causes of morbidity and mortality	V01-Y98
XI	Factors influencing health status and contact with health services	Z00-Z99

International Classification of Diseases, Eleven Revision (ICD-11)

A version of ICD-11 was released on 18 June 2018 to allow Member States to prepare for implementation, including translating ICD into their national languages. ICD-11 will be submitted to the 144th Executive Board Meeting in January 2019 and the Seventy-second World Health Assembly in May 2019 and, following endorsement, Member States will start reporting using ICD-11 on 1 January 2022.

International Classification of Diseases, Eleven Revision (ICD-11)

- New core chapters include 'Diseases of the immune system', 'Sleep-wake disorders', and 'Conditions related to sexual health'.

https://www.who.int/classifications/icd/en/

Trends and leading causes of morbidity

- Diseases with highest incidence

STD

ARI

Diarrhea

- Diseases with highest prevalence

Hypertension

Mental disorders

Trends and leading causes of morbidity

- Diseases with highest rate of GP consultations

adults	children
Heart diseases	Respiratory diseases
Respiratory diseases	Nervous system diseases
Nervous system diseases	Skin diseases
Injury and poisoning	Infectious diseases

Trends and leading causes of morbidity

- Diseases with highest rates of hospitalisation

Heart diseases

Respiratory system

Digestive system

Injury and poisoning

Mental disorders

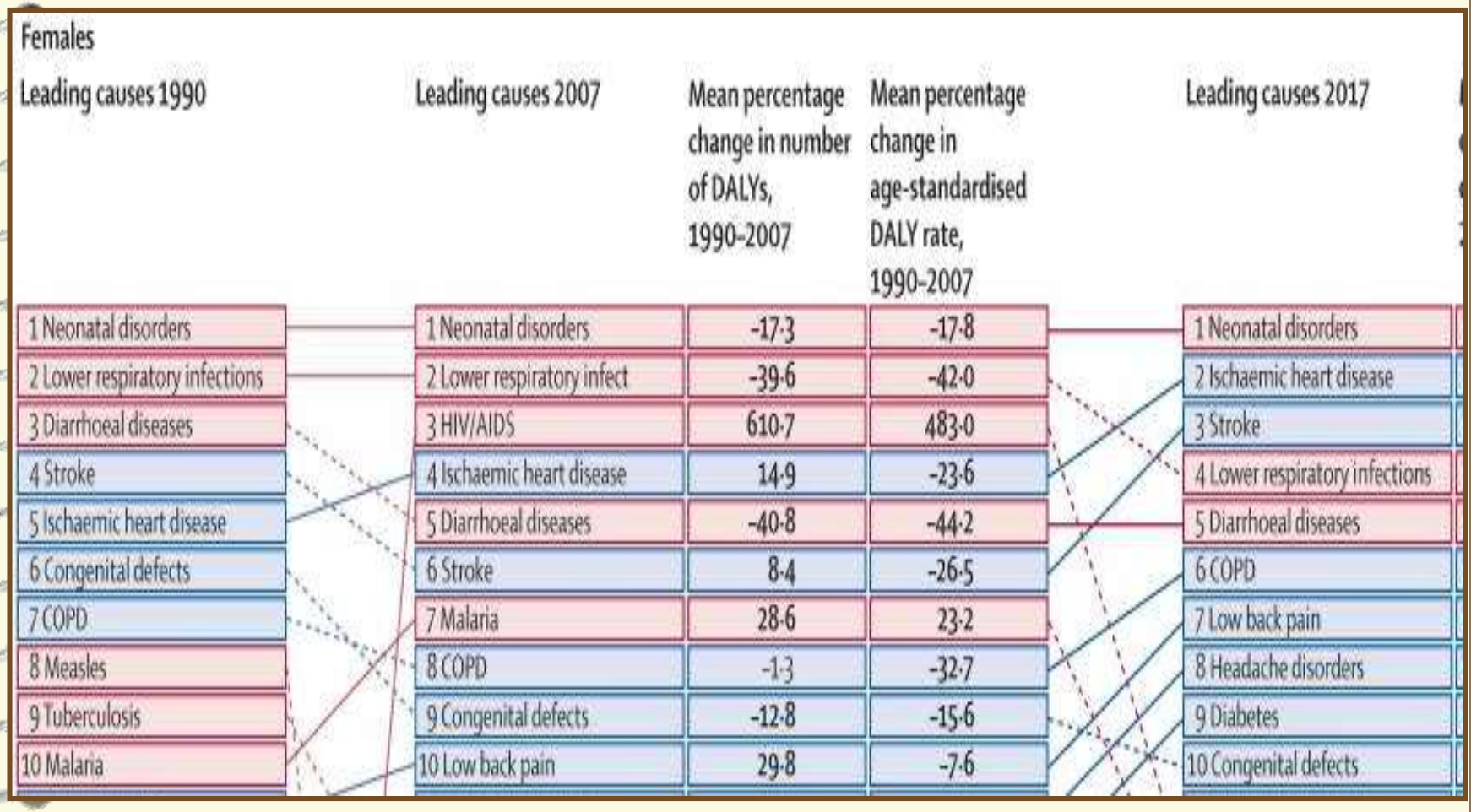
Disability-Adjusted Life Years (DALYs)

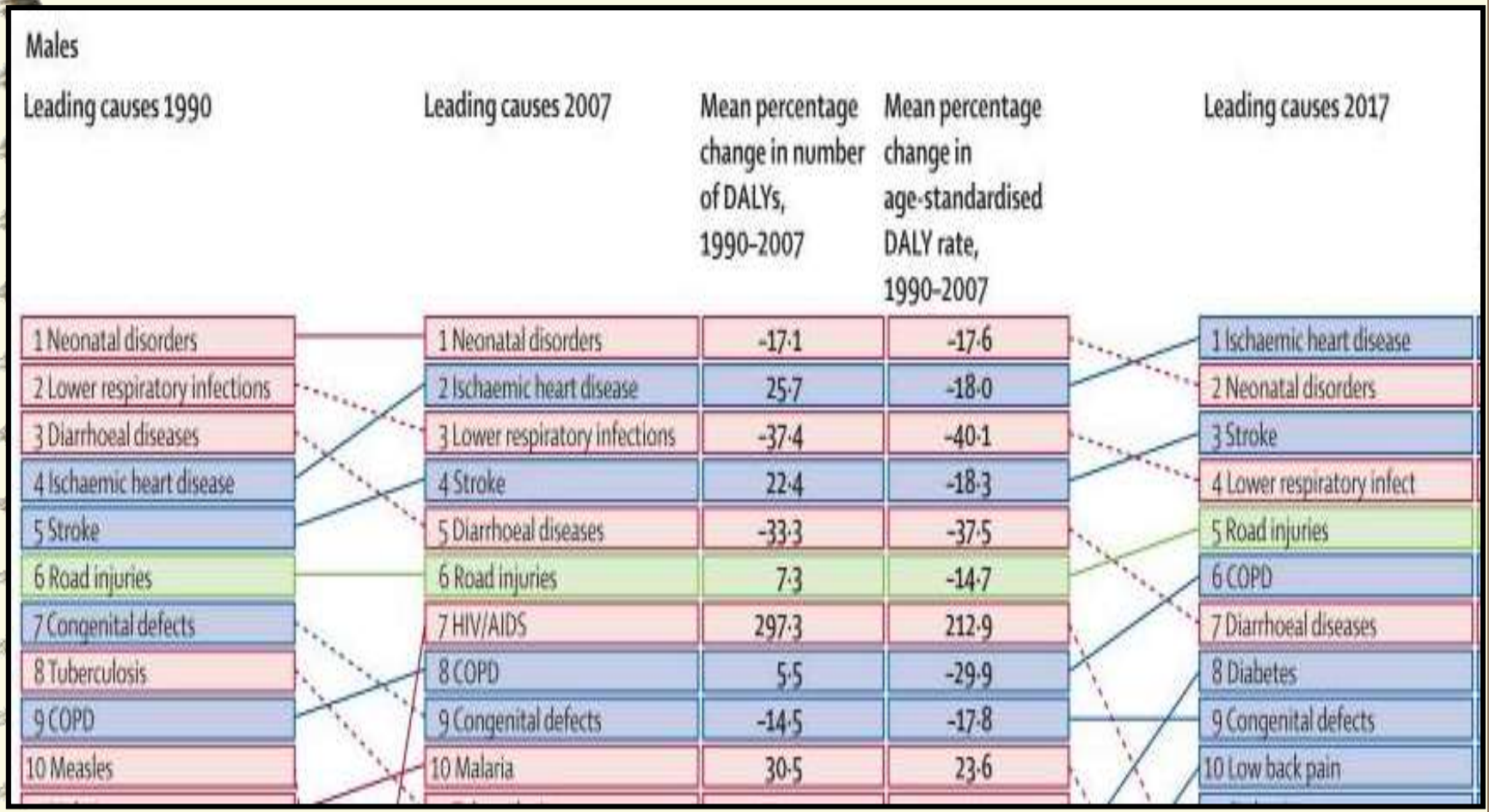
- DALYs are a measure of the burden of disease on a define population and the effectiveness of interventions
- Based on an adjustment of life expectancy to allow for long-term or permanent disability as estimated from available national statistics
- 1 DALY is 1 year of life lost due to disability and premature death

- Between 1990 and 2017, age-standardized DALY rates:
  - Decreased by 41·3% (38·8–43·5) for communicable diseases and
  - Decreased by 49·8% (47·9–51·6) for neonatal disorders.
  - For non-communicable diseases, global DALYs increased by 40·1% (36·8–43·0),

Although age-standardized DALY rates decreased by 18·1% (16·0–20·2).

- Globally, in 2017, the five leading causes of DALYs were:
  - neonatal disorders,
  - ischemic heart disease,
  - stroke,
  - lower respiratory infections,
  - chronic obstructive pulmonary disease.


Females
Leading causes 1990
Leading causes 2007
Mean percentage change in number of DALYs, 1990–2007
Mean percentage change in age-standardised DALY rate, 1990–2007
Leading causes 2017
1 Neonatal disorders
2 Lower respiratory infections
3 Diarrhoeal diseases
4 Stroke
5 Ischaemic heart disease
6 Congenital defects
7 COPD
8 Measles
9 Tuberculosis
10 Malaria
1 Neonatal disorders
2 Lower respiratory infect
3 HIV/AIDS
4 Ischaemic heart disease
5 Diarrhoeal diseases
6 Stroke
7 Malaria
8 COPD
9 Congenital defects
10 Low back pain
-17·3
-39·6
610·7
14·9
-40·8
8·4
28·6
-1·3
-12·8
29·8
-17·8
-42·0
483·0
-23·6
-44·2
-26·5
23·2
-32·7
-15·6
-7·6
1 Neonatal disorders
2 Ischaemic heart disease
3 Stroke
4 Lower respiratory infections
5 Diarrhoeal diseases
6 COPD
7 Low back pain
8 Headache disorders
9 Diabetes
10 Congenital defects



Lancet. 2018 Nov 10; 392(10159): 1859–1922.

PREVENTION

DEFINITION, LEVELS, SCREENING TESTS

Prepared by:
Assoc. Prof. Dr. Stela Georgieva, MD, PhD

Definition of Prevention

- **Prevention** is a wide range of medical and non-medical activities aimed at eradicating, eliminating or minimizing the impact of diseases and disability or, if non of this is feasible, retarding the progress of disease or disability

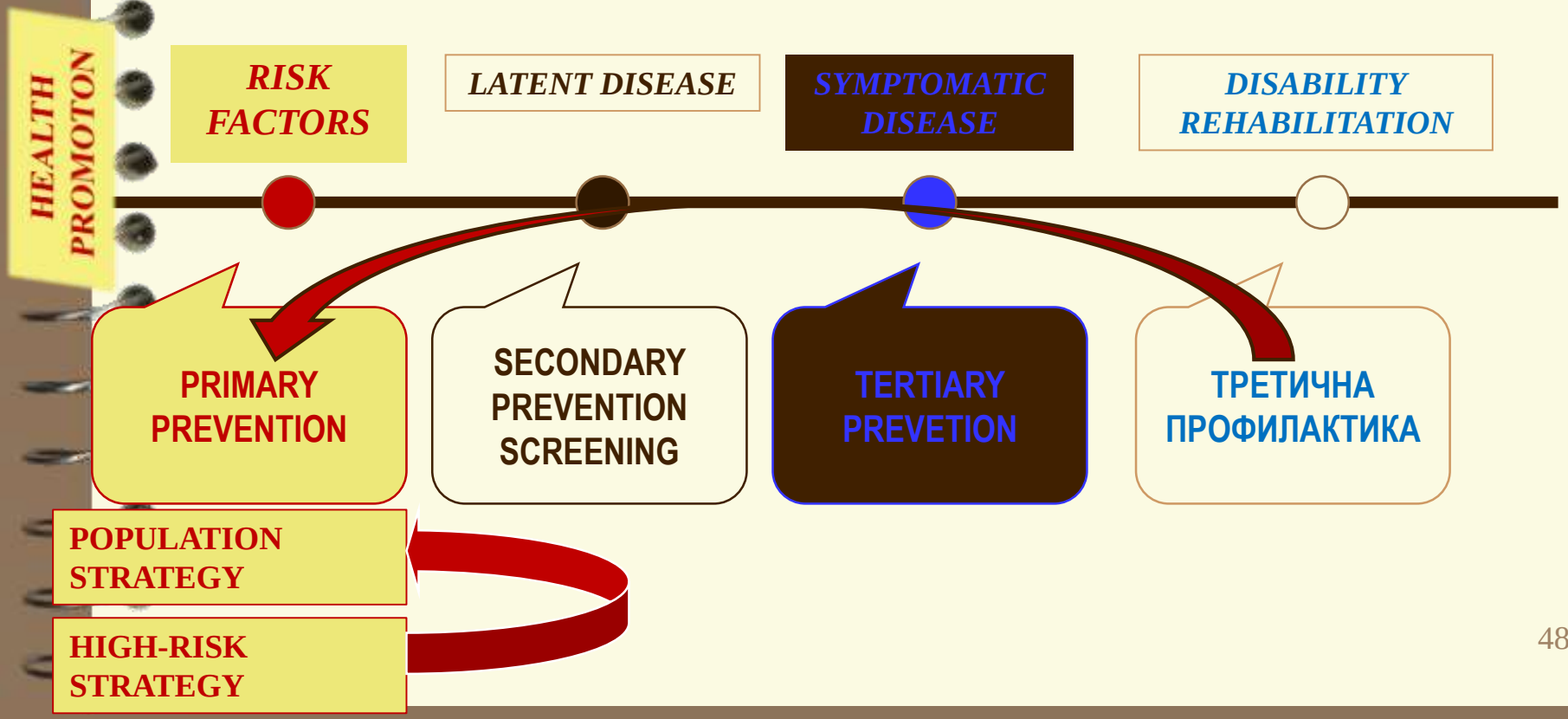
Levels of prevention

1. Primordial prevention
2. Primary prevention
3. Secondary prevention
4. Tertiary prevention
5. Quaternary prevention

1 and 2 - contribute most to health of total population

3, 4 and 5 - are focused on people who already have signs of disease

Levels of prevention



Primordial prevention

Objective – to avoid the establishment of social, economic and cultural patterns of living that contribute to higher risk of poor health.

Examples:

- Better hygiene, sanitation
- Health education in childhood
- National policies and programs on nutrition, physical activity
- Pro-active health protection by health legislation

Primary prevention

Objective – to limit incidence (disease occurrence) by controlling specific causes and harmful effect of risk factors (risk reduction).

Examples:

- Immunizations; chemoprophylaxis – to increase resistance of individuals against pathogenic agents
- Dose control; protection against occupational hazards – to decrease the time of exposure and the amount of risk factors

Strategies of primary prevention

1. **Population (mass) strategy** aims to reduce (by a small amount) risk factors in entire population

2. **High-risk (individual) strategy** aims to reduce risk of disease for people with the highest level of exposure in population (people susceptible to disease)

Strategies of primary prevention	Advantages	Disadvantages
Population strategy	+ *Radical* + *Large potential for whole population* + *Appropriate to reduce behavior risk factors*	- *Small benefit to individuals* - *Poor motivation of subjects* - *Poor motivation of physicians* - *Benefit-to-risk ratio may be low*
High-risk strategy	+ *Large benefit to individuals* + *High subjects motivation* + *High physicians motivation* + *Benefit-to-risk ratio may be favourable*	- *Difficulties in identifying high-risk individuals* - *Temporary effect* - *Limited effect* - *Behaviorally inappropriate*

Prevention paradox

Prevention paradox is a phenomenon typical for population strategy of primary prevention.

It is a states that large number of people must participate in population strategy for the direct benefit to relatively few.

Example: Most people will wear a seat-belt while driving a car for their entire life without being involved in a crash. The widespread wearing of seat-belts has been very beneficial to the population as a whole but little apparent benefit accrued by those individuals who are never personally involved in a crash.

Secondary prevention

Objective – to reduce serious consequences of disease through early diagnosis and treatment

An intervention implemented **after** the disease has began but **before** it is symptomatic. It attempts to arrest the disease progress and treating it before irreversible pathological changes take place

Secondary prevention

Example:

- Screening

Screening is the process of using tests on a large scale to identify the presence of disease in apparently healthy people.

Types of Screening

- **Mass screening** – aims to screen whole population
- **Multiple screening** – uses several screening tests at the same time
- **Targeted screening** – includes people or groups with specific exposures
- **Opportunistic screening** – aimed at patients who consult a health practitioner for some other purpose

Requirements for implementation of screening program

Disorder	Well-defined
Prevalence	Known
Natural history	Long period between first signs and overt disease Medically important disorder for which there is an effective remedy
Test choice	Simple and safe
Financial	Cost-effective
Facilities	Available or easily provided
Acceptability	Acceptable to both the screening authorities and to those screened
Equity	Equity of access to screening services; effective, acceptable and safe treatment available

Validity of the Screening test

Disease / Screeningtest	Presence (ill people)	Absence (healthy people)	Total
Positive	a True positive	b False positive	a+b
Negative	c False negative	d True negative	c+d
Total	a+c	b+d	a+b+c+d

Validity of the Screening test

- **Sensitivity** – probability of a positive test in people with the disease (proportion of ill people that are detected by the test)

$$S = \frac{a}{a+c} \times 100$$

Validity of the Screening test

- **Specificity** – probability of a negative test in people without the disease (proportion of healthy people that are detected as negative by the test)

$$Sp = \frac{d}{b+d} x100$$

Validity of the Screening test

- **Positive predictive value** – probability of the person having the disease when the test is positive

$$\text{PPV} = \frac{a}{a+b} \; x \; 100$$

Validity of the Screening test

- **Negative predictive value** – probability of the person not having the disease when the test is negative

$$\text{NPV} = \frac{d}{c+d} \; x \; 100$$

Tertiary prevention

Objective – to reduce the progress or complications of disease by timely and adequate treatment and rehabilitation.

- An intervention implemented after the disease or injury has established to stop bad things getting worst.
- It is defined as “all measures available to reduce or limit impairments and disabilities and to promote patient’s adjustment to irremediable conditions”

Tertiary prevention

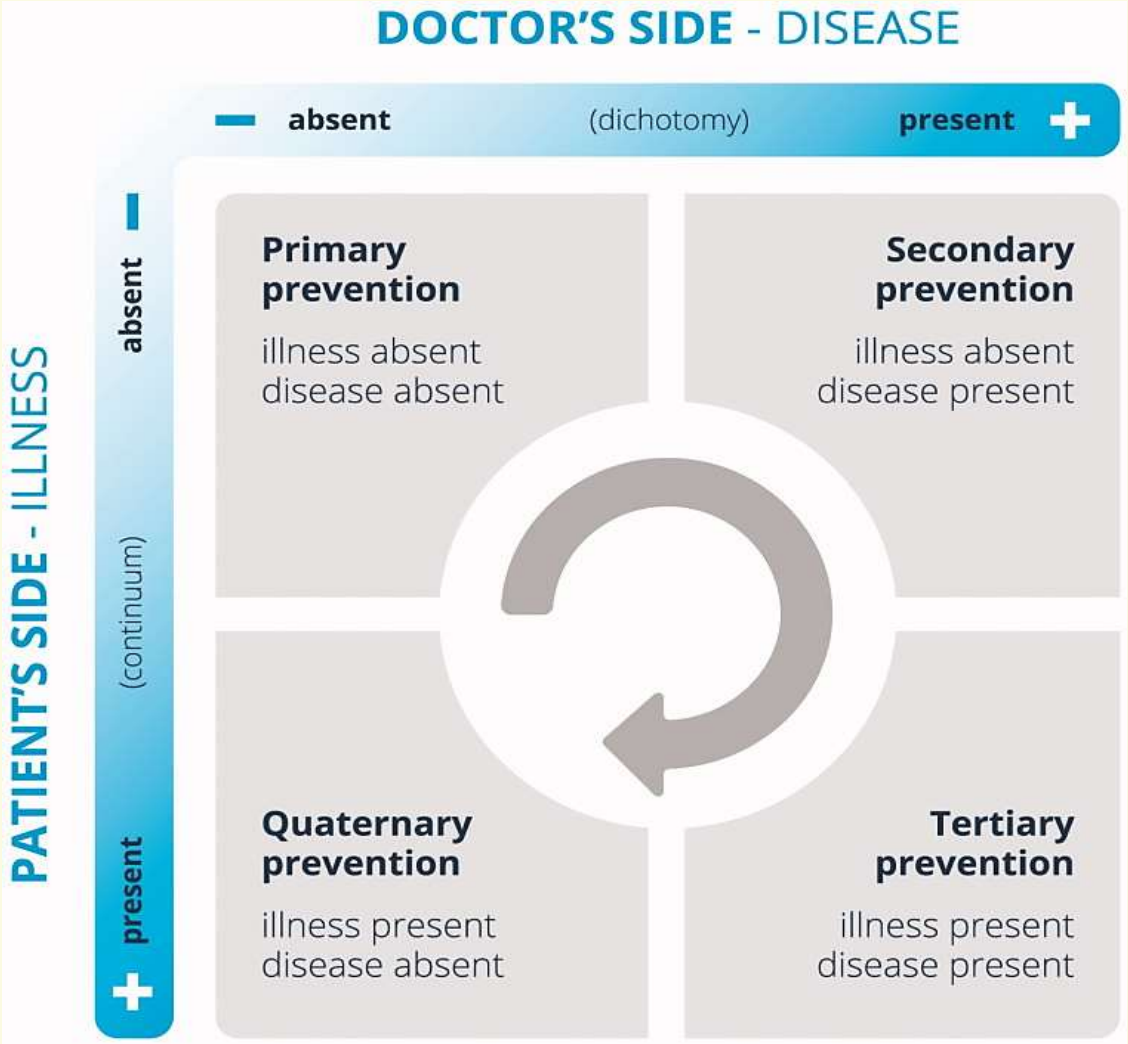
Examples:

- Measures to reduce impairments and disability
- Minimize suffering
- Restoring ability to work and earn a livelihood

Levels and scope of Prevention

Type of prevention	Implications to practice
Primordial prevention	Measures to prevent development of risk factors for disease
Primary prevention (prevention)	Measures to avoid the development of disease
Secondary prevention (treatment)	Measures for early detection and treatment of disease
Tertiary prevention (rehabilitation)	Measures to reduce harm from symptomatic disease
Quaternary prevention	Measures to avoid over-medicalization and unnecessary interventions

MODEL OF DIFFERENT CATEGORIES OF PREVENTION IN THE RELATIONAL MODEL PROPOSED BY MARC JAMOULLE.



Quaternary prevention

Definition 1– “Action taken to identify a patient at risk of overmedicalization, to protect him from new medical invasion, and to suggest interventions which are ethically acceptable.“ *(Wonca International Dictionary for General/Family Practice)*

Definition 2– “Action taken to protect individuals (patients/persons) from medical interventions that are likely to cause more harm than good.“

Objective – to reduce over-medicalization (overdiagnozis and overtreatment) and iatrogenic harm

Quaternary prevention

Example:

- the set of health activities to mitigate or avoid the consequences of unnecessary or excessive intervention of the health system.

Application in health management and quality of health care