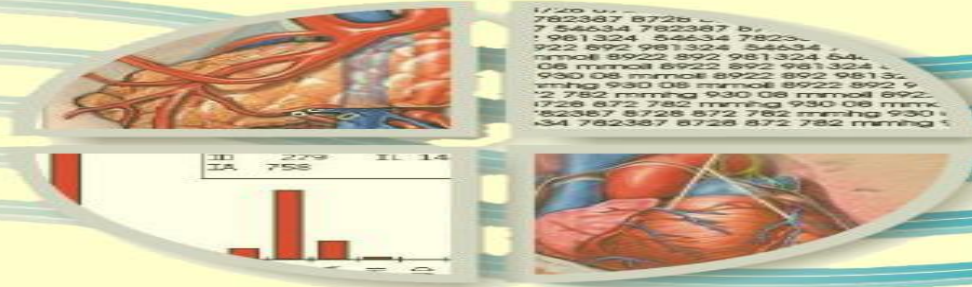


Course 3



Transmission through food, objects, vectors, the receiving population, favouring factors, and the manifestation forms of the epidemiological process

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Foods of animal origin



■ The contamination can be:

PRIMARY – coming from sick animals or animals carrying germs, with the following being contaminated in the animal organism itself:

Meat – trichinosis, salmonellosis, anthrax, TB

Milk – brucellosis, typhoid fever, TB, staphylococcal/streptococcal infections

SECONDARY – the most frequent, arising in the following ways:

1. Food products can be contaminated **through the urine and faeces** of sick or carrying animals
2. Contamination **through other factors of complex indirect routes**, including through sick or carrying humans (from slaughtering the animal to marketing it)

Foods of vegetable origin



■ Contamination:

- through the irrigation of vegetable fields with residual water;
- Using animal faeces as manure;
- From sick or carrying humans – from harvesting the crop to marketing it

Examples of diseases:

- ✓ **typhoid fever, paratyphoids,**
- ✓ **cholera, viral hepatitis A,**
- ✓ **botulism, toxinfections with *Salmonella* sp.**

Mixed food



- These are good culture medium and a good transmission route.
- Most germs mentioned above can be transmitted through:

- ✓ Creams;
- ✓ Salads;
- ✓ Mayonnaises;
- ✓ Beer;

Objects



- Contamination can occur through direct contact with secretions or excretions of sick or carrying people, through blood or other factors of the complex indirect transmission route;
- Any object can be contaminated;
- The following can be carried:

1. **Bacteria** – *Staphylococcus* sp., *Streptococcus* sp., *Salmonella* sp., *Pseudomonas aeruginosa*, *E.coli*, *Mycobacterium tuberculosis*; *rickettsia rickettsii* as well as sporulated anaerobic bacteria – gas gangrene germs and *Clostridium tetanii*
2. **Viruses** – adeno- and enteroviruses;

Dirty hands



■ Possible scenarios:

- Self-contaminations with the body's own germs through secretions/excretions;
- Contamination from a sick person or germ carrier, which can be:

DIRECT – direct contact with the infection source

INDIRECT – contact with its pathological products

- Dirty hands can also be contaminated by other factors of the complex indirect transmission route;

Dirty hands



- Pathogens can be transmitted through dirty hands either directly or through the contamination of other factors of the complex indirect transmission route;

Examples of diseases that can be transmitted through dirty hands:

- ✓ typhoid fever, paratyphoid fever,
- ✓ dysentery,
- ✓ food poisoning,
- ✓ viral hepatitis A,
- ✓ zoonoses,
- ✓ Staphylococcal/streptococcal infections

- Disease transmission through dirty hands can be done through measures of individual hygiene.

Effective hand disinfection technique (repeat at least 5 times)

Palm to palm

1



2

Right palm over left dorsum
and left palm over right dorsum



3

Palm to palm with
fingers interlaced



4

Backs of fingers to opposing
palms with fingers interlocked



5

Rotational rubbing of right
thumb clasped in left palm and
vice versa



6

Rotational rubbing,
backwards and forwards
with clasped fingers of right
hand in left palm
and vice versa



*Remove all jewellery and watches
and keep your nails short*

Vectors



- According to the method of transmission, they can be:

PASSIVE (MECHANICAL) – flies, roaches;
ACTIVE (HEMATOPHAGOUS SPECIES) – lice,
flees, mosquitoes, ticks.

- According to the specificity of transmission:

MONOVALENT (SPECIFIC) – the tsetse fly
POLYVALENT – the louse
UNIVERSAL - housefly

The receiving population

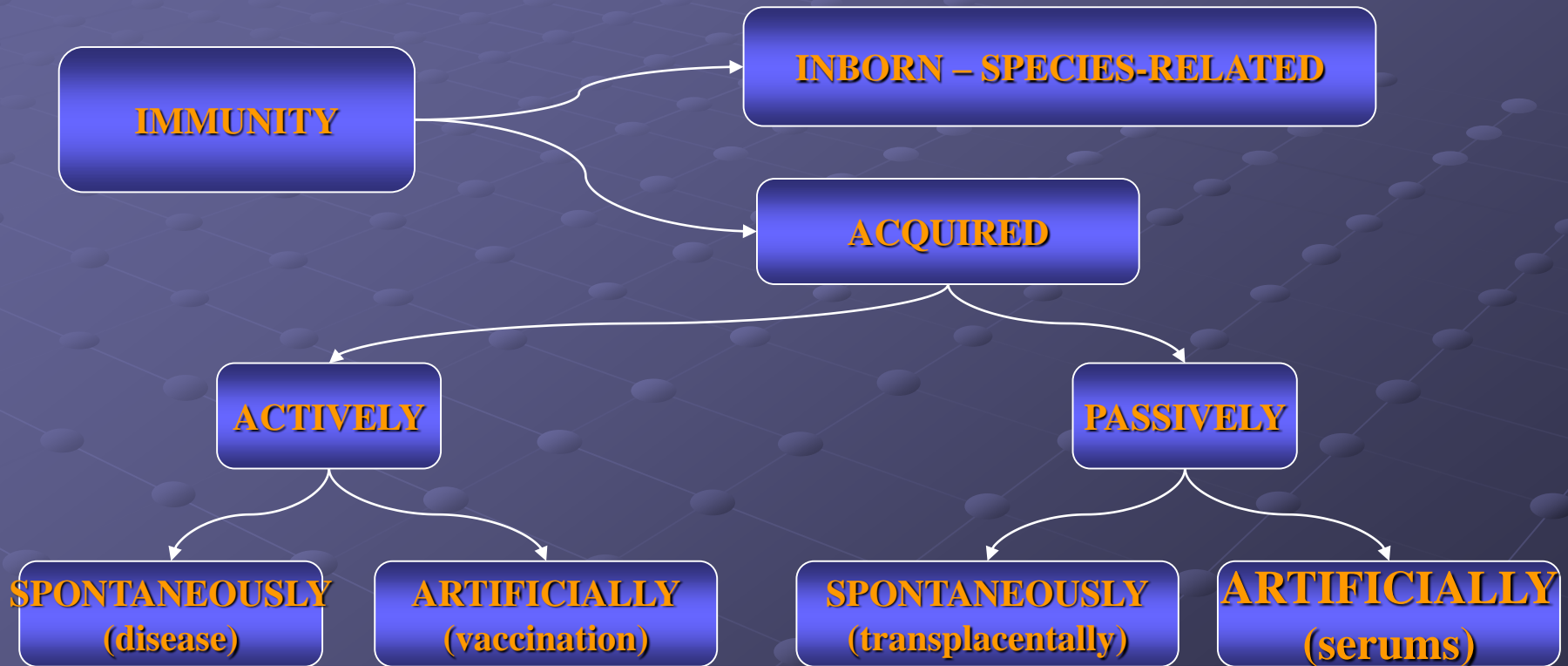


- A mass of people prone to the disease.
- The degree of receptiveness to infectious diseases is different.
An organism can be:
 - Receptive or
 - Resistant – specific/non-specific;
- **Receptiveness** – is the state of the organism that allows the pathogen to survive and multiply;
- **Non-receptiveness or resistance** – gives the organism the ability to prevent the entry of the pathogen, to destroy it or to eliminate it as quickly as possible.

The receiving population

- **The individual's immunity** – is the organism's property of not contracting an infection in case of an infecting contact with a pathogen or its toxins.
- **Collective immunity** – is not merely a sum of the immune individuals at a given moment, but the capacity of the collectivity to resist being affected by the pathogen, to prevent or limit the spreading of the pathogen in the collectivity.

The receiving population



The receiving population

- The individual factor is especially important because no infection that spreads in a collectivity occurs in an identical form in each individual.
- Thus, in some people it is manifested:

TYPICALLY

ATYPICALLY

INAPPARENTLY
(immunological and biochemical changes)

- **The contagiousness index** – is the percentage of individuals in a receiving collectivity who, when exposed to the infection, develop the typical disease;

The receiving population

- For some diseases, **90-100% of those exposed** develop the typical disease – **Measles**;
- There are diseases with a **high percentage of inapparent infection** – **POLIOMYELITIS** – there are several hundred inapparent infections for 1 typical or atypical sick person;

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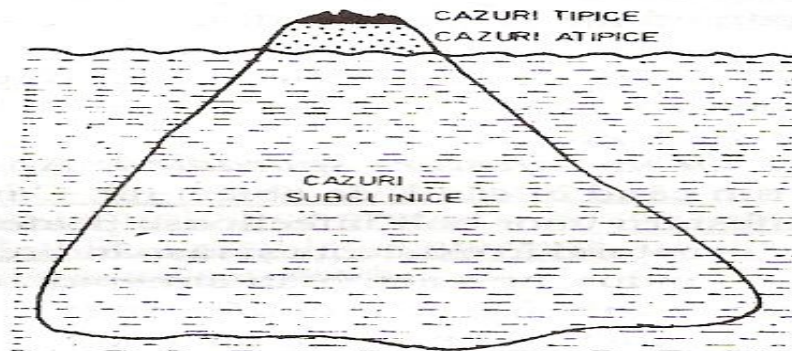


Fig. 31: Fenomenul iceberg în procesele epidemiologice

The receiving population

- In this case, the person has high receptiveness for infection, but a low tendency to develop the disease;
- The inapparent infection is also immunizing, so, by assessing the number of immunizing individuals taking into account only those that have already had the disease, we would be making **an exact calculation for measles and an incorrect one for poliomyelitis**;
- In the case of poliomyelitis – **the sum** of individuals that are immune after having had the disease is not equal to, but much smaller than, the collective immunity.

The receiving population

- There are infections from which all individuals gain **strong, long-term post-infectious immunity: MEASLES**
- However, there are also infections with **short-term, labile post-infectious immunity: INFLUENZA**



The immunological structure of a population

- It is determined by 2 categories of factors:

Specific factors:

- ✓ Going through the disease;
- ✓ Going through the inapparent infection;
- ✓ Applying chemoprophylaxis;
- ✓ Applying vaccination;
- ✓ Other measures of specific prophylaxis.

Non-specific factors:

- ✓ Age,
- ✓ Food;
- ✓ Recent anergic diseases;
- ✓ Work type;
- ✓ Economic, cultural, sanitary level.

The immunological structure of a population

- In some diseases, collective immunity is determined by **specific factors: MEASLES** (through vaccination, post-infectious immunity);
- In other diseases, the determining role is played by **non-specific factors: DYSENTERY** (through methods concerning hygiene, food, lifestyle);
- In others, the 2 categories of factors **are combined: CHOLERA.**

The favouring factors



■ **Natural environmental factors:**

- **The seasons** – can favour or prevent the occurrence of morbid processes;
- **The cold** – favours aerogenous infections;
- **The heat** – favours digestive infections (higher intake of liquids, cellulose-rich foods, development of vectors, of rodents, etc.);
- **Atmospheric pressure oscillations** – temperature drops followed by sudden rises → influenza epidemics;
- **Heavy rainfall**, water from melting snow → digestive infections;
- **Natural disasters (floods, earthquakes)** → epidemic manifestation of the epidemiological process;
- Climatic, geographic, geologic, hydrologic factors

The favouring factors



■ **Economic and social factors:** they act on all determining factors and are represented by:

- ✓ Social life conditions;
- ✓ The population's economic state;
- ✓ Working conditions;
- ✓ Conditions of living together;
- ✓ Food;
- ✓ Population movements;
- ✓ Sanitary and moral level;
- ✓ Certain religious habits.

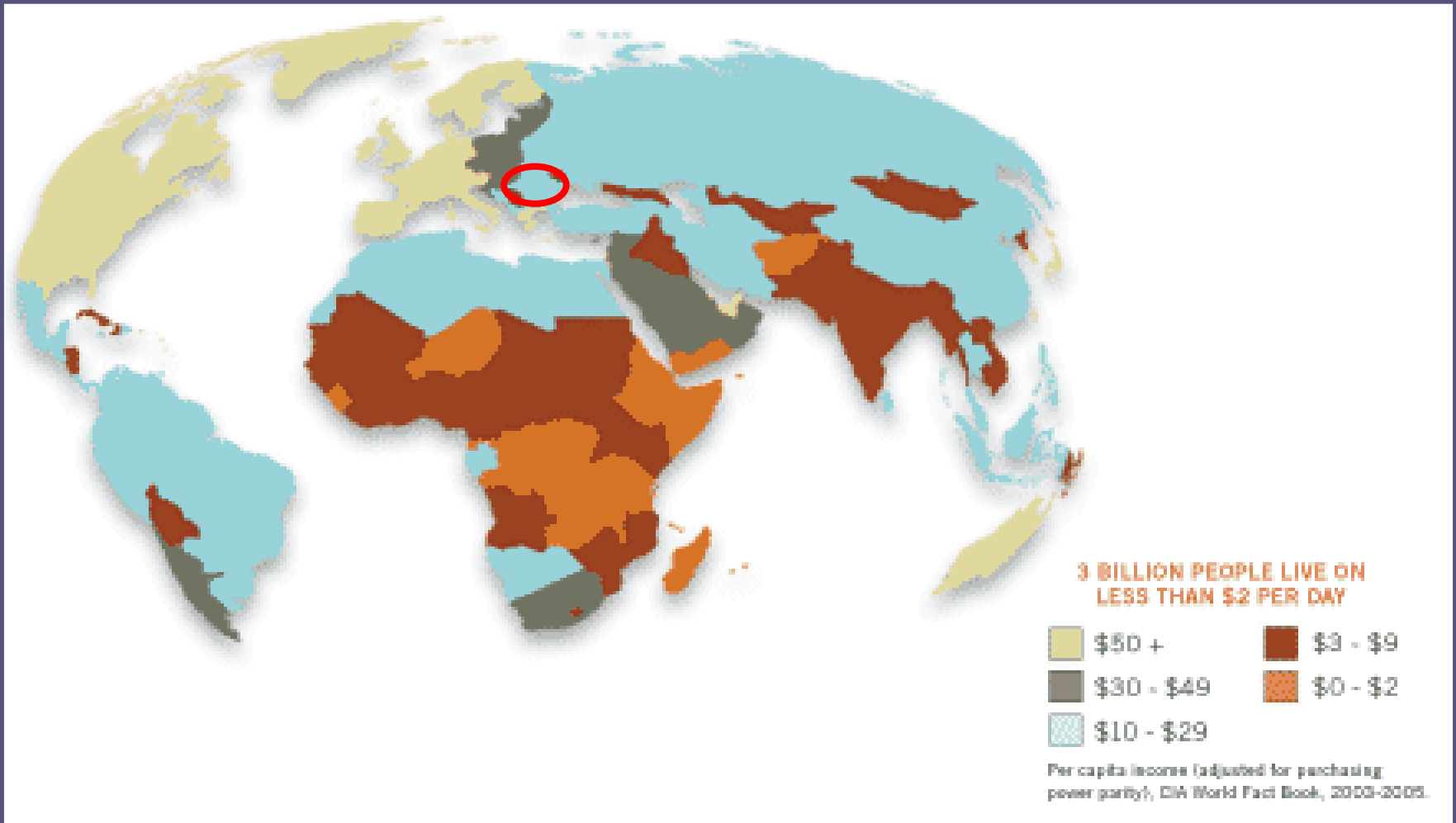
The favouring factors



■ **Social life conditions – economic and social factors:**

- **Insalubrious home** – influenza, viral hepatitides, tuberculosis;
- **Agglomerations** – aerogenous infections, vector infections;
- **Improper eating** (quantitatively or qualitatively) – decreases the body's resistance and favours the onset of diseases;
- **Contaminated food** – food poisoning;
- **Contaminated water** – hydric transmission diseases;
- **Job and working conditions** – viral B hepatitis is a job-related disease for the medical staff;
- **Social calamities** – wars – the epidemic manifestation form of the epidemiological process;

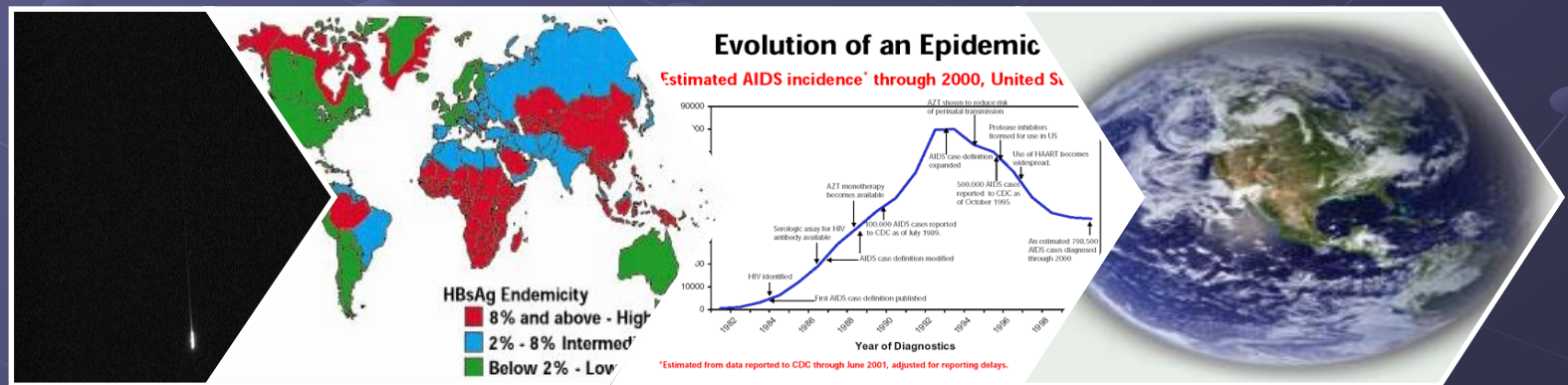
World poverty map



Manifestation forms of the epidemiological process

- The intensity of the epidemiological process is labelled through 4 forms of quantitative manifestation:

- ✓ Sporadic;
- ✓ Endemic;
- ✓ Epidemic;
- ✓ Pandemic.



Manifestation forms of the epidemiological process

- These manifestation forms are assessed according to: morbidity, mortality, fatality, contagiousness, diffusion ability and periodicity – in other words, according to the criteria for assessing the manifestation forms;
- **Morbidity** – expresses the number of cases of a certain disease occurring in a population living on a certain territory, over a certain period of time;
- **Mortality** – records the deaths within a population occupying a certain territory over a given period of time;

Manifestation forms of the epidemiological process

- **Lethality** – is expressed as the ratio of the number of deaths generated by a certain disease to the number of deaths by all causes in a certain territory and over a certain period of time;
- **Fatality** – expresses the ratio of the cases with a certain pathology resulting in death over a certain period of time to the global number of cases over the same period;

Manifestation forms of the epidemiological process

- **Diffusion ability or expansion** – expresses the propagation speed of an infectious disease in a fully receptive population;
- The spreading speed depends on:

- ✓ the number of infection sources,
- ✓ the number of transmission routes,
- ✓ the number of receptors,
- ✓ the duration of incubation, and
- ✓ the economic and social factors

Diseases with no expansion tendency
TETANUS

with slow expansion
DYSENTERY

with rapid expansion
INFLUENZA, RUBELLA

Manifestation forms of the epidemiological process

- **Periodicity** – is the increase in morbidity at certain intervals in the form of seasonal and multi-annual oscillations;
- **Seasonal oscillations** – express the increase of morbidity in a certain season regardless of the manifestation form of the epidemiological process during the rest of the year;

Digestive entry diseases
CHOLERA – SUMMER

Respiratory entry diseases
INFLUENZA – WINTER/SPRING

Manifestation forms of the epidemiological process

- **Multiannual oscillations** – are the recurrence of acute and extensive manifestations of the epidemiological process in the form of an epidemic or pandemic, in a collectivity, on a territory, after a time of interepidemic tranquility;
- During this interval that can last years, the disease has not manifested itself at all or has only manifested itself sporadically and endemically.
- Multi-annual oscillations manifest themselves in a population that has become 100% receptive after a while following the previous epidemic:
 - either through the loss of the weak immunity remaining after a disease
 - or through the accumulation of population segments that have not yet been vaccinated.

RUBELLA 3 to 5-year periodicity

INFLUENZA 2 to 3-year periodicity

Multi-annual oscillations

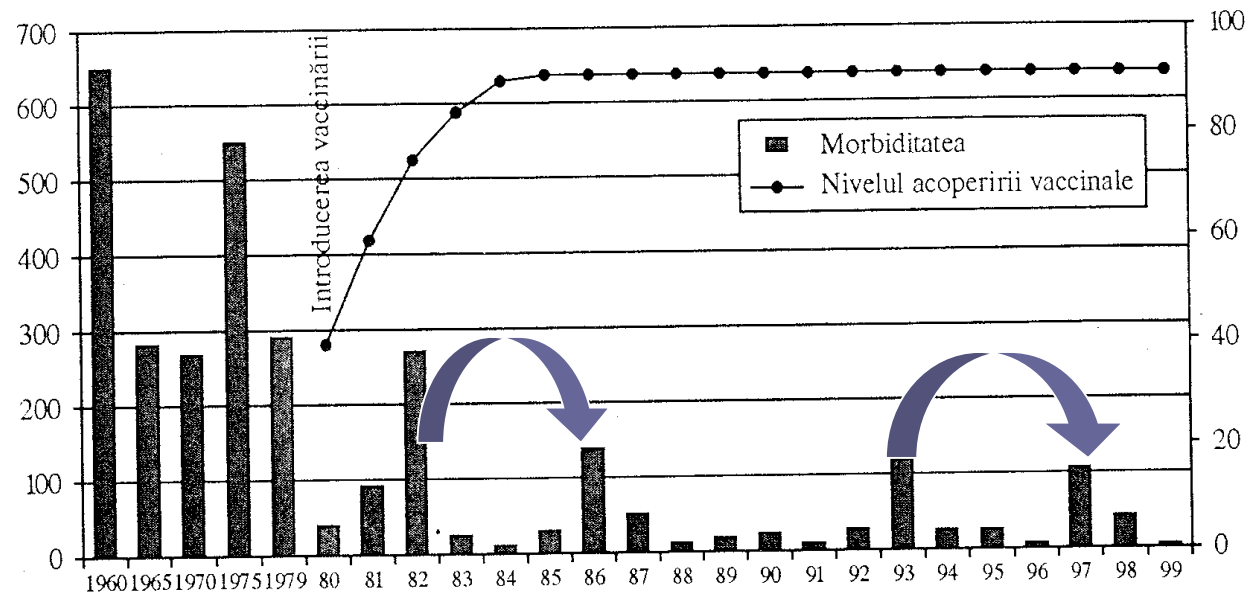
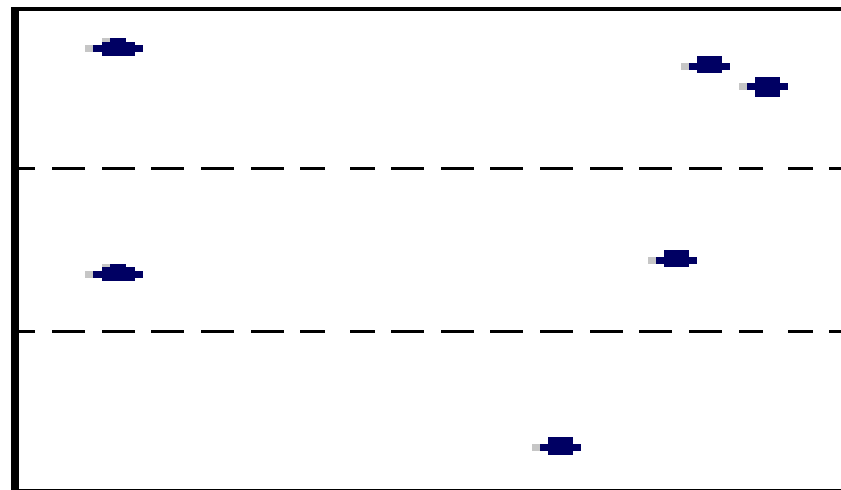


Fig.2. Incidența anuală a cazurilor de rujeolă raportate, comparativ cu acoperirea vaccinală, în România, în perioada 1960-1999 (după CCSSDM-MSF-2000)

1. The sporadic form

- Manifests itself in a small number of disease cases, recorded at large intervals, with no apparent link between them and disseminated on a wide geographic area – **tetanus, anthrax;**

Sporadic:



Baseline
level

Baseline
level

Baseline
level

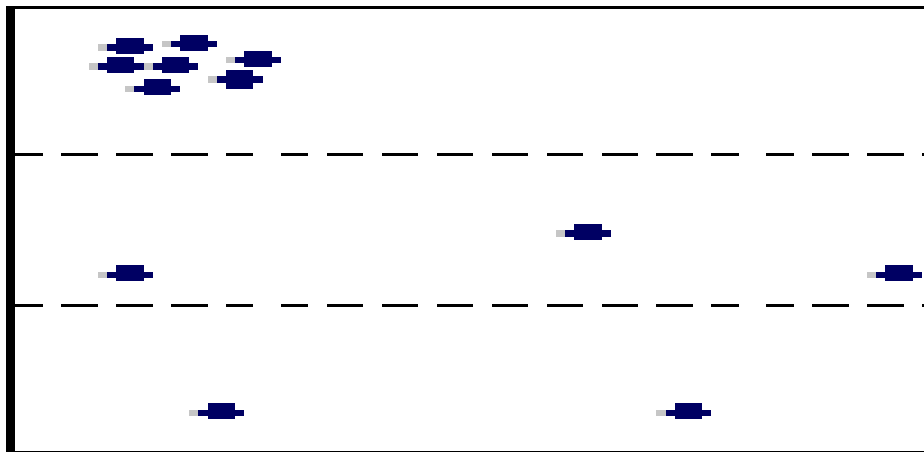
1. The sporadic form

- The sporadic nature may be a natural manifestation of some diseases or it may be determined by the existence of a population mass that is refractory to the disease as a result of post-infectious and/or post-vaccine immunity;
- The sporadic form may also occur in a receptive population when the transmitting vector is missing or the infecting contact is sporadic;
- It may also occur in highly contagious diseases when the sick people became infected outside the collectivity and the correct prevention and control methods have been taken within the community.

2. The endemic form

- There is a curve of relatively low and uniform morbidity;
- The endemic nature of a disease can be transformed, either naturally or through prevention and control methods, into a sporadic form or it may evolve towards an epidemic form;

Local outbreaks



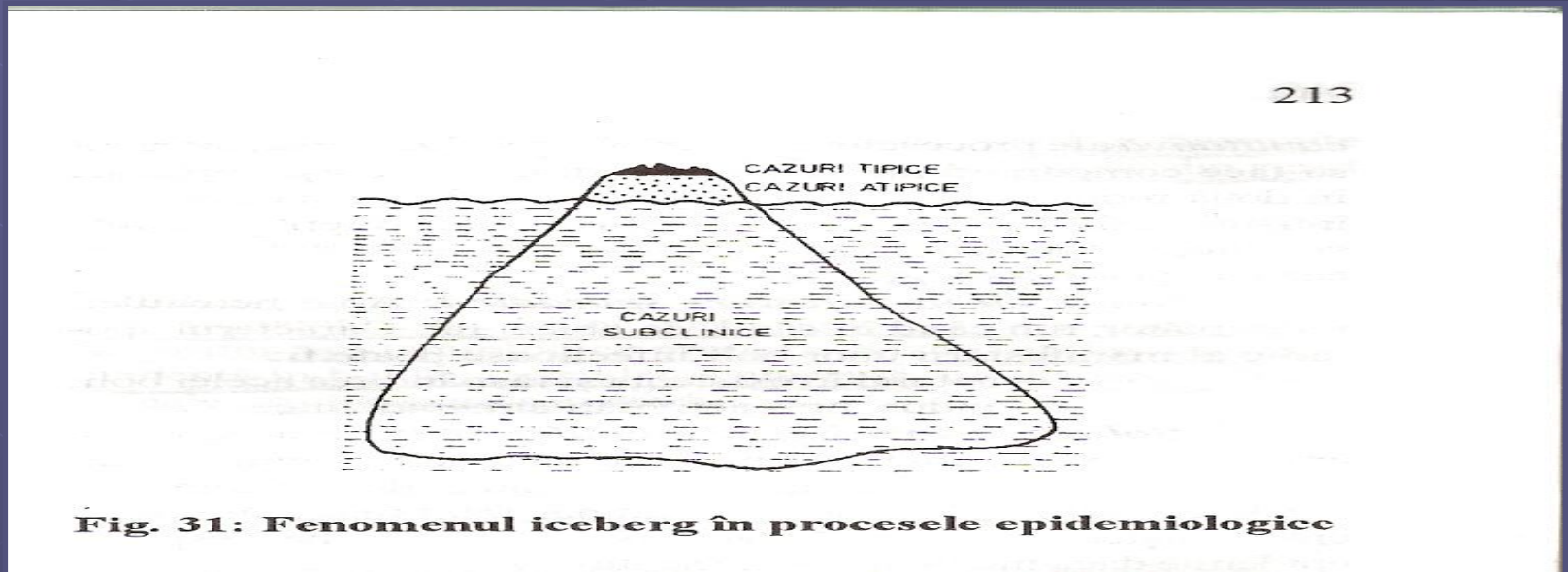
Baseline
level

Baseline
level

Baseline
level

2. The endemic form

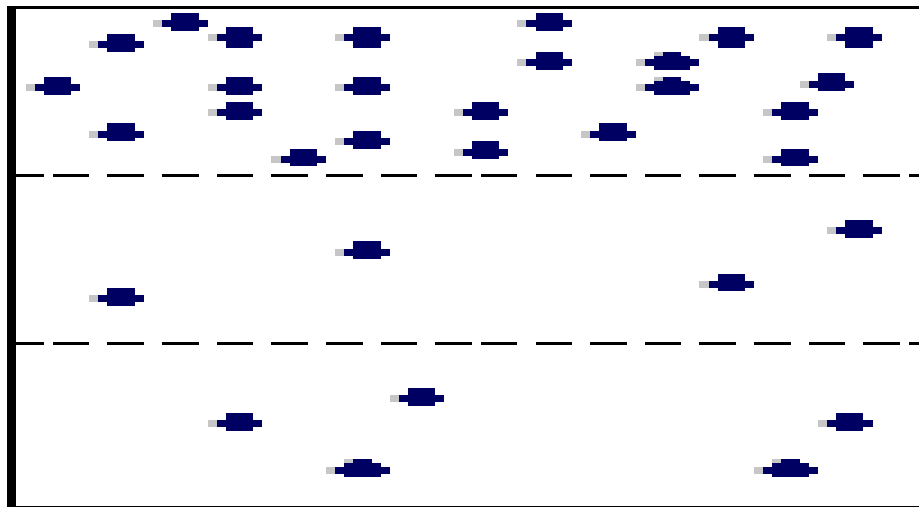
- Making a territory endemic by getting the population to be massively interested in that particular infection is known as **HYPERENDEMIC**.
- In this phase, there are many individuals with latent forms or inapparent infections, so that the clinically manifested



3. The epidemic form

- It is represented by numerous cases of the disease occurring in a collectivity on a given territory;

Regional activity:



Above
baseline

Baseline
level

Baseline
level

3. The epidemic form

■ The epidemic appears as a large scale manifestation in:

- ✓ Highly contagious diseases – influenza,
- ✓ When the population is 100% receptive,
- ✓ When the population is partly receptive, but there is an influx of many infection sources,
- ✓ When germs display maximum virulence,
- ✓ When there are many transmission routes,
- ✓ When favouring factors occur

3. The epidemic form

- In practice, we can encounter **explosive or slow epidemics**;

Explosive epidemics:

- ✓ They have a sudden outbreak and are characterized by a large number of cases in a short time,

Types of epidemics:

- **Hydric**
- **Food-related** (milk) – food poisoning;
- **Vector-based**
- **Respiratory** - influenza

Slow epidemics:

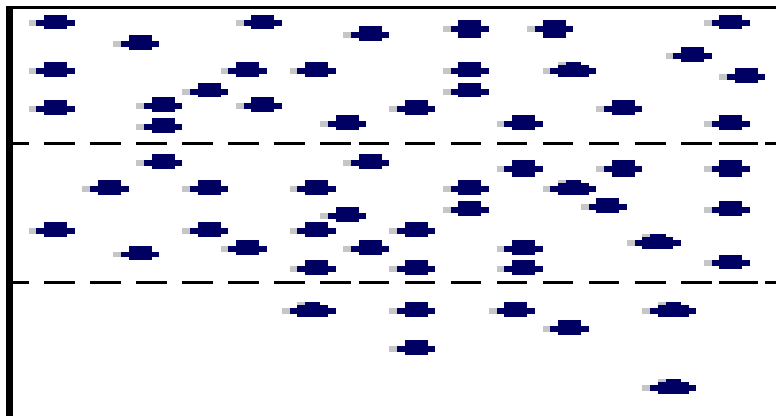
- ✓ Due to infecting contacts occurring intermittently and individually or in small population groups;
- ✓ They are usually transmitted through contact, and contamination occurs at the level of the transmission route, with small doses of germs or weakly virulent germs

Example – Recurrent fever

4. *The pandemic form*

- It is an amplified manifestation of the epidemic, where the disease foci expand successively and permanently,
- Currently, pandemic manifestations are noticed in the case of **type A influenza**, while in the case of viral hepatitides, through their universal spreading, a slowly evolving pandemic manifestation is taking place.

Widespread activity:



Thank you!



*Images – sources
The Internet*