The role of biostatistics and informatics in the every day medical practice

The **purpose** of medical science:
- Prevention of diseases,
- Healing of the sick

Diagnostics: **scientific** methodology of recognition of diseases.
Therapy

Auxiliary sciences: e.g. anatomy, physiology, physics, chemistry, biology; *and*

Biostatistics and informatics

Medical doctors: series of decesions
                                Confidence
                    Lots of uncertainty
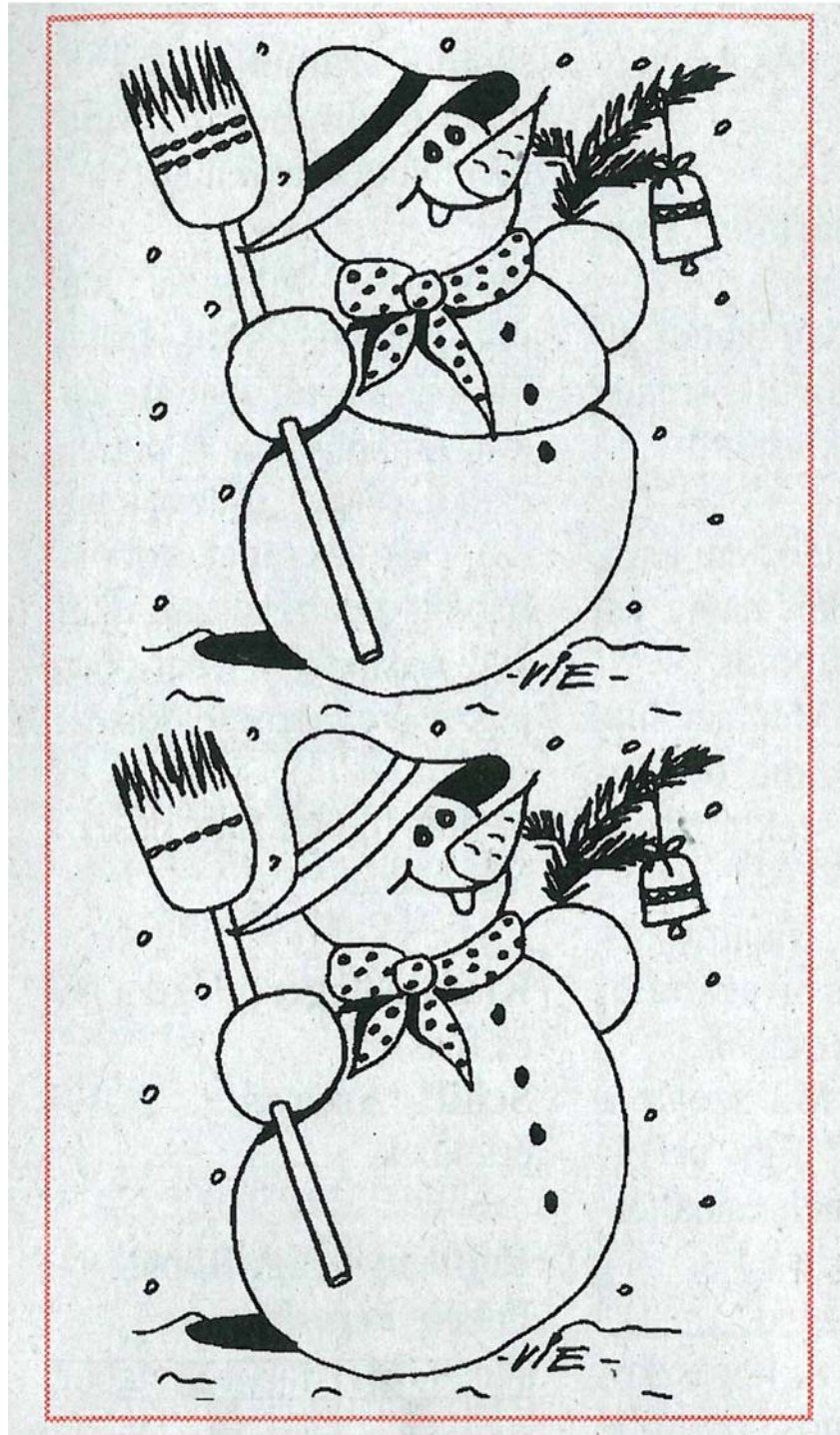
General experience:
many of us make inappropriate conclusions easily, and make decisions based on them. (whisky)

Main purpose of biostatistics and informatics:

to know **quantitatively**;
two or more things are similar or different

Data: facts for the cognition, characterization of somebody or something;
qualitative and quantitative characteristics of the surrounding world.

Signals: transmitter units of data (suitable for description of data)

Identity: sometime names, "two eggs"

"theoretical ball" model
spherical
white
with 38 mm diameter
with 2.5 g mass

"practical ball" reality
measurements

Honvédelmi Minisztérium Állami Egészségügyi Központ

1134 Budapest, Róbert Károly krt. 44. Tel.: 06-1-465-1800 Fax: 06-1-340-3129
Főigazgató:
Működési engedély száma:

Központi Laboratóriumi Diagnosztikai Osztály
Osztályvezető főorvos :

Laboratóriumi eredmények

Megnevezés	Érték	M.e.	Megjegyzés	Eltérés	Referencia értékek	
Klinikai kémia						
Glukóz	3,5	mmol/l			3,1	5,6
Karbamid	6,1	mmol/l			1,7	8,3
Kreatinin meghat.	75	µmol/l			44	80

Zuglói Egészségügyi Szolgálat 1148 Budapest, Örs Vezér tér 23. Telefon: 469-4600	**LABORATÓRIUMI LELET**	Szakorvosi Rendelõintézet Laboratórium Labor vezetõ:

Lelet kelte:

Páciens neve:
TAJ szám: Nem:
Született: **Napi sorszám: 749**   Beut. egység: **340092019** Azon.: 012101003
Anyja neve:

Kért vizsgálatok:		Eredmény: mértékegység	Referencia érték:
VÉRKÉP XT WBC		**10,71** 10'3/u	4,0 - 13,0
RBC vvt szám		**4,22** 10'6u	3,9 - 5,6
KARBAMID	+	**9,6** mmol/l	1,7 - 8,3
KREATININ	+	**113,0** umol/l	50,0 - 110,0

Semmelweis Egyetem ÁOK Központi Laboratórium
1083 Budapest, Korányi Sándor u. 2/a.
Intézetvezető:
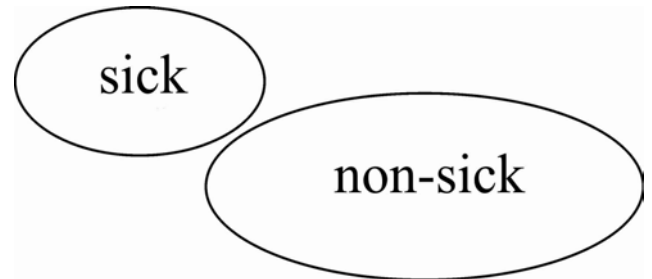Tel: 06 1 2100 278/1522,1457

LABORATÓRIUMI EREDMÉNYKÖZLŐ LAP

Név   :
Születési idő :   Nem:
TAJ/azonosító :   Rendelés sorszáma: 6037990

Vizsgálat	Eredmény		M.Egység	Ref.tart
VVt süllyedés	2		mm/h	1-20
Karbamid	6,7		mmol/l	2,5-8
Kreatinin	108	*	umol/l	62-106

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The most important fundamental concepts and the connected problems

Who is sick and who is healthy?

Set: collection of distinct objects, considered as an object in its own right. They are characterized uniquely. Things belonging to the set are the **elements** of the set.
In general: **variable**

In which set the given element can be found?
Systematization, classification, separation

What is the similarity between this toy and the diagnosis?

Not so much!

3 very different bodies
Characteristics:

„case/variable"	shape	color	size
1	sphere	yellow	4,3 cm
2	tetrahedron	blue	4,5 cm
3	cube	red	3,8 cm

3 very different holes
Characteristics:

„case/variable"	shape	color	size
1	circle	yellow	4,3 cm
2	triangle	blue	4,5 cm
3	square	red	3,8 cm

„Can not" miss it.
There is one-to-one correspondence.

Same (exists only exceptional cases)
  ("We both step and do not step in the same rivers." Heraclitus)

Instead, more or less **similar**

The absence of uniqueness can cause the problems.
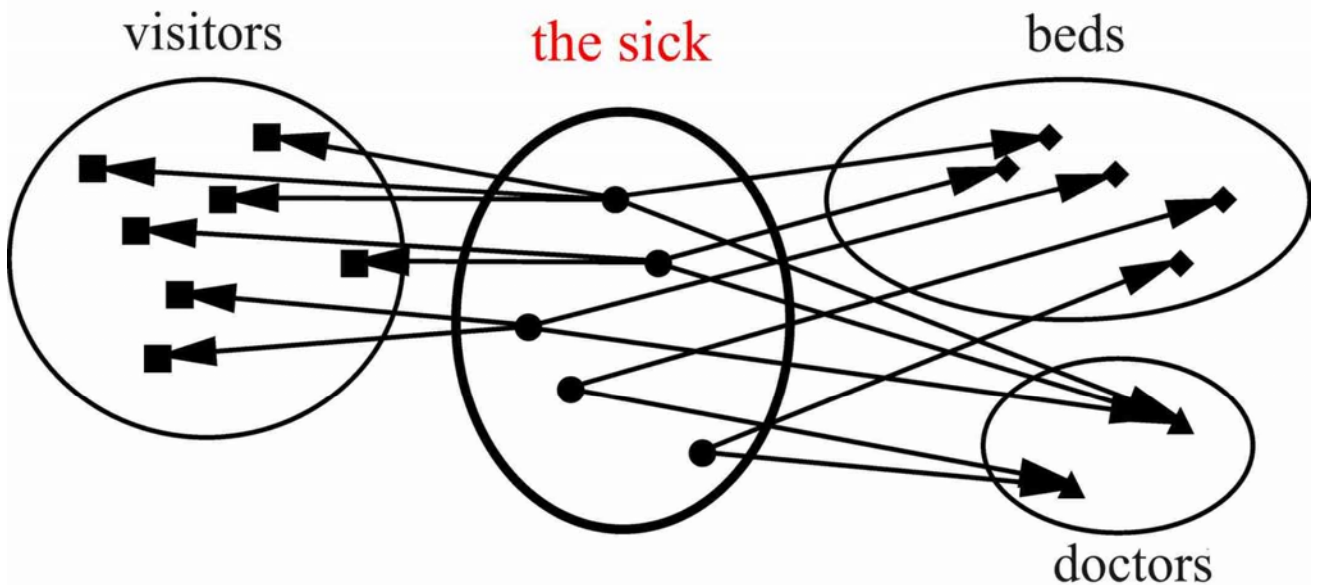We are not able to take into account all of the circumstances.

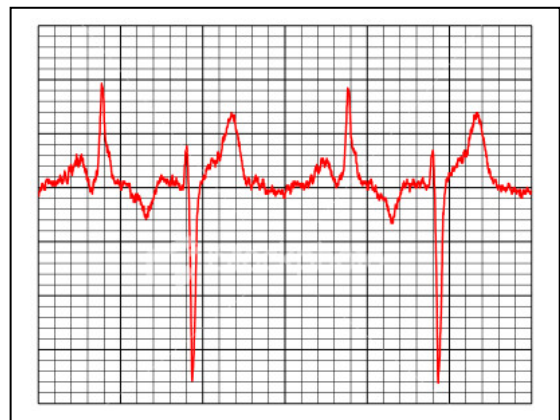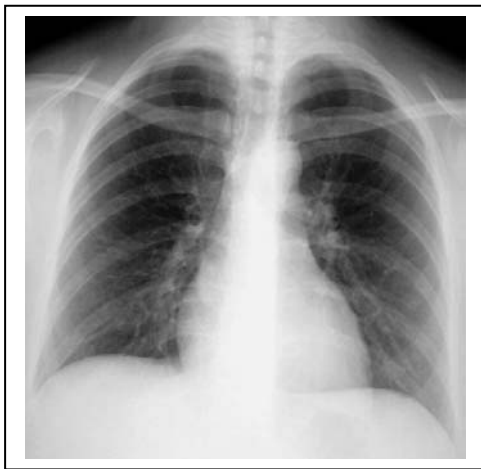Measure of similarity: confidence

The essence of the problem:
There are no two identically sick people.
There are diseases which can produce very similar symptoms.

Function (mapping),
but there are exceptions

changes in space or time, (or in both) e.g. change of light, sound, any sensation or a measurable quantity

The role of „change" in theory and practice

The "most important" feature of a function is the **change.**

How does it change?
Increases or decrease; quickly or slowly

The simplest function is the linear one: $y = ax + b$
(in most cases we prefer it)

Some further important functions

1. Exponential function

$$y = b\, 2^{ax}$$

2. Logarithmic function

$$y = a\, \boxed{\log_2 x} + b$$

3. Powerfunction

$$y = b\, x^{a}$$

Remarks:

1. $\boxed{\log_2 y} = \log_2 b + a\, x \underbrace{\log_2 2}_{= 1}$

3. $\boxed{\log_2 y} = \log_2 b + a\, \boxed{\log_2 x}$

After this transformation we get a linear function in all cases.