The language of Epidemiology

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Aims of Epidemiology

1) Descriptive epidemiology:
To describe the distribution of diseases in human populations - Distribution in space and time

2) Analytic epidemiology:
To identify the risk and protective factors that modify distributions of diseases
Cause-effect relationship

3) Evaluative epidemiology:
To collect essential information in order to plan, manage, and evaluate interventions of disease prevention and treatment
experimentation

Evaluative epidemiology: Some examples of possible application fields

"Children living in the United States are three times more likely to undergo tonsillectomy than children living in England.

Women are three times more likely to have the uterus removed, men are three times more likely to have the prostate removed.

The most likely explanation is that these discrepancies reflect differences in the health care system of the two countries, which is mainly private in the U.S. and public in England."

"In Switzerland, where the health care system is private, physicians' and lawyers' relatives undergo about half the surgical procedures, which are given to the other people.

Maybe a physician prescribes his relatives only surgical procedures that are strictly necessary, and he does the same with lawyer's relatives, maybe because he is unconsciously afraid of being sued for unnecessary procedures."

Fabio Verlato (2003) Ho paura: piccoli ospedali o grandi ospedali. Pordenone: Edizioni Biblioteca dell'Immagine.

EPIDEMIOLOGY

In the past	In the 2nd half of the 20th century
Infectious diseases	Tumors and chronic-degenerative diseases
Epidemics with lots of deaths in a short time	High mortality rate among men aged 40-60 years
Diffusion by contact	Diseases are treated, but not cured
Public Health measures: quarantine, lazarets	Prevention is mandatory

Chronic-degenerative diseases = Ischemic heart diseases, cerebrovascular diseases, diabetes, Chronic Obstructive Pulmonary Diseases, osteoarthrosis.

Definitions - 1

Outcome (Italian esito): event or state whose occurrence is measured in a population – the end stage of a process, as in "the health outcome of treatment"

Examples:

- ***death from cancer***
- ***doctor-diagnosed disease (asthma, diabetes, ...)***
- ***self-reported symptom***
- ***glycaemia, measured in mmol or mg/100 ml***
- ***survival time***

Outcome is always measured at individual level and is the consequence of some physio-pathologic process.

Olli S Miettinen. Theoretical Epidemiology: Principles of Occurrence Research in Medicine. John Wiley & Sons: New York, 1985, Glossary

Etymology of the English word «outcome» and corresponding Italian word «esito»

	English	Italian (derived from Latin)
word	outcome	Esito
adverb	out = fuori	ex= fuori da (moving from)
Verb paradigm	come, came, come = venire	eo, is , ivi, itum, ire (latin) = to go
Past participle	come = venuto	itus = gone
Meaning	come out	andato fuori da

Definitions - 2

Measure (parameter) of Occurrence (It: Parametro di occorrenza) (P): measure that conveys the frequency of the outcome in the population.

Example:

- *mortality rate from lung cancer*
- *incidence of diabetes*
- *prevalence of asthma*
- *mean glycaemia in a sample of patients*
- *median survival time in a cohort of patients*

Usually it is an estimate of the probability (risk) that a particular group of subjects will develop the disease under study.

Definitions - 3

Determinant (D): **an individual characteristic (constitutional, behavioral, or environmental) on which a parameter of occurrence depends (causally or non-causally).**

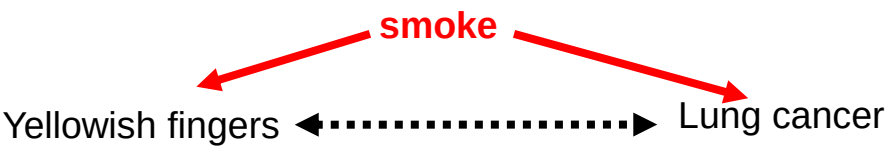
Examples:

• Tobacco smoking is a determinant of lung cancer incidence
(the risk of lung cancer among smokers is about 20-30 times higher than among never smokers)

• Atopy is a determinant of new onset asthma
(the risk of new onset asthma is higher in atopic subjects than in non-atopic coevals)

• Age was a determinant of median systolic pressure
(systolic pressure is higher in elderly people than in young adults)

Both cigarette smoking and having yellowish fingers are determinants of lung cancer.
However, while cigarette smoking is one the main CAUSES of lung cancer,
yellowish fingers are associated with lung cancer without a cause-effect relation.



Cigarette smoking = determinant of lung cancer and RISK FACTOR
Yellowish fingers = determinant of lung cancer, but NOT risk factor

Determinant is a characteristic, usually measured at individual level, with at least 2 values:

D_0 = absent (subject not exposed)
D_1 = present (subject exposed)

Example:

determinant = smoke

- *qualitative variable* ⇒ *0 = never smoker*
  1 = past smoker
  2 = current smoker

- *quantitative variable* ⇒ *0*
  1
  2
  ...
  60 cigarettes / day

Definitions - 4

Occurrence relation (function):
The relation of a parameter of occurrence (eg, incidence rate) to one or more characteristics of a person (or other unit of observation).

Example:

smoke - Lung cancer
Cholesterol – Myocardial Infarction

In the Seventies, family physicians followed a simple thumb rule to evaluate systolic arterial pressure:

Median systolic pressure (mmHg) = 100 + age (years)

OBESITY and SEDENTARY LIFESTYLE

The prevalence of obesity increases with increasing television viewing time.

Obesity = outcome

Prevalence of obesity = parameter of occurrence

TV viewing time = determinant

BMI (Body Mass Index) = Weight (Kg) / height (m) ^2

Occurrence relation

BMI (Kg/m^2) = intercept + 0.21 * (TV viewing time, hours)

Xie YJ, Stewart SM, Lam TH, Viswanath K, Chan SS. Television Viewing Time in Hong Kong Adult Population: Associations with Body Mass Index and Obesity. PLoS ONE 9(1): e85440. doi:10.1371/journal.pone.0085440