GOALS of Lectures Sept 03-06.

- Learn nature and purposes of epidemiology
- Understand measures used in epidemiology
- Recognize different epidemiologic designs
- Realize their strengths and weaknesses
- Understand play of "chance" [random error]

TEXTBOOK
Clinical Epidemiology: The essentials. Third Edition. R.H. Fletcher, S.W. Fletcher and E.H. Wagner, Lippincott Williams and Wilkins Philadelphia, 1996.

Lecture September 03

- Nature and Purposes of epidemiology [Ch1]
- Measures used in epidemiology [Ch 4]
- Experimental Studies [Ch 7]

CLINICAL MEDICINE	PUBLIC HEALTH
• DIAGNOSIS	• SURVEILLANCE
• ETIOGNOSIS	• PROTECTION
• PROGNOSIS	• PREVENTION

Symptoms/ Complaints

•TREATMENT
- Benefits?
- Risks?

Asymptomatic

• RISK MODIFICATION
• CASE-FINDING

Epidemiology used to identify / quantify risks and benefits and to guide decisions, actions and policies.

EPIDEMIOLOGY: DEFINITIONS

• (OLD) That branch of medical science which treats of epidemics (OED)

• a branch of medical science that deals with the incidence, distribution, and control of disease in a population (Merriam-Webster)

• the sum of the factors controlling the presence or absence of a disease or pathogen (Merriam-Webster)

• Epidemiology may be viewed as based on two fundamental assumptions: human disease
  - does not occur at random,
  - has causal and preventive factors that can be identified through systematic investigation of different populations or subgroups of individuals within a population in different places or at different times

This leads directly to a useful and comprehensive definition of epidemiology:

"the study of the **distribution** and **determinants** of disease **frequency** in human populations" [MacMahon and Pugh, 1970].

- measurement of disease **frequency**: Availability of data is a prerequisite for any systematic investigation of patterns of disease occurrence.
- **distribution** of disease (**who/where/when**?) essential to describe patterns of disease as well as to formulate hypotheses concerning possible causal or preventive factors.
- knowledge of frequency and distribution of disease is necessary to test epidemiologic hypotheses (**determinants**)

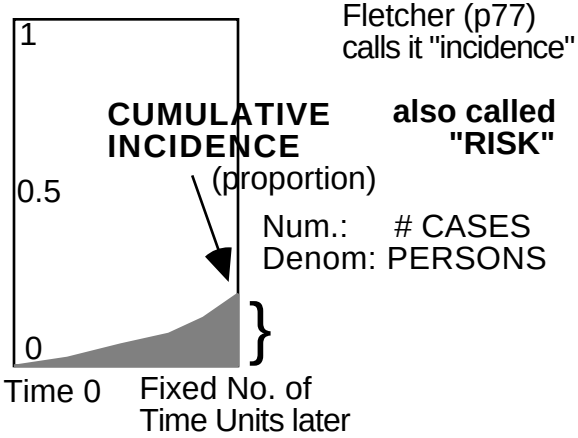
HENNEKENS, and **BURING**,

EPIDEMIOLOGY: MEASURES [Ch 4]

"NEW CASES": **Incidence** [see 2 types below]

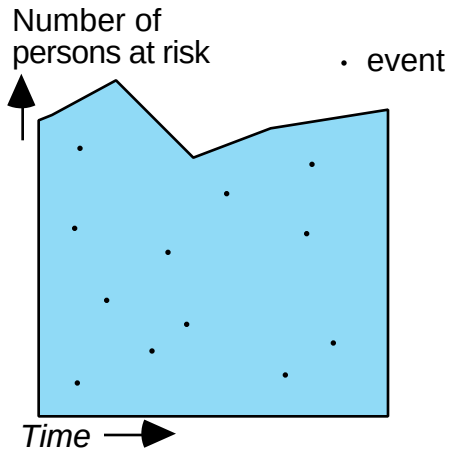
"STATES": **Prevalence**

(event = transition from one state to another)



Fletcher (p77) calls it "incidence"

also called "RISK"

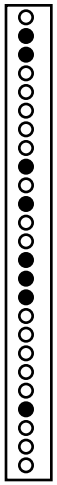


INCIDENCE DENSITY

Numerator: # EVENTS
Denominator: PERSON-TIME

- more general that Fletcher p80

EPIDEMIOLOGY: MEASURES...



PREVALENCE (proportion, % etc.)

Num.: # EXISTING CASES(●)

Denom: # PERSONS (● + ○)

* "Time" can be a fixed Calendar Time (same for all) or fixed relative to some other 'clock' that starts at different calendar time for each person e.g. 3rd day post-surgery

"Period Prevalence": cases at some point during a specific period of time

A Point in Time*

See Table 4.1 (p 79) of Fletcher et al.

Other Applications

Concept of Prevalence also used for measuring frequency of behaviours, characteristics, states, etc..

e.g. Csizmadi I, Benedetti A, Boivin JF, **Hanley JA,** Collet JP.Use of post menopausal estrogen replacement therapy (in Saskatchewan) from 1981 to 1997 CMAJ. 2002;166(2):187-8)

Prevalence is central to DIAGNOSIS (see p 88)

Concept of Incidence can also be used for other desirable and undesirable life events and transitions (graduation, marriage, pregnancy, bankruptcy, promotion, ...)

[Csizmadi also measured rate of starting HRT (an "incidence" measure)]

Table **Special types of incidence and prevalence measures** (from Hennekens and Buring, p62)

Rate	Type	Numerator	Denom-inator
Morbidity	Incidence	New cases of non-fatal disease	Total popln. at risk
Mortality	Incidence	Number of deaths from a disease (or all causes)	Total popln.
Case-Fatality	Incidence	Number of deaths from a disease	Number of cases of that disease
Attack	Incidence	Number of cases of a disease	Total popln. at risk, for a limited period of obser-vation
Disease at autopsy	Prevalence	Number of cases of a disease	Number of persons autopsied
Birth Defect	Prevalence	Number of babies with a given abnormality	Number of live births
Period Prevalence	Prevalence	Number of existing cases plus cases diagnosed during a given time period	Total popln.

Incidence, Prevalence and Duration
(see Fletcher p 84-85)

Prevalence depends on incidence rate and duration of disease from onset to termination.

e.g. low inc. + long durn. -> high prevalence

adult onset diabetes ?
AIDS ?
common cold?

Changes in prevalence over time

change in incidence rates?
duration?
both?

#hospital beds in new MUHC mega-hospital?

In steady state..

Prevalence

=Incidence rate × average duration

E.g.

Beds occupied

= Admissions/day × average L.O.S.