COHORT STUDY

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Epidemiology

Defined by John M. Last in 1988

- "Study of Distribution and Determinants of health related state or event in a specified population and the application of this study to the control of health problem".
- We measure –
  - Disease frequency
  - Diseases distribution
  - Determinants of disease.

TYPES OF EPIDEMIOLOGICAL STUDIES

1. OBSERVATIONAL STUDIES
   - A. DESCRIPTIVE STUDY
     - DESCRIBE DIESEASE BY
       - TIME
       - PLACE
       - PERSON
   - B. ANALYTICAL STUDIES
     - ECOLOGICAL STUDY
     - CROSS SECTIONAL STUDY
     - CASE-CONTROL STUDY
     - COHORT STUDY
2. EXPEREMENTAL STUDIES
   - RANDOMIZED CONTROLLED TRIAL (RCT)
   - FIELD TRIAL
   - COMMUNITY TRIAL

Descriptive Epidemiology

- Describe the disease by
- Time
- Place
- Person

Types of Epi Studies

Observational

Descriptive

- Natural history
- Allocation of resources
- Suggest hypotheses

Analytic

- Test hypotheses
- Assess causation

•Cohort study is undertaken to support the existence of association between suspected cause and disease

- A major limitation of cross-sectional surveys and case-control studies is difficulty in determining if exposure or risk factor preceded the disease or outcome.
- Cohort Study:

Key Point:

- Presence or absence of risk factor is determined before outcome occurs.

WHAT IS COHORT

- Ancient Roman military unit, A band of warriors.
- Persons banded together.
- Group of persons with a common statistical characteristic. [Latin]
- E.g. age, birth date,

Cohort studies

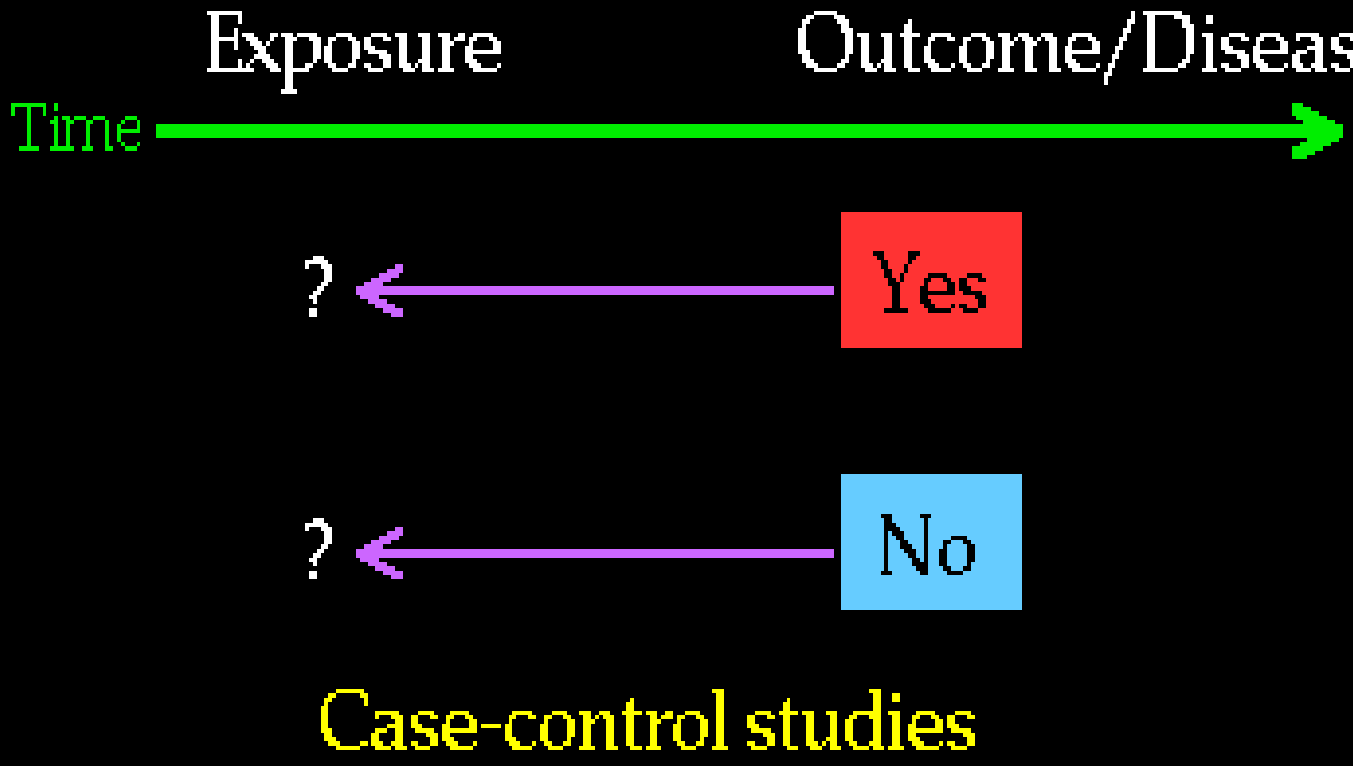
- longitudinal
- Prospective studies
- Forward looking study I
- Incidence study

- starts with people free of disease
- assesses exposure at “baseline”
- assesses disease status at “follow-up”

INDICATION OF A COHORT STUDY

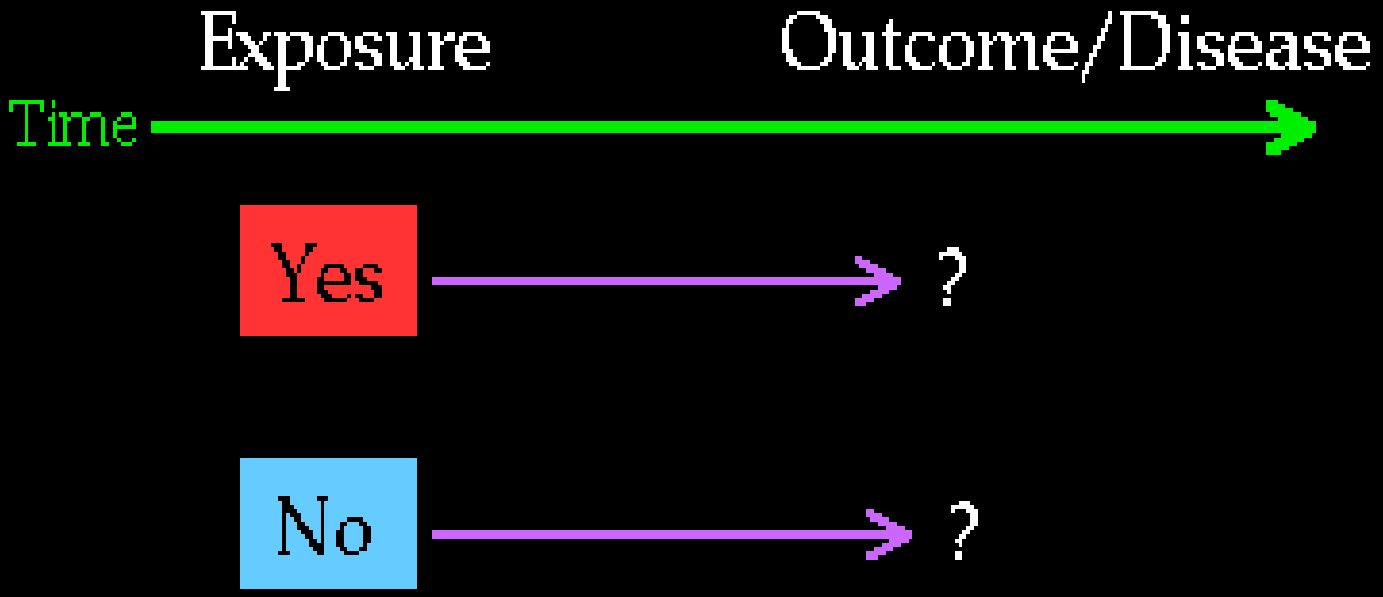
- When there is good evidence of exposure and disease.
- When exposure is rare but incidence of disease is higher among exposed
- When follow-up is easy, cohort is stable
- When ample funds are available

Backwards Directionality



Case-control studies

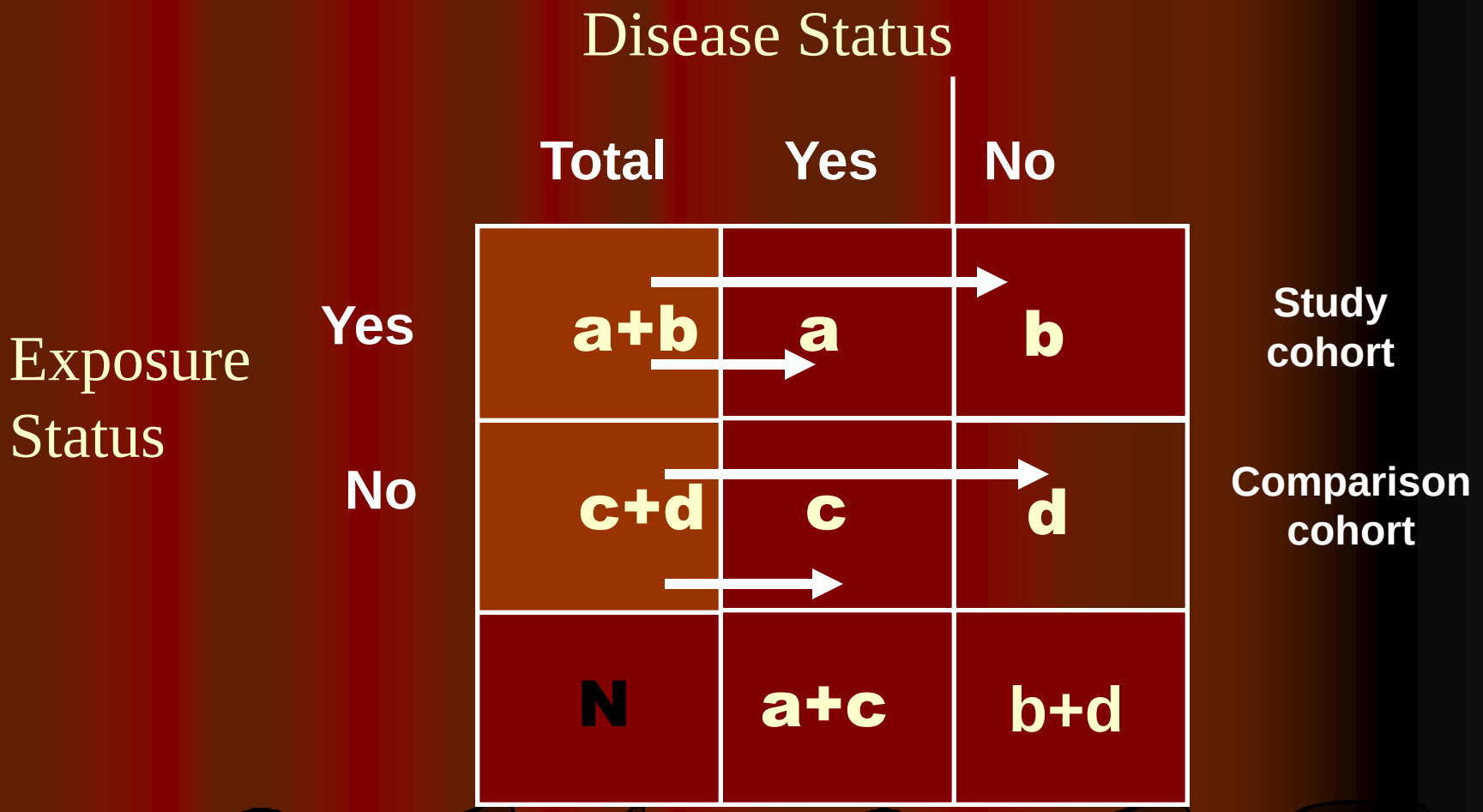
Forward Directionality



Cohort studies

Clinical trials

Frame work of Cohort studies



General consideration while selection of cohorts

- Both the cohorts are free of the disease.
- Both the groups should equally susceptible to disease
- Both the groups should be comparable
- Diagnostic and eligibility criteria for the disease should be defined well in advance.

Elements of cohort study

- Selection of study subjects
- Obtaining data on exposure
- Selection of comparison group
- Follow up
- Analysis

Selection of study subjects

- General population
  - Whole population in an area
  - A representative sample
- Special group of population
  - Select group
    - occupation group / professional group (Dolls study)
  - Exposure groups
    - Person having exposure to some physical, chemical or biological agent
      - e.g. X-ray exposure to radiologists

Obtaining data on exposure

- Personal interviews / mailed questionnaire
- Reviews of records
  - Dose of drug, radiation, type of surgery etc
- Medical examination or special test
  - Blood pressure, serum cholesterol
- Environmental survey

- By obtaining the data of exposure we can classify cohorts as
  - Exposed and non exposed and
  - By degree exposure we can sub classify cohorts

Selection of comparison group

- Internal comparison
  - Only one cohort involved in study
  - Sub classified and internal comparison done
- External comparison
  - More than one cohort in the study for the purpose of comparison
  - e.g. Cohort of radiologist compared with ophthalmologists
- Comparison with general population rates
  - If no comparison group is available we can compare the rates of study cohort with general population.
  - Cancer rate of uranium miners with cancer in general population

Follow-up

- To obtain data about outcome to be determined (morbidity or death)
  - Mailed questionnaire, telephone calls, personal interviews
  - Periodic medical examination
  - Reviewing records
  - Surveillance of death records
  - Follow up is the most critical part of the study
- Some loss to follow up is inevitable due to death change of address, migration, change of occupation.
- Loss to follow-up is one of the draw-back of the cohort study.

ANALYSIS

- Calculation of incidence rates among exposed and non exposed groups
- Estimation of risk

Incidence rates of outcome

Exposure Status	Disease Status: Yes	Disease Status: No	Total	
Yes	a	b	a+b	Study cohort
No	c	d	c+d	Comparison cohort
	a+c	b+d	N	

Incidence rate

- Incidence among exposed =

$$\frac{a}{a+b}$$

- Incidence among non-exposed =

$$\frac{c}{c+d}$$

Estimation of risk

- Relative Risk

$$RR = \frac{\text{incidence of disease among exposed}}{\text{Incidence of disease among non-exposed}}$$

$$= \frac{a/a+b}{c/c+d}$$

Estimation of Risk

- Attributable Risk

  Incidence of disease among exposed – incidence of disease among non exposed

$$AR = \frac{\text{Incidence of disease among exposed}}{\text{Incidence of disease among exposed}}$$

$$AR = \frac{a/a+b - c/c+d}{a/a+b}$$

Smoking	Lung cancer		Total
	YES	NO	
YES	70	6930	7000
NO	3	2997	3000
	73	9927	10000

Find out RR and AR for above data

- Incidence of lung cancer among smokers

  70/7000 = 10 per 1000

- Incidence of lung cancer among non-smokers

  3/3000 = 1 per thousand

RR = 10 / 1 = 10

(lung cancer is 10 times more common among smokers than non smokers)

AR = 10 – 1 / 10 X 100

= 90 %

(90% of the cases of lung cancer among smokers are attributed to their habit of smoking)

Types of Cohort Study

- Prospective cohort study
- Retrospective (historical) cohort study
- Combination of Retrospective and Prospective cohort study.

Cohort studies

Strengths

- We can find out incidence rate and risk
- More than one disease related to single exposure
- can establish cause - effect
- good when exposure is rare
- minimizes selection and information bias

Weaknesses

- losses to follow-up
- often requires large sample
- ineffective for rare diseases
- long time to complete
- expensive
- Ethical issues


THANK YOU