Case-Control Studies

Objectives

- How to design a case-control study?

- When to use case-control study?

- How to minimize bias in case-control study?

- How to establish association between exposure and outcome?

Case-Control

- It is observational analytic epidemiologic investigation

- Subjects are grouped based on their <u>outcome</u>

- The groups are then <u>compared</u> with respect to the proportion having history of an <u>exposure</u> or characteristic of interest

Case control studies

- Are good for long latency period (efficient in time and costs)

- Are good for rare diseases

- allow for evaluation of a wide range of potential etiologic exposures

- Major problem with this design:
  - Both exposure and disease have already occurred at the time the participants enter the study

Aspects to be considered

- You have to:
  - Guarantee comparability between cases and controls
  - Do your best to obtain accurate and complete data
  - Have different sources of information (about exposure and disease) and insure the validity of these sources
  - Clear definition of the outcome (homogenous disease entity) e.g. congenital malformation
    - Definite
    - Probable
    - possible

Selection of cases

- Hospital-based case-control study
- Population-based case-control study

Validity should not be compromised in an attempt to achieve generalizability

Selection of controls

- The controls must be selected to represent not the entire nondiseased population

- But they should represent the population of individuals who would have been identified and included as cases had they developed the outcome
  - Sources of controls could be:
    - Hospital controls
    - General population controls
    - Special controls such as:
      - Friends
      - Neighbors
      - Relatives

- How many controls per case should be used (1:1 to 4(controls):1(case))

Advantages of using hospitalized controls

- Easily identified

- Readily available in sufficient numbers

- Reduce recall bias (how?)

- Minimizing bias due to nonresponse (how?)

What is (are) the disadvantage(s) of having hospitalized controls

Ascertainment of Disease and Exposure Status

- Any potential source of information must be carefully considered (accurate and comparable for all study groups)

- Possible sources of information:
  - Death certificates
  - Case registries
  - Office records of physicians
  - Hospital admission or discharge records
  - Log books
  - HIS

Exposure

- From study subjects

- Surrogate

- Medical records

- HIS
  - IT IS ADVISED TO HAVE THE INTERVIEWER UNAWRE OF THE HYPOTHESIS, WHY?
  - IT IS RECOMMENDED TO OBTAIN EXPOSURE INFORMATION FROM RECORDS COMPLETED BEFORE THE OCCURNCE OF THE OUTCOME, WHY?

The role of bias

- Selection bias:

  Can occur whenever the inclusion of cases or controls into the study depends in some way on the exposure of interest

- Observation bias:

  This type of bias may arise because of the prior knowledge of the disease status by the participant or by the investigator

- Recall bias:

  Relates to differences in the ways exposure information is remembered by cases and by controls.

- Misclassification:

  Refers to error in the categorization of either exposure or disease status

  Differential vs NonDifferential

Strength and limitations of case-control study

- Strengths:
  - Relatively quick and inexpensive
  - Well-suited to the evaluation of diseases with long latent periods.
  - Optimal for the evaluation of rare diseases
  - Can examine multiple etiologic factors for a single disease

Strength and limitations of case-control study

- Limitations:
  - Insufficient for the evaluation of rare exposures
  - In some situations, the temporal relationship between exposure and disease may be difficult to establish
  - It is particularly prone to bias (selection and recall)

exposure and disease

Thank you