Selecting Controls

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Advantages of general population controls

- Because of selection process, investigator is usually assured that they come from the same base population as the cases.

Disadvantages of general population controls

- Time consuming, expensive, hard to contact and get cooperation; may remember exposures differently than cases

(Gordis, Epidemiology) 7th Edition by Leon Gordis MD MPH DrPH, Chapter 7

Selecting Controls

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What illnesses make good hospital controls?

- Those illnesses that have no relation to the risk factor(s) under study

  Example: Should respiratory diseases be used as controls for a study of smoking and myocardial infarction? Do they represent the distribution of smoking in the entire population that gave rise to the cases of MI?
- Special control groups like friends, spouses, siblings, and deceased individuals.

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Matching in Epidemiology

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Types

- Individual matching
- Frequency matching

Data are analyzed in terms of case-control pairs rather than for individual subjects

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Odds Ratio: Calculated in Case-Control Studies

Odds Ratio=

$$\frac{\text{Odds of exposure in diseased}}{\text{Odds of exposure in healthy}}$$

or

$$\frac{\text{Odds of disease in exposed}}{\text{Odds of disease in unexposed}}$$

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Analysis of case-control studies

	Disease Status		
Exposure Status	Yes	No	ODDS
Yes	A	B	A/B
No	C	D	C/D

Odds Ratio=[A/B]/[C/D]= [A x D]/[B x C]

Or [A/C]/[B/D]= [A x D]/[B x C]

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How would you design a Cohort study?

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- First you would recruit people who meet wear hats. Here again, you must decide on your “inclusion criteria.”
- Then you would find a control group with people who do not wear hats.
- You would then follow them through time to calculate an incidence rate of colds in the hat wearers vs the non-hat wearers.

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Analysis of cohort studies

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- Basic analysis involves calculation of incidence of disease among exposed and unexposed groups.
- Recall set up of 2 x 2 tables.

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Relative Risk: Calculated in a Cohort Study

$$\text{Relative risk} = \frac{\text{Incidence rate (risk) in the exposed}}{\text{Incidence rate (risk) in the non-exposed}}$$

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Interpreting Relative Risk

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- Relative Risk = 1.0 No Risk

(meaning the rate of poor outcome among those with risk factor is the same as those without)

- Relative Risk > 1 Elevated Risk

(meaning the rate of poor outcome is more common among those with the risk factor present)

- Relative Risk < 1 Reduced Risk

(meaning the rate of poor outcome is less common among those with the risk factor present)

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Use of Placebo and Blinding

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Placebos are used to make the groups as comparable as possible (recall laboratory experiment)

Blinding: subjects do not know if they are receiving treatment or placebo (single blind); neither subjects nor investigators know who is receiving treatment or placebo (double blind).

Purpose of blinding: To avoid bias in ascertainment of outcome

Placebo allows study to be blind

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Number Needed to Treat (NNT)

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Number of persons who would have to receive an intervention for 1 to benefit.

NNT = 1/ (rate in untreated group-rate in treated group)=1/Absolute risk reduction)

- To determine absolute risk reduction subtract incidence with treatment from incidence without treatment : 0.0043 − 0.0028 = 0.0015 = Absolute Risk Reduction
- The number needed to treat is the inverse of the Absolute risk reduction: 1/0.0015=667
- This means that if 667 individuals are exposed to the risk factor, 1 case will be prevented (NNT).
- Number Needed to Harm (NNH) is similar but is 1/attributable risk when you are looking at the harmful side effects of a drug.

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Interaction (Effect Modification)

- When an exposure behaves differently in different groups.
- For example, if you find smoking increases the risk for heart attacks much more in males than females (these are fictional numbers and not based on fact!)

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How would you address interaction and/or confounding in an analysis?

Stratification!

Both issues, though very different from one another, have the same solution

Selection Bias

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- Results from procedures used to select subjects into a study that lead to a result different from what would have been obtained from the entire population targeted for study.

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Recall bias

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People with disease remember or report exposures differently (more or less accurately) than those without disease.

Can result in over- or under-estimate of measure of association. (see following slide)

Solutions: Use controls who are themselves sick; use standardized questionnaires that obtain complete information, mask subjects to study hypothesis

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