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Estimating Risk

- Relative Risk (RR)= Incidence in exposed/ Incidence in nonexposed
 - If the RR=1, there is no association
 - If the RR >1, the risk in exposed > nonexposed • If the RR<1, the risk in exposed < nonexposed
- Hazards Ratio(HR): A form of RR; HR is instantaneous while RR is cumulative.
- · Odds= Probability that disease developed/Probability that it did not develop
- Odds Ratio:
 - · Cohort study: ratio of odds of disease occurring in exposed to the odds of disease occurring in non-exposed
 - Case Control: ratio of the odds that the cases were exposed to the odds that the controls were exposed
 - If the OR=1, there is no association between exposure and disease
 - If the OR>1, the exposure is positively related to the disease
 - If the OR<1, the exposure is negatively related to the disease



- In a population of 1000 people, 400 were having condomless sex. Infection-Y occurred in 100 of the 400 who were having condomless sex and in 5 of the 600 who were not.
- What is the RR of Y in those having condomless sex?
- What are the relative odds (odds ratio) of Y in those having condomless sex?

- RR: 100/400/5/600= 31.3
- OR: 100/300/5/595=41.3
- The odds ratio is a good estimate of the relative risk when the disease being studied is RARE

Estimating Risk 2

• The **attributable risk** is the proportion of disease incidence that can be attributed to a specific exposure

AR= Incidence in exposed- Incidence in non-exposed

• This is one of the most important measures when deciding *how* to spend money and resources in public health

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Example: Estimating Risk 2

- Exposure A is spelunking and Exposure B is gardening • NOW how are you going to spend your money?
- Even though the relative risk of spelunking is far more than gardening, most of the cases in your state are likely the result of gardening (a lot more people garden).
- The attributable risk of gardening, therefore, is much greater than that of spelunking

Exposure	Incidence	Relative Risk	Attributable Risk
Spelunking	32 per million	16	30 per million
No Spelunking	2 per million		
Gardening	640 per million	2	320 per million
No Gardening	320 per million		



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Number Needed to Treat (NNT)

• NNT= 1/(Rate in untreated)- (Rate in treated)

Example: NNT

RCT for a new Ebola vaccine: the mortality rate in the experimental group is 20 per 100 while the mortality rate in the control group is 85 per 100. How many people do we need to vaccinate to prevent one death from Ebola?

NNT= 1/(0.85-0.20)=1.5

1.5 people need to be vaccinated to prevent a single death from Ebola. This would be a GREAT public health intervention in endemic areas.



Definitions

- Precision: How close do the results cluster to each other?
- Accuracy: How close do the results cluster to the truth?
- Bias: systematic error leading to a decrease in accuracy
 Bias is reduced by careful study design
- Confounding: a distortion in the degree of association between an exposure and an outcome due to a mixing of effects between the exposure and an incidental factor, which is known as the confounder
 You must adjust for confounding; otherwise, it will lead to misinterpretation of results
- Effect Modification (i.e. interaction): a variable that differentially (positively and negatively) modifies the observed effect of a risk factor on disease status. Different groups have different risk estimates when effect modification is present
 - Effect modification is a true phenomenon that should be reported. You do NOT need to adjust for it.

Example: Definitions

- Drinking coffee is found to be strongly associated with an increased risk of HPV-induced cervical cancer. We later find out that those who drink coffee are much more likely to smoke cigarettes.
- Cigarette smoking is a _____ in the relationship between coffee drinking and cervical cancer

Thank you!