Last day

- odds ratio - comparative measure for two proportions probabilities

$p_1\ p_2$ : OR : $\dfrac{p_1 / 1-p_1}{p_2 / 1-p_2}$

- "convenient" association parameter
- estimated from retrospective data - case control study
- also prospective studies cross-sectional studies

interpretation "exaggerated" relative risk

OR = 1 RR = 1 $p_1 - p_2 = 0$

no difference

RR > 1 OR > RR } further from 1
RR < 1 OR < RR }

Practical interpretation of comparative measures

- $p_1 - p_2$ - risk difference (benefit difference) related "perspective" is to consider $\frac{1}{p_1 - p_2} = NNT$

- $p_1$ & $p_2$ measuring benefits

→ clinical trials
- number need to treat.

ex. $\frac{1}{.443} \simeq 2$ or $3$

NNT = number of patients needed to treat before 1 patient obtains benefit

$p_1 - p_2 = .5 \quad NNT = 2$
$p_1 - p_2 = 1 \quad NNT = 1$

Relative Risk $p_1/p_2$

Rel. risk of continued pain if only placebo $\frac{9/13}{3/12}$ - pla - IRR

$= 2.8$

- relative measure

so if $p_1 = .0000003$
$p_2 = .0000001$

$RR = 3.$ $p_1 - p_2 = \text{negligible}$

$p_2 = .10 \to p_1 = .30$

→ RR convenient to use
in Poisson regression
- natural parameter
- common in epidemiology
especially "rare" diseases

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OR ?? $\left(\frac{p_1}{p_2}\right) \times \left(\frac{1-p_2}{1-p_1}\right) \approx 1$
RR $\times$ ↗

if $p_1$ & $p_2$ small

both $< .10$

OR $\approx$ RR when disease is rare.

- can make RR. interpretation based on OR if rare outcome

I×J Contingency Tables
r x c

eg 6 x 2 table
→ cross-classification by two factors - Row factor - program applied to
6

Col. factor : Admission
$\underbrace{\text{Yes/No}}_{2}$

pattern of association between categorical variables

To test for association between row & column factors - Pearson's test - for independence

equivalent to saying admission rates same across programs

- Pearson's test is also a test

for equality of row or column proportions.

- eg. $p < .000001$
  - clearly some "real" differences

→ there's a difference
  - but where??

- similar to ANOVA
  - follow up with pairwise comparisons
    - procedures to reduce problem of multiple comparisons
    - Tukey's
      → - set overall or experiment-wise error rate.

→ in R. - pairwise.prop.test

4x4 example

Pearson's $X^2 = \sum_{i=1}^{4} \sum_{j=1}^{4} \frac{(obs - exp)^2}{exp}$

row colum

$exp = \frac{r_i \times c_j}{N}$

under $H_0$: no association

$X^2$ approx $\chi^2$ d.f. $= (r-1) \times (c-1)$

in example $p = .21$

- $X^2$ doesn't reflect any ordering or trends

- will look at better tests later.