Hypothesis testing in statistical studies (1)

TEST	VARIABLES used in test
Interval/ordinal data	2 interval(I) / 2ordinal
Nominal data	2 nominal (any number of groups)
t test	1N(max. 2 groups) + 1I
ANOVA one way	1N (many groups) + 1I
ANOVA two way	2 N + 1I

STATISTIC FORMULA for each of the tests
Pearson (2I)/Spearman (2O) correlation
chi square
t statistic
F statistic
F statistic

p value

cannot tell if it is BIAS in study

cannot tell if the result is clinically significant

it can only tell you if it is statistically significant

- Now the question is: what's the link between all these we described? I refer to categories, confidence intervals, p value, alfa error, etc?

- The link is this: imagine you want to compare 2 or more categories and draw a conclusion. First you need to DESIGN A STUDY. You need to know what do you want to compare in your study: only nominal data, interval data or nominal and interval data.

If the categories are not identical you can find either a correlation or a difference between them depending on categories.

Let's assume you found a difference. The next question : is this difference due to hazard or it is significantly statistic? To know this you will apply for each study a specific STATISTIC FORMULA specially designed for that study. You found a number and you want to know if this number is in your 95% confidence interval, that what you found is statistically significant. You take the number you obtained and check in the tables for the p value related to your number. If the p found<0.05 then YES, your study result shows a significant statistic difference. If p found>0.05, your study result shows no statistically difference.

Hypothesis testing in statistical studies (2)

Ask Mish

REALITY

STUDY RESULT	DIFFERENCE	NO DIFFERENCE
DIFFERENCE		**Type I error** **error** "false positive"
NO DIFFERENCE	**Type II error or** **error** "false negative"	

*NULL Hypothesis (Ho) = no difference found
If the study finds a difference : REJECT Ho
If the study finds no difference : FAIL to reject Ho (H1)

- HYPOTHESIS in STATISTICS (2):
- When the study finds a difference when a difference truly exists (box1) and when the study finds no difference when no difference exists (box4) everything is OK. (smiley)
- When the study finds a difference when it truly exists then this is called THE POWER of the study (to see difference)- the first box.
- In TYPE I error or alfa error the study finds a difference when no difference really exists. This is a "false positive" study. It equals p.
- In TYPE II error or beta error the study finds no difference when one truly exists. It's a "false negative" study. Usually:10-20% but no more than 20%.
- POWER= 100 - beta error(%) or 1- beta(decimal). You choose the power when you design the study. If the difference you need to find is small you need an increased power and you need to increase the SAMPLE SIZE which will also increase the costs. You have to find the optimum balance for all. Power > 80%.