

Statistics for the FRCA

Data types

- Discrete or continuous
- Nominal, ordinal, interval or ratio
 - Nominal; named categories, no implicit order eg male/female
 - Ordinal; ordered categories eg none mild moderate severe
 - Interval; numerical data with meaningful difference between the values but not a meaningful ratio
 - Ratio; equal intervals with a meaningful zero
- Dependent variables are those responding to experimental manipulation eg BP, time to onset of neuromuscular block whereas independent variable are under the control of the experimenter eg male/female, smoker/non-smoker

Descriptive statistics

Allow description of the average (mean, median and mode) and spread (range or standard deviation) of numerical data.

Inferential statistics

These are designed to :

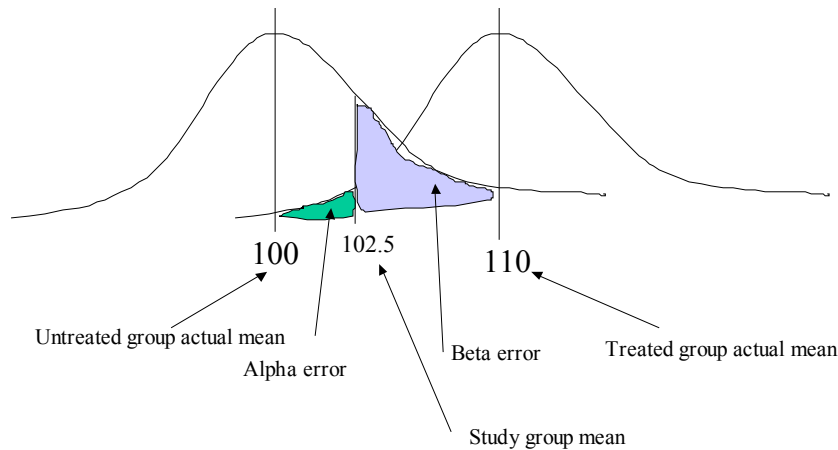
1. show that the measurements made from the sample studied represent the whole population
2. indicate that any random error within the measurements will not have altered the conclusions drawn.

Essential steps in conducting a clinical trial

1. the hypothesis (and so the null hypothesis)
2. the method
 - randomised – to avoid selection bias
 - prospective – to allow equivalent conditions to be compared
 - controlled – to compare with a gold standard or placebo
 - double blind – to further avoid investigator bias
3. the statistics
 - data classification, parametric v non parametric
 - appropriate tests
4. power analysis
 - determined by the spread of data likely, the difference anticipated and level of significance accepted.
 - Essential if the study turns out to be negative to ensure an adequate number of subjects was studied to show that a difference would have been found if it did exist
5. the ethics committee

NB

Significance and error



Noddys guide to statistical tests

- Is the data nominal or ordinal? If so you must use a non-parametric test such as Chi square or Wilcoxon rank sum test.
- The central limit theorem states that for sample sizes that are sufficiently large the means of the samples will be normally distributed regardless of the shape of the original distribution. Sufficient size seems to be >25 approximately.
- Generally small sample sizes should be treated with non parametric tests.
- If the data is ratio and there are two groups apply students t test (paired for data from the same subjects and unpaired when the data comes from different subjects)
- If there are more than 3 groups then apply analysis of variance to determine whether or not there is a difference between the groups and then get help. You will need a post hoc test to find where the difference is (i.e. is group 1 different from 2 or 3 or both etc) this should not be a t test but rather something like Tukey's honestly significantly different test (I jest not).

Rule of thumb for stats test

	Parametric	Non-parametric
Unpaired	T-test	Mann-Whitney U
Paired	T-test	Wilcoxon
Multiple	ANOVA + post-hoc test (e.g Tukey's HSD) Friedman	Kruskal-Wallis

Epidemiology

	Test positive	Test Negative
Disease positive	A	B
Disease negative	C	D

Sensitivity: Ability to pick up all with disease
 $A/A+B$

Specificity: Ability to pick up only those with disease
 $D/C+D$

Positive predictive value
Proportion with positive test who have disease
 $A/A+C$

Negative predictive value
Proportion with negative test without disease
 $D/D+B$

	Pass	Fail
FRCA course	A	B
Homework	C	D

Relative risk

Chance of outcome with one group vs another
 $(A/A+B)/(C/C+D) = P1/P2$

Odds ratio

Compares the odds of an outcome from one group with another

$$(P1/1-P1)/(P2/1-P2)$$