# Statistics in R - Introduction

Miranda Y Mortlock

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# OUTLINE

- Use R Project for your work
- Statistical Principles
- T Tests
- Sample Size
- Method Comparison
- ANOVA
- Regression
- Advanced (not in scope)

# Statistical Principles

Stephen Stigler, Univ Chicago

1. Aggregation eg a statistic to describe the data
2. Information
3. Likelihood to calibrate inference (R.A. Fisher, Neyman J and E.S. Pearson)
4. Intercomparison
5. Regression
6. Design of Experiments (Peirce and Fisher)
7. Residual (eg model comparison)

# HELP and record the R Packages we used

- Make a record the R Packages we used
- Be aware of how to use HELP
- Cheatsheets
- Package notes and Vignettes
- Help on CRAN
- In the Help tab
- Use the console ?'t.test'

# Three types of t tests

1. Single Sample
2. Two Sample
3. Paired t test

# Sample Size

Choosing a sample size requires using 3 out of 4 aspects. For example by using $n$, $\sigma^2$ and $\delta$ you can calculate the power.

Use R these very easily.

1. Sample size (n)
2. Variability ($\sigma^2$)
3. Effects size of interest ($\delta$)
4. Power (1-$\beta$)

Where $\alpha$ is the Type I error, and $\beta$ is the Type II error.
Sample size should be chosen before the experiment begins.

# ANOVA

1. Designed
2. With or without Blocks
3. Factors (levels) - efficient design
4. Interpret

# Regression

1. Linear, ( Nonlinear, Logistic, Poisson )
2. Check on linear, quadratic, cubic etc
3. Nonlinear
4. Model building and interpret
5. Test best fit

# Advanced

1. Designed - multilevel (nested or crossed)
2. Repeated measures
3. Random and fixed effects
4. Multivariate methods

# Resources

yieldingresults.org

https://caloua.wixsite.com/biometry

Quick R

miranda.mortlock@gmail.com