Reading materials: Statistical considerations when planning your research project

Biljana Jonoska Stojkova
Applied Statistics and Data Science Group (ASDa)
Department of Statistics, UBC
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Links in the presentation

These are the links that we have checked and found useful. We provide links to some applets which include tutorials that guide you through the basic statistical concepts such as sampling distribution of the means, effect size, power and sample size. You are encouraged to play with the applets and follow the short tutorial before the webinar. We will discuss these concepts together during the webinar.

Hands-on workshops in R

http://ecoscope.ubc.ca/events/

Survey sampling - selection bias

Learn why pollsters were wrong about Brexit
http://uk.businessinsider.com/pollsters-know-why-they-were-wrong-about-brexit-2016-7

Sampling distribution - applets

Learn about the sampling distribution of the means. Change the sample size and see how it affects the sampling distribution of the mean. Click on the tutorial button to guide you through the applet. You will learn how the sample size affects the precision of the estimates.

Applet 1. Sampling distribution of the means when population follows normal distribution
http://www.zoology.ubc.ca/~whitlock/Kingfisher/SamplingNormal.htm

Applet 2. Sampling distribution of the means when population follows non-normal distribution
http://www.zoology.ubc.ca/~whitlock/Kingfisher/CLT.htm

For more stats tutorials visit StatSpace
https://statspace.elearning.ubc.ca/

Applet 3. Sample size and power

Learn how the changes in sigma, effect size and power affect the sample size needed. You can select various study designs.

Power and Error Limits If the applet does not work from the web browser, you can download the piface.jar You will need. You will need to have the Java Runtime Environment (JRE) or the Java Development Kit
(JDK) installed on your system. You probably already have it; but if not, these are available for free download for several platforms from Sun.

Other resources for sample size calculation are included in Wikipedia -> Statistical Power

**Discussions covered in the presentation**

**Sampling methods**

https://www.bcps.org/offices/lis/researchcourse/develop_data_sampling.html

**Election polling**

https://www.nytimes.com/2016/10/06/upshot/when-you-hear-the-margin-of-error-is-plus-or-minus-3-percent-think-7-instead.html

**Confounding**

https://blogs.qub.ac.uk/griefstudy/2013/12/18/dag-blog-part-1-understanding-confounding/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4017459/

**Simpson’s paradox**

https://en.wikipedia.org/wiki/Simpson%27s_paradox

**The Significance of Power**


**Effect size**

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3444174/

**Randomized block design**

https://onvegetables.com/2014/03/31/snake-oils/

**Experimental design**

http://www.3rs-reduction.co.uk/html/9__experimental__designs.html

**Factorial experiment**

http://www.3rs-reduction.co.uk/html/10___factorial_experiments.html
Repeated measurements within a subject

Experimental units and Pseudo-replication
https://www.statisticsdonewrong.com/pseudoreplication.html
https://onlinecourses.science.psu.edu/stat502/node/174
https://www.ma.utexas.edu/users/mks/statmistakes/pseudorep.html

Good article on the multiple testing problem:
http://egap.org/methods-guides/10-things-you-need-know-about-multiple-comparisons

Other resources

Various stat resources
https://www.stat.ubc.ca/~jenny/resources.html

Introductory stat references:
Statistics and data with R: an applied approach through examples, Cohen, Yosef; Cohen, Jeremiah Y (2008)
Software for Data Analysis, Programming with R, John Chambers (2008) This one seems to be mainly about using R and not on any types of specific analyses

The following two references cover a good variety of popular topics and how to use R in each case: