

Activity Title	Statistics 101: A Modern Introduction
Activity description	<p>This is an introduction to the basic statistical concepts and computer skills that are necessary for analysing data. The focus is on how to make your empirical research useful and credible. Real data sets from the Monash Statistical Consulting Service will be used as case studies.</p> <p>There are 3 computer-lab style sessions of 3 hours duration. During each session, everyone will be required to analyse data on their own computer. The detailed content of the course is as follows.</p> <p>Session 1: Estimation and Sampling Variance</p> <ul style="list-style-type: none"> • Gentle introduction to R and RStudio • Overview of hypothesis testing • Random variables and probability • Simulation and resampling • Means, the central limit theorem and normal distributions <p>Session 2: Inference</p> <ul style="list-style-type: none"> • Theoretical sampling variance • Bootstrap sampling variance • t-tests, p-values and confidence intervals • Size and Power • Multiple hypothesis testing <p>Session 3: Data Analysis</p> <ul style="list-style-type: none"> • Histograms • QQ-plots • Boxplots and “error bars” • Categorical variables and dimension reduction • Correlation measures, outliers and ranks • Mann-Whitney/Wilcoxon tests
Learning Outcomes	<p>At the end of this course, you will be able to: 1. Use a computer to properly analyse scientific data (which entails going beyond Microsoft Excel); 2. Make justifiable and reproducible statistical inferences using real data; and 3. Plan ahead for the statistical analysis of data for journal articles.</p> <p>You will also be able to easily tackle the best online statistics courses; for example, the Harvard University “Statistics and R” course on edX.</p>
Proposed alignment to program topics	Excellence in Research and Teaching - Research Methods & Analysis
Activity Level	Foundational
Recommended or required prerequisites	<p>There are no prerequisites, but taking Monash’s shorter “Statistics 101: Statistical Inference for Research” course would give you a head-start.</p> <p><i>No background in any programming is required:</i> sufficient R coding basics are included within the course (and it is not a waste of time, even you plan to only use Excel or SPSS for your research).</p>

	Please have a computer with R and RStudio installed before the first session starts. RStudio is open source software and can be downloaded from: https://www.rstudio.com/products/rstudio/download/ . Instructions for installing R (immediately before RStudio) are at the same site.
Keywords associated with activity	modern and computer-based statistics; statistical inference; R
Duration	9 hours (split into three sessions)