STAT704

Statistical Methods for Research

S1 Day 2014

Statistics

Contents

General Information

Unit convenor and teaching staff
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Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit covers statistical principles and methods needed for the design, analysis and critical appraisal of scientific studies. The different types of study designs (observational, experimental; cross-sectional, longitudinal, retrospective), and different levels of data (continuous, categorical, ordinal), are discussed initially. Statistical distributions are introduced and univariate and multivariate methods covered, as appropriate for each study design and data type. These include one- and two-sample tests, analysis of variance and covariance, simple and multiple linear regression, logistic regression, Poisson regression, principal components analysis, factor analysis and cluster analysis. The design concepts of power, sample size calculation, randomization, blocking and replication; and the synthesis of information from previous studies via critical appraisal and systematic review, are covered. Methods are illustrated and implemented on data sets from the students' research areas, using statistical software. Interpretation of results is emphasised throughout.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

The ability to identify the appropriate design of a study

Understanding of the basic principles of research design

Understanding of commonly used study designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design

The ability to analyse data from an experiment or study and to interpret the results

The ability to perform power and sample size calculations

The ability to undertake and interpret critical appraisal and systematic review of studies on a specified topic

Assessment Tasks

Name	Weighting	Due
Assignment 1	20%	10/4/14 10am
Assignment 2	20%	5/6/14 10am
Final Examination	25%	See exam timetable
Final Exam (Take Home)	35%	TBD

Assignment 1

Due: **10/4/14 10am**
Weighting: **20%**

Covers the first 5 weeks of unit content. More details will be provided on iLearn. No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

• The ability to identify the appropriate design of a study

• Understanding of the basic principles of research design

• Understanding of commonly used study designs and be able to apply appropriate

statistical method(s) for the analysis of data arising from each design

- The ability to undertake and interpret critical appraisal and systematic review of studies on a specified topic

Assignment 2

Due: **5/6/14 10am**
Weighting: **20%**

This assignment includes the first 11 weeks of course material. More details will be available on iLearn. No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- The ability to identify the appropriate design of a study
- Understanding of the basic principles of research design
- Understanding of commonly used study designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- The ability to analyse data from an experiment or study and to interpret the results
- The ability to undertake and interpret critical appraisal and systematic review of studies on a specified topic

Final Examination

Due: **See exam timetable**
Weighting: **25%**

All material covered is examinable for the final exam unless stated otherwise. The date of the exam will be listed on the exam timetable when that becomes available.

On successful completion you will be able to:

- The ability to identify the appropriate design of a study
- Understanding of the basic principles of research design
- Understanding of commonly used study designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- The ability to analyse data from an experiment or study and to interpret the results
- The ability to perform power and sample size calculations
- The ability to undertake and interpret critical appraisal and systematic review of studies on a specified topic

Final Exam (Take Home)

Due: **TBD**

Weighting: **35%**

All material is examinable for the Take Home exam. More details will be provided in class.

On successful completion you will be able to:

- The ability to identify the appropriate design of a study
- Understanding of the basic principles of research design
- Understanding of commonly used study designs and be able to apply appropriate statistical method(s) for the analysis of data arising from each design
- The ability to analyse data from an experiment or study and to interpret the results
- The ability to perform power and sample size calculations
- The ability to undertake and interpret critical appraisal and systematic review of studies on a specified topic

Delivery and Resources

- This unit will be delivered through iLearn.
- There is one two hour lecture (Mondays 11-1pm in E4B 208) and one tutorial (Mondays 1-2pm in E4B 206) which are both in E4B214. Tutorials begin in week 1.
- Resources for the course in terms of recommended and required readings and so on will be described in the Resources section of iLearn or in the weekly information.
- The statistical software package R will be used in this course. It is free publicly available software and can be downloaded from: http://cran.csiro.au/ (click on Download R for [select the appropriate platform…]) to your personal computer or laptop.

Unit Schedule

WEEK	WEEK_STARTING	LECTURE_TOPIC
W1	3 March	Research questions: revision of data types, types of studies and probability distributions
W2	10 March	Transformations of data, the CLT and one and two-sample tests for means, proportions and rates

W3	17 March	ANOVA and nonparametric methods
W4	24 March	Simple and multiple linear regression, GLMs: linear and logistic
W5	31 March	More on GLMs: Poisson, loglinear, ordinal and multinomial. Mixed-effects and longitudinal models.
W6	7 April	Mixed-effects and longitudinal models continued. Systematic reviews and evidence synthesis
	Semester break	14-25 April
W7	28 April	Survival analysis
W8	5 May	Power and sample size
W9	12 May	Designing studies (for example observational or experimental) including factorial designs and randomization.
W10	19 May	Multivariate data: PCA and factor analysis
W11	26 May	More on factor analysis and clustering
W12	2 June	More on clustering and review
W13	9 June	Public holiday

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.