STAT818

Epidemiological Methods

S2 Day 2014

Statistics

Contents

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General Information

Unit convenor and teaching staff
Unit Convenor
Kehui Luo
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E4A532
Tuesday 9 - 11 am

Credit points
4

Prerequisites
Admission to MAppStat or PGDipAppStat or PGCertAppStat

Corequisites

Co-badged status
Co-badged with STAT718; Co-taught with STAT395

Unit description
This unit provides an introduction to the more commonly used research study designs (randomised prospective trials, case control studies, cohort studies and cross-sectional studies) with applications to epidemiological problems. The unit explores statistical methods for analysing data from such studies, with particular emphasis on categorical data analysis, including logistic and Poisson regression, and models for censored survival data.

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:

Demonstrate a good understanding of the four commonly used Epidemiological designs, and the strength, weakness and theoretical properties of these designs.

Calculate key epidemiological measures, including odds ratios and relative risks, in both unstratified and stratified analyses, and understand the statistical properties of these measures.

Demonstrate a good understanding of and be able to apply logistic and Poisson

regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.

Have a good understanding of sample size issues and be able to perform sample size calculations.

Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.

Analyse data using SAS.

Have the skills necessary to critically appraise a piece of research literature.

Assessment Tasks

Name	Weighting	Due
Assignments 1 & 2	30%	Week 6 and 8
Assignment 3	15%	Week 12
Examination	55%	University Examination Period

Assignments 1 & 2

Due: **Week 6 and 8**
Weighting: **30%**

These two assignments together with Assignment 3 are set for students to complete independently, applying the knowledge gained from lectures and their own reading, with and/or without using the statistical software, SAS.

Note:

The three assignments will be made available on the unit **iLearn**. **Details about due date and submission for each assignment will be included in the assignment.** Students must submit all assignments **on-time and perform satisfactorily (ie, achieve pass standard)** in order to pass this unit. Students who are unable to submit any assignment on time, because of documented illness or other disruption, must report the circumstances in writing to the lecturer in charge and may consider applying for Special Consideration in relation to Disruption of Studies. A web link to Disruption to Studies policy is given under Policies and Procedures within this unit guide. Students who have not submitted an assignment prior to the deadline will be awarded a mark of 0 for the assignment, except for cases in which an application for Disruption of Studies is made and approved.

Marked assignments will be handed back to the student within two to three weeks after the due date.

Students must keep a soft or hard copy of any assignment that they submit. In the event of their

assignment being misplaced, a replacement will be requested.

On successful completion you will be able to:
- Demonstrate a good understanding of the four commonly used Epidemiological designs, and the strength, weakness and theoretical properties of these designs.
- Calculate key epidemiological measures, including odds ratios and relative risks, in both unstratified and stratified analyses, and understand the statistical properties of these measures.
- Demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.
- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.
- Analyse data using SAS.

Assignment 3

Due: **Week 12**
Weighting: **15%**

For more information, refer to the notes under Assignments 1 & 2.

On successful completion you will be able to:
- Demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.
- Have a good understanding of sample size issues and be able to perform sample size calculations.
- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.
- Analyse data using SAS.
- Have the skills necessary to critically appraise a piece of research literature.

Examination

Due: **University Examination Period**
Weighting: **55%**

The final examination is used to assess students' understanding of the material presented in the

unit.

The final examination will be a three hour written exam (plus ten minutes reading time) and will be held during the examination period which runs from 17 November to 5 December, 2014. It will examine any materials covered in the unit. Relevant statistical tables will be attached to the final examination. Students will be permitted to take **ONE A4 sheet**, **handwritten on both sides**, into the final examination. The right to bring two A4 sheets into the examination may be forfeited in any supplementary examination, on the grounds that extra preparation time will have been available to the candidate. **Calculators** (**non text returnable**) should be brought into the exam. No other electronic devices (e.g. mobile phones, mp3 players) are allowed during the exam.

The University Examination timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations at: http://www.timetables.mq.edu.au/exam

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching session, which is the final day of the official examination period.

Attendance at the examination is compulsory. The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may consider applying for Special Consideration in relation to Disruption of Studies. A web link to Disruption to Studies policy is given under the Policies and Procedures within this unit guide.

Special Consideration request relating to Disruption will only be granted to students whose performance in all parts of the coursework is satisfactory. In particular, you must have obtained at least 22.5 out of the total 45 marks in the coursework.

If a Supplementary Examination is granted as a result of the Special Consideration process, the examination will be scheduled after the conclusion of the official examination period.

Note carefully:

Your final grade in STAT818 will be based on your work during the semester and in the final examination as specified in the Assessment Tasks. You need to achieve the same standards in the assessment tasks during the semester and the final examination to be awarded a particular grade as set out in the Grading Policy. Your final result will include one of these grades plus a standard numerical grade (SNG).

On successful completion you will be able to:
- Demonstrate a good understanding of the four commonly used Epidemiological designs, and the strength, weakness and theoretical properties of these designs.
- Calculate key epidemiological measures, including odds ratios and relative risks, in both unstratified and stratified analyses, and understand the statistical properties of these measures.

- Demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.
- Have a good understanding of sample size issues and be able to perform sample size calculations.
- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.
- Analyse data using SAS.
- Have the skills necessary to critically appraise a piece of research literature.

Delivery and Resources

Classes

Internal students are required to attend a 3-hour lecture per week (together with STAT395 students) beginning in Week 1, and may also attend (not compulsory) a 1-hour laboratory tutorial class designed for STAT395 students, beginning in Week 2.

The timetable for classes can be found on the University web site at: http://www.timetables.mq.edu.au/. In the case of changing classes, time and/or location, you will be informed at the lecture and/or on the unit iLearn (https://ilearn.mq.edu.au/) in advance.

Note: You are welcome to come to see the lecturer during staff consultation time with questions related to the unit. You could also contact the lecturer by email or telephone. Only the **Macquarie University student email accounts** may be used to communicate with staff.

Course materials and recommended reading

Weekly lecture notes will be made available on the unit iLearn at https://iLearn.mq.edu.au/ at least one day before the lecture. Students should print out and bring the relevant lecture notes into the lecture.

There is no compulsory textbook for this unit. Students may find the following book by McNeil (1996) to be a useful supplement to the lecture notes. Additional relevant reading is also provided below.

Recommended reading:

Epidemiological research methods, by D. McNeil, Wiley, 1996.

Additional recommended reading:

Epidemiology in Medicine, by H. Hennekens & J. E. Burning, Little Brown, 1987.

Statistics in

Epidemiology, by H. Sahai & A. Khurshid, CRC Press, 1996. Statistical Methods in Medical Research, 3rd Edition, by P. Armitage & G. Berry, Blackwell, 1994.

Epidemiologic Research: Principles and Quantitative Methods, by D. G. Kleinbaum et al, Van Nostrand Reinhold, 1982.

An introduction to categorical data analysis, by A. Agresti, Wiley, 1996.

Logistic regression: a self-learning text, by D. G. Kleinbaum, Spring-Verlag, 1992. Applied

Logistic Regression, D. Hosmer & S. Lemeshow, John Wiley & Sons, 1989.

Survival Analysis: A Self-Learning Text, by D. G. Kleinbaum, Springer, 1996.

Modelling survival data in medical research, by D. Collett, Chapman & Hall, 1994. Analysis of Survival Data, by D. R. Cox & D. Oakes, Chapman & Hall, 1984.

Technology Used and Required

Software: SAS (version 9 or newer) is used in this unit. It is available in all E4B computing labs on campus. The software is provided to students enrolled in this unit. Students will be provided with information about obtaining a free SAS DVD and the Student Use Agreement form on the unit iLearn at https://ilearn.mq.edu.au/. You may also use it via iLab. For more information about iLab, refer to https://wiki.mq.edu.au/display/iLab/About.

Calculator: An electronic calculator is required throughout this unit. Only non-text returnable calculators are permitted to be used in the final examination.

Unit Web Page and iLearn Access: The unit web page is available on iLearn and can be accessed at http://ilearn.mq.edu.au, under 'STAT395 Biostatistics and Epidemiology/STAT818_STAT718 Epidemiological Methods' link.

Weekly lecture notes, including power point slides and iLectures (**echo360**), will be made available on iLearn. Other course materials including assignments, tutorial exercises and their solutions, and relevant data files can also be downloaded from iLearn.

The **Discussion Forum** on the unit **iLearn** can be used for online discussion with other students enrolled in STAT395 or STAT818_STAT718 on any problems or topics related to the unit.

To login into iLearn, you will be asked for your **Macquarie OneID number** and **myMQ Portal password**. If you have any problem accessing this website, you should visit Student Help web site at www.mq.edu.au/iLearn/help-pages/students.htm. **Note** that you should visit this web site regularly for updated course materials, and also possible announcements placed by the Lecturer.

If **iLearn** site is down, students can send an e-mail to the lecturer, using your Macquarie University student e-mail accounts. Furthermore, students should check and read their Macquarie University student e-mail account on a regular basis.

Learning and Teaching activities

Lectures: Lectures begin in Week 1. Internal students are required to attend a 3-hour lecture each week. Topic(s) for each week are set in the Unit Schedule at the end of this unit outline. Students are encouraged to read relevant lecture notes before coming to the lecture.

An iLecture will be recorded for each lecture **when possible** and made available on the unit iLearn (under echo360) soon after the lecture is completed.

Tutorial Exercises: Each week a set of tutorial exercises will be made available for students to practice, which is usually presented on the last slide(s) of each lecture. Its solution will be discussed in the STAT395 tutorial class of the following week (starting from Week 2), and also made available on **iLearn** soon after the class.

Assignments: **Three assignments** are set in this unit for students to complete independently. To assist with further learning, solution to each assignment (when possible) will be made available on **iLearn**, soon after the assignment being marked.

Unit Schedule

Week	Topic
1	Introduction to epidemiological research methods and SAS
2	Review of basic statistical methods
3	Simple methods for binary outcomes and determinants; Matching in case-control studies
4	Mantel-Haenszel methods; Meta-analysis.
5	Logistic regression I
6	Logistic regression II
7	Poisson regression
8	Kaplan-Meier survival curves
9	Cox proportional hazards model

10	Cox proportional hazards model (Contd.) and its extension
11	Sample size calculations
12	Critical appraisal
13	Revision; Some readings on clinical trials

Note: There may be minor deviations from this timetable if insufficient time is available for some topics.

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.

Graduate Capabilities

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Demonstrate a good understanding of the four commonly used Epidemiological designs, and the strength, weakness and theoretical properties of these designs.

- Calculate key epidemiological measures, including odds ratios and relative risks, in both unstratified and stratified analyses, and understand the statistical properties of these measures.

- Demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.

- Have a good understanding of sample size issues and be able to perform sample size calculations.

- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of

assumptions, potential biases and valid interpretation of the statistical methods used.

- Analyse data using SAS.

- Have the skills necessary to critically appraise a piece of research literature.

Assessment tasks

- Assignments 1 & 2

- Assignment 3

- Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, basic and more advanced methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model.

- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.

- Have the skills necessary to critically appraise a piece of research literature.

Assessment tasks

- Assignments 1 & 2

- Assignment 3

- Examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcome

- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.

Assessment tasks

- Assignments 1 & 2
- Assignment 3
- Examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.

Assessment tasks

- Assignment 3
- Examination

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Be able to apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and present the results in written report that displays the understanding of assumptions, potential biases and valid interpretation of the statistical methods used.
- Have the skills necessary to critically appraise a piece of research literature.

Assessment task

- Assignment 3

Changes from Previous Offering

No major changes from previous offerings.