



STAT395

Biostatistics and Epidemiology

S2 Day 2014

Statistics

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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

3

Prerequisites

39cp including (STAT270(P) or STAT271(P) or BIOL235(P) or PSY222(P) or PSY248(P))

Corequisites

Co-badged status

Co-taught with STAT818/STAT718

Unit description

This unit introduces a range of statistical concepts in the design and analysis of epidemiological studies. The first part of the unit presents an insight into the main types of study designs: cross-sectional surveys, case-control studies, cohort studies, and randomised control trials. Attention is given to the role of matching in the design of case-control studies. The second part of the unit introduces the statistical methods and modelling techniques used in analysing data derived using various epidemiological design strategies. These include the Mantel-Haenszel methods; logistic and Poisson regression; survival analysis using the Kaplan-Meier method; and the Cox proportional hazards model and its extensions.

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:

Case-control study, cohort study, cross-sectional study and clinical trials

be able to calculate odds ratios and relative risks, and perform stratified analysis

demonstrate a good understanding of and be able to apply logistic and Poisson regression methods

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

perform sample size calculation

apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis

be able to analyse data using SAS

have the skills necessary to critically appraise a piece of research literature

Assessment Tasks

Name	Weighting	Due
<u>Tutorial participation</u>	5%	Ongoing
<u>Tutorial exercises</u>	5%	next tutorial class
<u>Assignments</u>	30%	Week 6, 8, 12
<u>Final Examination</u>	60%	University Examination Period

Tutorial participation

Due: **Ongoing**

Weighting: **5%**

Students are **required** to attend a 1-hour tutorial per week. A mark of from 0 (never attended or very rarely attended tutorials) to 5 (attending and **actively** participating all tutorials) is also awarded according to your attendance and participation in tutorials. To pass the unit, you need to attend and participate **at least eight (8) tutorials**.

On successful completion you will be able to:

- demonstrate a good understanding of the four commonly used Epidemiological designs:
Case-control study, cohort study, cross-sectional study and clinical trials

Tutorial exercises

Due: **next tutorial class**

Weighting: **5%**

Each week a set of tutorial exercises will be made available for you to work on and then discussed in the tutorial of the following week.

Your solutions to the tutorial **must be** handed in or shown (as instructed) to the tutor at each

tutorial session, and a mark of 0 or 1 or 2 will be awarded depending on whether a reasonable attempt has been made. To pass the unit, you need to complete **at least eight (8) tutorial Exercises**.

On successful completion you will be able to:

- demonstrate a good understanding of the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
- be able to calculate odds ratios and relative risks, and perform stratified analysis
- demonstrate a good understanding of and be able to apply logistic and Poisson regression methods
- apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- perform sample size calculation
- be able to analyse data using SAS
- have the skills necessary to critically appraise a piece of research literature

Assignments

Due: **Week 6, 8, 12**

Weighting: **30%**

Three assignments are set for students to apply the knowledge gained from lectures, tutorials and their own reading, with and/or without using the statistical software, SAS. Questions and tasks have been designed to assess a student's level in relation to the unit learning outcomes. Students will be further evaluated in relation to the unit learning outcomes in the final examination.

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 assignments or tutorials that they submit. In the event of their assignments or tutorials 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: Case-control study, cohort study, cross-sectional study and clinical trials
- be able to calculate odds ratios and relative risks, and perform stratified analysis
- demonstrate a good understanding of and be able to apply logistic and Poisson regression methods
- apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- perform sample size calculation
- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS

Final Examination

Due: **University Examination Period**

Weighting: **60%**

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. A page of formulae and 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 an A4 sheet 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 other 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 Policies and Procedures within this unit guide.

Special Consideration request relating 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 20 out of the total 40 marks in the coursework (tutorials and assignments), attended at least eight tutorial classes and completed at least eight tutorial exercises.

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

Note carefully:

Your final grade in STAT395 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: Case-control study, cohort study, cross-sectional study and clinical trials
- be able to calculate odds ratios and relative risks, and perform stratified analysis
- demonstrate a good understanding of and be able to apply logistic and Poisson regression methods
- apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- perform sample size calculation
- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS
- have the skills necessary to critically appraise a piece of research literature

Delivery and Resources

Classes

Students are required to attend a 3-hour lecture per week (together with STAT818_STAT718) beginning in Week 1, and a 1-hour laboratory tutorial class **beginning in Week 2**.

Times and locations for all classes can be found on the University web site at: 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 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 (McNeil) 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, Springer-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 information about iLab, visit <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 **iLearnsite** 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. 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.

Tutorials and tutorial exercises: Students are **required** to attend a 1-hour tutorial per week from Week 2, and **complete relevant tutorial exercises (usually presented in the last slide(s) of each lecture) before coming to their tutorial class**. The solution to the tutorial exercises will be discussed in the tutorial class, and also made available on **iLearn** soon after the tutorial class.

Assignments: **Three assignments** are set in this unit for students to complete independently. To assist with further learning, solutions to assignments (when possible) will be made available to students later on **iLearn**.

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

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

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- have the skills necessary to critically appraise a piece of research literature

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where

relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- demonstrate a good understanding of the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials?
- be able to calculate odds ratios and relative risks, and perform stratified analysis
- demonstrate a good understanding of and be able to apply logistic and Poisson regression methods
- apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- perform sample size calculation
- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS
- have the skills necessary to critically appraise a piece of research literature

Assessment tasks

- Tutorial exercises
- Assignments
- Final Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- perform sample size calculation
- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS
- have the skills necessary to critically appraise a piece of research literature

Assessment tasks

- Assignments
- Final Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS

Assessment tasks

- Assignments
- Final Examination

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- be able to analyse data using SAS

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- apply appropriate statistical method(s) acquired in this unit for the analysis of real life data, and interpret the results from the analysis
- have the skills necessary to critically appraise a piece of research literature

Assessment tasks

- Tutorial participation
- Assignments
- Final Examination

Changes from Previous Offering

No major differences from previous offering.

Changes since First Published

Date	Description
28/07/2014	Add the mapping between Assessment tasks and Grad Capabilities.