



STAT395

Biostatistics and Epidemiology

S2 Day 2016

Dept of Statistics

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General Information

Unit convenor and teaching staff

Unit Convenor

Kehui Luo

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AHH, Level 2

Friday 1 - 3 pm

Credit points

3

Prerequisites

6cp at 200 level including (STAT270(P) or STAT271(P) or BIOL235(P) or PSY222(P) or PSY248(P))

Corequisites

Co-badged status

Co-taught with STAT818 and 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, and apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model

apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size calculation

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

General Assessment Information

Assignments:

Three assignments 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, and they will be made available on iLearn.

Each of the three assignments should be submitted electronically on the unit iLearn by its due date and time, which will be included in the assignment.

No extensions will be granted. 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.

Examination:

There will be a three-hour written examination that will be timetabled in the official University examination timetable. Students will be permitted to take ONE A4 sheet, typed or handwritten on both sides, into the examination. Calculators with no text retrieval capacity should be brought into the examination.

Assessment Tasks

Name	Weighting	Due
<u>Assignment 1</u>	12%	Week 6
<u>Assignment 2</u>	16%	Week 9
<u>Assignment 3</u>	12%	Week 12
<u>Final Examination</u>	60%	University Examination Period

Assignment 1

Due: **Week 6**

Weighting: **12%**

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?

Assignment 2

Due: **Week 9**

Weighting: **16%**

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, and apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- have the skills necessary to critically appraise a piece of research literature

Assignment 3

Due: **Week 12**

Weighting: **12%**

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

- apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size calculation

Final Examination

Due: **University Examination Period**

Weighting: **60%**

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, and apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size calculation
- 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. SAS 9.4 is available via iLab (<https://wiki.mq.edu.au/display/iLab/Applications+on+iLab>) in all E4B computing labs on campus and outside the University. Remember that any work or results produced via iLab in those labs must be saved to the iLab desktop and then emailed to yourself. For information about iLab, visit <http://wiki.mq.edu.au/display/iLab/About>. You may also download SAS University Edition for home use, known as SAS studio. It is free for downloading at http://www.sas.com/en_za/software/university-edition.html where you can also find information about this free software.

Calculator: An electronic calculator is required throughout this unit. Only calculators with no text retrieval capacity are permitted to be used in the 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. **Note** that you should visit this web site regularly for course materials including lecture slides, lecture recordings, tutorials and assignments, and also possible announcements placed by the Lecturer.

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. The lecturer will visit the Forum from time to time.

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. A set of tutorial exercises will be made available each week for students to practice, which is usually presented on the last slide(s) of each lecture. Its solution will be discussed in the tutorial class of the following week. Students are encouraged to complete relevant tutorial exercises before coming to their 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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/grading/policy.html>

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.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/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au.

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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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, and apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size calculation
- have the skills necessary to critically appraise a piece of research literature

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- 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

- demonstrate a good understanding of and be able to apply logistic and Poisson regression methods, and apply basic methods of survival analysis, including the Kaplan-Meier method and the Cox proportional hazards regression model
- apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size calculation
- have the skills necessary to critically appraise a piece of research literature

Assessment tasks

- Assignment 2
- Assignment 3
- 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 outcome

- apply appropriate statistical method(s) acquired in this unit for the analysis of real world data using SAS and interpret the results from the analysis, and perform sample size

calculation

Assessment tasks

- Assignment 3
- Final Examination

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 outcome

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

Assessment tasks

- Assignment 3
- Final Examination

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

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

Changes from Previous Offering

Tutorial participation and exercises were parts of assessment tasks in previous offerings, but are not in the unit assessment of this semester.