



STAT395

Biostatistics and Epidemiology

S2 Day 2019

Dept of Mathematics and Statistics

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General Information

Unit convenor and teaching staff

Lecturer in Charge

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See iLearn for consultation hours

Lecturer

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See iLearn for consultation hours

Gillian Heller

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Credit points

3

Prerequisites

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

Students enrolled in STAT395 are required to complete independently three assignments and submit each of them by its due date specified in the assignment, and sit a two-hour written examination during the University examination period for the semester. Students enrolled in STAT395 are required to participate in a 1-hour SGTA class per week from Week 2.

Submit assignments online via the appropriate assignment link below. A personalised coversheet is not required with online submission. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

Submit and access feedback from an iLearn assignment (this is a hyperlink to the attached file)

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments in the link above.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make

frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

Late Submission of Work

All assignments must be submitted by the official due date and time. No marks will be given to late work unless an extension has been granted following a successful application for Special Consideration. Please contact the unit convenor for advice as soon as you become aware that you may have difficulty meeting any of the assignment deadlines.

Assessment Tasks

Name	Weighting	Hurdle	Due
SGTA participation	5%	No	Week 2 to Week 13
Assignments	45%	No	Wednesday (Week 6, 9 & 12)
Final Examination	50%	No	University Examination Period

SGTA participation

Due: **Week 2 to Week 13**

Weighting: **5%**

Each week a set of SGTA exercises are made available on the last few slides of the lecture for that week and/or on iLearn for students to practice. Students in STAT395 are required to participate in a 1-hour SGTA class per week from Week 2, contributing to the class discussion with fellow students and the tutor. A mark will be given each week based on completion of the 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, 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

Assignments

Due: **Wednesday (Week 6, 9 & 12)**

Weighting: **45%**

Three assignments (15% each) are set for students to complete independently, applying the knowledge gained from lectures, SGTA and their own reading, with and/or without using the statistical software, SAS. They will be made available on iLearn 2 weeks before the due date.

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. Students must keep a soft or hard copy of any assignment submitted. In the event of an assignments being misplaced, a replacement of it 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, 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

Final Examination

Due: **University Examination Period**

Weighting: **50%**

There will be a two hour written examination that will be timetabled within the official University Examination Timetable. The University Examination Timetable will be available in draft form approximately eight weeks before the commencement of the the University examinations and in final form approximately four weeks before the commencement of the examinations at: http://students.mq.edu.au/student_admin/exams/.

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via ask.mq.edu.au/.

If you apply for Special Consideration for the final examination, you must make yourself available for the Supplementary Examination as organised by the Faculty of Science & Engineering. If you are not available at that time, there is no guarantee that an additional examination time will be offered. You can check the Supplementary Exam information page on FSE011 in iLearn (bit.ly/

[FSESupp](#)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

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

Learning and Teaching activities

Lectures: Lectures begin in **Week 1** and continue until **Week 12**. Lectures should be either attended or reviewed using iLearn.. 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.

SGTA and SGTA exercises: A set of SGTA 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 SGTA class of the following week, and also made available on iLearn soon after the class. Students are encouraged to complete relevant SGTA exercises before coming to their SGTA 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 later on **iLearn**, soon after the assignment being marked.

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 arrange a consultation time with questions related to the unit. You could also contact the lecturer by email. 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 (<https://iLearn.mq.edu.au/>) at least one day before the lecture. Students may print out and bring the relevant lecture notes into the

lecture.

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

Recommended reading:

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

Other useful references:

Modern epidemiology, by K.J. Rothman et al, 3rd edition, 2012.

Statistics for epidemiology, by N. Jewell, 2004.

Statistics in Epidemiology, by H. Sahai & A. Khurshid, CRC Press, 1996.

Statistical Methods in Medical Research, 4rd Edition, by P. Armitage, G. Berry & J.N.S. Matthews, Blackwell, 2001

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, Third edition, Wiley, 2018.

Logistic regression: a self-learning text, by D. G. Kleinbaum & M. Klein, 3rd edition, Springer-Verlag, 2010.

Applied Logistic Regression, D. Hosmer, S. Lemeshow & R.X. Sturdivant, 3rd edition, John Wiley & Sons, 2013.

Survival Analysis: A Self-Learning Text, by D. G. Kleinbaum, 3rd edition, Springer, 2012.

Modelling survival data in medical research, by D. Collett, 3rd edition, Chapman & Hall, 2015.

Technology Used and Required

Software: SAS is used in this unit. SAS 9.4 is available via iLab (<https://wiki.mq.edu.au/display/iLab/Applications+on+iLab>) in all 6 Eastern Road 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 <https://wiki.mq.edu.au/display/iLab/About>. You may also download SAS University Edition (see details at https://www.sas.com/en_us/software/university-edition/download-software.html) 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.

iLearn: All unit content 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 iLearn regularly for course materials including lecture slides, lecture recordings, SGTA material 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 STAT818 on any problems or topics related to the unit. The lecturer will visit the Forum from time to time

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	Public Holiday (no lecture)
10	Cox proportional hazards model
11	Cox proportional hazards model (Contd.) and its extension
12	Sample size calculations
13	No Lecture

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 \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)

- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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

If you are a Global MBA student contact globalmba.support@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

- 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

- 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

- 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

- 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

Assessment tasks

- Assignments

- 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:

Assessment tasks

- SGTA participation
- Assignments
- Final Examination

Changes from Previous Offering

No major differences from previous offering.