



# STAT818

## Epidemiological Methods

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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Credit points

4

Prerequisites

Corequisites

((Admission to MAppStat or GradCertAppStat or GradDipAppStat or MSc) and STAT680)) or (admission to MActPrac or MDevStudGlobalHlth or MDevStud or MPH)

Co-badged status

Co-taught with STAT718 and 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:

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 STAT818 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.

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
<u>Assignments</u>	45%	No	Wednesday (Week 6, 9 & 12)
<u>Final Examination</u>	55%	No	University Examination Period

### 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: **55%**

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/](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/](http://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/FSESup](https://bit.ly/FSESup)) 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. There is no on campus session for external students.

**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. External students may also attend the SGTA or otherwise the work should be reviewed.

**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](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 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](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](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](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>).

## 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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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](http://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](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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/](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

### 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: 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

## 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 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

## 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 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

## **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 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

## **Changes from Previous Offering**

No major differences from previous offering.