# STAT395

Biostatistics and Epidemiology

S2 Day 2013

## Statistics

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>2</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>2</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>3</td>
</tr>
<tr>
<td>Delivery and Resources</td>
<td>6</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td>9</td>
</tr>
<tr>
<td>Policies and Procedures</td>
<td>9</td>
</tr>
<tr>
<td>Graduate Capabilities</td>
<td>10</td>
</tr>
</tbody>
</table>

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General Information

Unit convenor and teaching staff
Unit Convenor
Kehui Luo
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Contact via kehui.luo@mq.edu.au
E4A532
Thursday 10-12pm

Credit points
3

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

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://students.mq.edu.au/important-dates

Learning Outcomes

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

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial participation</td>
<td>5%</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Tutorial exercises</td>
<td>5%</td>
<td>next tutorial class</td>
</tr>
<tr>
<td>Assignments</td>
<td>30%</td>
<td>Week 6, 8, 12</td>
</tr>
<tr>
<td>Final Examination</td>
<td>60%</td>
<td>University Examination Period</td>
</tr>
</tbody>
</table>

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.

This Assessment Task relates to the following Learning Outcomes:
- understand the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
- understand and perform sample size calculation

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.**

This Assessment Task relates to the following Learning Outcomes:

- understand the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
- understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
- understand logistic and Poisson regression methods
- understand basic methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model
- understand and 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 illness or some other causes, must report the circumstances in writing to the lecturer in charge and may consider applying for Special Consideration. Request for Special Consideration should be lodged via MQ Student Admin at [https://ask.mq.edu.au/index.php](https://ask.mq.edu.au/index.php). **No extensions will be granted unless satisfactory documentation outlining illness or misadventure is submitted.**

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.

This Assessment Task relates to the following Learning Outcomes:

• understand the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
• understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
• understand logistic and Poisson regression methods
• understand basic methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model
• understand and perform sample size calculation
• be able to 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 11 November to 29 November, 2013. 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 unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about special consideration process and policy is available at: [http://www.mq.edu.au/policy/docs/special_consideration/policy.html](http://www.mq.edu.au/policy/docs/special_consideration/policy.html). Student Request for Special Consideration should be lodged via MQ Student Admin at [https://ask.mq.edu.au/index.php](https://ask.mq.edu.au/index.php).

**Special Consideration 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 process, 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 semester and in the final examination as specified in the Assessment Tasks. The grades allocated are as set out in the Grading Policy at [http://www.mq.edu.au/policy/docs/grading/policy.html](http://www.mq.edu.au/policy/docs/grading/policy.html). Your final result will include one of these grades plus a standard numerical grade (SNG).

This Assessment Task relates to the following Learning Outcomes:

- understand the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
- understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
- understand logistic and Poisson regression methods
- understand basic methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model
- understand and perform sample size calculation
- be able to 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 beginning in Week 1, and a 1-hour laboratory tutorial class 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 make 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:**


Additional recommended reading:


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


**Technology Used and Required**

**Software:** SAS is used in this unit. It is available in EMC_G210 and 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/.

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. 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.
Changes
No major differences from previous offering.

Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to epidemiological research methods and SAS</td>
</tr>
<tr>
<td>2</td>
<td>Review of basic statistical methods</td>
</tr>
<tr>
<td>3</td>
<td>Simple methods for binary outcomes and determinants; Matching in case-control studies</td>
</tr>
<tr>
<td>4</td>
<td>Mantel-Haenszel methods; Meta-analysis.</td>
</tr>
<tr>
<td>5</td>
<td>Logistic regression I</td>
</tr>
<tr>
<td>6</td>
<td>Logistic regression II</td>
</tr>
<tr>
<td>7</td>
<td>Poisson regression</td>
</tr>
<tr>
<td>8</td>
<td>Kaplan-Meier survival curves; The proportional hazards model</td>
</tr>
<tr>
<td>9</td>
<td>No lecture/tutorial (public holiday)</td>
</tr>
<tr>
<td>10</td>
<td>The proportional hazards model (contd.)</td>
</tr>
<tr>
<td>11</td>
<td>Sample size calculations</td>
</tr>
<tr>
<td>12</td>
<td>Critical appraisal</td>
</tr>
<tr>
<td>13</td>
<td>Revision</td>
</tr>
</tbody>
</table>

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:

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

• understand the four commonly used Epidemiological designs: Case-control study, cohort study, cross-sectional study and clinical trials
• understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
• understand logistic and Poisson regression methods
• understand basic methods of survival analysis including the Kaplan-Meier method and the Cox proportional hazards regression model
• understand and perform sample size calculation
• be able to 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

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

• understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
• understand and perform sample size calculation
• be able to 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

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

- understand and be able to calculate odds ratios and relative risks, and be able to undertake stratified analysis
- understand and perform sample size calculation
- be able to 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

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

- be able to 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

- be able to 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

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:
Learning outcome

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

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

• be able to 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