FOSX1015
Statistical Concepts for Science
Session 1, Fully online/virtual 2021
Science and Engineering Faculty level units

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Notice
As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit’s iLearn space or consult your unit convenor.
General Information

Unit convenor and teaching staff
Lecturer
Karol Binkowski

Administrative assistance
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Huan Lin
huan.lin@mq.edu.au

Credit points
10

Prerequisites

Corequisites

Co-badged status
It is co-badged with STAT1170.

Unit description
This unit provides a broad introduction to statistical concepts and data analysis techniques. You will develop an understanding of statistical practice through a study of those techniques most commonly used in the sciences, social sciences and humanities. Topics covered in this unit include data collection methods, data quality, data summarisation, and statistical models such as the normal distribution, followed by sampling distributions and statistical inferences about means and proportions. Also studied are methods of analysis relating to comparisons, counted data and relationships, including regression and correlation. Statistical computer packages are used for handling and analysing data. However, no prior computing knowledge is assumed. This unit introduces vital skills for tertiary learning and explores their relationship to success in future careers.

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
On successful completion of this unit, you will be able to:

ULO1: Organise and summarise data graphically and numerically
ULO2: Analyse and solve problems about distributions and sampling distributions.
ULO3: Evaluate and apply statistical strategies to answer a research question.
ULO4: Draw conclusions from the results of a statistical analysis.
ULO5: Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.
ULO6: Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

General Assessment Information

The data in the above table's "Estimated Time on Task" column is automatically generated, and potentially confusing. The times given for the tests (2 hours each) are just estimates; for each student, this will depend on how many times the test is attempted. The times allocated to activity participation (each 0 hours) should be ignored.

HURDLES: All assessment tasks are hurdle requirements to pass this unit. These can be different for internal and external students. Details will be provided on the iLearn page for the unit.

ATTENDANCE and PARTICIPATION: There is no participation requirement for Practicals or SGTAs for FOSX1015 students, but you should work through this material to develop your understanding.

TEST SUBMISSION: Each statistics module's tests will be online, via the iLearn page. For some of the tests, multiple attempts are allowed; in this case, the highest mark counts toward the student's grade. For each statistics module, at least 50% of the available marks must be scored in order to pass the unit.

A student who does not pass any statistics module by its deadline will fail the unit, unless Special Consideration is granted. If you miss a test deadline due to circumstances out of your control, you may be eligible to apply for Special Consideration via ask.mq.edu.au.

EMPLOYABILITY SKILLS: This unit has been designed so that 20% of student workload is allocated to employability skills. The employability skills modules are not graded, but the modules are hurdle tasks: you must complete the activities as outlined in order to pass this unit. Some activities will be automatically graded, but all will ask you to apply the modules to your work in this unit, general university studies and your personal goals. You will be informed of any due dates, but most modules can be completed in your own time. See your iLearn unit for detailed information on how to complete the skills modules.

FINAL EXAM POLICY: There is no final exam for this unit.

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 2 Test</td>
<td>20%</td>
<td>Yes</td>
<td>Week 6</td>
</tr>
<tr>
<td>Name</td>
<td>Weighting</td>
<td>Hurdle</td>
<td>Due</td>
</tr>
<tr>
<td>----------------------</td>
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<td>-------------------</td>
</tr>
<tr>
<td>Foundation activities</td>
<td>0%</td>
<td>Yes</td>
<td>Throughout semester</td>
</tr>
<tr>
<td>Module 5 Test</td>
<td>20%</td>
<td>Yes</td>
<td>Week 12</td>
</tr>
<tr>
<td>Module 3 Test</td>
<td>20%</td>
<td>Yes</td>
<td>Week 8</td>
</tr>
<tr>
<td>Module 4 Test</td>
<td>20%</td>
<td>Yes</td>
<td>Week 10</td>
</tr>
<tr>
<td>Module 1 Test</td>
<td>20%</td>
<td>Yes</td>
<td>Week 4</td>
</tr>
</tbody>
</table>

### Module 2 Test

Assessment Type 1: Quiz/Test  
Indicative Time on Task 2: 2 hours  
Due: Week 6  
Weighting: 20%  
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This quiz will test the ability of students to analyse and solve statistical problems leveraging the properties of distributions and sampling distributions.

On successful completion you will be able to:
- Organise and summarise data graphically and numerically
- Analyse and solve problems about distributions and sampling distributions.
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

### Foundation activities

Assessment Type 1: Participatory task  
Indicative Time on Task 2: 0 hours  
Due: Throughout semester  
Weighting: 0%  
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Activities related to foundational employability and self-directed learning skills
On successful completion you will be able to:

- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

**Module 5 Test**

**Assessment Type**: Quiz/Test  
**Indicative Time on Task**: 2 hours  
**Due**: Week 12  
**Weighting**: 20%  

*This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)*

This quiz will test the ability of students to answer research questions about the appropriateness of models for a categorical random variable, and the independence of two categorical random variables.

On successful completion you will be able to:

- Organise and summarise data graphically and numerically  
- Analyse and solve problems about distributions and sampling distributions.  
- Evaluate and apply statistical strategies to answer a research question.  
- Draw conclusions from the results of a statistical analysis.  
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

**Module 3 Test**

**Assessment Type**: Quiz/Test  
**Indicative Time on Task**: 2 hours  
**Due**: Week 8  
**Weighting**: 20%  

*This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)*

This quiz will test the ability of students to answer research questions about population means.

On successful completion you will be able to:
• Organise and summarise data graphically and numerically
• Analyse and solve problems about distributions and sampling distributions.
• Evaluate and apply statistical strategies to answer a research question.
• Draw conclusions from the results of a statistical analysis.
• Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

Module 4 Test
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 2 hours
Due: Week 10
Weighting: 20%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This quiz will test the ability of students to answer research questions about the linear relationship between two numerical random variables.

On successful completion you will be able to:
  • Organise and summarise data graphically and numerically
  • Analyse and solve problems about distributions and sampling distributions.
  • Evaluate and apply statistical strategies to answer a research question.
  • Draw conclusions from the results of a statistical analysis.
  • Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

Module 1 Test
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 2 hours
Due: Week 4
Weighting: 20%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

This quiz will test the ability of students to summarise a data set numerically and graphically, and to understand and interpret the output of such analyses.
On successful completion you will be able to:

- Organise and summarise data graphically and numerically
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

1 If you need help with your assignment, please contact:
   - the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
   - the Learning Skills Unit for academic skills support.

2 Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

**Delivery and Resources**

**Classes**

The statistics content will be delivered in classes from Week 1 to Week 11. Specifically, students should work through the following material on a weekly basis:

- A 2-hour lecture – recorded **Weeks 1–10**.
- A 1-hour SGTA on the topics of the previous lecture – **Weeks 1–11**. (Week 1 will introduce the employability module.)
- A 1-hour practical on the topics of the previous one or two lectures – **Weeks 1–11**. (Week 1 will introduce the employability module.)

Some activities will be available in connection to the employability modules, especially near the end of semester. Details will be announced via iLearn.

**Assistance**

For help with any matters related to this unit, students should contact the appropriate department staff, by emailing stat1170.admin@mq.edu.au.

**Required and Recommended Texts and/or Materials**

- A calculator with statistics mode may be useful during lectures.
- Software:
  - The software used in this unit is **Excel**, the spreadsheet application from Microsoft's **Office** suite. For students with Mac or Windows computers, this application can be downloaded from the student portal. This can be accessed from the web page for Student IT services: [http://students.mq.edu.au/it_service](http://students.mq.edu.au/it_service)
Students using other operating systems might find Google Sheets or OpenOffice Calc to be a workable alternative.

Recommended textbook for this unit:


Other recommended reading:

- *Statistics without Tears* by Rowntree (Penguin)
- *Mind on Statistics* by Utts & Heckard (Thomson, 2004)
- *Elementary Statistics* by Johnson & Kuby (Thomson, 2007)
- *The Statistical Sleuth* by Ramsey and Schafer (Duxbury, 2002).

Technology Used and Required

iLearn (a version of Moodle) is used for delivery of course material and can be accessed at: http://ilearn.mq.edu.au.

Prizes

The Don McNeil Prize for Introductory Statistics is named in honour of the foundation Professor of Statistics at Macquarie University. The prize is awarded twice per year to the student with the best overall performance in a first-year statistics unit.

Unit Schedule

In Weeks 1–10, the lectures will introduce the following topics. Each topic will be developed in SGTAs and Practicals in the following week.

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Data, research questions, graphics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Numerical data</td>
</tr>
<tr>
<td>Week 3</td>
<td>Introduction to distributions</td>
</tr>
<tr>
<td>Week 4</td>
<td>Sampling distributions</td>
</tr>
<tr>
<td>Week 5</td>
<td>Hypothesis tests for a population mean</td>
</tr>
<tr>
<td>Week 6</td>
<td>Comparing population means</td>
</tr>
<tr>
<td>Week 7</td>
<td>Simple linear regression</td>
</tr>
<tr>
<td>Week 8</td>
<td>Simple linear regression</td>
</tr>
</tbody>
</table>

https://unitguides.mq.edu.au/unit_offerings/135795/unit_guide/print
Employability activities and assessment will occur throughout the semester, including Weeks 11–13.

**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). 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.)*

Students seeking more policy resources can visit the 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).

**Student Code of Conduct**

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/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://stu
Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Enquiry Service

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

Equity 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.

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.

Changes from Previous Offering

This new unit was been adapted from an earlier unit, STAT170, in Semester 1 of 2020. For the current offering, there are few changes: just some minor adjustments to the assessment structure.