# STAT8127

## Survival Analysis

Session 1, Online-flexible 2022

*School of Mathematical and Physical Sciences*

# Contents

# General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
(BCA808 or STAT8609) or ((admission to MAppStat or MScInnovationStat or GradCertAppStat or GradDipAppStat or MActPrac or BMathScMAppStat) and (STAT6175 or STAT811 or STAT8111))

Corequisites
STAT6110 or STAT806 or STAT810 or STAT8310 or BCA817 or STAT8603

Co-badged status
STAT7127

Unit description
This unit explores biostatistical applications of survival analysis. These begin with the Kaplan-Meier curve definition and its extension to the comparison of survival of several groups of subjects. The Cox proportional hazards model is introduced as a method for handling continuous covariates, and parametric accelerated failure-time models are covered. Time-dependent covariates and multiple outcomes are also considered.

## 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:

**ULO1:** Demonstrate understanding of survival data by identification and application of correct models.

**ULO2:** Summarise and display survival data using nonparametric methods.

**ULO4:** Analyse survival data using parametric models.

**ULO3:** Analyse survival data using the Cox proportional hazards model, including time-

dependent covariates and multi-event models.

**ULO5:** Produce appropriate displays for publication.

**ULO6:** Determine sample size for simple survival analysis.

# General Assessment Information

Please be aware that we adopt the Faculty policy on late submissions of assignments:

(i) All assignments must be submitted by their due time.

(ii) Should these assignments be missed due to illness or misadventure, students should apply for Special Consideration.

(iii) Late submissions are permitted but a consistent penalty will be applied for late submissions as follows: A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

# Assessment Tasks

| Name | Weighting | Hurdle | Due |
|---|---|---|---|
| Assignment 1 | 30% | No | Week 4 |
| Assignment 2 | 40% | No | Week 9 |
| Assignment 3 | 30% | No | Week 13 |

## Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 4**
Weighting: **30%**

Simple analyses performed by hand to demonstrate understanding of the basic principles of survival analysis and analysis using statistical software of univariate and simple Cox models.

On successful completion you will be able to:

- Demonstrate understanding of survival data by identification and application of correct models.
- Summarise and display survival data using nonparametric methods.

- Analyse survival data using the Cox proportional hazards model, including time-dependent covariates and multi-event models.

# Assignment 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 14 hours
Due: **Week 9**
Weighting: **40%**

Full statistical analysis of a survival data set. This requires choosing an appropriate survival model, performing diagnostic tests and modifying the model to correctly satisfy the assumptions of the Cox model and presenting the results for presentation to a general audience.

On successful completion you will be able to:
- Demonstrate understanding of survival data by identification and application of correct models.
- Summarise and display survival data using nonparametric methods.
- Analyse survival data using the Cox proportional hazards model, including time-dependent covariates and multi-event models.

# Assignment 3

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 13**
Weighting: **30%**

Statistical analyses covering advance material including multiple events, time-dependent covariates, parametric models, presentation of results and sample size calculations.

On successful completion you will be able to:
- Analyse survival data using parametric models.
- Produce appropriate displays for publication.
- Determine sample size for simple survival analysis.

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[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 Writing Centre 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

## Unit content

The unit is divided into 7 modules, summarised in more detail below. Each module will involve 2 weeks of study, except for Module 7 which is only for 1 week, and generally includes the following material:

1. "Module Notes" describe concepts and methods, and possibly including some exercises of a more "theoretical" nature.

2. Sometime, "Selected Readings" from published articles or textbooks will also be included.

3. One or more "Extended Examples" illustrating the concepts/methods introduced in the notes and including more practically oriented exercises.

Study materials for all Modules are downloadable from the eLearning unit site. Assignments and supplementary material, such as datasets will be posted to the unit site. Please note that we may not be able to post copies of copyright material (for example journal articles and book extracts)—for these you will have to rely on resources from your home university's library.

## Recommended approaches to study

Students should work through each module systematically, following the module notes and any readings referred to, and working through the accompanying exercises. *You will learn a lot more efficiently if you tackle the exercises systematically as you work through the notes.* You are encouraged to post any content-related questions to eLearning, whether they relate directly to a given exercise, or are a request for clarification or further explanation of an area in the notes. You should also work through all of the computational examples in the notes for yourself on your own computer.

Outline solutions to the exercises in each module (except those to be submitted for assessment, as described below) will be posted online at the midway point of the allocated time period for the module. This is intended to encourage you to attack the exercises independently (or via the eLearning site), and yet not make you wait too long to see the sketch solutions.

## Method of communication with coordinator(s)

Questions about administrative aspects or course content can be emailed to the coordinator, and when doing so please use "SVA:" in the Subject line of your email to assist in keeping track of

our email messages.  Coordinator/s will be available to answer questions related to the module notes and practical exercises, and to address any other issues that require clarification. However, please note that instructors are not necessarily available every day of the week and you should expect that it may take a day or so to respond to questions (possibly longer over weekends and during breaks!).

We strongly recommend that you post content-related questions to the Discussions tool in the eLearning site. In 2022 we are using the Learning Management system hosted by the University of Sydney and Macquarie University.  You should already be familiar with the university student learning system from previous units.

# Unit Schedule

Unit schedule

Semester 1, 2022

| Week | Module | Assessment |
|------|--------|------------|
| 1 | Module 1 | Assignment 1 available |
| 2 | Module 1 (cont) | |
| 3 | Module 2 | |
| 4 | Module 2 (cont) | Assignment 1 due |
| 5 | Module 3 | Assignment 2 available |
| 6 | Mid semester break | |
| 7 | Module 3 (cont) | |
|   | Module 4 | |
| 8 | Module 4 (cont) | |
| 9 | Module 5 | Assignment 2 due and Assignment 3 available |
| 10 | Module 5 (cont) | |
| 11 | Module 6 | |
| 12 | Module 6 (cont) | |
| 13 | Module 7 | Assignment 3 due |

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). 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
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

## 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

# Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

# Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

## The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the 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 Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

# Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

# 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.