School of Medicine and Public Health

BIOS6940: Generalised Linear Models

Online
Semester 1 - 2024

COURSE OUTLINE

www.newcastle.edu.au
CRICOS Provider 00109J

OVERVIEW

Course Description

This course presents methods for analyses of categorical data, with a key focus on generalised linear models (GLMs). Students will study contingency tables and gain experience with a range of generalised linear models appropriate to binary, count, nominal, ordinal and time-to-event response variables. There will be an emphasis on understanding model equations, fitting statistical models using statistical software, using fitted model equations to identify estimates of interest, checking model assumptions and accurately interpreting results for reporting or publication.

Academic Progress Requirements

Nil

Assumed Knowledge

Students are assumed to have basic algebraic skills, including familiarity with mathematical functions and equations and the ability to rearrange equations to solve for terms of interest. It is also assumed that students understand the relationship between logarithmic and exponential functions and can convert from one form to the other.

Students are also assumed to have a basic understanding of probability, or at a minimum, not be daunted by exposure to probabilistic concepts. The course refers to various probability distributions (e.g., normal, binomial, Poisson distributions), to teach students how to identify the distribution(s) appropriate for a given response variable. Mathematical notation is used to describe distributions and represent the parameter(s) being estimated by a regression model, such as the mean of a normal distribution, or the probability of a binomial event. Use of such terminology/notation is largely descriptive and complex calculations are not required. Prior completion of a course in probability theory (e.g., BIOS6170) is not necessary to succeed in this course but will enhance students' theoretical understanding of the models.

Students are also assumed to have basic, prior experience with simple and multiple regression, e.g., linear or logistic regression. This may be gained by prior completion of an introductory regression course, e.g., BIOS6920 Biostatistics B or BIOS6070 Linear Regression, or similar practical experience. BIOS6940 is an intermediate regression course focused on providing a unified approach to diverse regression methods. Students lacking a basic understanding of regression methods may find this course challenging.

Contact Hours

ONLINE
Online Activity
Online
10 hour(s) per week(s) for 13 week(s) starting Week 1
Contact Hours are an Indication Only

Unit Weighting	10
Workload	Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator	**Online** Prof Liz Holliday Liz.Holliday@newcastle.edu.au (02) 4042 0508
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	**School of Medicine and Public Health** **Education Office** SMPH-edoffice@newcastle.edu.au (02) 404 20667

SYLLABUS

Course Content

Topics covered include contingency tables, the exponential family and generalised linear models. Students will learn about estimation and modelling using logistic regression for binary, ordinal and multinomial responses, Poisson and negative binomial regression for counts, and Cox regression for time to event responses. There will be an emphasis on fitting appropriate models using Stata or SAS statistical software, checking model fit and interpreting results.

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Construct and analyse contingency tables for a range of study designs, using both manual calculations and statistical software
2. Determine when contingency table analysis requires methods for stratified or matched data, and correctly apply and appraise the results of such methods
3. Identify and define the components of a generalised linear model (GLM)
4. For a given generalised linear model equation and sample from an exponential family distribution, estimate distributional parameters and interpret these in relation to a linear predictor
5. Propose and fit appropriate GLMs for binary, ordinal and nominal data, and interpret results in relation to the original research question
6. Construct GLMs for count data using Poisson or negative binomial regression and defend the choice of model
7. Recognise time-to-event response variables and correctly format and analyse these using Kaplan-Meier estimators and Cox regression
8. Present results from GLMs in publication-ready tables and interpret results for a non-statistical audience

Course Materials

Other Resources:

- See Canvas for course materials.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Assignment 1	See Canvas for due date	Individual	15%	1, 2
2	Assignment 2	See Canvas for due date	Individual	15%	3, 4, 8
3	Assignment 3	See Canvas for due date	Individual	35%	3, 4, 5, 8
4	Assignment 4	See Canvas for due date	Individual	35%	3, 4, 6, 7, 8

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Assignment 1

Assessment Type Written Assignment
Description See Canvas for assignment details
Weighting 15%
Due Date See Canvas for due date
Submission Method Online

Assessment 2 - Assignment 2

Assessment Type Written Assignment
Description See Canvas for assignment details
Weighting 15%
Due Date See Canvas for due date
Submission Method Online

Assessment 3 - Assignment 3

Assessment Type Written Assignment
Description See Canvas for assignment details
Weighting 35%
Due Date See Canvas for due date
Submission Method Online

Assessment 4 - Assignment 4

Assessment Type Written Assignment
Description See Canvas for assignment details
Weighting 35%
Due Date See Canvas for due date
Submission Method Online

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35.

Adverse Circumstances	The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where: 1. the assessment item is a major assessment item; or 2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system; 3. you are requesting a change of placement; or 4. the course has a compulsory attendance requirement. Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at: https://policies.newcastle.edu.au/document/view-current.php?id=236
Important Policy Information	The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.