ST409-15 Medical Statistics with Advanced Topics

26/27

Department
Statistics
Level
Undergraduate Level 4
Module leader
Alice Corbella
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module is available for students on a course where it is a listed option and as an Unusual Option to students who have the required background as specified in the pre-requisite modules.

Pre-requisite for UG Students
ST346 Generalised Linear Models for Regression and Classification OR ST426 Generalised Linear Models with Advanced Topics. For Year 4 integrated masters students ST404 Applied Statistical Modelling is an alternative to ST346/ST426.

Pre-requisite for MSc Students
ST961 Statistical Methods and Practice AND a background in GLMs such as covered by ST426 Generalised Linear Models with Advanced Topics.

For anti-requisite modules please check under the availability tab and in the course handbook.

Module web page

Module aims

Modern applications of statistics to medicine are highly developed, and many medical research papers employ statistical techniques. Large numbers of statisticians are employed in medical research establishments, particularly in pharmaceutical companies and medical schools. Medical statistics continues to be a buoyant area for statistical recruitment. The course will explain why and how statistics is used in medicine, and study some of the statistical methods commonly used in medical research. We will include examples from our own research. The statistical techniques applied to medical data are also relevant in other applications.

Students will be given selected advanced research material for independent study and examination.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Study designs: cohort, case-control and survey designs; randomised clinical trials; adaptive clinical trial designs.
- Analysis of censored survival data: Life tables; hazard and survival functions; Kaplan-Meier survival curves; parametric survival models, the proportional hazards regression model.
- Systematic reviews and meta-analysis: Systematic reviews summarise evidence on particular medical topics; meta-analyses use statistical methods such as glms to summarise studies included in systematic reviews; publication bias and funnel plots; Cochrane reviews.

The module's advanced topic will include research material for independent study and assessment. This research material will reflect current trends, innovations and expertise in the area.

Learning outcomes

By the end of the module, students should be able to:

- understand how to use and interpret generalised linear models and survival analysis in medical data analysis,
- appreciate the role of statistics in medical research,
- understand some of the statistical principles of good practice in medical investigations,
- understand, through independent study, an advanced topic in medical statistics.

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Research element

Sourcing and summarizing medical research articles.
Novel secondary analysis of data.

Defining research questions and evaluating appropriate study designs.

Interdisciplinary

Students are required to study medical research articles, learn some medical terms, and translate the results of statistical analyses into summaries suitable for medical professionals and for the general public.

International

Students will be expected to review medical articles published by non-UK research groups.

Subject specific skills

- Know the relevance of generalized linear models in analysis of medical data, and good practice in fitting and interpreting such models.
- Analysis of survival data from medical studies, and good practice in fitting and interpreting such models.
- To appreciate the particular study the role of statistics in the design.

Transferable skills

- Appreciation of the role of statistics in the design and analysis of studies addressing questions related to health and other aspects of society.
- Competence in using descriptive statistics, generalized linear models and survival analysis to investigate and summarise data.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Practical classes	5 sessions of 1 hour (3%)
Private study	85 hours (57%)
Assessment	30 hours (20%)
Total	150 hours

Private study description

Study of advanced topics, weekly revision of lecture notes and materials, wider reading, practice exercises.

Other activity description

Revision support equivalent to approximately 2 hours.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group D5

	Weighting	Study time	Eligible for self-certification
Individual Project	20%	30 hours	No

You will work on specified data sets and research articles to carry out analysis and then present, discuss and evaluate results. The final submission must include:

1. a concise 4 to 5 page technical report with an abstract, the analysis, suitable presentation of results, discussion and conclusions.
2. a technical appendix with clearly annotated files (e.g. .Rmd) giving details that permits the results and analysis to be reproduced. If more than 1 files is included there clear instructions must be included detailing how to reproduce the results and analysis.
3. a 1 page summary that effectively communicates the findings, including the nature of any uncertainty to an intelligent, but not statistically trained audience.

Centrally-timetabled examination (On-campus)	80%		No

The examination will contain one compulsory question on the advanced topic and four additional questions of which the best marks of TWO questions will be used to calculate your grade.

- Answerbook Pink (12 page)
- Students may use a calculator
- Cambridge Statistical Tables (blue)

Assessment group R4

	Weighting	Study time	Eligible for self-certification
On-campus Examination - Resit	100%		No

The examination will contain one compulsory question on the advanced topic and four additional questions of which the best marks of TWO questions will be used to calculate your grade.

- Answerbook Pink (12 page)
- Students may use a calculator
- Cambridge Statistical Tables (blue)

Feedback on assessment

Assignments are marked and given feedback online within 20 working days of the submission deadline.
Where appropriate, model solutions will be provided.

Solutions and cohort level feedback will be provided for the examination.

Past exam papers for ST409

Availability

Anti-requisite modules

If you take this module, you cannot also take:

- ST332-15 Medical Statistics

Courses

This module is Optional for:

- TMAA-G1PE Master of Advanced Study in Mathematical Sciences
  - Year 1 of G1PE Master of Advanced Study in Mathematical Sciences
  - Year 1 of G1PE Master of Advanced Study in Mathematical Sciences
- Year 1 of TMAA-G1PD Postgraduate Taught Interdisciplinary Mathematics (Diploma plus MSc)
- Year 1 of TMAA-G1P0 Postgraduate Taught Mathematics
- TMAA-G1PC Postgraduate Taught Mathematics (Diploma plus MSc)
  - Year 1 of G1PC Mathematics (Diploma plus MSc)
  - Year 2 of G1PC Mathematics (Diploma plus MSc)
- Year 1 of TMAA-G1PF Postgraduate Taught Mathematics of Systems

- Year 1 of TSTA-G4P1 Postgraduate Taught Statistics
- USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
    - Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
    - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics

This module is Option list A for:

- Year 1 of TSTA-G4P1 Postgraduate Taught Statistics
- Year 5 of USTA-G301 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics (with Intercalated
- Year 4 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 4 of USTA-G140 Undergraduate Mathematics and Statistics (MMathStat)

This module is Option list B for:

- TSTA-G4P1 Postgraduate Taught Statistics
    - Year 1 of G40B Statistics with Data Science (Taught)
    - Year 1 of G40C Statistics with Finance (Taught)
    - Year 1 of G40A Statistics with Probability (Taught)
- Year 4 of USTA-G304 Undergraduate Data Science (MSci)
- Year 3 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 3 of USTA-G140 Undergraduate Mathematics and Statistics (MMathStat)

This module is Option list C for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
    - Year 4 of G105 Mathematics (MMath) with Intercalated Year
    - Year 5 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 3 of G103 Mathematics (MMath)
    - Year 4 of G103 Mathematics (MMath)
- Year 4 of UMAA-G107 Undergraduate Mathematics (MMath) with Study Abroad

This module is Option list D for:

- Year 5 of USTA-G301 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics (with Intercalated

This module is Option list E for:

- Year 5 of USTA-G301 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics (with Intercalated

This module is Option list F for:

- Year 4 of USTA-G301 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics (with Intercalated

This module is Unusual option for:

- USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
    - Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
    - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics