ST332-15 Medical Statistics

26/27

Department
Statistics
Level
Undergraduate Level 3
Module leader
Elke Thonnes
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 covered in the pre-requisite modules.

Pre-requisite: 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.

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.

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.

Learning outcomes

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

- appreciate the role of statistics in medical research
- understand some of the statistical principles of good practice in medical investigations
- understand how to use and interpret generalised linear models and survival analysis in medical data analysis

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

- To understand the relevance of generalised linear models in analysis of medical data, and good practice in fitting and interpreting such models.
- To understand the 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

- Problem solving: Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions. Retain an open mind, optimistic of finding solutions, thinking laterally and creatively to look beyond the obvious. Know how to learn from failure.
- Self awareness: Reflect on learning, seeking feedback on and evaluating personal practices, strengths and opportunities for personal growth.
- Communication: Present arguments, knowledge and ideas, in a range of formats.
- Professionalism: Prepared to operate autonomously. Aware of how to be efficient and resilient. Manage priorities and time. Self-motivated, setting and achieving goals, prioritising tasks.
- 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, generalised 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

Weekly revision of lecture notes and materials, wider reading, practice exercises.

Other activity description

Revision support.

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 D6

	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 paper will contain four questions, of which the best marks of THREE questions will be used to calculate your grade.

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

Assessment group R4

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

	Weighting	Study time	Eligible for self-certification

The examination paper will contain four questions, of which the best marks of THREE questions will be used to calculate your grade.

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

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 ST332

Availability

Anti-requisite modules

If you take this module, you cannot also take:

- ST409-15 Medical Statistics with Advanced Topics

Courses

This module is Core option list A for:

- USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
  - Year 3 of G1G3 Mathematics and Statistics (BSc MMathStat)
  - Year 4 of G1G3 Mathematics and Statistics (BSc MMathStat)
- USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
  - Year 3 of GG14 Mathematics and Statistics
  - Year 3 of GG14 Mathematics and Statistics
- USTA-Y602 Undergraduate Mathematics,Operational Research,Statistics and Economics
  - Year 3 of Y602 Mathematics,Operational Research,Stats,Economics
  - Year 3 of Y602 Mathematics,Operational Research,Stats,Economics
- Year 4 of USTA-Y603 Undergraduate Mathematics,Operational Research,Statistics,Economics (with Intercalated Year)

This module is Core option list B for:

- USTA-G302 Undergraduate Data Science
    - Year 3 of G302 Data Science
    - Year 3 of G302 Data Science
- Year 3 of USTA-G304 Undergraduate Data Science (MSci)

This module is Core option list D for:

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

This module is Core option list E for:

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

This module is Core option list F for:

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