



## MODULE SPECIFICATION

<b>Academic Year (student cohort covered by specification)</b>	2024-25
<b>Module Code</b>	2497
<b>Module Title</b>	Survival Analysis
<b>Module Organiser(s)</b>	Prof Ruth Keogh
<b>Faculty</b>	Epidemiology & Population Health
<b>FHEQ Level</b>	Level 7
<b>Credit Value</b>	<b>CATS:</b> 15 <b>ECTS:</b> 7.5
<b>HECoS Code</b>	101031 : 101030 : 101034
<b>Term of Delivery</b>	Term 2
<b>Mode of Delivery</b>	<p>This module will be delivered by predominantly face-to-face teaching modes.</p> <p>Where specific teaching methods (lectures, seminars, discussion groups) are noted in this module specification these will be delivered by face-to-face sessions. There will be a combination of live and interactive activities (synchronous learning) as well as self-directed study (asynchronous learning).</p>
<b>Mode of Study</b>	Full-time
<b>Language of Study</b>	English
<b>Pre-Requisites</b>	<p>A good understanding of linear regression (including multiple linear regression models with interaction terms), logistic regression [taught concurrently on module 2462: Statistical Models for Discrete Outcomes], likelihoods and maximum likelihood estimation, and simple methods of analysing quantitative and categorical data is essential.</p> <p>Have attended term-1 MSc Medical Statistics modules and are attending or have attended module 2462: Statistical Models for Discrete Outcomes, or have equivalent knowledge. Familiarity with Stata or R is needed.</p>
<b>Accreditation by Professional Statutory and Regulatory Body</b>	None

<b>Module Cap (indicative number of students)</b>	35 (numbers may be capped due to limitations in facilities or staffing)
<b>Target Audience</b>	This module is intended for people with both mathematical (up to first year undergraduate level) and statistical backgrounds (undergraduate degree level in joint mathematics/statistics for example) intending to pursue a career in medical statistics.
<b>Module Description</b>	Survival analysis methods are widely used in medical statistics, epidemiology, data science and beyond to study outcomes which are the time to occurrence of an event, and how that time-to-event may be affected by or associated with individual characteristics or exposures. Specialised methods are needed to study time-to-event outcomes. This module equips students with the knowledge and practical skills needed to analyse time-to-event data to address questions in medical research, and to interpret the findings.  The module is assessed through an analysis and reporting exercise.
<b>Duration</b>	5 weeks at 2.5 days per week
<b>Timetabling slot</b>	Slot C2
<b>Last Revised (e.g. year changes approved)</b>	July 2024

<b>Programme(s)</b>	<b>Status</b>
This module is linked to the following programme(s)	
MSc Medical Statistics	Compulsory

## Module Aim and Intended Learning Outcomes

<b>Overall aim of the module</b>
The overall module aim is to: <ul style="list-style-type: none"> <li>equip students with the necessary skills to (i) understand the principles underlying statistical models and methods for survival/time-to-event outcomes, (ii) analyse data with time-to-event outcomes to address research questions in medical statistics.</li> </ul>



### Module Intended Learning Outcomes

Upon successful completion of the module a student will be able to:

1. Demonstrate an understanding of the theoretical basis of survival analysis and assumptions related to different survival analysis techniques and models.
2. Apply different techniques and models for description and analysis of survival data, interpret the findings, and make assessments of key assumptions.
3. Devise analysis strategies and apply methods to address questions about causal effects and risk prediction, and interpret the results.
4. Demonstrate an understanding of more advanced concepts in survival analysis, including competing risks and time-dependent covariates, and analyse data with these features.
5. Apply survival analysis methods to data from a range of sources using Stata and/or R.
6. Present results clearly and accurately in a structured report.

### Indicative Syllabus

#### Session Content

The module is expected to cover the following topics:

- Introduction to Survival Analysis concepts, including: censoring; functions used in the description and analysis of survival data, including hazard and survivor functions; rates and their estimation.
- Non-parametric analysis of survival data and comparison of survival probabilities between groups.
- The theory and use of parametric regression models for survival data (exponential, Weibull, log-logistic).
- The Cox proportional hazards model.
- Approaches to allowing for non-proportional hazards and model assessment.
- Concepts and analysis methods when there are competing risks.
- Handling of time-dependent variables.
- Estimating treatment effects in trials and using observational data.
- Risk prediction modelling and validation.
- More advanced models such as flexible parametric, accelerated failure time and additive hazard models.



## Teaching and Learning

### Notional Learning Hours

Type of Learning Time	Number of Hours	Expressed as Percentage (%)
Contact time	50	33
Directed self-study	30	20
Self-directed learning	20	14
Assessment, review and revision	50	33
<b>Total</b>	<b>150</b>	<b>100</b>

Student contact time refers to the tutor-mediated time allocated to teaching, provision of guidance and feedback to students. This time includes activities that take place in face-to-face contexts such as lectures, seminars, demonstrations, tutorials, supervised laboratory workshops, practical classes, project supervision as well as where tutors are available for one-to-one discussions and interaction by email.

The division of notional learning hours listed above is indicative and is designed to inform students as to the relative split between interactive and self-directed study.

#### Teaching and Learning Strategy

The teaching and learning strategy is structured around a combination of live lectures accompanied by computer or non-computer practical sessions and question and answer sessions. Practical sessions ensure that students have the opportunity to apply the concepts and methods covered by lecture content. They provide students with “hands on” experience in analysing and interpreting data, using a range of data sets. Students are provided with detailed solutions to the tasks set in practical sessions, enabling them to check their understanding of the material. The assessment task, which comes towards the end of the module, is the point at which students demonstrate a consolidation of their learning across the whole module.

## Assessment

#### Assessment Strategy

The assessment will consist of an analysis of time-to-event data. Students will submit a report on their results and interpretation. Resit/deferred/new attempts - the tasks will be similar to the original assessment although the data set to be analysed will be different.



## Summative Assessment

Assessment Type	Assessment Length (i.e. Word Count, Length of presentation in minutes)	Weighting (%)	Intended Module Learning Outcomes Tested
Coursework	4-5 pages	100	1 – 5

### Resitting assessment

Resits will accord with [Chapter 8a](#) of the LSHTM Academic Manual.

Resit/deferred/new attempts - The task will be a data analysis report. The next assessment deadline for coursework will be during mid/late September of the current academic year.

## Resources

### Indicative reading list

#### Survival Analysis:

Collett D (2003): "Modelling Survival Data in Medical Research"

Cox DR and Oakes D (1984): "Analysis of survival data"

Marubini and Valsecchi (1995): "Analysing Survival Data from Clinical Trials and Observational Studies"

Machin D., Cheung Y.B. and Parmar M.K.B: "Survival Analysis. A practical approach (2006).

Aalen, Borgan, Gjessing. (2008) "Survival and Event History Analysis". Springer

#### Other resources

Extensive lecture notes, exercises and practical exercises are provided. Module Information can be found on the Virtual Learning Environment (MOODLE) containing information about each session and key references for the module.



## Teaching for Disabilities and Learning Differences

The module-specific site on Moodle gives students access to lecture notes and copies of the slides used during the lecture. Where appropriate, lectures are recorded and made available on Moodle. All materials posted on Moodle, including computer-based sessions, have been made accessible where possible.

LSHTM Moodle is accessible to the widest possible audience, regardless of specific needs or disabilities. More detail can be found in the [Moodle Accessibility Statement](#) which can also be found within the footer of the Moodle pages. All students have access to “SensusAccess” software which allows conversion of files into alternative formats.

Student Support Services can arrange learning or assessment adjustments for students where needed. Details and how to request support can be found on the [LSHTM Disability Support pages](#).