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MODULE SPECIFICATION

Academic Year (student cohort covered by specification)	2020-21
Module Code	EPM304
Module Title	Advanced Statistical Methods in Epidemiology
Module Organiser(s)	Sian Floyd, Daniel Grint
Contact	<p>The LSHTM distance learning programmes and modules are run in collaboration with the University of London. Enquiries may be made via their Student Advice Centre at: https://london.ac.uk/contact-us</p> <p>(Enquiries from London-based LSHTM MSc or research students regarding study of DL modules should be emailed to distance@lshtm.ac.uk)</p>
Faculty	<p>Faculty of Epidemiology and Population Health London School of Hygiene & Tropical Medicine http://www.lshtm.ac.uk/eph/</p>
FHEQ Level	Level 7
Credit Value	CATS 15 ECTS 7.5
HECoS Code	101335 : 101030 : 100962
Mode of Delivery	Distance Learning
Mode of Study	Directed self-study, through online materials via the Virtual Learning Environment
Language of Study	English
Pre-Requisites	<p><u>Epidemiology students</u> must have passed EPM101 <i>Fundamentals of Epidemiology</i> and EPM102 <i>Statistics for Epidemiology</i> [previously entitled <i>Statistics with Computing</i>], and should have studied and have an understanding of EPM103 <i>Practical Epidemiology</i>, EPM105 <i>Writing and Reviewing Epidemiological Papers</i> and EPM202 <i>Statistical Methods in Epidemiology</i> prior to studying this module. If students wish to study both EPM202 and EPM304 in the same year, they are recommended to have achieved at least a grade 3 in EPM102.</p> <p>Epidemiology students may choose to study CTM208 <i>Further Statistical Methods in Clinical Trials</i> in place of EPM304, but must apply to the Programme Director for approval, and</p>



	<p>must not register for and must not study both EPM304 <i>Advanced Statistical Methods in Epidemiology</i> and CTM208.</p> <p><u>Clinical Trials students</u> may choose to study EPM304 in place of CTM208 <i>Further Statistical Methods in Clinical Trials</i>, but must not register for and must not study both CTM208 <i>Further Statistical Methods in Clinical Trials</i> and EPM304. Clinical Trials students wishing to study EPM304 must also ensure that they have studied CTM207 <i>Design and Analysis of Epidemiological Studies</i> before studying EPM304 or must obtain Programme Director approval before registration. Students can register for both EPM304 and CTM207 in the same year but should first study the material for CTM207 as explained above.</p> <p><u>Students studying this module as an individual module</u> must have basic epidemiological knowledge and skills equivalent to EPM101 <i>Fundamentals of Epidemiology</i>, EPM102 <i>Statistics for Epidemiology</i> [previously entitled <i>Statistics with Computing</i>], EPM103 <i>Practical Epidemiology</i>, EPM105 <i>Writing and Reviewing Epidemiological Papers</i> and EPM202 <i>Statistical Methods in Epidemiology</i>.</p>
<p>Accreditation by Professional Statutory and Regulatory Body</p>	<p>Not currently accredited by any other body.</p>
<p>Module Cap (Maximum number of students)</p>	<p>There is no cap on the number of students who can register for this distance learning module.</p>
<p>Target Audience</p>	<p>This is an advanced module intended for students with a strong grasp of quantitative methods, who have previously completed the module in <i>Statistical Methods in Epidemiology</i>.</p>
<p>Module Description</p>	<p>This module equips students with the skills needed to analyse and interpret data from matched case-control studies, cohort studies, studies in which there is correlation among observations, and cluster-randomised trials. An overall framework for analysis strategy, building from univariable to multivariable modelling, is provided. An introduction to causal inference, to key concepts in thinking about accounting for missing data, and to additive versus multiplicative models, is provided. The module is aimed at students familiar with Stata who wish to build on existing</p>



	quantitative analysis skills to broaden and deepen their understanding of key analytical methods, and is assessed through a data analysis and reporting exercise.
Duration	<p>Students may start their studies at any time from access/receipt of study materials (made available annually usually in October, depending on date of registration) and work through the material until completion of their assessment (see in the 'Dates' section below for more details).</p> <p>Students registering after September (continuing and individual module students only) should note that introductory messages, and some online activities (for example discussion forums and/or real-time welcome sessions) may have already taken place before they get access to the Virtual Learning Environment (Moodle). All such messages and recordings (where applicable) will be available to access throughout the study year.</p>
Last Revised (e.g. year changes approved)	May 2020

Programme(s)	Status
This module is linked to the following programme(s)	
PGCert/PGDip/MSc Epidemiology (Distance Learning - University of London Worldwide)	Elective
PGDip/MSc Clinical Trials (Distance Learning - University of London Worldwide)	Elective

Module Aim and Intended Learning Outcomes

Overall aim of the module
<p>The overall module aim is to:</p> <ul style="list-style-type: none"> enable students to understand, apply, and interpret the results of, a range of relatively advanced methods for the design and analysis of epidemiological studies.



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Module Intended Learning Outcomes

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

1. Choose and then apply an appropriate regression model, and interpret the results from this model, for the analysis of individually and frequency-matched case-control studies, cohort studies, cross-sectional surveys, and cluster-randomised trials, using appropriate computer software,
2. Understand when individual observations are not independent, and how to account for this in statistical analysis of cohort and cross-sectional studies by using methods that account for correlation,
3. Understand the difference between additive and multiplicative models, and how to choose which is most appropriate,
4. Plan a strategy of analysis to answer an epidemiological research question, using an appropriate choice and order of statistical analyses to control for confounding and account for interaction, informed by a causal inference framework,
5. Write a clear report presenting and interpreting the results of an analysis of epidemiological data.

Indicative Syllabus

Session Content

The module is expected to cover the following topics:

- | | |
|------|--|
| AS01 | Framework for regression modelling |
| AS02 | Strategies of analysis |
| AS03 | Conditional logistic regression |
| AS04 | Stratifying on time for cohort studies |
| AS05 | Further Poisson regression |
| AS06 | Cox regression |
| AS07 | Further issues for Cox regression |
| AS08 | Additive and multiplicative models |
| AS09 | Analysis of correlated data |
| AS10 | Cluster-randomised trials |
| AS11 | Population attributable fractions |
| AS12 | Meta-analysis and systematic reviews |
| AS13 | Quantitative analysis |
| AS14 | Causal Inference |



Session Content

These sessions are followed by one optional session:

AS15 Missing data

Teaching and Learning

Notional Learning Hours

Type of Learning Time	Number of Hours	Expressed as Percentage (%)
Directed self-study	75	50
Self-directed learning	25	17
Assessment, review and revision	50	33
Total	150	100

Teaching and Learning Strategy

Learning is self-directed against a detailed set of learning objectives using the materials provided. The key learning methods are:

- Reading and reflecting on CAL (computer-assisted learning) materials which introduce, explain and apply the principles and methods covered in the module.
- Reading and reflecting on paper-based materials which support the learning in the CAL sessions.
- Completing paper and computer-based practical exercises.
- Accessing academic support which is available from the module tutors through the web-based discussion forums and occasional real-time sessions (using Collaborate Ultra) in which students are encouraged to participate.
- Completing the formative assignment and reflecting on written feedback from module tutors.
- Completing the assessed assignment and reflecting on written feedback from module tutors.



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Assessment

Assessment Strategy

Formal assessment of the module will be by one assessed assignment contributing 100% of module marks. If a student fails the module overall, they are allowed one further attempt at the assignment.

For both their formative and summative assessments, students are asked to analyse a dataset to address a research question and to prepare a brief report describing their analysis strategy and the results they obtained, discussing their results in the light of the methods used to obtain the data. The assessment tasks require students to demonstrate: the ability to select and apply appropriate statistical methods to a specific problem, including the investigation of confounding and effect modification; the ability to present their analysis strategy and results in an appropriate way; and the ability to interpret their findings appropriately in the light of the study design and research question. The formative assessment task enables students to prepare for their summative assessment, as both have a similar format, but may cover different epidemiological study designs. The assessment tasks thus give students an opportunity to consolidate their learning and require students to apply their learning across the whole of the module.

Prior to 2019/20, students were required to sit an unseen written examination (70% of module marks) and submit an assessed assignment (30% of module marks). Students who registered for EPM202 prior to 2019/20 must note the following:

- A student registered for EPM304 prior to 2019/20 who has not attempted any element of the EPM304 assessment will be required to complete the assessed assignment only (100% of the module marks).
- A student registered for EPM304 prior to 2019/20 who has completed one element of assessment but not the other (i.e. the unseen written examination or the assessed assignment) must still complete both elements of assessment.
- A student registered for EPM304 prior to 2019/20 who has obtained a GPA of between 1.0 and 1.99 for the module overall, must resit the failed element(s) unless the overall EPM202 GPA is compensatable.
- A student registered for EPM304 prior to 2019/20 who has previously obtained a GPA of less than 1.0 on the assessed assignment or the module overall, must resit the failed element(s).



Summative Assessment

Assessment Type	Assessment Length (i.e. Word Count, Length of presentation in minutes)	Weighting (%)	Intended Module Learning Outcomes Tested
Assessed Assignment	1,500 words of text and 3-4 tables and/or figures	100	1 - 5

Resitting assessment

Resits will accord with the LSHTM's [Resits Policy](#)

Resources

Indicative reading list

1. Textbook:

Kirkwood, B.R. and Sterne, J.A.C. Essential medical statistics. Blackwell Science, 2003

2. Journal articles relating to analysis and reporting

Altman, D. and Bland, M. Absence of evidence is not evidence of absence. BMJ 1995; 311:485

Sterne, J.A.C. and Davey Smith, G. Sifting the evidence – what's wrong with significance tests? Another comment on the role of statistical methods. BMJ 2001; 322:226-31

3. Journal articles relating to strategies of analysis

Victoria, C., Huttly S.R., Fuchs, S.C., Olinto, M.T.A. The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. IJE 1997; 26:224-227

Greenland, S. Modeling and variable selection in epidemiologic analysis. AJPH 1989; 79:340-9



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Other resources

The Moodle Virtual Learning Environment (VLE) contains the key materials and resources for EPM304 as follows:

- Interactive study material, referred to as Computer Assisted Learning (CAL), which is the key learning material for the module. The CAL sessions are accessible online and available to download also.
- Workbook (contain practical exercises to work through using the statistical software Stata)
- Readings (via the LSHTM online library)
- Discussion forums
- Assignments
- Past examination papers and examiner reports.

The following is also provided (if not previously provided for other EPM or CTM modules):

- Stata software
- Textbook: *Essential Medical Statistics* (Kirkwood, Sterne).

Moodle can be accessed from the first week of October, after module registration.

Students who are taking this as an individual module or as part of the MSc CT programme also have online access to the EPM1 and EPM2 computer-based sessions (this access will exclude tutor support and associated readings/workbooks/ textbooks).

Teaching for Disabilities and Learning Differences

The module-specific site on Moodle provides students with access to the module learning materials, including a study guide and online reading list (containing both essential and recommended readings), and additional resources including supplementary exercises and optional lecture recordings. All materials posted up on Moodle areas, including computer-based sessions, have been made accessible where possible. The LSHTM Moodle has been made accessible to the widest possible audience, using a VLE that allows for up to 300% zoom, permits navigation via keyboard and use of speech recognition software, and that allows listening through a screen reader. All students have access to "SensusAccess" software which allows conversion of files into alternative formats.

For students with special needs, reasonable adjustments and support can be arranged – details and how to request support can be found on the University of London Worldwide website at <https://london.ac.uk/applications/how-it-works/inclusive-practice-access-arrangements>