Advanced Quantitative Research Methods - 7KNIP042

Level: 7
Credits: 30

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This handbook must be read in conjunction with module information provided on KEATS, the King’s E-Learning And Teaching Service. You will be given access to KEATS on enrolment. Important information relating to assessment and related regulations can be found in the Postgraduate Programme Handbook, available on KEATS and via the Student Services Centre.

This handbook can also be provided in alternative formats (such as large print) upon request to asc@kcl.ac.uk.
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Module overview
This module forms part of the MRES Clinical Research. The module contributes to your programme of study by providing a solid grounding in quantitative research methods, providing you with skills for designing, conducting and appraising your own and others’ research. This is the first module of the programme and provides a foundation for your research methods training, complemented by the Advanced Qualitative Research Methods module taken in term 2.

The module can also be taken as a freestanding module, and is usually taken in the first year by MPhil/PhD students.

Module aim
The aim of this module is to equip students with in-depth knowledge and critical analytical skills to understand, design, conduct and critically appraise quantitative health research.

Learning outcomes
On completion of the module, successful students will have demonstrated:

- Advanced understanding of key approaches in quantitative health research
- Advanced understanding of the application and use of appropriate quantitative research methods
- Advanced understanding of stages involved in undertaking quantitative research
- Advanced critical appraisal skills to interrogate the application of quantitative research approaches, methods and analyses
- Advanced skills in selecting appropriate statistical tests for quantitative data.

Teaching arrangements
Module content is delivered using a range of teaching approaches including lectures, seminars, directed learning activities and practical exercises. The module content has been designed in order to build understanding incrementally across the six days of the module, with an explicit expectation that students will complete directed learning exercises and reading as specified in between the days of attendance at KCL.

A quiz at the start of the module – based on level 6 quantitative research methods — will enable students to assess their knowledge of quantitative methods and statistics at the start of the course to facilitate formative assessment and feedback. The remainder of day 1 is focussed on ensuring these foundations are well understood and students will be signposted to resources to help fill any gaps in understanding/knowledge of the foundations of research methods and statistics. A second quiz is provided in KEATS for students to self-assess their learning after day 1 teaching and self-directed learning that students complete between days 1 and 2 regarding the foundations of quantitative research design and statistics.

These concepts are then progressed to sessions regarding bivariate and multivariate analyses on day 2 using a mix of small group work and lectures, prior to which students will be expected to access pre-recorded lectures regarding linear and logistic regression and complete a worksheet. In preparation for day 3 of the module, students will be expected to access a pre-recorded lecture about the design principles and concepts in RCTs. These concepts and principles will then be applied in a session on day 3 where some recent/current RCTs undertaken in the Faculty of Nursing & Midwifery will be presented and discussed.
A seminar on day 4 of the module will use a student-led approach to examine and discuss their critiques of a pre-read published research article in small groups, facilitated by an experienced quantitative researcher. This session is followed by a series of sessions regarding observational research, including small group work and lectures based on real world observational research conducted in the faculty. A session whereby students will read and mark excerpts from previous exemplar assignments on day 5 will be aimed at enhancing learning regarding appraisal, clarity and depth of writing, and familiarity with the assessment criteria for the summative appraisal. A lecture from the London Research Design Service health economist to introduce health economics principles and concepts, and a session regarding complex interventions will also be provided on day 5.

Between days 5 and 6 of the module students will complete a final directed learning activity by drafting the key elements of a research proposal. Proposals will be discussed in small groups and then presented to the whole group for further discussion/appraisal. A session on lessons learned from conducting quantitative research will complete the module on day 6.

Published studies from healthcare research will be referred to throughout teaching, and the module includes sessions where faculty members will describe their completed/ongoing studies to enable students to apply the conceptual knowledge to real life examples. Each day of the module will require completion of directed learning prior to the day at KCL, and it is expected that students will do this to maximise their understanding of session content and participation in class activities. This will include reading published research articles (which will be used to underpin teaching in many of the lectures), and relevant chapters in key texts may be set as pre-reading for some of the lectures, as well as completing set activities.

The module is supported by e-learning. This resource includes lecture content and independent learning activities. Module notices will be posted using this resource. E-learning can be accessed via KEATS, the link to which is available on the opening page of the Kings website; a username and password are required to login.
Submitting coursework
For this module you are assessed by Janet Anderson and a marking team with knowledge of the course. The summative assessment (described below) is submitted via the TurnItIn link provided at least 2 weeks before the submission date.

Assessment criteria
Assignments submitted for summative assessment are marked according to the Faculty version of KCL marking criteria for taught postgraduate courses (available in your Programme Handbook and on KEATS). An assignment -specific marking rubric – showing how these criteria are applied to the assignment you need to do for this module – is provided on KEATS.

Feedback is provided in line with university guidelines such that students should expect to receive feedback structured under the following headings: 1) The strengths of this work; 2) Areas in which this work could be developed; 3) General development needs. The originality report will be reviewed and commented upon.

Assignments are marked by a member of Faculty academic staff (and a proportion within each grade band and across each marker is second-marked/moderated by a second member of the marking team.

Formative assessment
There are several inbuilt opportunities for students to receive formative assessment of their critical appraisal skills and quantitative research methods knowledge. These include:

- A quiz based on level 6 quantitative research methods and statistics on day 1 of the module (with a second quiz provided on KEATS for students to reassess their knowledge after the subsequent teaching on day 1 and any self-directed learning that students have done).
- A seminar on day 4 where students will have an opportunity to present and receive feedback on their critique of a pre-read research publication in a small group setting.
- Small group work on day 6 based on discussion of a draft research proposal completed by students between days 5 and 6 of the module.

In addition, many of the core lectures include practical components (small group work) where students can apply the knowledge they have gained and receive feedback.

Summative assessment
Assessment will be based on a written assignment which should not exceed 3,000 words. Students will be expected to read and critically appraise one published quantitative research paper that will be provided on KEATS at the end of the module. They will be expected to outline strengths and weaknesses of the quantitative method used, approaches to sample selection, method of analyses and how issues such as potential bias and confounding were dealt with. Use of a critical appraisal tool appropriate for the type of quantitative method reported will be recommended, and a template will be provided on KEATS for structuring appraisal of the papers under key headings.
Coursework submission are provided on the modules KEATS site. It is essential that you use your candidate number on all assignments/examinations. Your candidate number, which will begin with **Y for the academic year 2017/18**, will be available via Student Records on the King’s Intranet approximately one month after you enrol.

If you are unable to submit your work by the deadline please refer to the information in your programme handbook on “mitigating circumstances”. If you require further support in these circumstances you are advised to contact KCLSU.

**Submission date for coursework:**
**First submission:** Tuesday 9 January 2018 (unratified marks available 6 Feb 2018)
**Resubmission date:** Tuesday 10 April 2018.

Late submissions will be accepted for **24 hours** following the submission date. All work submitted late will be marked as normal but will be capped at the pass mark for the module. If your assignment is a hard copy please ensure you date stamp it and submit it to the submission room G15 James Clerk Maxwell Building. If your assignment is submitted electronically through TurnItIn, information about how to submit late will be provided on KEATS module sites under assessment information. Please label the file with your candidate number and double-check you have submitted the correct file.

The external examiner for this module is **Dr Mark Pearson**. *Students are not to make direct contact with external examiners, in particular regarding their individual performance in assessments.*

The College and its Examination Boards in the ten Faculties (Institutes/Schools, King’s Learning Institute and the Association of King's College (AKC), work with over 500 external examiners to ensure the quality and standard of our taught awards. Find the latest report on the [External Examiners Report](#) page, navigate to the Faculty of Nursing and Midwifery section.

**Results and resubmissions for coursework**
Students will receive a provisional (unratified) mark for their coursework 4 weeks following submission. According to the method of submission as detailed on your KEATS site, if your work was submitted online you will be able to download marked coursework from KEATS; alternatively, if you completed a hard copy submission you can collect your coursework and feedback from the Student Services Centre.

To collect a hard copy assignment, you must provide your candidate number. Alternatively, you may send a stamped addressed envelope to the Student Services Centre ensuring that this is large enough to accommodate your assignments and that you have applied sufficient postage. Hard copy assignments will be retained for four weeks; if you have not collected your assignment by then, it will be destroyed.

Feedback will include the award of a numerical grade which remains provisional until ratified by the examination boards. The dates for the examination boards are available on KEATS. Ratified marks can be viewed via Student Records on the King’s Intranet, the Monday following the relevant examination board.

The marking criteria by which your work is judged are provided in full in your programme handbook. Please also refer to the section in your programme handbook on plagiarism and how to avoid it. If you have a query about how to refer to a specific piece of work please ask your module leader, your group leader or a member of library staff for guidance or please use King’s Libguides site.
The feedback you receive on your assignment will guide you towards how to do better next time or how to maintain your existing high standard!

If you do not understand your mark or the feedback you receive please contact Janet Anderson (janet.anderson@kcl.ac.uk)

If you are unsuccessful, it is recommended that you contact the module leader before submitting your second attempt. This will enable the module leader to provide you with an appropriate level of support as you prepare to resubmit your work.
Learning resources

Pre-module reading/revision
Prior to the start of the module you are required to revise level 6 quantitative methods and concepts in order to provide a firm grounding for the module — we have quiz in an early session on day 1 so you can assess your understanding/gaps in knowledge.

An online module for foundations in statistics will be available for you to access via KEATs (this is called ‘Statistics Primer’).

Reading/revision should include texts or resources that consider the following topics:
Experimental and observational study designs; descriptive and inferential statistics; measures of central tendency; measures of distribution/spread and precision; parametric vs. non-parametric tests (choice of statistical test); independent/dependent variables; statistical significance.

Suggested reading may include the following (or any other introductions to quantitative research methods/statistics, including texts and online resources listed above this section):


Saltikov & Whittaker (2014) Selecting the most appropriate inferential statistical test for your quantitative study. *Journal of Clinical Nursing,* 23(11-12), 1520-31. DOI: 10.1111/jocn.12343

**Session 1 – Foundations for Quantitative Design and Analysis**  
During this session you will learn:  
- About your current knowledge of the foundations of quantitative design and analysis  

**Reading Material:**  
See pre-module reading section in the handbook for guidance about this.

**Session 2 – Epistemology/Philosophical Approaches to Research**  
During this session you will learn:  
- The meaning of epistemology and ontology and why this is important for research. We will explore how this applies to quantitative research designs.  

**Reading Material:**  

**Session 3 – Foundations for Quantitative Design and Analysis**  
During this session (split into 3 parts) you will learn:  
- How to describe descriptive data in relation to types/levels of data; central tendency and dispersion, and recognise their importance in quantitative research.  
- About the basis for inferential statistics including probability and sampling distributions  
- About frequentist approaches to analysis (including p values and null hypothesis significance test NHST).  
- Why we sample, identify different methods of sampling and critique the quality of sampling  
- The key components of sample size calculations and how they relate to one another  
- How to identify and describe inferential statistics in relation to type of test and fit with data/research question; to understand about hypothesis testing and interpretation of results in relation to Type I/II errors and confidence intervals.  
- The difference between observational and experimental research designs and the importance of fit between design and research question.  
- About some of the key factors involved when describing and critiquing outcome measures  

**Reading Material:**  
As session 1 — see pre-module reading section in the handbook for guidance about this.
**Session 4 – Univariate/Bivariate Analyses**
During this session you will learn:

- About the Null Hypothesis Significance Test as it applies to uni/bivariate statistics
- How to interpret the p-value for uni/bivariate statistics, and to differentiate clinical from statistical significance
- How to choose and use the correct statistical tests for a variety of different data types
- How to apply data from samples to populations, and the main pitfalls in doing this.

**Reading Material:**
See recommended reading list for module but a good online source is: [http://onlinestatbook.com/](http://onlinestatbook.com/)

**Session 5 – Modelling/Multivariate Analyses**
**Linear regression (Part 1)**
During this session you will learn:

- When can linear regression modelling (LRM) be used and to answer what types of question; what is a regression line; how to interpret the results; fitting models with two or more independent variables
- How to understand LRM results presented in published articles

**Logistic regression (Part 2)**
During this session you will learn:

- When can logistic regression modelling (LogRM) be used and to answer what types of question; what is an odds ratio; how to interpret the results; fitting models with two or more independent variables
- How to understand LogRM results presented in published articles

**Reading Material:**

**Web resources**
From the [National Centre for Research Methods ReStore](http://www.restore.ac.uk/srme/www/fac/soc/wie/research-new/srme/modules/mod2/index.html) web pages:


Session 6 – Diagnostic Tests and Screening
During this session you will learn:

- The background to diagnostic and screening tests
- How to define and measure sensitivity and specificity, and how they are applied to clinical practice

Reading Material:

Books


Articles
Altmann D.G. & Bland J.M. (1994) Diagnostic tests 1: sensitivity and specificity *BMJ* 308, 1552 [http://www.bmj.com/content/308/6943/1552.full](http://www.bmj.com/content/308/6943/1552.full)


Session 7 – Critical Appraisal
During this session you will learn:

- Why critical appraisal is important
- To be able to describe and critically evaluate key aspects of “quality” common to quantitative studies
- To be aware of the range of different critical appraisal tools available – and be able to critically evaluate their value.

Reading Material:


Simple introduction to help with statistics: [http://www.nntonline.net/](http://www.nntonline.net/)

Session 8 – RCTs: Design and Conduct in Real World Examples
During this session you will learn:

- Methodological and practical issues to consider when developing, implementing and evaluating a multi-centre RCT
- The role of feasibility trials to estimate important parameters for a future definitive RCT

Reading Material:
http://www.biomedcentral.com/1471-2393/10/10: Highly accessed article.


http://www.nihr.ac.uk/CCF/RfPB/FAQs/Feasibility_and_pilot_studies.pdf

Session 9 – Critical Appraisal: A Practical Session
During this session you will learn:

- How to approach and conduct a critical appraisal of a paper
- How to use the module template for critical appraisal.

Reading Material: Please print this paper out and bring with you to the session – there will be a little bit of time for you to read it in the class but you will get more from the session if you read it before coming too.


Session 10 – Critical Appraisal of a Pre-read and Prepared Quantitative Research Paper
During this session you will learn:

- About your skills in critical appraisal (formative feedback)
- About key aspect of quantitative design and analysis as per the content of the paper you are appraising
- About how to discuss and appraise your peers appraisals.

Reading Material:
You will be allocated to a seminar group – details will be available on KEATS and each seminar group will have a different paper to read and critique between days 3-4 of the module.
Session 11 – Introduction to Observational Study Designs
During this session you will learn:

- About the key features and appropriate applications of common observational study designs including cross sectional, cohort and case-control studies
- How to describe and critically evaluate key risks of bias in observational studies
- How to describe key approaches in analysis of observational study data
- About what to consider when critically evaluating the strengths and limitations of observational study designs

Reading materials:


Sedgwick BMJ 2015350:h1286.


http://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated

Session 12 – Introduction to Survey Design and Instrument Development
By the end of the session you will have a greater understanding of the survey design and how to critically evaluate survey-based research.

During the session you will learn:

- The principles of survey design and gain a comprehensive understanding of the survey process.
- The importance of key concepts in survey development, including the links between theoretical constructs and ways of measuring these.
- Different ways of conducting survey research and ways of developing or choosing survey tools in order to minimise bias.
- How to assess the quality of research that utilizes survey methodology, including the processes used for analysing data and reporting of results
- Key issues steps and concepts in relation to psychometric testing.

Reading Material:


Session 13 – Observational Studies and Instrument Development: Real World Examples

During this session you will learn:

1. The challenges of maintaining methodological rigour in the real world
2. The importance of objective and balanced reporting of your research findings

Two main studies we will discuss:

Observational:

Questionnaire development:

Supplementary reading:


Session 14 – Assessing Critical Appraisals (Practice Grading Exemplar Written Appraisals)

During this session you will learn:

- How the module assessment rubric was developed, and will have the opportunity to apply it to exemplar assignments and discuss the ratings given.

Reading Material:

Please bring a copy of the module marking rubric with you to the session (it is on KEATS), and your learning will be further supported if you have read and critiqued the Ferguson paper (below) on which the assignments are based.

Session 15 – Introduction to Health Economics
During this session you will learn:

- The general components of an economic evaluation
- How to analyse cost-effectiveness in health care using quality-adjusted life-years (QALYs)

Reading Material:
Shearer J. & Byford S. The basics of economic evaluation in mental health care. BJPsych Advances 2015; 21:345-353 (will be uploaded to KEATS as is not open access).

Session 16 – Complex Interventions
During this session you will learn:

- What makes an intervention ‘complex'
- Key guidance for designing and evaluating complex interventions (MRC complex evaluation framework) including process evaluation
- How this has been applied in some real world examples.

Reading Material:
MRC Developing and evaluating complex interventions: new guidance
https://www.mrc.ac.uk/documents/pdf/complex-interventions-guidance/


Session 17 – Research Plan Discussion and Appraisal
During this session you will receive feedback from peers regarding your proposed research plan (in small groups) and agree on the best design going forward in small groups. You will then share this with the wider group and answer questions they pose to you about your plans.

Session 18 – Lessons from Conducting Quantitative Research
TBC
Overall module learning resources

No books are specified as core texts for this module as learning about statistics and research methods is very individual. You may find that you do not understand a concept in one book or paper that another student finds helpful, and that you find another text that works for you. The following is therefore a list of books, journal articles and online resources that we feel are good and/or have been reported to be useful by previous students.


Online resources

https://www.openintro.org/stat/textbook.php

http://onlinestatbook.com/2/introduction/ch1_exercises.html

http://www.bmj.com/about-bmj/resources-readers/publications/how-read-paper

http://www.bmj.com/specialties/statistics

https://www.youtube.com/user/CreativeHeuristics
Module evaluation

As part of the university’s Student Voice Strategy, King’s uses an electronic module evaluation system known as EvaSys. This provides an opportunity for you to feedback on different aspects of the module through a series of pre-set questions and qualitative comments. At the end of the module you will receive an automated invitation via your KCL email account to complete your evaluation online.

Please take the time to complete as your feedback is important. It informs ongoing developments to individual modules to ensure that the learning needs and expectations of the Faculty’s student community are met to a high standard.

To strengthen the feedback cycle, a report summarizing the quantitative results for the module as a whole and the module lead’s reflections on your feedback will be sent to you after the online evaluation survey has closed.

In addition, a learning needs assessment has been developed specific to this module (a self-assessment tool). This is completed before, during and after the module – this allows both assessment of learning throughout the module as well as identification of specific needs or gaps in learning that can be plugged to help you get the most from the module. This is also an opportunity for you to feedback on things you find helpful and less helpful in the module so that the content/teaching can be adapted if necessary. The pre-module learning needs assessment link will be available on KEATS 2 weeks before the module starts.

Action from previous evaluations

Key areas for improvement highlighted in last years’ evaluation and relevant actions taken include:

- Having more practical based learning on day 2 statistics (both sessions will involve more group work examining statistics in papers and a worksheet has been developed for completion prior to the session).
- Making more use of ‘flipping’ – getting students to read/do work ahead of sessions so that the sessions can be more practical in focus
- Ensuring relevance of the teaching – lecturers will draw on examples from their research and several of the sessions are designed to share and discuss the research being undertaken by professors in the faculty.
**Timetable**

NB: This programme may be subject to alteration at short notice.

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Session</th>
<th>Title</th>
<th>Time</th>
<th>Lecturer</th>
<th>Room</th>
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<tbody>
<tr>
<td><strong>DAY 1</strong></td>
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<tr>
<td>28 Sept 2017</td>
<td>Welcome</td>
<td>Welcome and introduction to the module</td>
<td>09.00-09.45</td>
<td>Dr Janet Anderson</td>
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<tr>
<td></td>
<td>Session 1 - quiz</td>
<td>Foundations for quantitative design and analysis research</td>
<td>09.45-11.15</td>
<td>Dr Janet Anderson/Dr Cath Taylor</td>
<td>FWB 1.14</td>
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<td></td>
<td>Session 2</td>
<td>Epistemology/Philosophical approaches to research and introduction to research design</td>
<td>11.45-13.00</td>
<td>Dr Janet Anderson</td>
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<td></td>
<td>Session 3</td>
<td>Foundations for quant methods/statistics</td>
<td>14.00-17.00</td>
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<tr>
<td><strong>29 Sept-8 Oct 2017</strong></td>
<td>Further revision/learning of any foundations that are still unclear</td>
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<td></td>
<td>Directed learning for day 2 (information will be available on KEATS).</td>
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<td><strong>DAY 2</strong></td>
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<td>9 Oct 2017</td>
<td>Session 4, part 1</td>
<td>Univariate/Bivariate analysis</td>
<td>09.30-10.30</td>
<td>Dr Ed Purssell</td>
<td>FWB 2.48</td>
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<tr>
<td></td>
<td>Session 4, part 2</td>
<td>Univariate/Bivariate analysis</td>
<td>11.00-12.30</td>
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<td>Session 5, part 1</td>
<td>Modelling (multiple variable analysis)</td>
<td>13.30-15.00</td>
<td>Trevor Murrell</td>
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<td></td>
<td>Session 5, part 2</td>
<td>Modelling</td>
<td>15.30-17.00</td>
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| 10 October-18 October 2017 | Further revision/learning of any day 2 that are still unclear  
Directed learning for day 3 (information will be available on KEATS). |
|---------------------------|------------------------------------------------------------------|
| **DAY 3**  
19 October 2017  
(Students in college for the whole day) | Session 6  
Diagnostic tests and screening  
09.30-11.00  
Prof. Alison Metcalfe  
FWB 1.14 |
| Session 7  
Critical appraisal – what is it?  
11.00-13.00  
Dr Janet Anderson |
| Session 8  
RCTs: design and conduct in real world examples  
14.00-15.30  
Prof. Debra Bick |
| Session 9  
Critical appraisal: a practical session  
16.00-17.00  
Dr. Janet Anderson |
| **DAY 4**  
30 October 2017  
(Students in college for the whole day) | Session 10  
Seminar: critical appraisal of a pre-read and prepared quantitative research (group allocations via KEATS)  
09.30-11.00  
A: Dr Julia Philippou  
B: Dr Ed Purssell  
C: Trevor Murrells  
A: FWB 2.48  
B: FWB 2.44  
C: WBW LG/3 |
| Session 11  
Introduction to observational study designs  
11.00-12.30  
Dr Julia Philippou  
FWB 2.48 |
| Session 12  
Introduction to survey design and choosing/developing outcome measures  
13.30-14.30  
Dr Julia Philippou |
| Session 13  
Observational studies and tool development – real world examples  
15.00-17.00  
Prof. Chris Norton |
<table>
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<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>31 October - 8 November 2017</td>
<td>Further revision/learning of any day 4 content that are still unclear Directed learning for day 5 (information will be available on KEATS).</td>
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<tr>
<td><strong>DAY 5</strong> 9 November 2017</td>
<td><strong>Session 14, part 1</strong> Assessing critical appraisals (practice grading exemplar written appraisals) 09.30-11.15 Dr Janet Anderson</td>
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<tr>
<td></td>
<td><strong>Session 14, part 2</strong> Assessing critical appraisals (practice grading exemplar written appraisals) 11.45-13.00</td>
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<td><strong>Session 15</strong> Introduction to health economics 14.00-15.30 Dr James Shearer</td>
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<td><strong>Session 16</strong> Complex interventions 15.45-17.00 Prof. Angus Forbes</td>
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| 10 November - 19 November 2017 | Further revision/learning of any day 5 content that are still unclear Directed learning for day 6 (information will be available on KEATS). |

| **DAY 6** 20 November 2017  | **Session 17** Small group discussion (followed by whole group discussion) of research plans. 09.30-13.00 (with a break in the middle) Dr Janet Anderson |
|                          | **Session 18** Lessons from conducting quantitative research 14.00-15.45 Dr Janet Anderson |
|                          | **Session 19** Summative assessment Q&A session 16.15-17.00 Dr Janet Anderson |

**Key:**

FWB – Franklin-Wilkins Building, Waterloo campus; WBW – Waterloo Bridge Wing, Waterloo campus