**Course outline – Fall 2023**

HRM 747 : Advanced Methods in Evidence Synthesis

## Background

This course covers advanced methodological and statistical topics in evidence synthesis that are not covered in other HRM courses. Meta-analytic techniques are applied in a wide range of disciplines including medicine, psychology, sociology, education, and economics. The widespread and growing application of meta-analysis to synthesize evidence from studies of diagnosis, intervention, and prognosis, as well as its application in health technology assessment, makes it useful for healthcare professionals and researchers. This course provides an in-depth practical and hands-on learning on a diverse range of meta-analytic approaches such as trial sequential analysis, individual participant data meta-analysis, meta-analysis of prognosis questions, dose-response meta-analysis, indirect treatment comparison, and network meta-analysis. Students will learn to design, analyse, interpret, and report the results of a variety of advanced evidence synthesis methods using a range of software and tools – e.g., advances in GRADE approach for prognosis and multiple treatment comparison.

You are expected to bring to the course the research topics of interest to you in your own field. The course is organized to enable learning to occur in a variety of ways. First, your faculty advisor from HRM program, is a key resource who can assist you in ensuring that the issues covered are applied to your own area of interest. Second, in the small group tutorials your tutor/facilitator will assist you in learning the concepts, approaches, and the interpretation of the course material. Large group presentations are also included at the start of each session to help you synthesize key areas and introduce you to experts on a specific topic. And finally, don't forget that your student colleagues in the course will have much to offer in terms of expertise, cross-discipline knowledge, and ways of learning the areas covered.

## Course objectives

Students who successfully complete the course will have knowledge and skills to:

1. Design and conduct complex evidence synthesis projects
2. Apply advance methods as well as emerging meta-analytic techniques to address a wide range of clinical and scientific research questions using different study designs (e.g., randomized trials, observational studies, prognosis and prediction models) and outcome types (e.g., binary, continuous, count, time-to-event, etc.)
3. Use statistical packages (in Stata and R) for meta-analysis and network meta-analysis
4. Use GRADE methodology to evaluate certainty of evidence and draw appropriate conclusions from different meta-analytic methods for different research questions
5. Structure and write a research report containing meta-analysis and network meta-analysis results

**Educational Methods/Course Format**

The course uses problem-based learning in small groups and integrative large group sessions. The course will include three main components: Readings, lectures, and hands-on exercises/assignments. Prior to each session students will receive selected readings. The first half of the session will be a lecture, followed by a hands-on exercise/assignment to be completed in class.

Students are expected to submit a 1-page description of a meta-analysis topic that they either already have extracted data for or expect to finish data extraction by the time the course starts. The topic can be for prognostic, or dose-response meta-analysis, trial sequential analysis, or network meta-analysis. Course instructor will assess the feasibility of suggested projects and will offer alternative projects or sample datasets in case students project would not be feasible to finish within the course timeframe. For the final session, students will present results of their projects in class.

**Evaluation methods**

Our intent is to provide many opportunities to demonstrate your mastery of evidence synthesis methods by

1- Weekly assignments/hands-on exercises in class
2- Tutorial participation
3- Final course paper on issues covered during the course
4- Course paper presentation

Students performance will be evaluated based on:

**Participation and completion of hands-on exercises: 20%**

During sessions 2 to 11, students will be expected to complete a hands-on exercise/assignment to demonstrate practical knowledge of the material covered. Students will be marked based on their participation in the tutorial session and hands-on exercise [0.5 mark for minimal participation, 1 mark for moderate participation, and 2 marks for full-participation and completing the hands-on exercise].

**Research question and statistical analysis plan (mid-term assignment): 15%**

Students will select one of the topics in the course (prognostic, or dose-response meta-analysis, trial sequential analysis, or network meta-analysis and are expected to develop a 2-page document containing a clear and defendable research question, detailed plans for the analysis methods they intend to use, and show feasibility of applying suggested methods using their chosen dataset for final assignment.

**Final assignment (course paper): 40%**

Students will complete analyses based on their suggested dataset or a dataset that will be provided to them. Student-owned topics and datasets must be approved by the instructor. A written report on statistical methods used, meta-analysis findings, and the interpretation of the results for the selected topic not exceeding 15 pages, double-spaced, 12-point font with 1-inch margins.

**Final presentation: 25%**

The final presentation should go over topics covered in the final paper. The presentation should not exceed 10 minutes and should leave at least 5 minutes for discussions and comments.

Core textbooks for general reading

- Matthias Egger, Julian P.T. Higgins, George Davey Smith. *Systematic Reviews in Health Research: Meta-Analysis in Context*. Third Edition, 2022 Wiley-Blackwell BMJ Books. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119099369
- Christopher H. Schmid, Theo Stijnen, Ian R. White. *Handbook of Meta-Analysis*. First edition, 2020 Chapman and Hall/CRC. https://doi.org/10.1201/9781315119403
- Sofia Dias, A. E. Ades, Nicky J. Welton, Jeroen P. Jansen, Alexander J. Sutton. *Network Meta-Analysis for Decision Making.* 2018, Wiley. https://doi.org/10.1002/9781118951651

***Optional***

- Tom M. Palmer and Jonathan A. C. Sterne. *Meta-analysis in Stata: An updated collection from the Stata Journal*. Second Edition, 2016 Stata Press. www.stata.com/bookstore/meta-analysis-in-stata
- Michael Borenstein. *Common mistakes in meta-analysis and how to avoid them*. 2019 Biostat, Inc.
- Michael Borenstein, Larry V. Hedges, Julian P.T. Higgins, Hannah Rothstein. *Introduction to Meta-Analysis.* 2009 Wiley.

**CONTACT INFORMATION**

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**PLEASE NOTE - When emailing, you must include "HRM 747" in the subject line.**

**Course schedule**

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| Session 1 | Course Overview and typology of systematic reviews and meta-analyses (Behnam Sadeghirad) | September 8 |
| Session 2 | Meta-analysis of interventions - Part I (Behnam Sadeghirad) | September 15 |
| Session 3 | Meta-analysis of interventions - Part II (Behnam Sadeghirad) | September 22 |
| Session 4 | Combining evidence on quantitative exposures (Dena Zeraatkar) | September 29 |
| Session 5 | Meta-analysis of interventions - Part III (Lawrence Mbuagbaw) | October 6 |
| Session 6 | Meta-analysis of observational studies (Lawrence Mbuagbaw) | October 13 |
| Session 7 | Meta-analysis of prognostic studies and prediction models (Farid Foroutan) | October 20 |
| Session 8 | Network meta-analysis - Part I (Behnam Sadeghirad) | October 27 |
| Session 9 | Network meta-analysis - Part II (Behnam Sadeghirad) | November 3 |
| Session 10 | Bayesian methods for meta-analysis and network meta-analysis (Lehana Thabane/Michael Zoratti) | November 10 |
| Session 11 | Network meta-analysis - Part III (Gordon Guyatt) | November 17 |
| Session 12 | Handling missing participants data in meta-analysis and network meta-analysis (Behnam Sadeghirad) | November 24 |
| Session 13 | Final presentation (Behnam Sadeghirad) | December 1 |