

9th GESIS Summer School in Survey Methodology August 2020

Syllabus for short course C: "Applied Systematic Review and Meta-Analysis"

Lecturers:	Dr. Jessica Daikeler	Sonila Dardha
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Date: 12-14 August 2020
Time: 10:00-16:00
Time zone: CEST, course starts on Wednesday at 10:00
Venue: Online via Zoom

About the Lecturers:

Jessica is a survey methodologist and works at GESIS in the Survey Operations and Survey Statistics teams in the Survey Design and Methodology department. Jessica wrote her dissertation on "The Application of Evidence-Based Methods in Survey Methodology" with Prof. Michael Bosnjak (University of Trier & ZPID) and Prof. Florian Keusch (University of Mannheim). At GESIS she is involved in the application of evidence-based methods, in particular experiments, systematic reviews and meta-analyses. She has lots of experience with different systematic review and meta-analysis projects. Her research is currently focused on data quality in web and mobile surveys, link of nonresponse and measurement errors, data linkage and, of course, methods for the accumulation of evidence.

Sonila is a survey methodologist researching interviewer effects, response patterns, nonresponse error and 3MC surveys, and a survey practitioner coordinating cross-country comparative projects. She is currently pursuing her PhD in Survey Research Methodology at City, University of London, the home institution of the European Social Survey (ESS ERIC). Sonila has previously obtained three Master degrees, one of which in M.Sc in Statistics (Quantitative Analysis for the Social Sciences) from KU Leuven, Belgium. She is an experienced consultant for quantitative methods and statistics and has worked for Kantar Public in Brussels and London, undertaking international projects for institutional clients. These include, e.g., the Enterprise Surveys (World Bank), Eurobarometer Surveys (European Commission), European Elections 2015 (European Parliament), Life in Transition Countries (European Bank for Reconstruction and Development), and Global Attitudes Project (Pew Research Center).

Selected Publications:

- Daikeler, J., Bosnjak, M., and Lozar Manfreda, K. (2019). "Web versus other survey modes: An updated and extended meta-analysis comparing response rates." *Journal of Survey Statistics and Methodology* online first. DOI: <http://dx.doi.org/10.1093/jssam/smz008>.
<https://academic.oup.com/jssam/advance-article/doi/10.1093/jssam/smz008/5488703?guestAccessKey=1ac1c66f-3f2d-4f91-a819-4fd8fc9a1fcf>.
- Daikeler, J. (2019). *The Application of Evidence-Based Methods in Survey Methodology: Inauguraldissertation zur Erlangung des akademischen Grades eines Doktors der Sozialwissenschaften der Universität Mannheim*.
- Daikeler, J. and Bosnjak, M. (2020). *How to Conduct Effective Interviewer Training: A Meta-Analysis. Interviewer Effects from a Total Survey Error Perspective*. K. Olson, Jolene D. Smyth, Jennifer Dykema et al., CRC Press, forthcoming
- Heck-Grossek, N. & Dardha, S. (2020). *Void of the Voiceless: An Analysis of Residents with a Language Barrier in Germany, France, and the United Kingdom*. In Sha, M & Gabel, T. (eds.), *The Essential Role of Language in Survey Research*. RTI Press: USA. DOI: 10.3768/rtipress.bk.0023.2004.6

Short Course Description:

The increasing amount of literature in many social science fields makes it difficult for researchers to assess and keep up with new evidence. As a result, systematic reviews and meta-analyses play an important role in synthesising research and help researchers and practitioners make evidence-based decisions. The aim of this three-day course is to provide participants with an applied introduction to methods for conducting systematic reviews and meta-analyses in the social sciences. The course focuses on all parts of a research synthesis, from how to formulate a research question, search and evaluate the literature, extract and code the data and finally, integrate findings using meta-analytic models. The course will be interactive and practical, with the delivery of sessions based on lectures and individual/small groups working on their own research projects. Prior use of R is advantageous for Day 2 and 3 of this workshop.

Keywords:

systematic review, meta-analysis, research synthesis, evidence-based methods

Course Prerequisites:

- Participants are expected to have a forthcoming/working project that necessitates knowledge in systematic reviews or meta-analyses.
- Participants are expected to have a good working knowledge of statistics at an undergraduate level, e.g. statistical inference (standard error, confidence interval), bivariate statistics (correlation coefficient, mean differences, odds ratio) as well as a basic understanding of (linear) regression analysis and ANOVA.
- Participants are interested in any sub-topic in social research or survey methodology.
- Participants are expected to install R, and preferably RStudio, as well as the *metafor* package on their computers. Please see the "Software and Hardware Requirements" section below for more information.

Target Group:

Participants will find the course useful if:

- They are planning to or currently working on a Master/PhD thesis, or a scientific publication in social sciences or survey methodology using research synthesis methods (systematic review or meta-analysis).
- They want to gain a better understanding of the pros and cons of the method when evaluating meta-analytical results. However, in this course participants are encouraged to work on their own projects and perform all the different steps of systematically synthesising evidence for their research problem.

Course and Learning Objectives:

By the end of the course participants will be able to:

- define a review question and understand how to develop a review protocol and the key stages of the systematic review process
- develop a search strategy to identify relevant studies for a specific review question
- understand how to conduct a comprehensive literature search
- apply eligibility criteria to identify relevant studies
- understand how to perform a meta-analysis and how to present meta-analytic results
- conduct a basic meta-analysis and meta-regression using the *metafor* package in R

Organizational Structure of the Course:

The course will consist of three 50-minute lectures as well as a 90-minute hands-on session per day. Participants will spend time applying the course content to their evidence synthesis projects. They can either work individually or in small groups to complete a research project relating to systematic reviews and/or meta-analyses. The instructors will be available during the practical sessions to answer questions, both with regards to course exercises and individual/group projects. We will use "Zoom" for online teaching and online group/ pair work.

Software and Hardware Requirements:

Participants need to use a laptop with R and RStudio installed. If you have never worked with R before, an (online) tutorial is advisable to get you started. Due to the short course time, this course cannot provide an introduction into R. During the course, the R package *metafor* will be used; please install this package and add it into your library using the following instructions: after starting R, type in "install.packages("metafor")". If you receive the message "package 'metafor' successfully unpacked and MD5 sums checked", then everything works fine. More information on this R package can be found at: <http://www.metafor-project.org/doku.php/installation>.

Participants need access to ILIAS, the e-learning platform for accessing all the resources of this course. Please access the platform to download the material prior to the start of the course. Since we will conduct a literature search during the course, a(VPN)access to the University library of your own institutions would be very helpful. Finally, participants need to download and install Zoom; this will be our online platform for delivering this course virtually. The GESIS summer school team will provide you information how to get Zoom installed.

Long Course Description:

"Non-reproducible single occurrences are of no significance to Science." - Popper (1956).

With this quotation, Karl Popper already named in 1956 a highly relevant issue in Science – the replicability of scientific studies. Particularly in the last decade, key results of many scientific studies in the Social and Life Sciences have been difficult or impossible to replicate or reproduce. Neither independent researchers nor the original researchers have succeeded in replicating them – this phenomenon is also known as the replication crisis (Baker, 2016). Besides the reproducibility of results, the immense flood of new publications is also a challenge for science. Thus, every published result is only one data point within the distribution of all possible results. This is exactly where evidence-based methods, such as systematic reviews and meta-analyses, come into play. In a nutshell, systematic reviews and meta-analyses can be described as a set of methods for aggregating, summarizing, and drawing inferences from collections of thematically-related studies. The key idea is to qualitatively and quantitatively describe the results and different study design features.

This course provides a step-by-step approach and describes each of the necessary steps for obtaining systematic reviews and meta-analyses. In particular, evidence synthesising projects consist of the following six steps:

- (I) Formulating a research question;
- (II) defining the eligibility criteria for including and excluding studies;
- (III) conducting the literature search and study screening;
- (IV) performing the study coding;
- (V) synthesizing the evidence; and,
- (VI) presenting and interpreting the results.

Running through the exercises, the participants will have the direct opportunity to apply what they have learned in each of the six steps mentioned above directly onto their own projects.

This course will focus on applying systematic reviews and meta-analyses in the field of survey methodology, so the lecturers' examples will mostly focus on this field. Despite the exponentially growing amount of primary studies in survey methodology, the use of meta-analysis to synthesize this body of knowledge remains limited. Only about 60 meta-analytic studies from 54 published manuscripts, mapped onto the TSE framework (Čehovin, Bosnjak & Manfreda, 2018), do currently exist, which equals the annual output of meta-analyses in top tier journals in the health and behavioral sciences (Daikeler, 2019). The overall course aim is to promote the use of evidence-based methods such as systematic reviews and meta-analyses by introducing participants into a broad range of techniques. Especially on the second and third day, we will work with R.

Day-to-day Schedule and Literature:

Day	Topic(s)
1	<p>Monday: From study planning and literature search to study coding</p> <p><u>Lecture:</u></p> <ol style="list-style-type: none"> 1. Introduction <ul style="list-style-type: none"> - Classification of evidence-based methods - The research cycle in the accumulation of evidence 2. Study design <ul style="list-style-type: none"> - Problem statement: the first step of systematic reviews - Study eligibility: inclusion and exclusion criteria 3. Conducting a literature search and study screening <p><u>Hands-on:</u></p> <p>Creating your own search string and testing it Getting to know different search engines Searching for studies and search documentation Screening studies</p> <p><u>Compulsory reading (have to be read before the session):</u></p> <ul style="list-style-type: none"> • Lipsey, M. W., & Wilson, D. B. (2001). Practical meta-analysis. Introduction; SAGE publications, Inc. (Chapters 1 and to 23) • What is a systematic review?: https://www.campbellcollaboration.org/explore/what-is-a-systematic-review.html • The Campbell Collaboration: Introduction to meta-analysis https://youtu.be/How7LW7WIFQ <p><u>Suggested reading (suggested, yet do not have to be read before the session):</u></p> <ul style="list-style-type: none"> • Petticrew, M., & Roberts, H. (2008). Systematic reviews in the social sciences: A practical guide. John Wiley & Sons. (Chapters 1 to 4) • Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: a best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. Annual review of psychology, 70, 747-770. • Evidence and gap maps (EGMs): https://campbellcollaboration.org/evidence-gap-maps.html • Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Introduction to meta-analysis. John Wiley and Sons. (Preface, Part 1; Pages xxi-xxviii and 3-14) • Littell, J., Corcoran, J., & Pillai, V. (2008). Systematic reviews and meta-analysis. New York: Oxford University Press. • Gough, D., Oliver, S. & Thomas, J. (eds.) (2017) An Introduction to Systematic Reviews. London: Sage. 2nd edition. • Arksey H. & O'Malley L. (2005) Scoping studies: towards a methodological framework. International Journal of Social Research Methodology, 8 (1), 19-32. • Daikeler J., Bošnjak M., Lozar Manfreda K., Web Versus Other Survey Modes: An Updated and Extended Meta-Analysis Comparing Response Rates, Journal of Survey Statistics and Methodology, https://doi.org/10.1093/jssam/smz008

<p>2</p>	<p>Tuesday: Coding, Effect sizes and an Introduction to <i>metafor</i> <u>Lecture:</u> 1. Moderator and effect size coding, calculation and homogenization 2. Introducing <i>metafor</i> and the <i>escalc</i> function 3. Meta-analysis modelling: fixed- and random-effects models</p> <p><u>Hands-on:</u> Extracting and coding moderators and effect sizes Effect-size calculations and/or transformations Synthesising evidence in <i>metafor</i>: fixed- and random-effects models</p> <p><u>Compulsory reading (have to be read before the session):</u></p> <ul style="list-style-type: none"> • Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Introduction to meta-analysis. John Wiley and Sons. (Parts 2 and 3) <p><u>Suggested reading (suggested, yet do not have to be read before the session):</u></p> <ul style="list-style-type: none"> • Gough, D., Oliver, S., & Thomas, J. (2012). An introduction to systematic reviews. (Chapter 7) • Petticrew, M., & Roberts, H. (2008). Systematic reviews in the social sciences: A practical guide. John Wiley & Sons. (Chapters 5 and 6) • Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2010). A basic introduction to fixed-effect and random-effects models for meta-analysis. <i>Research Synthesis Methods</i>, 1(2), 97–111. https://doi.org/10.1002/jrsm.12 • Card, N. A. (2012). <i>Applied Meta-Analysis for the Social Sciences</i>. New York: Guilford Press. (Chapters 8 and 9) • Lipsey, M. W., & Wilson, D. B. (2001). <i>Practical meta-analysis</i>. Introduction; SAGE publications, Inc. (Chapter 4) • Viechtbauer, W. (2010). Conducting meta-analyses in R with the <i>metafor</i> package. <i>Journal of Statistical Software</i>, 36(3), 1–48. http://dx.doi.org/10.18637/jss.v036.i03
<p>3</p>	<p>Wednesday: Meta-Regressions, Data Quality and Reporting <u>Lecture</u> 1. Meta-regressions: Mixed-effect models 2. Data quality checks - Publication bias - Sensitivity analysis - Robustness checks - Model diagnostics 3. Reporting and miscellaneous topics</p> <p><u>Hands-on:</u> Applying mixed-effects models Applying model diagnostics Reporting the steps from your meta-analysis project Final Q&A session</p> <p><u>Compulsory reading (have to be read before the session):</u></p> <ul style="list-style-type: none"> • Weiß, B., and M. Wagner (2011). The Identification and Prevention of Publication Bias in the Social Sciences and Economics. <i>Journal of Economics and Statistics (Jahrbücher Für Nationalökonomie Und Statistik)</i> 231 (5–6): 661–84 • Petticrew, M., & Roberts, H. (2008). <i>Systematic reviews in the social sciences: A practical guide</i>. John Wiley & Sons. (Chapter 9) • Viechtbauer, W., & Cheung, M. W.-L. (2010). Outlier and influence diagnostics for meta-analysis. <i>Research Synthesis Methods</i>, 1(2), 112–125. <p><u>Suggested reading (suggested, yet do not have to be read before the session):</u></p> <ul style="list-style-type: none"> • Ellis, P. D. (2010). <i>The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results</i>. Cambridge University Press. • Gough, D., Oliver, S., & Thomas, J. (2012). <i>An introduction to systematic reviews</i>. (Chapter 9) • Anzures-Cabrera, J., & Higgins, J. (2010). Graphical displays for meta-analysis: An overview with suggestions for practice. <i>Research Synthesis Methods</i>, 1(1), 66–80. https://dx.doi.org/10.1002/jrsm.6

	<ul style="list-style-type: none"> • Van den Noortgate, W., López-López, J. A., Marin-Martínez, F., & Sánchez-Meca, J. (2013). Three-level meta-analysis of dependent effect sizes. <i>Behavior Research Methods</i>, 45(2), 576-594. https://dx.doi.org/10.3758/s13428-012-0261-6 • Valentine, J. C., & Cooper, H. (2008). A systematic and transparent approach for assessing the methodological quality of intervention effectiveness research: The Study Design and Implementation Assessment Device (Study DIAD). <i>Psychological Methods</i>, 13(2), 130-149. https://dx.doi.org/10.1037/1082-989X.13.2.130 • Harden, A., & Thomas, J. (2005). Methodological issues in combining diverse study types in systematic reviews. <i>International Journal of Social Research Methodology</i>. 8(3), 257-271.
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Additional Recommended Literature:

- Bornstein, M., Hedges, L. V., Higgins, J. P. T, & Rothstein, H. R. (2009). *Introduction to Meta-Analysis*. Chichester, UK: Wiley.
- Card, N. A. (2012). *Applied Meta-Analysis for the Social Sciences*. New York: Guilford Press.
- Cooper, H. (2010). *Research Synthesis and Meta-Analysis: A Step-by-Step Approach*. Thousand Oaks, CA: Sage.
- Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.) (2009). *Handbook of Research Synthesis* (2nd ed.). New York: Russell Sage Foundation.
- Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical Meta-analysis*. Thousand Oaks: Sage.
- Pigott, T. D. (2012). *Advances in Meta-Analysis*. New York: Springer.
- Rothstein, H., Sutton, A. J., & Borenstein, M. (2005). *Publication Bias in Meta-Analysis: Prevention, Assessment and Adjustments*. Chichester, England; Hoboken, NJ: Wiley.
- Schwarzer, G., Carpenter, J. R., & Rücker, G. (2015). *Meta-analysis with R*. Heidelberg: Springer.