

**NUTR 0392: Nutrition Systematic Review and Meta-Analysis  
Summer 2024**

**Class Meetings:** Virtual Zoom Meetings (TBD) Fridays and Saturdays 9am-10:30am ET

**Instructor(s):** Mei Chung, PhD, MPH  
Email: [mei\\_chun.chung@tufts.edu](mailto:mei_chun.chung@tufts.edu)

**TA:** TBD

**Instructor Office Hours:** By appointment via Zoom

**Semester Hour Units:** 3

**Prerequisites:** NUTR 0204: Principles of Epidemiology & NUTR 206/NUTR 207: Biostatistics I or equivalent, or by instructor permission.

**Course Description:** Systematic reviews are the backbone of evidence synthesis methods and the core of knowledge translation and evidence-informed decision making. Meta-analysis is a set of techniques for analyzing and summarizing the findings of multiple quantitative empirical studies. In recent decades, major U.S. and international agencies have adopted such evidence-informed decision-making processes to produce nutrition and public health guidelines and policies. It is important, therefore, that nutrition scientists learn how various review approaches can be used to advance their work in nutrition epidemiology, nutrition intervention, dietetic practice, and policy advocacy.

This course is designed to teach students about the various systematic literature review approaches available for the synthesis of nutrition research and will include a deep examination of the principles and methodologies of full systematic reviews, scoping reviews, evidence mapping, and meta-epidemiological study designs. Students will also learn how to conduct a meta-analysis using Stata (metan or meta [Stata 16 or newer]) or R (metafor) after a systematic literature review and how to utilize published systematic review and meta-analysis from the perspective of a public health practitioner. By combining classroom sessions with substantial individual work, students in this course will learn how to perform each step in a systematic review and meta-analysis and will apply that knowledge to a topic of their choosing by writing a review protocol with a student-designed data extraction form prototype. Students will get feedback at each stage in the review planning process and will have the opportunity to serve as peer-reviewers for their classmates' work. The final deliverable for the course will be a protocol for a systematic review and meta-analysis.

**Course Goals:** Through this course, students will learn how to differentiate the numerous review methods available to scientifically synthesize data across multiple studies and/or publications. Students will also be able to recognize the value of secondary research for identifying gaps in the current published literature, planning future research programs, and supporting the development of policies and guidelines. Students will gain experience planning a systematic review and practicing each stage of the review process in order to better understand the work involved. In addition, students will learn the basic steps for conducting meta-analysis including collecting and organizing quantitative data, running meta-analyses for continuous and dichotomous outcomes, creating forest plots to present results, and interpreting forest plot results.

By the end of the semester, students should have the basic tools and skills needed to:

1. Formulate key research questions for a review and determine the type of review best suited to those research questions.
2. Conduct a systematic, replicable search of the literature used to identify studies eligible for a systematic review and based on PICO criteria; identify which literature databases to search.
3. Prepare and utilize study eligibility criteria to screen titles, abstracts, and full-text publications for consideration in the systematic review.
4. Create a flowchart outlining the search strategy and selection process.
5. Design data extraction forms and extract relevant qualitative and quantitative information from studies in a systematic manner.
6. Select an appropriate risk of bias (ROB) assessment tool based on study design and rate the scientific quality of each study.
7. Prepare clear and concise evidence tables and summary tables.
8. Synthesize results narratively and with the aid of graphs or figures as appropriate.
9. Interpret the pattern of evidence in terms of strength and consistency, and prepare GRADE tables for reporting strength of evidence across study outcomes.

**Required Text:**

Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). *Cochrane Handbook for Systematic Reviews of Interventions* version 6.4 (updated August 2023). Cochrane, 2023. Available from [www.training.cochrane.org/handbook](http://www.training.cochrane.org/handbook).

Companion text to Cochrane handbook: *Evidence Analysis Manual: Steps in the Academy Evidence Analysis Process*

[https://www.anddeal.org/vault/2440/web/files/2016\\_April\\_EA\\_Manual.pdf](https://www.anddeal.org/vault/2440/web/files/2016_April_EA_Manual.pdf)

**Note:** Throughout the course, the instructor will put emphasis on the issues discussed in Cochrane Handbook Chapter 16: Equity, and Chapter 17: Intervention complexity. All required readings are freely accessible on PubMed Central or online. Please refer to the **Course Topics and Assignment Schedule at a Glance** table for required readings.

**Class Materials:**

All class materials, including lecture notes and assignments, will be posted on Canvas (<https://canvas.tufts.edu>).

**Communication Policy:** Students should try to seek out information for themselves before contacting the teaching team. If you cannot find your answer, we have included a 'Clarity Thread' discussion on Canvas. Please go there first to post your question and check if any student has already asked the same question. We will aim to check the Clarity Thread daily for any inquiries, but if other students know the answer, they should go ahead and post it. If you need to ask a more personal question, please get in touch with either instructor by email.

**Academic Conduct:**

Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School's Policies and Procedures Handbook and Tufts University policies (<https://nutrition.tufts.edu/about/policies-and-procedures>) and Tufts University policies (<https://students.tufts.edu/community-standards/support-resources/academic-integrity-resources>). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

**Classroom Conduct:**

Students are expected to attend all classes. Absences should be explained in writing at least 24 hours before class. Missing more than one or two classes per semester will usually result in

substantial underperformance. Students are also expected to read all assigned materials before class and come prepared to participate in class discussions and group activities.

**Assessment & Grading:** Homework assignments will provide practice on concepts discussed in class. You will be evaluated based on your ability to apply these concepts to plan a systematic review project. You are encouraged to help your classmates understand the course material. If you wish, you may work together on homework assignments; however, the work you turn in **MUST** be your own. Homework assignments will constitute more than half of the final systematic review protocol, so be sure to revise them based on the feedback you receive.

Class participation is important. We expect that you will be a prepared and active participant in class. If you miss class, it is your responsibility to make arrangements with another student in the class to obtain lecture notes and handouts.

**Grading Range:** Grading for the course will be based on the below distribution:

Homework (3 homework assignments): 45% (15% each)  
Presentation (2 presentations): 20% (10% each)  
Final systematic review protocol: 25%  
Class participation: 10%

*A passing grade in the course is B- or better. Course grades will be based on the below (subject to revision during the course):*

A+ >97%  
A > 94% - 97%  
A- 90 - <94%  
B+ 87 - <90%  
B 84 - <87%  
B- 80 - <84%

**Instructions for Submission of Assignments and Exams:**

Assignment	Date Assigned	Due Date
Homework 1: PICO & search strategy	May 31	June 14
Homework 2: Data extraction exercise	June 15	June 21
Homework 3: AMSTAR 2 appraisal	July 12	July 26
Presentation 1: AMSTAR 2 appraisal	n/a	July 26;July27
Presentation 2: Protocol draft (pre-final)	n/a	Aug 16;Aug17
Final systematic review protocol	May 31	Aug 24

***This schedule is subject to modification at the instructor's discretion***

**Accommodation of Disabilities:**

Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations, please contact the Friedman School Assistant Dean of Student Affairs by phone at 617-636-6719 to make arrangements for determination of appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

**Tufts Zoom:**

The Friedman School's on-campus courses may be offered by Tufts Zoom (<https://access.tufts.edu/zoom>) on days when the Boston campus is closed due to pandemic, weather or a temporary cancellation issue. Students should expect to be notified by email in the

event that class is cancelled and will be provided with the Zoom link for students to attend any remote class sessions during the normally scheduled class period. The Zoom meeting video and audio will be recorded and posted on [Canvas](#) when completed. If an on-campus examination or presentation was scheduled on a day when the Boston campus is closed due to weather or a temporary cancellation issue and cannot be conducted by zoom, the exam/presentation will be rescheduled for an alternate on-campus class session date.

**Diversity Statement:** We believe that the diversity of student experiences and perspectives is essential to the deepening of knowledge in this course. We consider it part of our responsibility as instructors to address the learning needs of all of the students in this course. We will present materials that are respectful of diversity: race, color, ethnicity, gender, age, disability, religious beliefs, political preference, sexual orientation, gender identity, socioeconomic status, citizenship, language, or national origin among other personal characteristics.

**Course Topics and Assignment Schedule at a Glance:**

DATE OF CLASS (all times are 9-10:30am ET)	SESSION	COURSE TOPICS	ASSIGNMENTS	READINGS
5/24; 5/25	1	<p>Introduction to different types of reviews</p> <p>Understanding what capacity means for systematic reviewing</p> <p>Getting started: defining review questions</p>	<p>All readings must be done before class</p> <p>Go over the syllabus in class</p> <p>In class lab: Critique of review question examples and applying PICO criteria to develop strong review questions</p>	<p>Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. <i>Health Info Libr J.</i> 2009;26(2):91-108. <a href="https://doi.org/10.1111/j.1471-1842.2009.00848.x">doi: 10.1111/j.1471-1842.2009.00848.x</a></p> <p>Munn, Z., Peters, M.D.J., Stern, C. et al. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. <i>BMC Med Res Methodol</i> 18, 143 (2018). <a href="https://doi.org/10.1186/s12874-018-0611-x">https://doi.org/10.1186/s12874-018-0611-x</a></p> <p>Improving Population Health: The Uses of Systematic Reviews <a href="http://www.milbank.org/uploads/documents/0712populationhealth/0712populationhealth.html">http://www.milbank.org/uploads/documents/0712populationhealth/0712populationhealth.html</a></p> <p>Lavis JN. How can we support the use of systematic reviews in policymaking? <i>PLoS Med.</i> 2009;6(11), e1000141. <a href="http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2777391/">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2777391/</a></p> <p>Lichtenstein AH, Yetley EA, Lau J. Application of systematic review methodology to the field of nutrition. <i>J Nutr.</i> 2008 Dec;138(12):2297-306. <a href="https://doi.org/10.3945/jn.108.097154">https://doi.org/10.3945/jn.108.097154</a></p>
5/31;6/1	2	<p>Developing criteria for including studies, searching the literature, and screening and identifying relevant studies for inclusion</p> <p>Literature database selection</p>	<p>Homework #1 assigned: PICO and literature review search strategy, "Build a Search Strategy Worksheet", and sample bibliography (Due 6/14, session 4)</p> <p>In class lab: Conduct a search strategy in Ovid MEDLINE, Embase, and Web of Science</p>	<p>(CH) chapter 4 (<a href="#">Searching &amp; selecting studies</a>)</p> <p>Guest Instructor: Tufts Research Librarian</p>

6/7;6/8	3	<p>Overview of the structure and methodologies of a systematic review</p> <p>PRISMA reporting guidelines for protocols</p> <p>Computer tools for conducting systematic reviews</p> <p>Screening abstracts and full-text reports</p>	<p>In class lab 1: Creating an eligibility criteria table</p> <p>In class lab 2: Using eligibility criteria to screen abstracts and titles with online software, and resolving conflicts with a team</p>	<p>(CH) chapter 1 (<a href="#">Starting a review</a>)</p> <p>(CH) chapter 2 (<a href="#">Determining the scope and questions</a>)</p> <p>(CH) chapter 3 (<a href="#">Inclusion criteria &amp; grouping for synthesis</a>)</p> <p>PRISMA for systematic review protocols (PRISMA-P): <a href="http://www.prisma-statement.org/Extensions/Protocols">http://www.prisma-statement.org/Extensions/Protocols</a></p> <p>Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. <i>Ann Intern Med.</i> 2018;169(7):467-473. <a href="https://doi.org/10.7326/M18-0850">https://doi.org/10.7326/M18-0850</a></p>
6/14;6/15	4	<p>Extracting data - Tools and strategies for qualitative and quantitative data collection and management</p>	<p>Homework #1 due today</p> <p>Homework #2 assigned: Data extraction exercise (Due 6/21)</p> <p>In-class lab: Design a data extraction form and summary tables</p>	<p>(CH) chapter 5 (<a href="#">Collecting data</a>)</p> <p>(CH) chapter 6 (<a href="#">Effect measure</a>)</p>
6/21;6/22	5	<p>Synthesizing results of the literature review using narrative and quantitative approaches; Graphs, figures, and tables for presenting review data; Introduction to forest plots</p>	<p>Homework #2 due today</p> <p>In-class lab: Interpreting results of a forest plot including measures of heterogeneity</p>	<p>(CH) chapter 9 (<a href="#">Summarizing study characteristics and preparing for synthesis</a>)</p> <p>(CH) chapter 12 (<a href="#">Synthesizing and presenting findings using other methods</a>)</p>
6/28;6/29	6	<p>Meta-analysis (Part 1) – Continuous outcomes with a focus on data from RCTs</p>	<p>In-class lab: Conduct a meta-analysis and produce a forest plot with and without subgroups</p>	<p>(CH) chapter 10 (<a href="#">Analysing data and undertaking meta-analyses</a>)</p>
7/5;7/6	7	<p>Meta-analysis (Part 2) – Dichotomous</p>	<p>In-class lab: Conduct a meta-analysis and produce a forest plot</p>	<p>(CH) chapter 10 (<a href="#">Analysing data and undertaking meta-analyses</a>)</p>

		outcomes with a focus on data from RCTs	then conduct sensitivity analyses	
7/12;7/13	8	<p>Risk of bias assessment (Part I) – <a href="#">Cochrane tools for various RCT study designs</a></p> <p>Integrate risk of bias assessment with literature synthesis</p> <p>Quality of systematic reviews – critical appraisal of published systematic reviews</p>	<p>Homework #3 assigned: Identify a published systematic review and apply AMSTAR 2 to appraise the quality (Due 7/26, session 10)</p> <p>In-class lab: Conduct a risk of bias assessment using Cochrane tools with a focus on RCT study designs; resolve conflicts with a team</p>	<p>(CH) 7 (<a href="#">Bias and conflicts of interest</a>)</p> <p>(CH) chapter 8 (<a href="#">Risk of bias in randomized trials</a>)</p> <p>Revised Cochrane risk-of-bias tool for randomized trials (RoB 2): <a href="#">Full guidance document</a> and <a href="#">short version (cribsheet)</a></p> <p>Tool for Critical appraisal of a published systematic review: Shea BJ, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. <i>BMJ</i>. 2017 Sep 21;358:j4008. doi: <a href="#">10.1136/bmj.j4008</a></p>
7/19;7/20	9	<p>Observational versus intervention studies: common biases and causal inference</p> <p>Risk of bias assessment (Part II) – Validated tools for observational study designs; what to do when there is no appropriate tool available</p> <p>Brief introduction to meta-epidemiological studies</p>	<p>In-class lab: Conduct a risk of bias assessment using different validated tools with a focus on cohort and case-control study designs; resolve conflicts with a team</p>	<p>Dickersin K. Systematic reviews in epidemiology: why are we so far behind? <i>Int J Epidemiol</i>. 2002 Feb;31(1):6-12. <a href="http://ije.oxfordjournals.org/content/31/1/6.1">http://ije.oxfordjournals.org/content/31/1/6.1</a> <a href="#">ong</a></p> <p>Lichtenstein AH, Yetley EA, Lau J. Application of systematic review methodology to the field of nutrition. <i>J Nutr</i>. 2008;138(12):2297-2306. doi:<a href="#">10.3945/jn.108.097154</a></p> <p>Kelly SE, et al. NUQUEST-Nutrition Quality Evaluation Strengthening Tools: development of tools for the evaluation of risk of bias in nutrition studies. <i>Am J Clin Nutr</i>. 2022 Jan 11;115(1):256-271. doi: <a href="#">10.1093/ajcn/nqab335</a></p> <p>Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses <a href="http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp">http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp</a></p> <p>Murad MH, Wang Z. Guidelines for reporting meta-epidemiological methodology research. <i>Evid Based Med</i>. 2017;22(4):139-142. doi:<a href="#">10.1136/ebmed-2017-110713</a></p>

7/26;7/27	10	Student presentations	Homework #3 is due today  Presentation #1: Critical appraisal of a published systematic review  Peer and instructor feedback and Q&A	
8/2;8/3	11	Results presentation and 'Summary of findings' tables  Introduction to the GRADE approach	In-class lab 1: Making summary tables for systematic reviews  In-class lab 2: Evaluating strength of evidence with the GRADE approach	(CH) chapter 14 ( <a href="#">'Summary of findings' tables &amp; GRADE</a> )  Chapter 4 in GRADE handbook (Schünemann H, Brožek J, Guyatt G, Oxman A, eds. GRADE Handbook. 2013. Available from: <a href="https://gdt.grade.pro.org/app/handbook/handbook.html">https://gdt.grade.pro.org/app/handbook/handbook.html</a> )  Guyatt GH, Oxman AD, Kunz R, et al. What is "quality of evidence" and why is it important to clinicians? <i>BMJ</i> . 2008;336(7651):995-998. doi: <a href="https://doi.org/10.1136/bmj.39490.551019.BE">10.1136/bmj.39490.551019.BE</a> .
8/9;8/10	12	Writing the report (Part I) – Interpreting the results  Writing the report (Part II) – Drawing conclusions  Presenting your results – PRISMA reporting guidelines for abstracts and full reports  Review of PRISMA reporting guidelines for protocols	In-class lab: Putting it all together for the final systematic review protocol	(CH) chapter 15 ( <a href="#">Interpreting results</a> )  Step 5: Write and Grade the Conclusion Statement in Evidence Analysis Manual: Steps in the Academy Evidence Analysis Process <a href="https://www.andeal.org/vault/2440/web/files/2016_April_EA_Manual.pdf">https://www.andeal.org/vault/2440/web/files/2016_April_EA_Manual.pdf</a>  Page M J, McKenzie J E, Bossuyt P et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews <i>BMJ</i> 2021; 372 :n71 doi: <a href="https://doi.org/10.1136/bmj.n71">10.1136/bmj.n71</a>  PRISMA 2020 <a href="#">Checklist</a> and <a href="#">flow diagram</a>  PRISMA for systematic review protocols (PRISMA-P): <a href="http://www.prisma-statement.org/Extensions/Protocols">http://www.prisma-statement.org/Extensions/Protocols</a>
8/16;8/17	13	Student presentations	Presentation #2: Pre-final systematic review protocol  Peer and instructor feedback and Q&A	



8/23;8/24	14	Finals Week	Final systematic review protocol is due today	
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*This schedule is subject to modification at the instructor's discretion.*

## Course Topics, Learning Objectives and Assignments

**Session #1:** Introduction and course overview, understanding what capacity means for systematic reviewing, & getting started defining systematic review questions

**Learning objectives:** Upon completion of this session, students will:

- 1: Be able to describe the differences between a traditional narrative review, scoping review, and a systematic review.
- 2: Be familiar with the need for scoping reviews and systematic reviews.
- 3: Be able to identify meaningful and important systematic review questions.

**Session #2:** Developing criteria for including studies, searching the literature, and screening and identifying relevant studies for inclusion

Guest Instructor: Tufts Research Librarian

**Learning objectives:** Upon completion of this session, students will:

- 1: Be able to substantiate why prudent literature searching is important.
- 2: Be familiar with key electronic databases of journal publications (e.g. MEDLINE and Embase).
- 3: Be familiar with the structure of a search strategy.
- 4: Become proficient in conducting a library database search.
- 5: Be able to appraise a systematic review question.
- 6: Be able to describe why transparency in the search process is important.
- 7: Understand how to avoid bias when formulating a systematic review question.

**Session #3:** Overview of the structure and methodologies of a systematic review, & computer tools for conducting systematic reviews

**Learning objectives:** Upon completion of this session, students will:

- 1: Be able to describe basic steps of a systematic review, i.e., develop a good question, search for and select studies for inclusion, extract data from studies, critically appraise the included studies, synthesize the studies, and organize and write a systematic review.
- 2: Be familiar with standards for systematic review reporting, i.e., PRISMA.
- 3: Be familiar with tools for facilitating the systematic review process.
- 4: Be able to define a systematic review question that specifies the types of populations (i.e. participants), interventions/exposures (and comparisons), and outcomes that are of interest (PICO).

**Session #4:** Extracting data – Tools and strategies for qualitative and quantitative data collection and management

**Learning objectives:** Upon completion of this session, students will:

- 1: Be able to describe why data extraction is important.
- 2: Be familiar with challenges faced when extracting data.
- 3: Be able to describe the general layout of a data extraction form.
- 4: Be able to choose tools and strategies for qualitative and quantitative data collection and management.

**Session #5:** Synthesizing results of the literature review

**Learning objectives:** Upon completion of this session, students will:

- 1: Understand how to synthesize results using narrative and quantitative approaches.
- 2: Be familiar with graphs, figures, and tables used to present review data.
- 3: Understand what forest plots are and how to interpret them.

**Session #6 & #7:** Meta-analysis

**Learning objectives:** Upon completion of this session, students will:

- 1: Understand what meta-analysis is and when it is appropriate to conduct a meta-analysis.
- 2: Be able to conduct meta-analysis of nutrition intervention studies (this can be done in both Stata and R) with dichotomized or continuous outcomes, fixed versus random-effects models, and understand how to deal with heterogeneity.
- 3: Be able to visualize individual study results using forest plots.
- 4: Be able to integrate meta-analysis with quality assessment and appropriately interpret meta-analysis results.

**Session #8 & #9:** Risk of bias tools for various study designs (and what to do when there is no appropriate tool available)

**Learning objectives:** Upon completion of this session, students will:

- 1: Understand the advantages and disadvantages of various study designs used in research.
- 2: Understand the difference between observational and experimental studies.
- 3: Understand the biases that commonly occur in research and how to prevent biases in study design.
- 4: Be able to describe the concept of risk-of-bias assessment.
- 5: Be able to identify reasons and methods for risk-of-bias assessment.
- 6: Understand how to integrate risk-of-bias assessment with literature synthesis.
- 7: Understand the importance of critical thinking in making causal inference.
- 8: Understand the design and utilities of meta-epidemiological studies.

**Session #10:** Student presentations #1: Critical appraisal of a published systematic review

**Learning objectives:** Upon completion of this session, students will:

- 1: Be able to critically appraise the quality of a systematic review.
- 2: Have experience verbally communicating systematic review objectives and strategies.
- 3: Understand how to critique a systematic review question and limitations.

**Session #11:** Results presentations and 'Summary of findings' tables; Introduction to the GRADE approach

**Learning objectives:** Upon completion of this session, students will:

- 1: Understand the goals of presenting systematic review data in tables that summarize data across studies.

- 2: Be familiar with approaches to graphical presentations of findings not synthesized through statistical or meta-analytic techniques.
- 3: Understand the GRADE approach.

**Session #12:** Writing the report – Part I: Interpreting the results & Part II - Drawing conclusions

**Learning objectives:** Upon completion of these sessions, students will:

- 1: Understand the GRADE approach for rating the body of evidence & why it may need to be modified for nutrition research.
- 2: Be able to cite factors that decrease the quality level of a body of evidence.
- 3: Be able to cite factors that increase the quality level of a body of evidence.
- 4: Be familiar with common errors made in reaching conclusions.
- 5: Be able to properly word systematic review interpretations and conclusions.

**Session #13:** Student presentations #2: Pre-final systematic review protocol

**Learning objectives:** Upon completion of this session, students will:

- 1: Have experience in giving constructive comments and feedback on research protocol.
- 2: Be able to critically revise the research protocol based on the comments and feedback.

**Session #14:** Final systematic review protocol