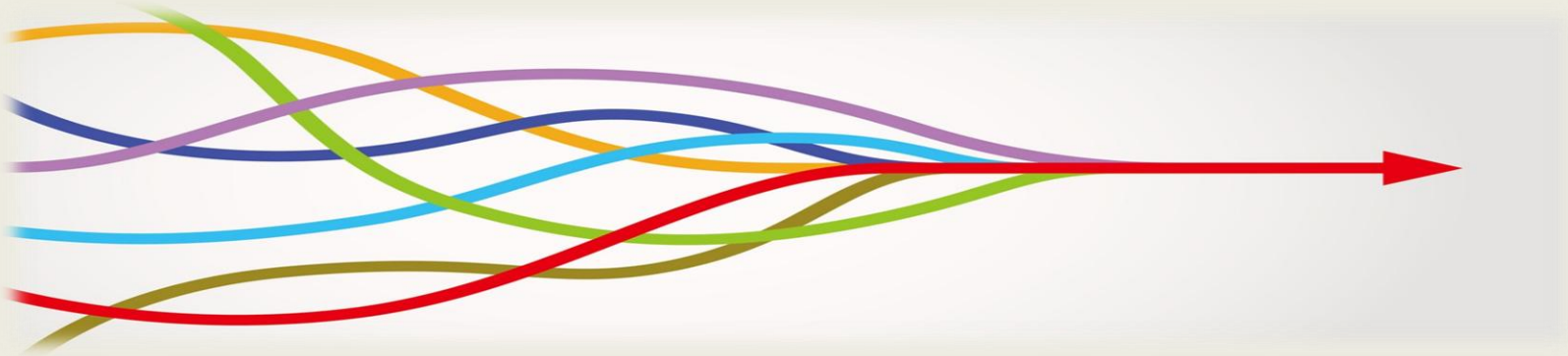
How to do a Systematic Review

HOLLY COOK

CLINICAL LIBRARIAN

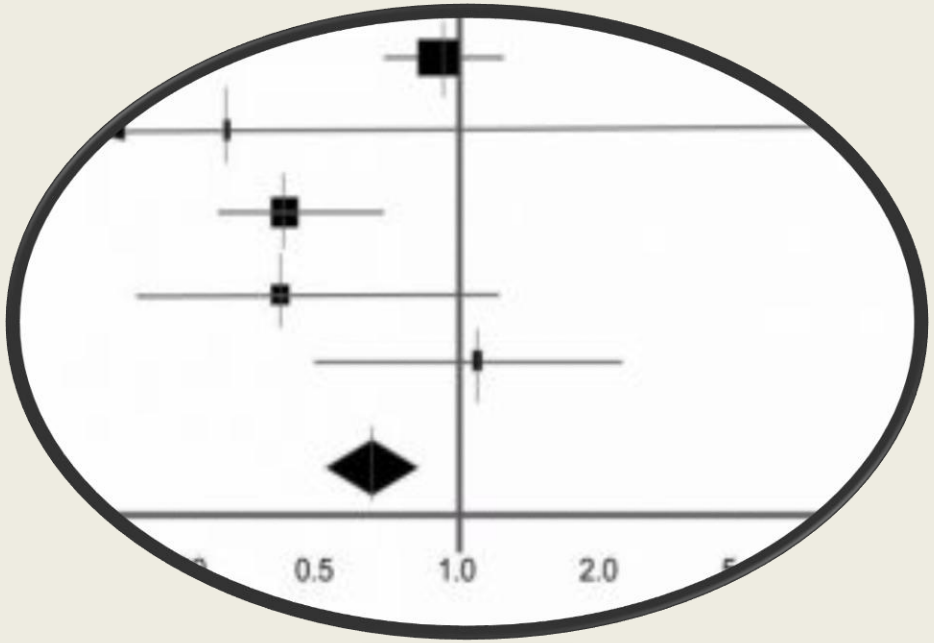


What I'll cover today

- What is a systematic review?
- How to do one
  - Planning
  - Searching
  - Format/writing
- Getting published

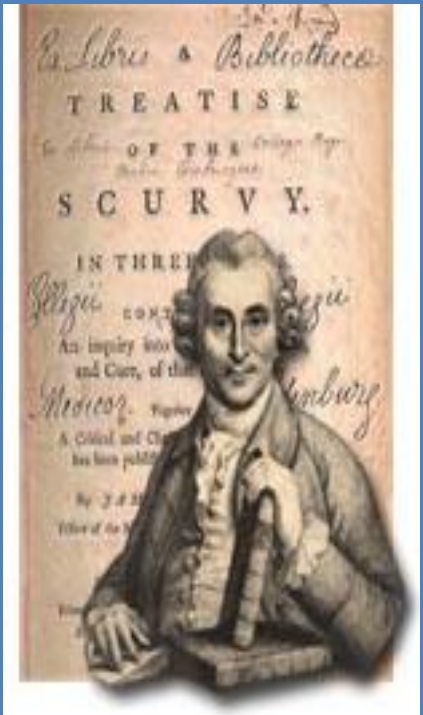
What I won't cover…

Detailed instruction on how to do a meta-analysis



History

1st Review!



- The first systematic review was conducted by James Lind in 1753 (following his clinical trial of 1747) "Treatise of Scurvy"
- In the 1970's UK, Archie Cochrane said that "healthcare in the NHS must be properly evaluated and shown to be clinically effective before use"
  - Cochrane AL (1972) *Effectiveness and efficiency: random reflections on health services*. London: Royal Society of Medicine Press.
- At a similar time in the USA, Gene Glass developed the meta-analysis
  - Glass GV, Smith ML (1979) Meta-analysis of research on the relationship of class-size and achievement. *Educational Evaluation and Policy Analysis* 1: 2-16.

What is a systematic review?

A systematic review attempts to identify, appraise and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a specific research question. Researchers conducting systematic reviews use explicit, systematic methods that are selected with a view aimed at minimizing bias, to produce more reliable findings to inform decision making.

- Not 'just' a review of the literature…
- A piece of research using rigorous methodology
- Uses the best evidence (usually RCT's) to answer a research question

Systematic Review

Description	Search approach
• Combines strength of critical review with exhaustive search processes. • Addresses broad questions to produce 'best evidence synthesis'	• Exhaustive search strategies

Literature Review

Description	Search Approach
• Examines recent or current literature. Can cover wide range of subjects at various levels of completeness and exhaustivity. May include research findings.	• Can be exhaustive but is not a requirement

Mapping Review

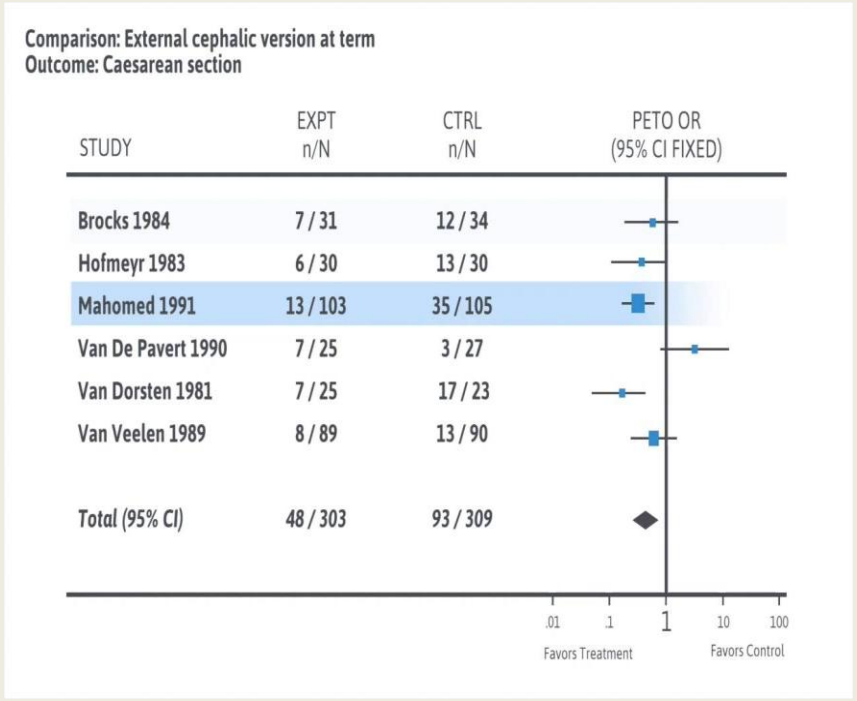
Description	Search Approach
• Maps out and categorises existing literature from which to commission further reviews and/or primary research by identifying gaps in the research literature	• As time allows

Meta-analysis

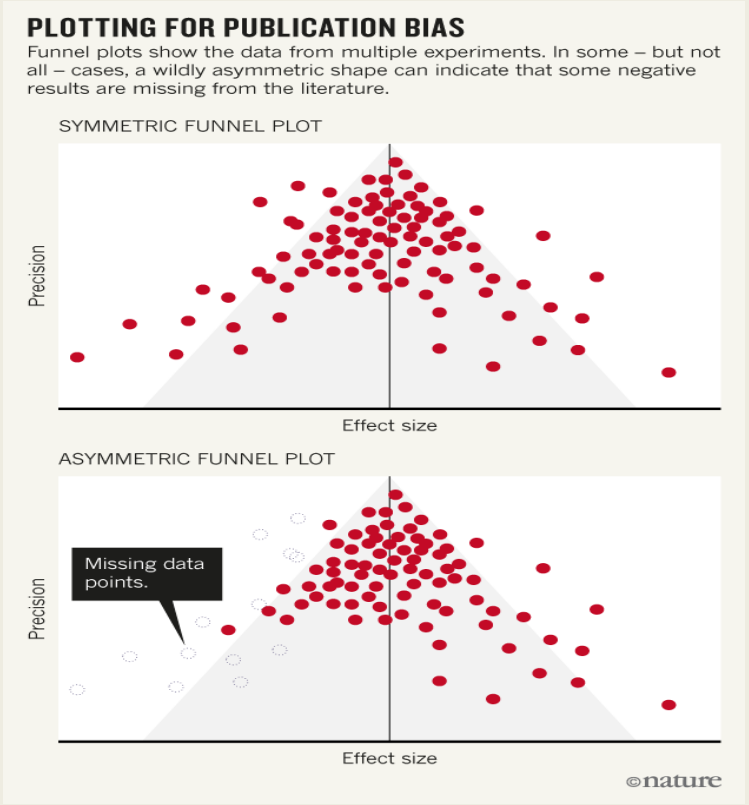
Description	Search approach
• Statistically combines results of quantitative studies to provide precise effects of results	• Exhaustive. May use funnel plot to assess completeness.

Meta-analysis statistical tools

Forest Plot



Funnel Plot



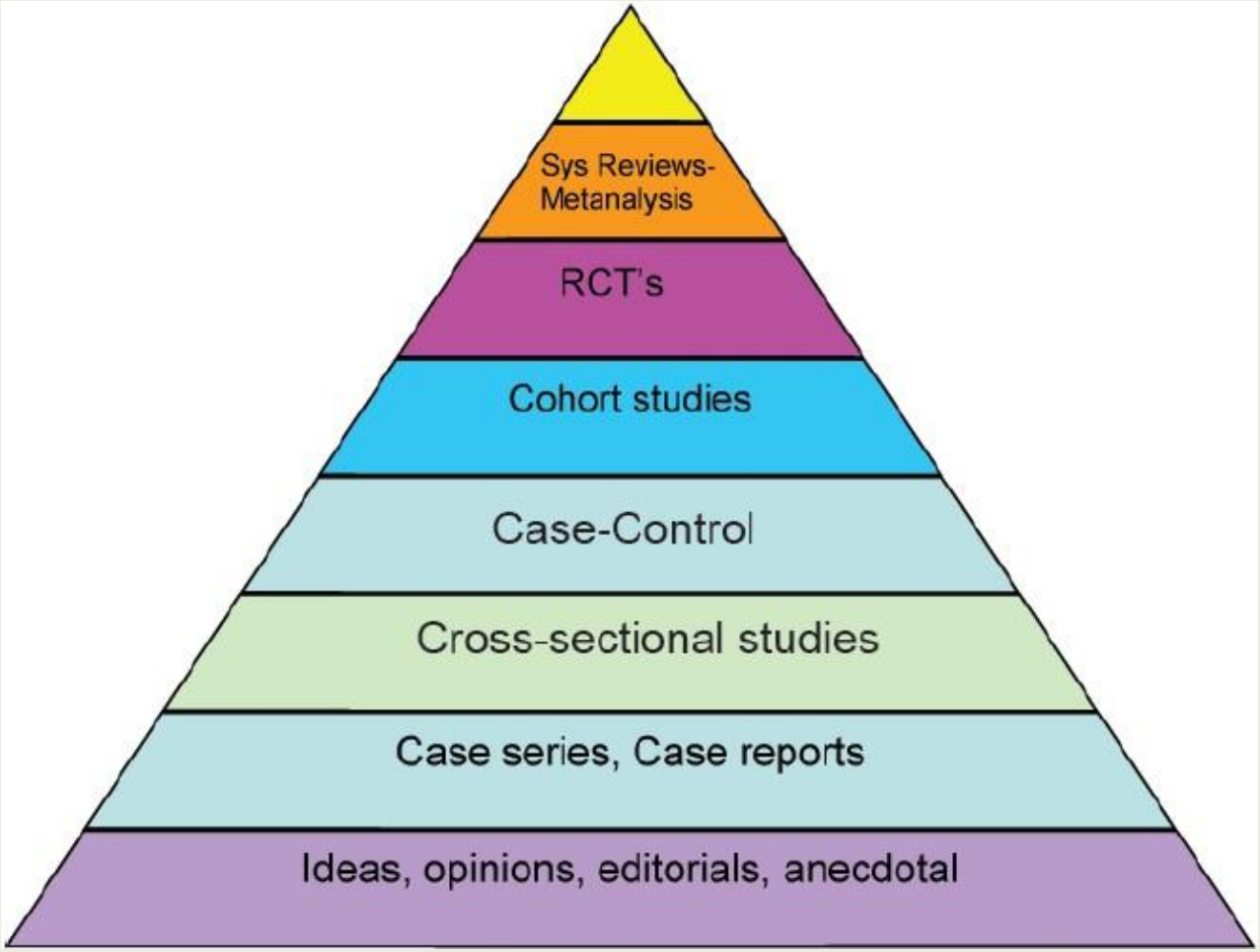
Umbrella review

Description	Search approach
• Summarises results from systematic reviews on a topic	• Exhaustive search for reviews only.

Rapid Review

Description	Search approach
• Rapidly assesses what is already about policy or practice.	• Uses accelerated or abbreviated methods as compared to a systematic review.

Why are they important?



Advantages

- You are in control of your learning objectives and your project
- You can focus on a topic that you're interested in
- You don't have to gain formal ethical approval for your review before you begin
- You don't have to recruit participants
- You can gain understanding of a number of different research methodologies
- You can gain insight into the strengths and limitations of published literature
- You can develop your critical appraisal skills
- The research can fit in, and around, your family (or social) life

Disadvantages

- You don't experience writing and defending an ethics application
- It can be isolating as you are likely to be primarily working on your own
- You don't face the challenge of recruiting participants
- You may not get a sense of the topic in terms of lived experience
- You are reliant on the quality and quantity of available published information to address your research question
- You may find the process dull or boring at times
- There are no short cuts and the process is time consuming

Boland, A., *Doing a Systematic Review*, 2nd edition. London: SAGE.

Features of a Systematic Review

- **Authors:** At least 2 (often more), preferably combining experts in the topics of interest and experts in the methodology of systematic review
- **Study protocol:** A published study protocol which includes a detailed plan of rigorous methods.
- **Research question:** A specific question which can be broken down into concepts such as PICO
- **Search Strategy:** A comprehensive and repeatable search strategy. Uses multiple databases and other sources of published and unpublished literature without language restrictions.

Features of a Systematic Review

- **Selection criteria:** The criteria for inclusion and exclusion of studies are specific and agreed in advance.
- **Critical appraisal:** Includes a systematic and thorough appraisal of the quality or risk of bias in the included studies.
- **Synthesis:** includes qualitative (narrative) synthesis and/or quantitative pooling of data in meta-analysis, with consideration given to the relative precision and quality of the included studies.

The Question

Is your question well defined?

It will determine bias

Essentially your question will determine your:

- Eligibility criteria
- Search strategy
- Analysis of the results
- Interpretation and presentation

Types of review questions

- **Intervention review:** compares two or more interventions on a range of different outcomes (or to compare an intervention with no outcome at all)
- **Diagnostic test accuracy review:** assesses how well a diagnostic test performs in detecting a particular disease
- **Prognostic review:** assesses the probable course or future outcomes for people with a specific health problem.
- **Methodological review:** will address questions about how research is conducted and reported.
- **Qualitative review:** synthesises evidence from other sources such as interviews, focus groups etc.

Narrow vs Broad

- Narrow question example:
  - Is aspirin effective in decreasing the risks of a particular thrombotic event, stroke, in elderly persons with a previous history of stroke?
- Broad question example:
  - Are antiplatelet agents effective in preventing thrombotic events in humans?

Narrow vs Broad

Narrow

Advantages:

- Easier to do
- One thing at a time
- Easier to read

Disadvantages:

- May need multiple reviews to answer all the questions or to compare the treatment options

Broad

Advantages:

- More comprehensive
- Allows for variations (that will always be there)

Disadvantages:

- More complex
- Can miss detail
- More difficult

Concepts / PICO

- **Participants:** Who are you interested in studying in your review?
- **Interventions:** What is the intervention or group of interventions you want to test?
- **Comparisons:** What will the interventions be compared to?
- **Outcomes:** What outcomes will tell you which intervention is the most effective?

Where to start?

Steps in conducting a systematic review

- **Define the question:** PICO or similar
- **Scoping/Mapping review:** Is it valid? Has it been done already?
- **Register title:** register the title with a Cochrane Review Group to prevent duplication, see also Joanna Briggs and PROSPERO databases.
- **Plan review:** select your inclusion criteria, identify resources etc.
- **Publish protocol:** Protocols for systematic reviews can be registered with the PROSPERO register
- **Conduct review:** run your search, sift and identify studies, assess for bias and then analyse and interpret their results – write up sections as you go.
- **Publish review:** Choose the most appropriate journal/platform

Searching

You have done your exploratory searches, you have a clearly defined question and you have clear (maybe) published research methodology.

Aim = to create a repeatable search strategy

- **Concepts**
- **Keywords**
- **Test Search**
- **Databases**
- **Additional searching**

Concepts

- Measurement tools for mental health problems and mental well-being in people with severe or profound intellectual disabilities: A systematic review

Psychological Assessments	Mental Health/Well-being	Intellectual Disabilities
(MJSUB.EXACT("Psychological Assessment") OR TI(clinical NEAR/2 (outcome* OR diagnosis OR evaluat*)) OR TI(assess* OR index* OR instrument* OR interview* OR inventor* OR item* OR measure* OR subscale* OR scale* OR screen* OR tool* OR survey* OR self-report* OR test*form OR observ* OR rating* OR rated OR score*) OR TI(validat* OR validity OR reliab* OR accura* OR sensitive* OR specific* OR predictab*))	(SU.EXACT.EXPLODE("Mental Disorders") OR (TI(mental* NEAR/2 (ill* OR well-being OR health* OR disease* OR disorder* OR abnormal* OR patholog* OR problem* OR condition*)) OR AB(mental* NEAR/2 (ill* OR well-being OR health* OR disease* OR disorder* OR abnormal* OR patholog* OR problem* OR condition*))) OR (TI(psych* NEAR/2 (ill* OR well-being OR health* OR disease* OR disorder* OR abnormal* OR patholog* OR problem* OR condition*)) OR AB(psych* NEAR/2 (ill* OR well-being OR health* OR disease* OR disorder* OR abnormal* OR patholog* OR problem* OR condition*))) OR (SU.EXACT.EXPLODE("Depression (Emotion)") OR SU.EXACT.EXPLODE("Anxiety Disorders") OR SU.EXACT.EXPLODE("Personality Disorders")) OR (TI(anger NEAR/3 (problem* OR disorder*)) OR AB(anger NEAR/3 (problem* OR disorder*))) OR (TI(anxiet* OR anxious* OR "gad" OR phobia OR phobic OR traum* OR	(SU.EXACT.EXPLODE("Intellectual Development Disorder") OR (TI(mental* NEAR/3 (disab* OR impair* OR handicap* OR subnormal* OR deficien* OR retard*)) OR AB(mental* NEAR/3 (disab* OR impair* OR handicap* OR subnormal* OR deficien* OR retard*))) OR (TI(learning NEAR/3 (disab* OR impair* OR difficult* OR disorder*)) OR AB(learning NEAR/3 (disab* OR impair* OR difficult* OR disorder*))) OR (TI(moron* OR imbecile* OR feeble*minded OR subnormal* OR retard*) OR AB(moron* OR imbecile* OR feeble*minded OR subnormal* OR retard*)) OR (TI(intellectual* NEAR/3 (disab* OR impair* OR handicap* OR disorder* OR subnormal* OR deficien*)) OR AB(intellectual* NEAR/3 (disab* OR impair* OR handicap* OR disorder* OR subnormal* OR deficien*))) OR (TI((low*functioning OR severe) NEAR/3 autis*) OR AB((low*functioning OR severe) NEAR/3 autis*)) OR (TI("Smith-Magenis" OR Rett* OR "Lesch-Nyhan" OR "Prader-

Keywords

Keywords form the basis of your search. For each of your concepts you will need to find synonyms

- MeSH databases
- Pubmed Reminer
- Other articles
- Database thesaurus

MeSH – Medical Subject Headings

- Neoplasms, Colorectal
- Colorectal Neoplasm
- Neoplasm, Colorectal
- Colorectal Tumors
- Colorectal Tumor
- Tumor, Colorectal
- Tumors, Colorectal
- Colorectal Carcinoma
- Carcinoma, Colorectal
- Carcinomas, Colorectal
- Colorectal Carcinomas
- Colorectal Cancer
- Cancer, Colorectal
- Cancers, Colorectal
- Colorectal Cancers

Create a Test Search

The idea is to create a repeatable search strategy which you can use across different databases. You may want to test the accuracy/robustness of this search.

You can create a 'test search'

- Find about 10 articles in this field
- Your search strategy should return these articles
- If it doesn't then there is something wrong with your strategy
- Compare the abstract text of your article and your keywords and tweak where necessary.

Remember your search will usually only search titles and abstracts unless you tell it otherwise (not recommended!)

Databases

The difference between Medline and PubMed

- **Medline** is the National Library of Medicine journal citation database and includes citations from more than 5200 scholarly journals published around the world. It has more than 25 million references to biomedical and life sciences journal articles back to 1946.

- **PubMed** is an interface for Medline but also includes ‘ahead of publication’ citations and other ‘out of scope’ articles such as astrophysics or plate tectonics which appear in general science and chemistry journals. Also uses different algorithms.

Databases

- **AMED** – Allied and Complementary Medicine 1985 to present
- **CINAHL** - Cumulative Index to Nursing and Allied Health Literature 1981 to present
- **EMBASE** - Excerpta Medica Database 1974 to present
- **EMCARE** - 1995 to present
- **HMIC** - Health Management Information Consortium 1979 to present
- **Medline** - 1946 to present
- **PubMed** - Medline from PubMed 1946 to present

Additional searching

- **Snowballing**

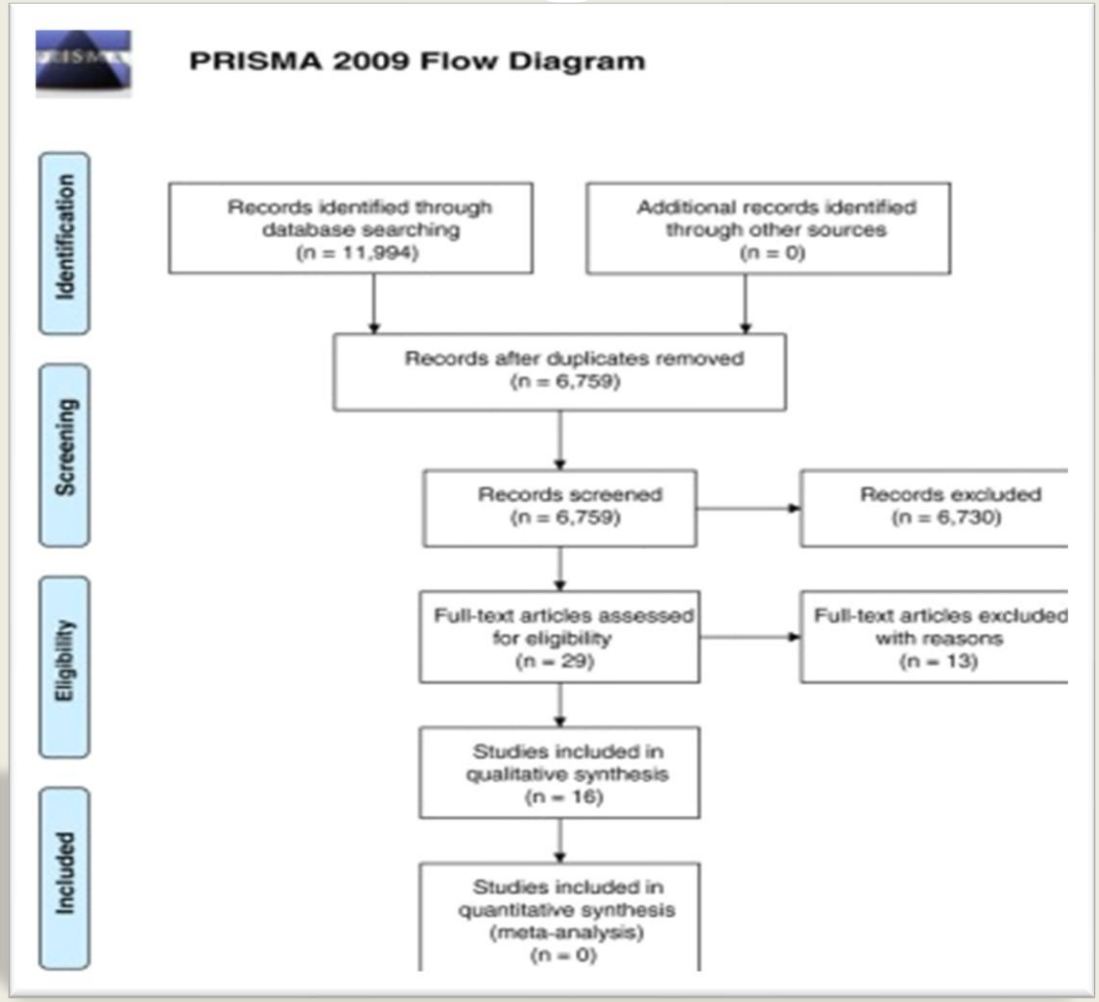
  Use one article to find others (cited by, similar articles etc)
- **Hand searching**

  Looking at ‘table of contents’ in relevant journals (some of the smaller society type journals may not be indexed in the databases) 😱
- **Grey literature**

  Includes: Reports, Conference Abstracts, Dissertations & Theses, Registered Clinical Trials, Interviews, Patents, Newsletters, White Papers, Book Chapters. There is often data in Grey Literature which you won’t find in published sources. By including Grey Literature in your review you will minimise publication bias and will increase the currency and accuracy of your review.
- **Experts**

  Ask an expert for any knowledge of unpublished data

Sifting / PRISMA



Critical Appraisal

Critically Appraise EVERYTHING

- Peer Review isn't what it used to be!
- Academic Publishing is lucrative
- Make sure that the study has answered the question it has asked
- Use a selection tool such as JADAD

CASP provides checklists for each study design

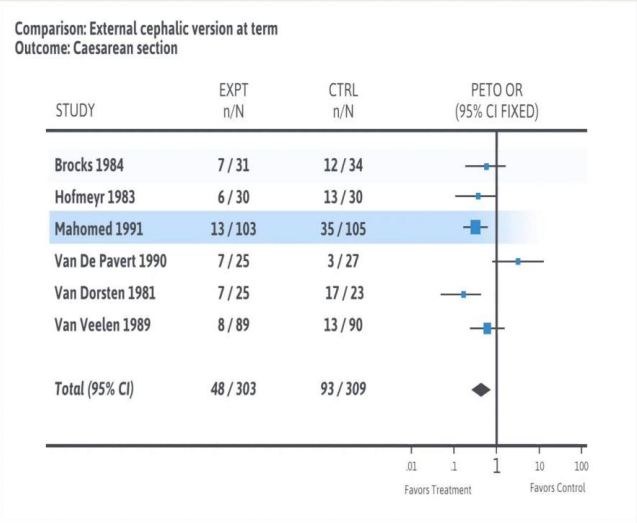
- Check your own statistics
- Do your studies have similar levels of heterogeneity?

Synthesising your results

- Meta-Analysis or Narrative Synthesis?

Meta-analysis statistical tools

Forest Plot



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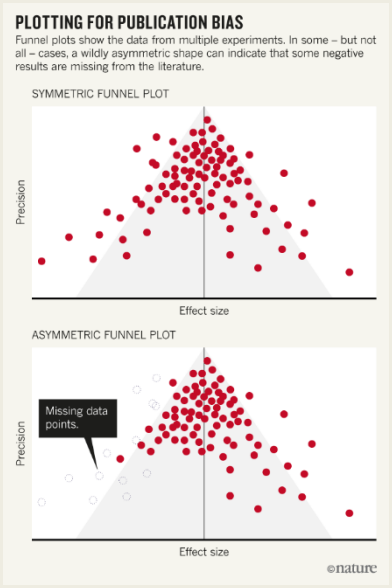

Writing up

Journals will ask you to follow a particular format and will usually give you section headings to conform to such as:

- Title page
- Abstract
- Keywords
- Background
- Methods
- Results
- Discussion
- Conclusion
- List of abbreviations
- Declarations
- References
- Figures, tables and dataset

Getting Published

- Make sure you are submitting to the most suitable journal
- Look at your citations - where have they published?
- Journal type: Subscription model or Open Access?
- Make datasets (your search strategies, search results etc) available or include in your manuscript
- Don’t worry if you get rejected, just try elsewhere…

To conclude….

- Not a linear process – lots of to-ing and fro-ing
- Planning and preparation is everything
- Do your (pre)-research
- Don’t try it alone – *when do you ever see single author SR?*
- Publishing your protocol will make it easier for you to get your review published
- Critically appraise EVERYTHING
- Write as you go…
- Be realistic about publication

Any questions?

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Useful links

- What is a systematic review? (Cochrane)

https://www.cochranelibrary.com

- Developing review questions and planning the systematic review (NICE)

https://www.nice.org.uk/process/pmg6/chapter/developing-review-questions-and-planning-the-systematic-review

- 7 steps to publishing in a scientific journal by By Aijaz A. Shaikh

https://www.elsevier.com/connect/7-steps-to-publishing-in-a-scientific-journal

- PRISMA flow diagram and checklist

http://www.prisma-statement.org/

- BioMed Central submission criteria

https://systematicreviewsjournal.biomedcentral.com/submission-guidelines/preparing-your-manuscript/research

Useful links

- MeSH database

https://www.ncbi.nlm.nih.gov/mesh

- PubMed Reminer

https://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi

- Oxford Quality Scoring System (JADAD)

https://www.rcemlearning.co.uk/modules/critical-appraisal-appraising-a-treatment-early-goal-directed-therapy/lessons/methodology-jadad-scores/topic/jadad-scores/