

Systematic literature review

What it is and how to do one?



What is it?

- A review of the literature based on a documented systematic approach

What is the purpose of a systematic review

- To identify and summarise all existing studies relating to a particular question
- To provide a synthesis of the findings of these different studies

Why not just do a traditional review?

- A well conducted **protocol-driven** comprehensive systematic review is at lower risk of bias and random error than a traditional review
- The collated evidence is thus more valid

Is a systematic review a meta-analysis?

- No
- Meta-analysis is a statistical technique for combining the data from different studies to provide estimates of overall effects
- Meta-analysis can provide more precise effect estimates than those from individual studies

How can systematic review evidence be used?

- To provide a description of the current state of knowledge
- To bring together consistent research results which may be valid to different populations and settings
- To set out the background for a thesis or grant application
 - Make sure someone hasn't already done what you would like to do!
 - Many grant awarding bodies specifically ask about systematic reviews
- To identify knowledge gaps and opportunities

What are steps to doing a review?

- Define the review question
- Identify studies
 - Apply pre-defined literature search
- Select studies
 - Applying pre-specified inclusion and exclusion criteria
- Extract data
- Critical appraisal and quality assessment
- Synthesis
- Interpret and report

Defining the question

- Think about:
- Study design
- Population
- Intervention/exposures
- Control
- Outcome
- Time

Identifying the studies

- Principle is to cast the net wide using multiple sources
 - Electronic bibliographic databases
 - Experts
 - Internet
 - Hand searches
 - Reference lists
 - Research registers
- Be systematic
- Use a protocol
 - transparency
- Follow from the review question

Selecting the studies

- Specify inclusion and exclusion criteria in the protocol
- Be mindful of the risk of selection bias
 - Try to be specific avoiding vague or ambiguous criteria
 - Think carefully about restrictions (eg language)

Extracting data

- Design and use a data extraction proforma
- Double screening/data extraction
- Collect information about
 - Study identifiers
 - Eligibility
 - Characteristics
 - Methods
 - Participants
 - Interventions/exposures
 - Outcome measures and results

Critical appraisal and quality assessment

- Process of systematically examining research evidence to assess
 - Validity
 - Results
 - Relevance
-before using it to inform a decision
- Write quality assessment into protocol
 - Newcastle-Ottawa scores
 - Cochrane risk of bias tool

Synthesis, Interpretation and reporting

- Study flow chart
- Study characteristics
- Synthesis
 - Narrative
 - Meta-analysis
- Discussion
 - Key findings
 - Inferences
 - Interpretation in broader context
 - Risk of bias (selection, publication, quality of primary studies)
 - Future research

PRISMA

- Preferred Reporting Items for Systematic Reviews and Meta-Analyses
- Evidence-based minimum set of items for reporting in systematic reviews and meta-analyses.
- <http://www.prisma-statement.org/>

PRISMA checklist



PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	

PRISMA checklist



PRISMA 2009 Checklist

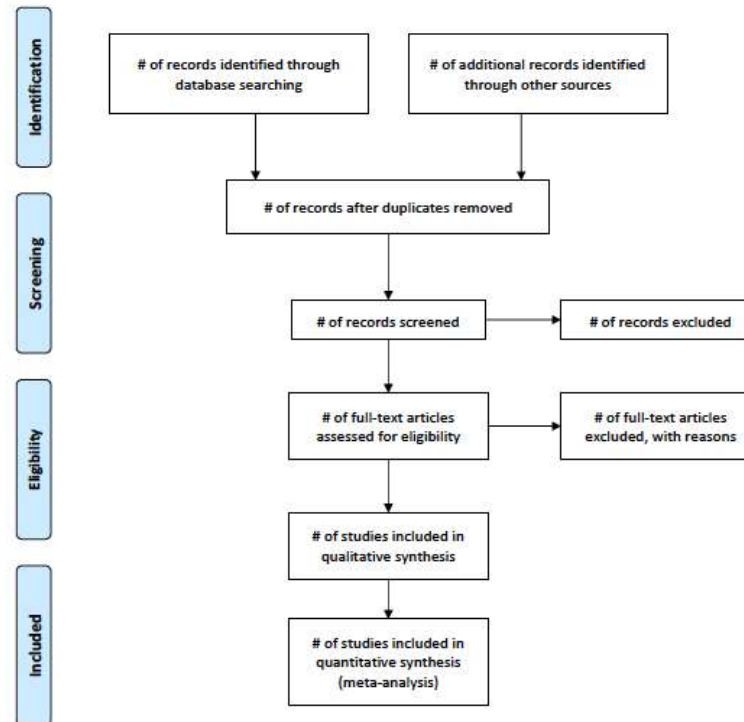
Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Flow diagram



PRISMA 2009 Flow Diagram



Is it a lot of work?

- Yes
- But it is worth it

Making it happen

- Take time to decide if you can commit the time, energy and effort to it
- Take time to find someone else who can do the same!
- Link up with someone who has done a systematic review before
- Work with an international expert in the subject area and mentor if possible

Summary

- Systematic literature reviews are useful tools for many purposes
- They provide a picture of the current state of knowledge that is less prone to bias and random error than traditional reviews
- They can be done with little or no budget but do take time and effort and are best done with someone with systematic review experience