

SLR PRO Series, **Episode 1:**

Systematic Reviews:

REACH the PEAK of EVIDENCE





1

What are systematic reviews?

2

Who uses systematic reviews?

3

How are they conducted?

4

How are they evaluated?

+ 4x Q&A: **Ask YOUR questions!**



edanz.com

Since 1995

- 300+ global experts to support you at all research stages
- Special benefits for Researcher.com users



[learning.edanz.com/
researcher-app](https://learning.edanz.com/researcher-app)

Since 2018

- ExpertBlog
- 30+ e-Courses
- 50+ PDFs and ebooks



tools.edanz.com

Since 2013

- Journal Selector
- MY protocol
- MY manuscript (formerly AuthorPath)

About Dr Victor Popoola

- Physician-epidemiologist
- Over 16 years of experience in medicine, public health, and academic research
- Obtained masters and doctoral education at Johns Hopkins University in Maryland, United States
- >20 peer-reviewed publications
- Owns a services marketplace startup (providing research consulting and other services) – OmniBios Inc.

<https://omnibios.com/>



About Dr Tim Spelman

- Assistant Professor
- a PhD biostatistician and clinician with 20+ years experience in statistics, epidemiology
- one of the world's leading registry/real-world data analysis and pharmaco-epidemiologists
- has authored or co-authored over 250 publications
- currently senior statistician at the Department of Surgery, St Vincent's Hospital and leader of statistics at a several international organizations

**What are
systematic
reviews?**



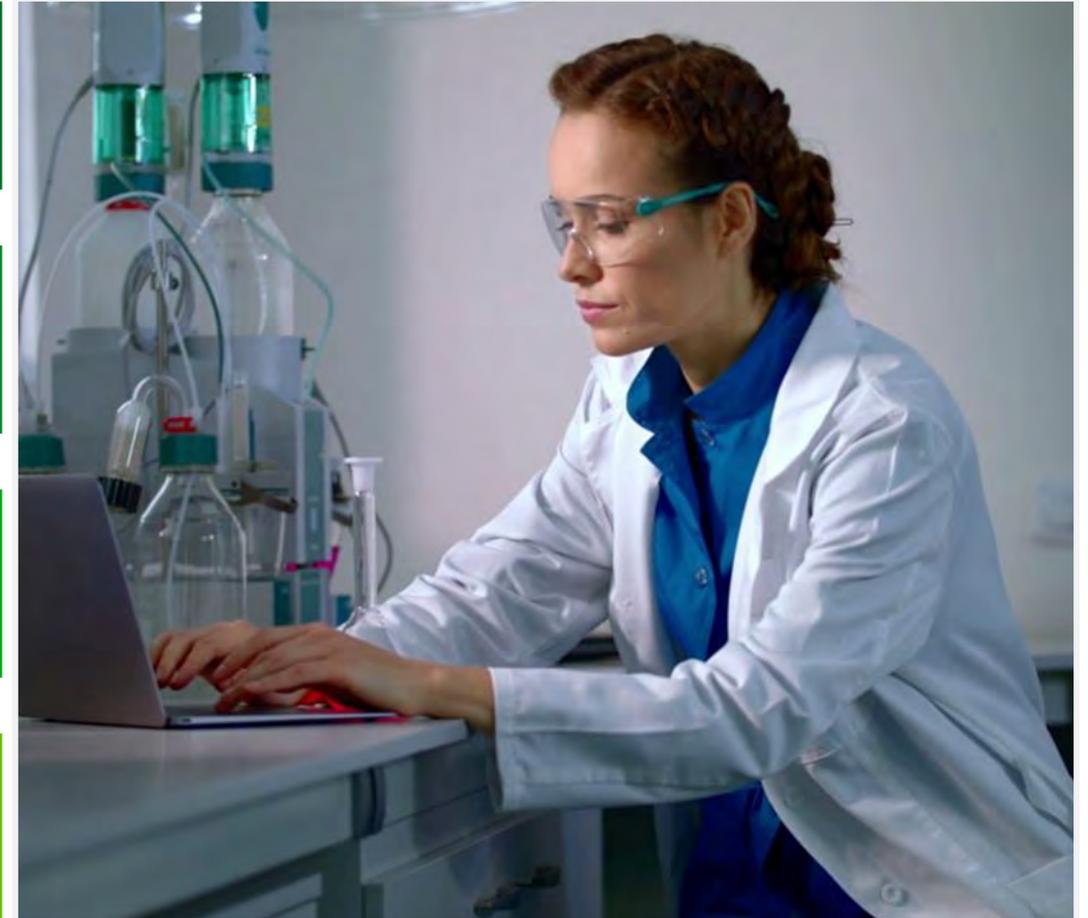
A systematic literature review (“SLR”) is a methodical summary of past research.

“Systematic” means that the review methods are planned in advance, as a protocol

Methods are transparent and repeatable

SLRs are a convenient source of high-level evidence

The names of systematic review study types can vary widely, so check the methods used!



The primary aim of an SLR is to try to answer a specific **question** or need.



In patients aged 70 years or older, how does the administration of an influenza vaccine compared with not administering a vaccine affect the risk of developing influenza during the winter?



The primary aim of an SLR is to try to answer a specific **question** or need. Such research questions often follow the **PICO** (or similar) **framework**:

“In **patients aged 70 years or older**, how does **the administration of an influenza vaccine** compared with **not administering a vaccine** affect the **risk of developing influenza during the winter?**”

PICO:

Patient or Population

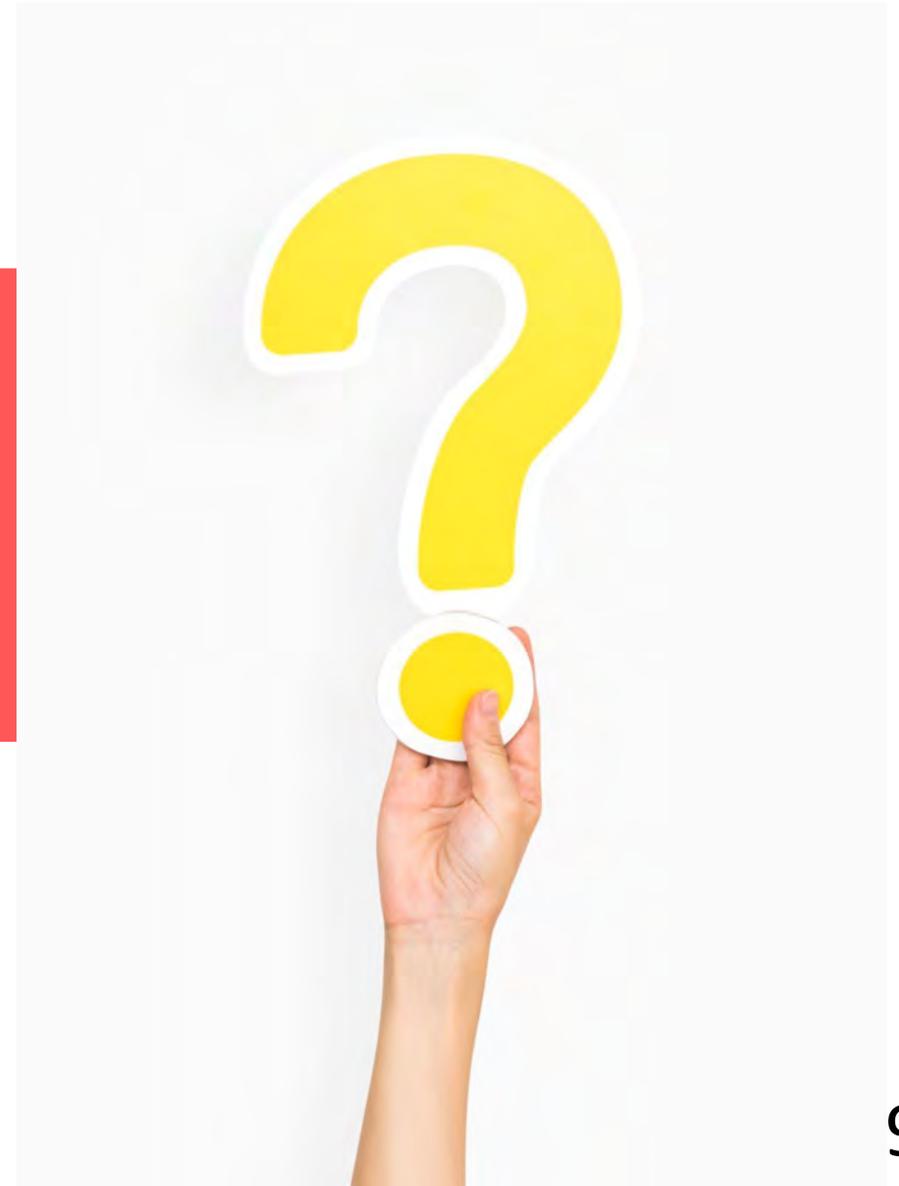
Intervention

Comparator or Control

Outcome

(timeframe or setting)

What's the difference between
systematic and **traditional** literature
reviews?



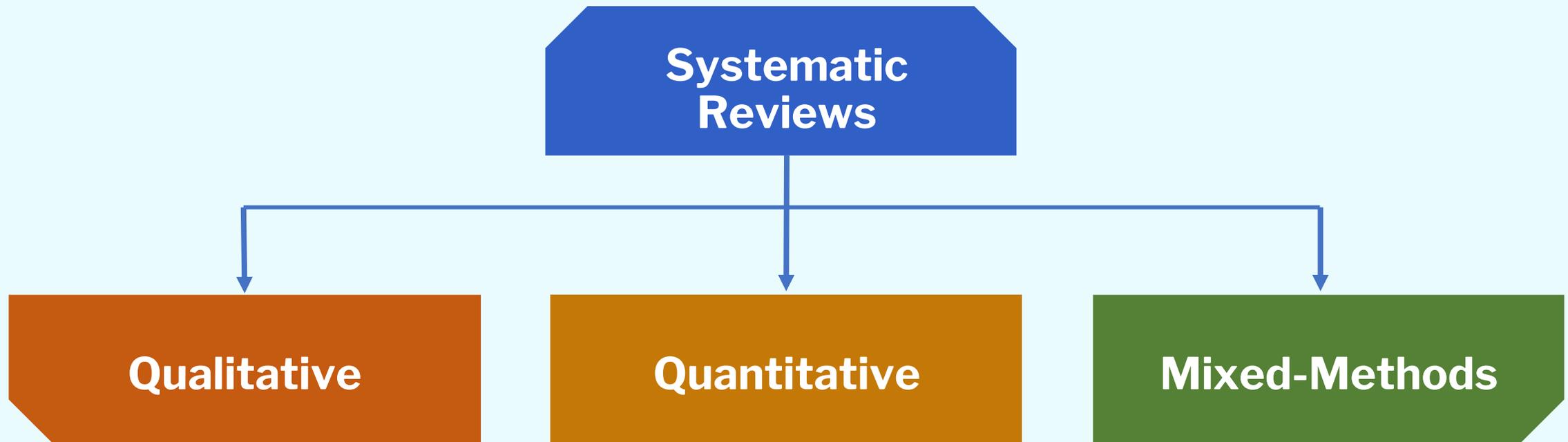
Systematic Literature Reviews

- are methodical
- are repeatable
- are comprehensive
- require at least two authors so that judgments and interpretations can be cross-checked and discussed

Traditional Literature Reviews

- are usually descriptive
- may not include all the available data
- do not analyze the data
- rigorously are commonly performed by one author





Qualitative systematic reviews evaluate, summarize, and interpret data that are not numerical such as descriptive results, observations, texts, and transcripts.

Observational study types:



Interviews



Surveys



Questionnaires



Focus-group studies



Diary studies



Case studies/reports

Quantitative systematic reviews or meta-analyses involve pooling the numerical data from two or more studies and using appropriate statistical tests to analyze the combined data.

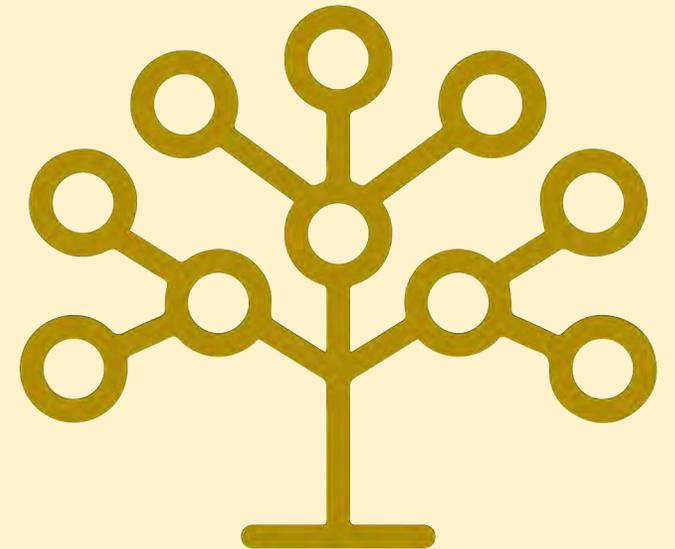
Study types included:



Quantitative case studies/reports/series



Observational epidemiologic studies clinical trials



A “mixed-methods systematic review” or “systematic review and meta-analysis” contains an initial general qualitative summary followed by a sub-analysis of relevant numerical data in a meta-analysis.

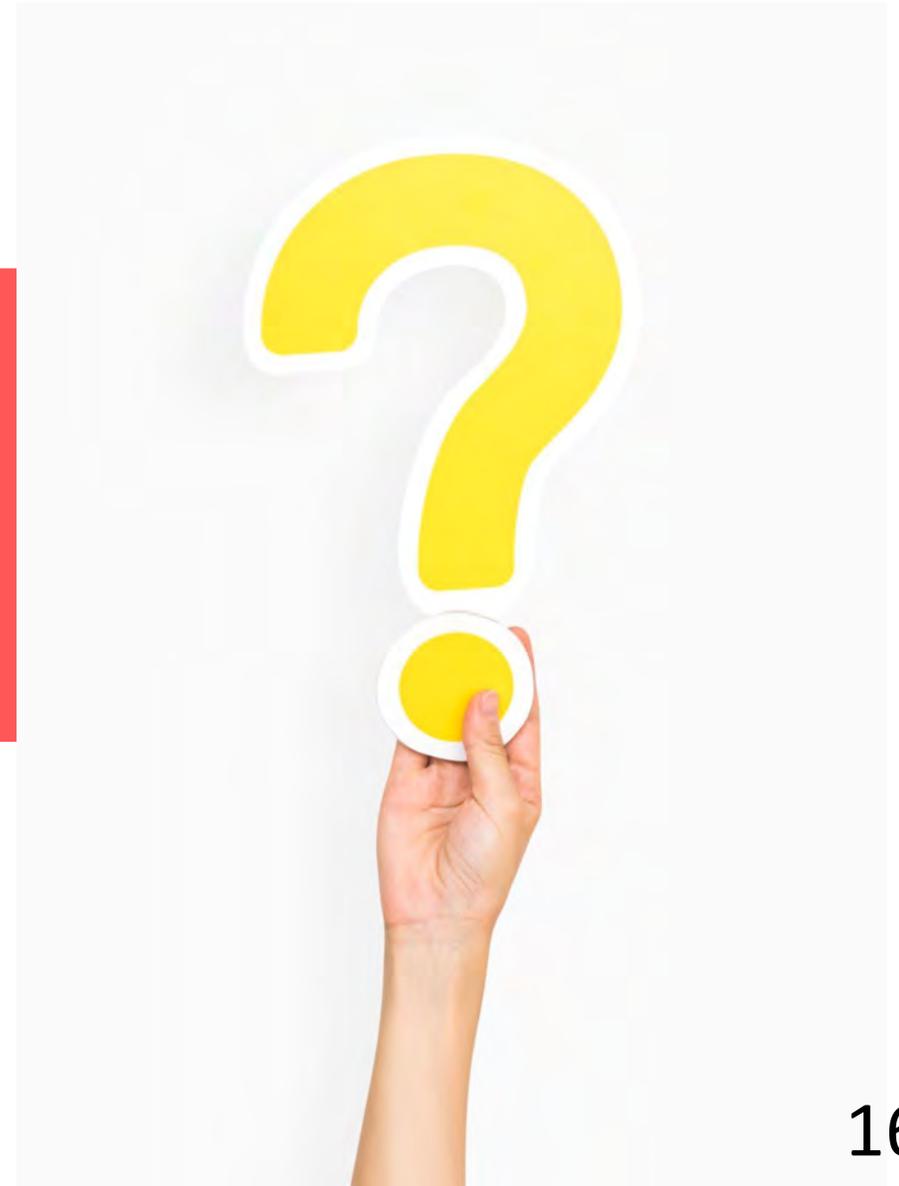




- Diagnostic test accuracy review
- Network meta-analysis
- Umbrella review ('systematic review of systematic reviews')
- Scoping reviews and integrative reviews



What are some of the **advantages** and **disadvantages** of systematic reviews?





- Are comprehensive
- Save time for readers
- Are more reliable and useful than any single study
- Can boost a researcher's career
- Inform “evidence-based” practice and decision-making



- The process may take many months
- An SLR can quickly become outdated
- There may not be enough research in the literature to analyze
- An SLR's quality depends on what has been published in the literature



Dr. Daniel McGowan,
Edanz Science Director



Some studies are biased or simply never published (called “publication bias”) because researchers and journals tend to prefer to publish only ‘positive’ results.



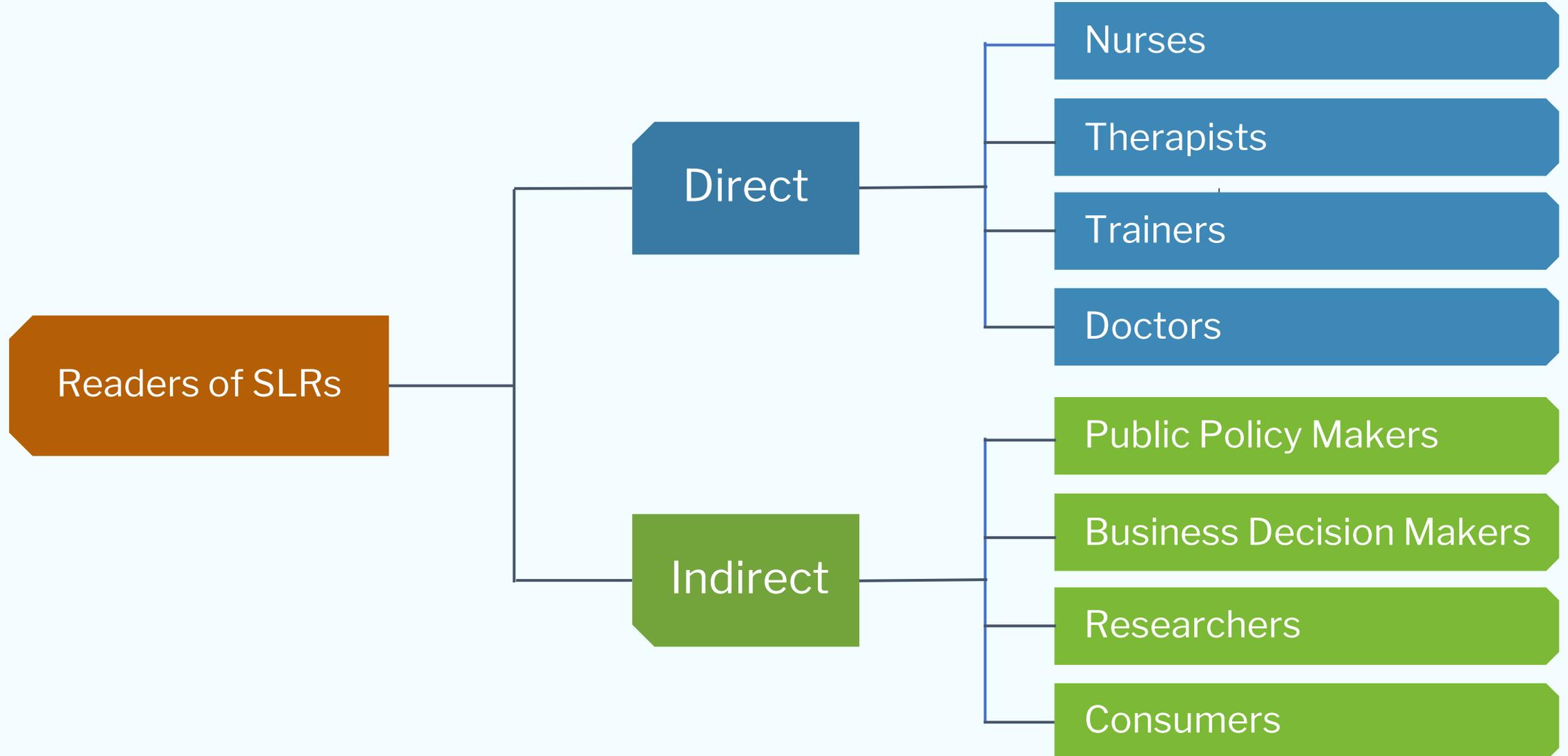
**Ask our
expert
panel!**

Ask us ANYTHING about systematic review types, features, strengths and weaknesses... etc.

Raise your hand to step up to the podium!

Who benefits from
systematic
reviews?





- To find the highest-level evidence
- To make informed decisions about health care provision
- For convenience and reliability
- To contribute to the research community
- For career advancement



Evidence-based practice in health care is the policy to use scientific information in treatment, intervention, support, and advice. It is important in areas such as **medicine, nursing, and dentistry**.

Systematic reviews provide the highest level of research evidence.



HCPs can formally or informally form teams of interested colleagues to perform systematic reviews.

The information may not be up-to-date; providers may need to conduct their own secondary research of new primary research studies.



Databases of systematic reviews for evidence-based practice

- The Cochrane Library (<https://www.cochranelibrary.com/>)
- JBI Evidence-based Practice Database (<https://joannabriggs.org/ebp#database>)
- Campbell Collaboration (<https://www.campbellcollaboration.org/library.html>)
- Turning Research into Practice (<https://www.tripdatabase.com/>).

Some peer-reviewed journals are dedicated to evidence-based practice:

- BMJ Evidence-Based Medicine, <https://ebm.bmj.com/>



**Ask our
expert
panel!**

**Ask us ANYTHING about SLRs,
uses, benefits...
their use in evidence-based practice...**

**Raise your hand to step up to the
podium!**

How are systematic reviews conducted?
What is the basic process?



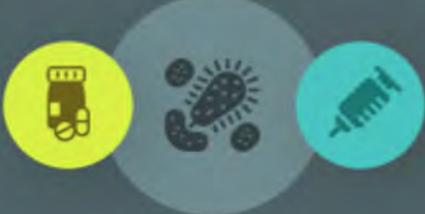
To plan the research question and search strategy:

- **Ask a precise research question**
- **Define eligibility criteria of studies**
- **Decide on search strategy and sources/databases**



**P.I.C.O.T.
question:**

“What is the relative efficacy of treatment X vs. treatment Y for condition Z?”



The synopsis can be used as

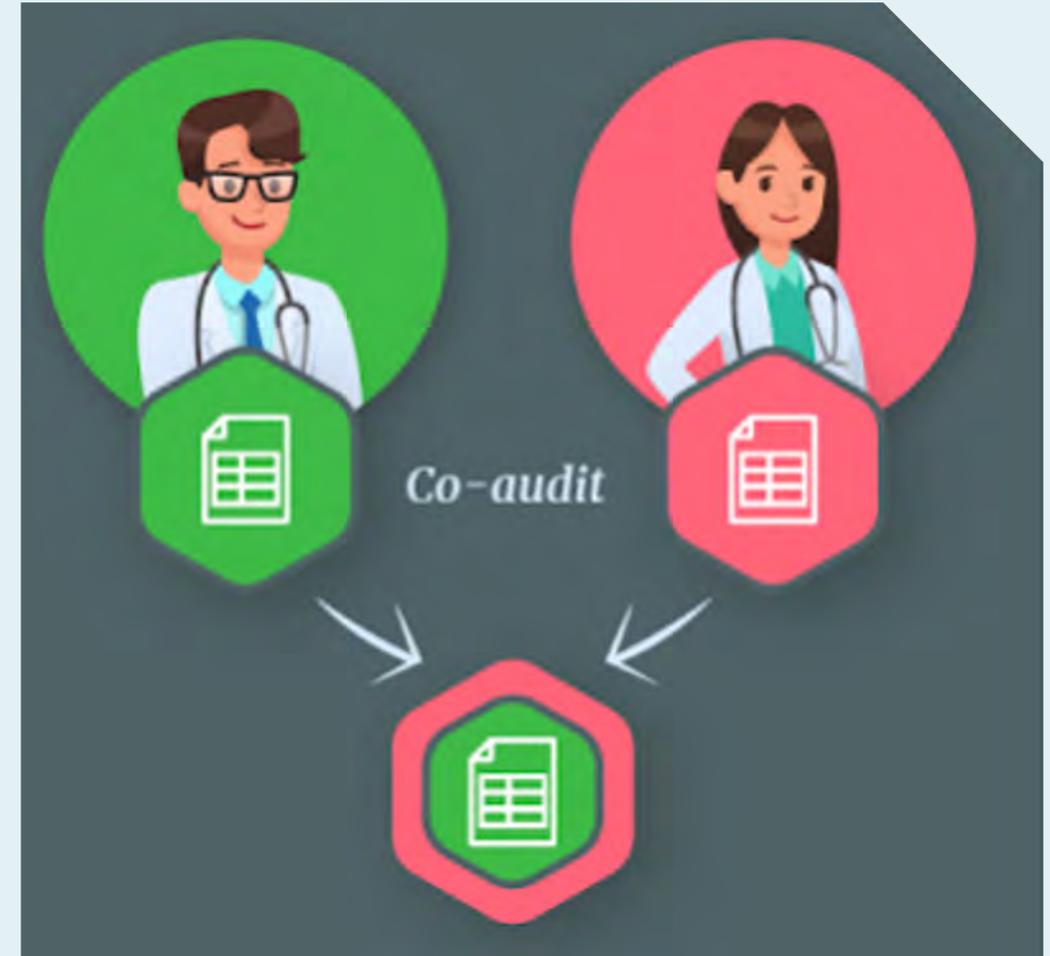
- a **guide for developing the protocol into several other items:**
- a **registered protocol** submitted to an online registry (i.e., PROSPERO)
- a **protocol paper** for posting to a preprint server or publishing in a journal
- a protocol for journal preregistration as a **registered report**
- (after finishing your review) the Introduction and Methods sections of the **manuscript of your final report**

Protocol synopsis:

- *Search terms*
- *Data sources*
- *Incl./excl. criteria*
- *Outcomes of interest*
- *Statistical analysis plan*



- Retrieve and select studies
- Extract relevant data
- Evaluate study quality
- Analyze the data
- Generate forest plots and funnel plots



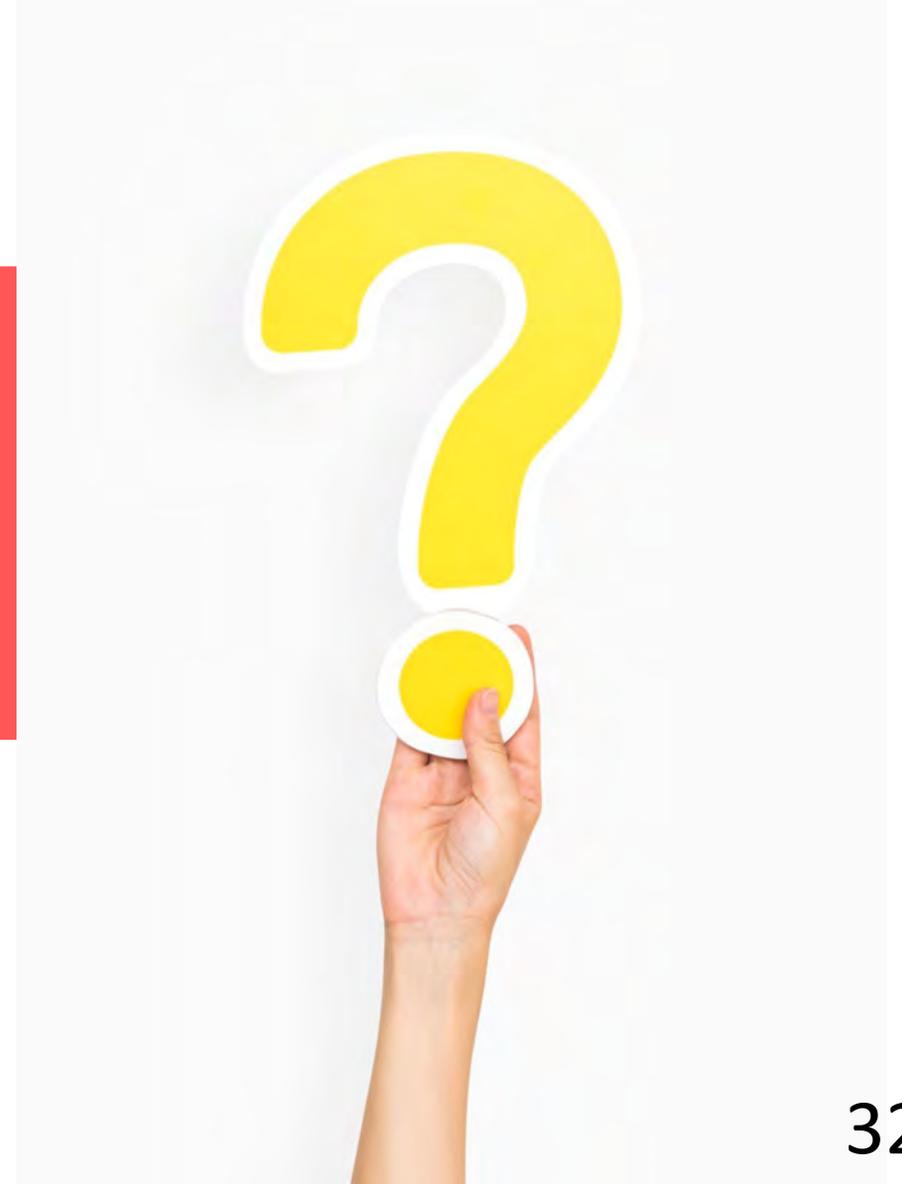
The SLR is published as a report giving a critical summary of the secondary research.

The report follows an IMRaD structure:

- **Introduction**
- **Methods** (with a flow diagram)
- **Results**
- **Discussion**



What are **forest plots** and **flow diagrams**?



What is a forest plot?



A forest plot summarizes the effects (effect sizes) and 95% confidence intervals of individual primary studies that are included in the review.

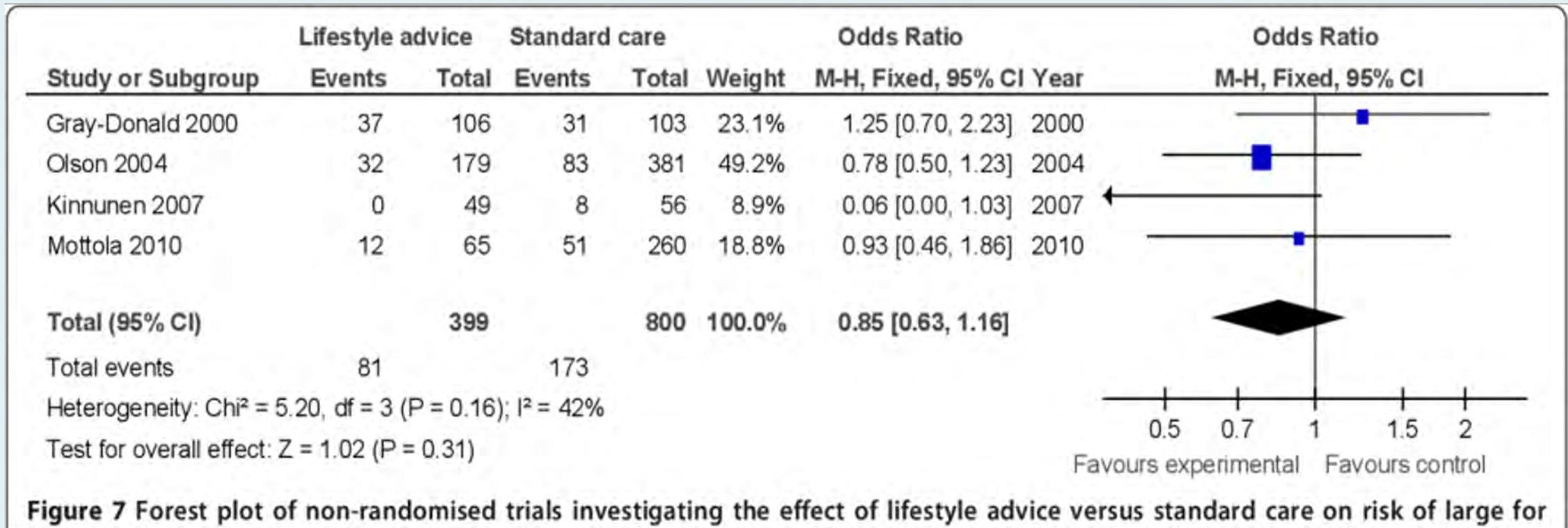


Figure 7 Forest plot of non-randomised trials investigating the effect of lifestyle advice versus standard care on risk of large for

<https://bmcmmedicine.biomedcentral.com/articles/10.1186/1741-7015-10-47>

Oteng-Ntim, E., Varma, R.R., Croker, H., Poston, L., & Doyle, P. (2012). Lifestyle interventions for overweight and obese pregnant women to improve pregnancy outcome: systematic review and meta-analysis. *BMC Medicine*, 10, 47 – 47.

What is a **flow diagram**?

Literature search: Mainstream databases (e.g. MEDLINE, EMBASE) and other databases

Search results
combined (n=154)

Articles screened on basis
of title and abstract

Excluded (n=117)

Devoid of relevant maternal or
infant outcomes
No control group
No lifestyle, dietary, health education
or exercise intervention GDM,
Pre-Pregnancy diabetes or PCOS

Included (n=37)

Full test manuscript review
and application of
inclusion criteria

Excluded (n=18)

Trial protocol (2)
Data not complete (4)
Duplicate publication data (2)
Observational study (1)
Outcome data not relevant (8)
Pilot RCT with small sample size (1)

RCTs (n=13)

Non-RCTs (n=6)

For **systematic reviews** in general and for **meta-analyses of randomized controlled trials**, the relevant guidelines are the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (**PRISMA**) guidelines

For meta-analyses of data from **observational studies**, the Meta-analysis of Observational Studies in Epidemiology (**MOOSE**) guidelines should be used



Ask the Edanz experts!

**Ask our
expert
panel!**

**Ask us ANYTHING about conducting
systematic reviews and writing the
report!**

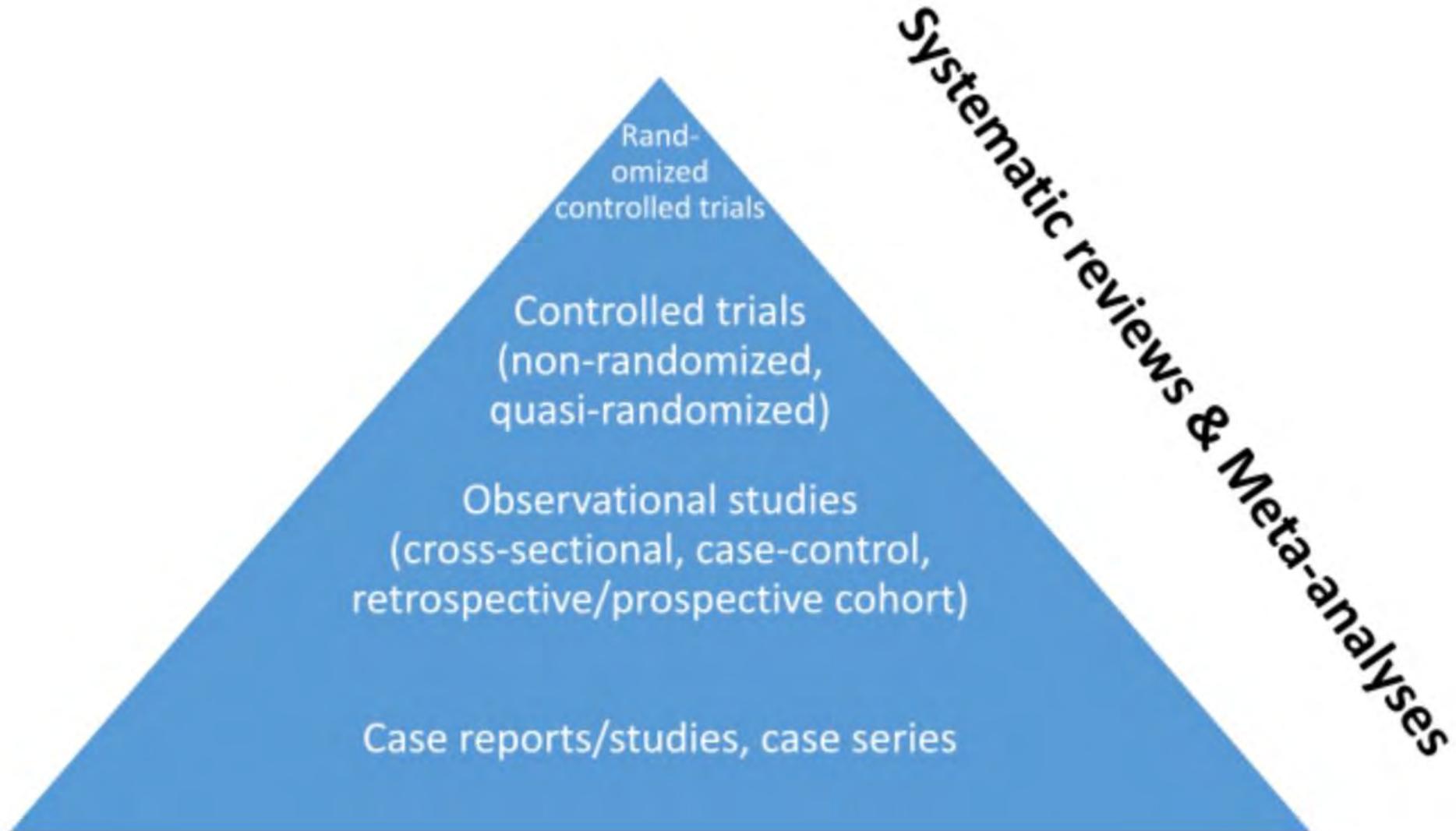
Raise your hand to step up to the podium!

What is the “**evidence pyramid**”?

Why do systematic reviews generally sit **on top** of the pyramid?

...But, can **all** systematic reviews be trusted as high-quality evidence?

The “Evidence Pyramid”



How are systematic reviews **evaluated** for quality?



Table 1. Grading the level of evidence obtained using different study methodologies to answer specific questions

Level of evidence	Study design	Study type
I	Systematic Reviews	Structured review
II	Randomized Clinical trials	Experimental
III	Cohort studies	Observational
IV	Challenge trails	Experimental
V	Case-control studies	Observational
V	Cross-sectional studies	Observational
VI	Descriptive studies, case reports/case series, opinion of respected authorities, reports of expert committees.	Descriptive

**QUICK
TIPS**

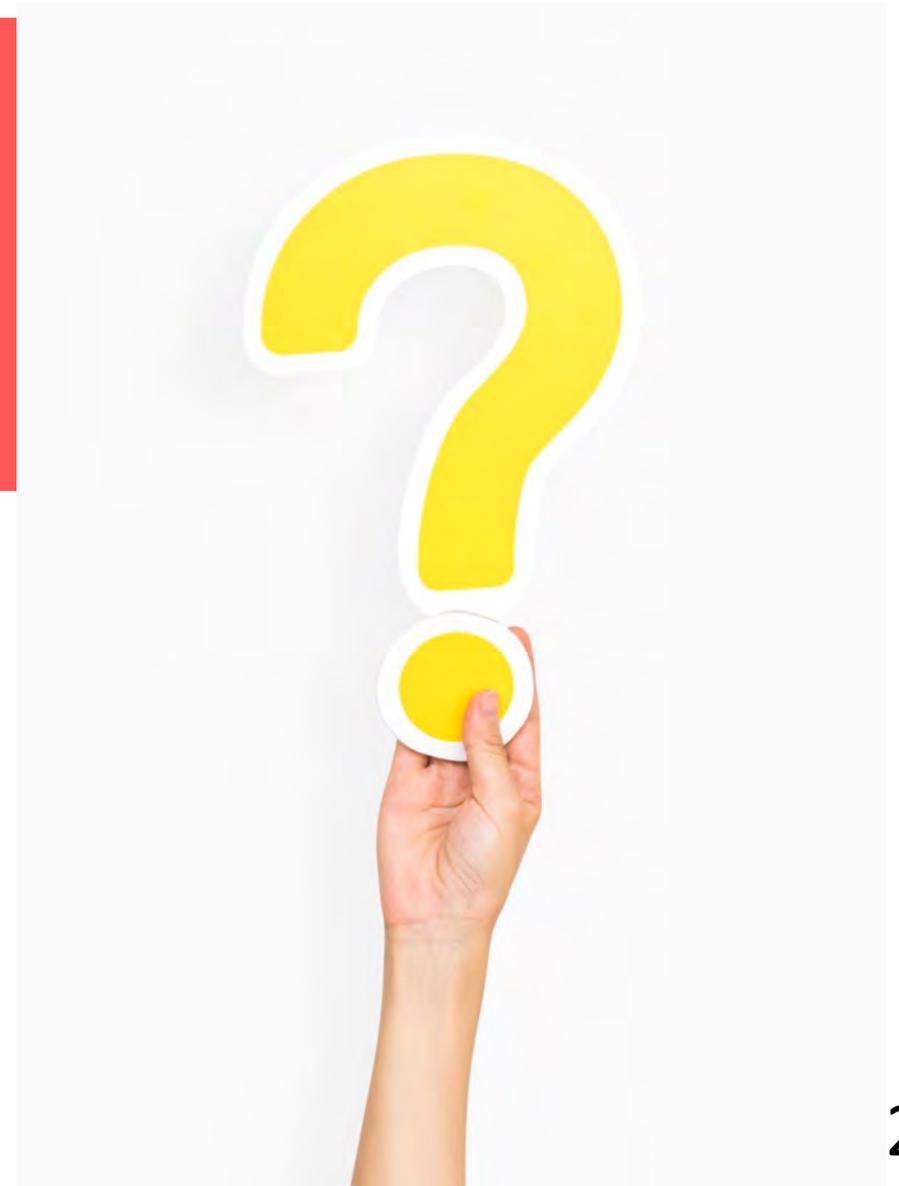
Readers must check the quality of an SLR before applying its conclusions to daily practice.

Randomized controlled trials (RCTs) are the gold standard of experimental studies, but still need to be checked for quality.

PRO TIP: To know what data were actually used in a quantitative SLR, check the methods carefully!

But WHAT should we check for...?

What are some things to look for when checking the **quality** of systematic reviews?



Authors of systematic reviews often use [the GRADE framework](#) when assessing the quality of individual primary research studies in their reviews (and when appraising the quality of their own review).



Assess the quality of a review before relying on its conclusions for practical application.

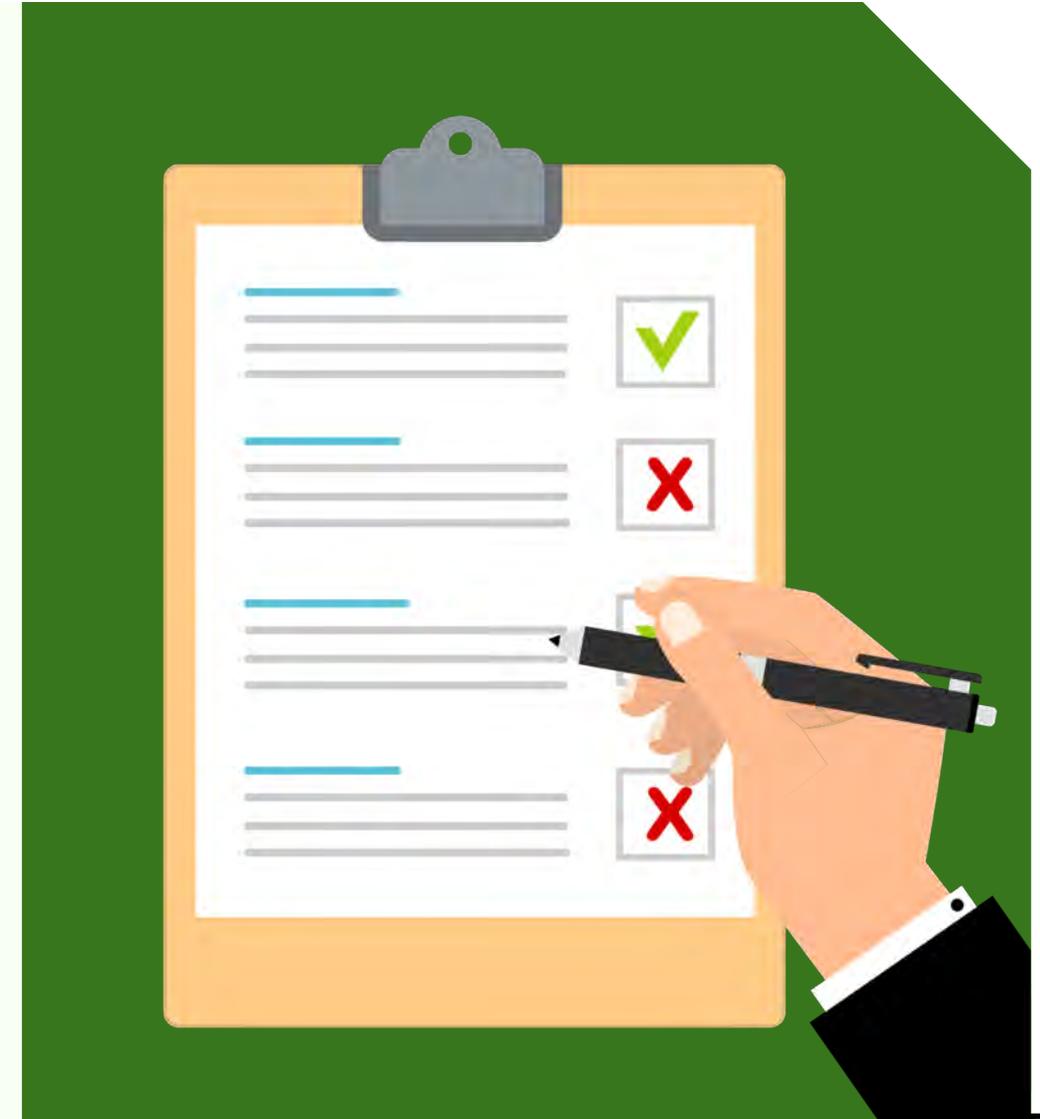
- Was the research question clear and focused?
- Was the literature search comprehensive and up-to-date?
- Can the search be repeated consistently?
- Were the inclusion and exclusion criteria reasonable and clear?
- Were the correct types of studies included?
- Were included studies appraised for their design and quality?



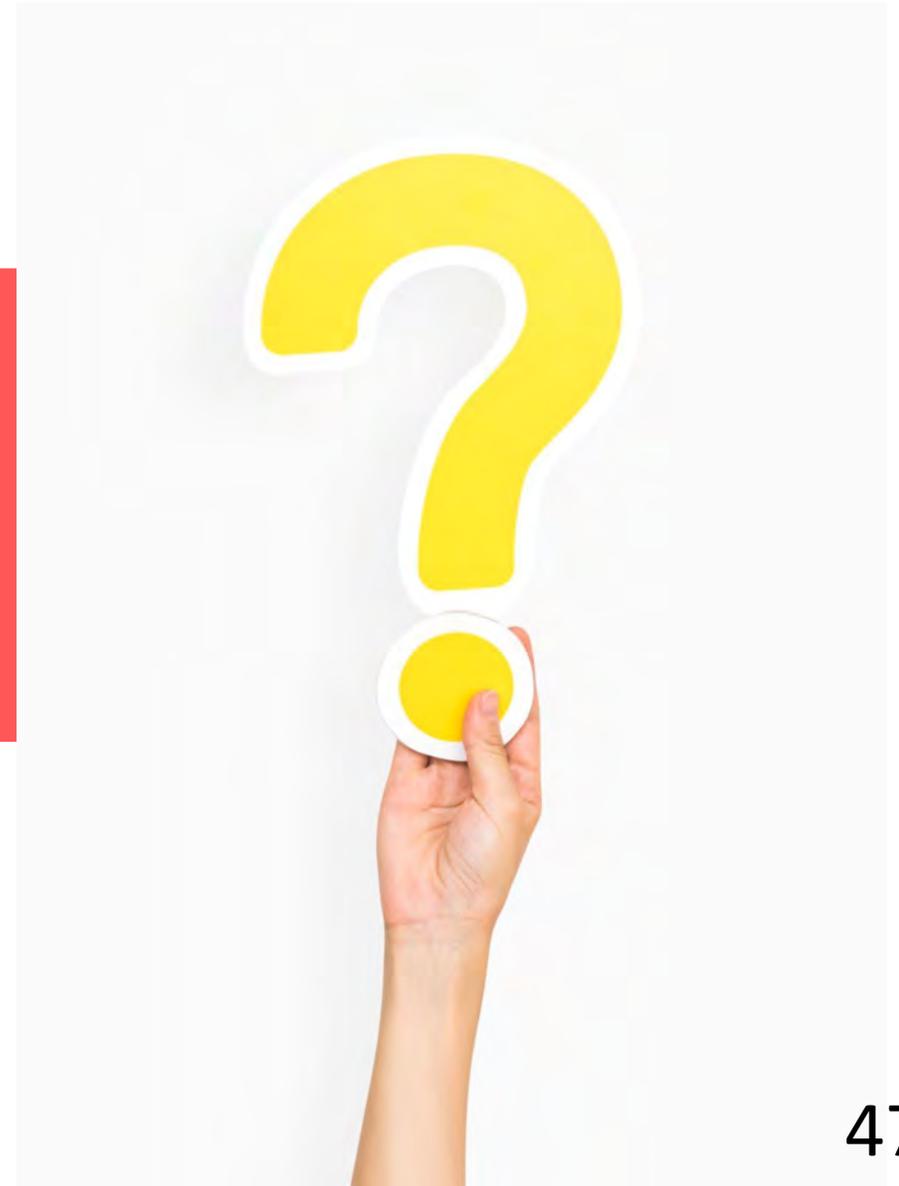
- Are the conclusions supported by the data?
- Is the clinical relevance of the conclusions reported?
- Do the benefits outweigh harms/costs?
- Are the results applicable now?



- Are data pooled, analyzed, and presented appropriately?
- Were additional analyses conducted to test for the degree of study variability (heterogeneity)?
- Is a minority of the studies biasing the results?
- Are the effect size (size of the effect of an intervention) and precision reported?



What are some examples of bias or conflicts of interest that might appear in systematic reviews?



Bias:

- Publication bias
- Hypothesizing after the results are known (HARK)
- **p** hacking or fishing trips/expeditions
- Cherry-picking and data manipulation

Conflicts of interest: :

- Financial
- Non-financial



https://amstar.ca/Amstar_Checklist.php

- Protocol for the systematic review was preplanned and registered before the start of the review (item 2)
- The literature search was adequate (item 4)
- Excluded studies were listed and their exclusion was justified (item 7)
- Included studies were assessed for risk of bias (item 9)
- Methods used in any meta-analysis were appropriate (item 11)
- Risk of bias was accounted for when interpreting the results of the review (item 13)
- Publication bias was assessed, and its likely impact was discussed (item 15)

**Ask our
expert
panel!**

Ask us ANYTHING about systematic reviews! Evidence levels... how to check for quality of reviews or individual studies...

Raise your hand to step up to the podium!

Thank you Dr Victor Popoola!

- Physician-epidemiologist
- Over 16 years of experience in medicine, public health, and academic research
- Obtained masters and doctoral education at Johns Hopkins University in Maryland, United States
- >20 peer-reviewed publications
- Owns a services marketplace startup (providing research consulting and other services) – OmniBios Inc.

<https://omnibios.com/>



Thank you Dr Tim Spelman!

- Assistant Professor
- a PhD biostatistician and clinician with 20+ years experience in statistics, epidemiology
- one of the world's leading registry/real-world data analysis and pharmaco-epidemiologists
- has authored or co-authored over 250 publications
- currently senior statistician at the Department of Surgery, St Vincent's Hospital and leader of statistics at a several international organizations

FREE resources: <https://learning.edanz.com/researcher-app>



FREE PDF

learning.edanz.com/ebooks

FREE COURSE

learning.edanz.com/courses



SLR1: Understanding Systematic Reviews

- 🕒 1 hour of self-study
- Rich text and illustrations
- Try-it-yourself activities
- Real-world examples and links