

# Advances in Methods for Overviews of Systematic Reviews

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# Land acknowledgement



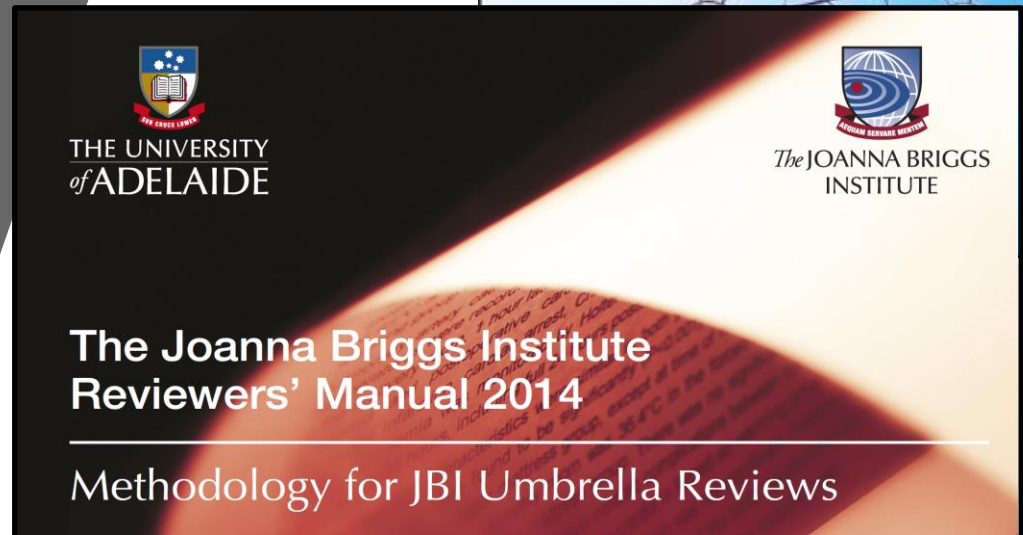
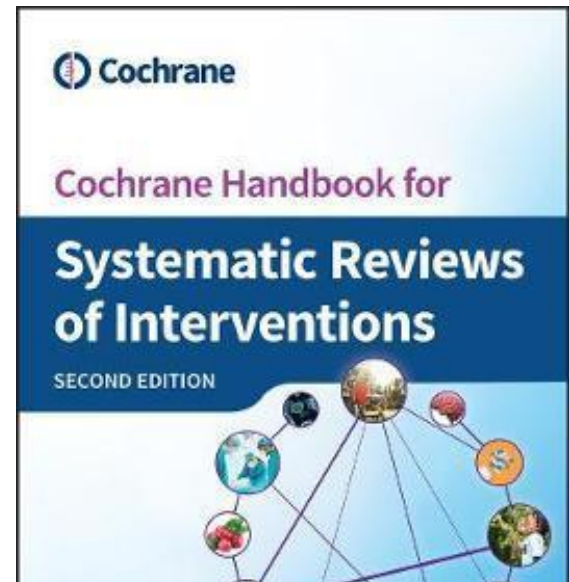
*From left to right): Symbols of Musqueam Indian Band (Salmon), Squamish Nation (Thunderbird) and Tsleil-Waututh Nation (Wolf-Man)*

We have no conflicts of interest

# Learning objectives

1. Cite the prevalence of overviews
2. How to categorise overviews with taxonomy of PICO eligibility criteria
3. Manage overlap in primary study data across systematic reviews (SRs) on the same topic
4. Assess discordance using the Jadad algorithm
5. Report on opinions of decision makers from a survey to determine how they compare and choose amongst competing SRs
6. Aware of the development of WISEST AI tool

# Current methods guidance for overviews



Pollock M, Fernandes R, Becker L, Pieper D, Hartling L. Chapter V: Overviews of reviews. In: Cochrane handbook for systematic reviews of interventions. London: Cochrane; 2020

Aromataris E, Fernandez R, Godfrey C, Holly C, Khalil H, Tungpunkom P. Chapter 10: Umbrella Reviews. In: Aromataris E, Munn Z, editors. Joanna Briggs Institute Reviewer's Manual. Adelaide: The Joanna Briggs Institute; 2017.

# Evidence map of methods for overviews

Lunny et al. *Systematic Reviews* (2017) 6:231  
DOI 10.1186/s13643-017-0617-1

Systematic Reviews

## METHODOLOGY

Open Access



Toward a comprehensive evidence map of overview of systematic review methods: paper 1—purpose, eligibility, search and data extraction

Lunny et al. *Systematic Reviews* (2017) 6:231  
<https://doi.org/10.1186/s13643-017-0617-1>

Systematic Reviews

## METHODOLOGY

Open Access

Toward a comprehensive evidence map of overview of systematic review methods: paper 2—risk of bias assessment; synthesis, presentation and summary of the findings; and assessment of the certainty of the

the results of  
n their infancy.  
difficult to determine

Pollock et al. *Systematic Reviews* (2019) 8:335  
<https://doi.org/10.1186/s13643-019-1252-9>

Systematic Reviews

## PROTOCOL

Open Access

Preferred Reporting Items for Overviews of Reviews (PRIOR): a protocol for development of a reporting guideline for overviews of reviews of healthcare interventions

Michelle Pollock<sup>1</sup>, Ricardo M. Fernandes<sup>2,3</sup>, Dawid Pieper<sup>4</sup>, Andrea C. Tricco<sup>5,6,7</sup>, Michelle Gates<sup>8</sup>, Allison Gates<sup>8</sup> and Lisa Hartling<sup>8\*</sup> 

### Abstract

**Background:** Overviews of reviews (i.e., overviews) compile information from multiple systematic reviews to provide a single synthesis of relevant evidence for healthcare decision-making. Despite their increasing popularity, there are currently no systematically developed reporting guidelines for overviews. This is problematic because the



ny<sup>1</sup>, Sue E. Brennan<sup>1</sup>, Steve McDonald<sup>1</sup> and Joanne E. McKenzie<sup>2\*</sup>

**Background:** Overviews of systematic reviews (SRs) attempt to systematically retrieve and summarise the results of systematic reviews. This is the second of two papers from a study aiming to develop a comprehensive evidence map of the methods used in overviews. Our objectives were to (a) develop a framework of methods for

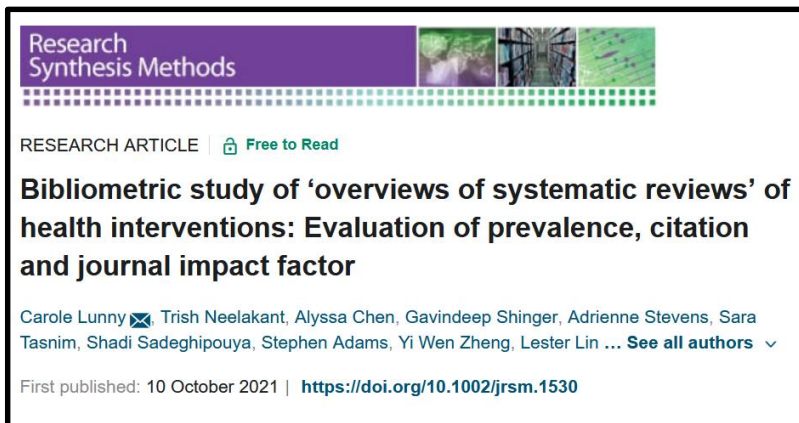


# What is the prevalence of overviews and are they growing in number?

Authors: Carole Lunny, Emma K. Reid, Trish Neelakant, Alyssa Chen, Jia He Zhang, Gavindeep Shinger, Adrienne Stevens, Sara Tasnim, Shadi Sadeghipouya, Stephen Adams, Yi Wen Zheng, Lester Lin, Pei Hsuan Yang, Manpreet Dosanjh, Peter Ngsee, Ursula Ellis, Beverley J. Shea, James M. Wright

# Background

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- Bibliometric analysis measures the impact of articles using metrics such as the Journal Impact Factor (JIF) and number of citations
- Overviews have been growing but unknown to what extent
- Evidence syntheses receive a higher citation rate compared to other study designs; but typically represent 4–6% of research output
- Unclear whether overviews are cited equally as highly as systematic reviews

# Objectives

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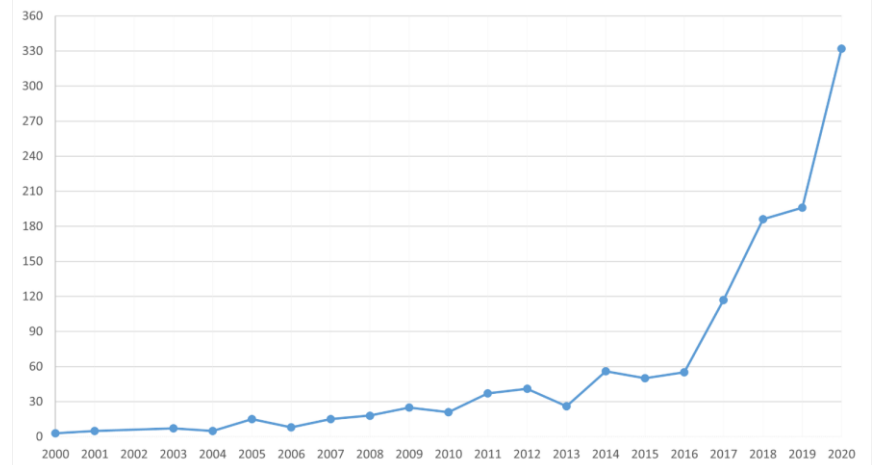
- Assess prevalence of overviews (published between 2000-2020)
- Evaluate their citation rates and journal impact factors



# Results

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- 1218 overviews published from 2000 to 2020
- The majority (73%) published in the most recent 5-year period
- 332 overviews published in 2020, which is equivalent to one overview published per day
- Majority had 4 to 6 authors on the team
- Took on average 1.6 years to produce from search date to publication



# Journal Impact Factors (JIF) and citations

Journal characteristic	Category	Summary data
Number of journals		307
Journals	Cochrane Database of Systematic Reviews	44 (8%)
	PLOS ONE	16 (3%)
	Sao Paulo Medical Journal	12 (2%)
	Journal impact factor	
	0.01 - 1.99	153 (29%)
	2.0 – 3.97	216 (41%)
	4.0 – 6.96	61 (11%)
	7.0 – 12.79	79 (14%)
Citations	13.6 – 59.1	23 (4%)
	Median (IQR)	2.8 (1.9-4.6)
	Median (IQR)	8.5 (3.5-18.3)

- 541 (2000-2018) overviews published in 307 journals
- Most prevalent: *the Cochrane Database of Sys Reviews* (8%), *PLOS ONE* (3%) and *Sao Paulo Medical Journal* (2%).
- Median citation count of 8.5 per year / overview
- 70% with JIFs between 0.05 and 3.97
- Overviews with high citation rates and JIFs had:
  - Group authorship
  - Large sample sizes
  - Open access
  - Reported funding

# Conclusions

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- 20-year bibliometric study across 307 journals
- 8-fold increase = popularity and demand
- 1 overview published per day
- Overviews perform above average for the journals in which they publish
- Citation analysis and impact factor metrics can quantify, compare, and communicate the influence of overviews of reviews



# Are overviews being published on the same topic?

**Authors:** Carole Lunny, Emma K. Reid, Trish Neelakant, Alyssa Chen, Jia He Zhang, Gavindeep Shinger, Adrienne Stevens, Sara Tasnim, Shadi Sadeghipouya, Stephen Adams, Yi Wen Zheng, Lester Lin, Pei Hsuan Yang, Manpreet Dosanjh, Peter Ngsee, Ursula Ellis, Beverley J. Shea, James M. Wright

# Background

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- Volume of systematic reviews published which are overlapping in content is high
- It is not known whether overviews of reviews are overlapping in content
- Multiple overviews conducted on the same topic (“overlapping overviews”) represent a waste of research resources
- Can confuse clinicians making decisions amongst competing treatments.



# Objectives

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- Categorise overviews as being narrow or broad in scope
- Assess if overviews overlap in PICO eligibility criteria
- Categorise overlap as identical, nearly identical, partial, or subsumed

## Narrow Overview

Population or  
Condition

1

AND

Intervention  
or Comparison

1

AND

Outcome(s)

$\geq 1$

## Broad Overview

Population(s) or  
Condition(s)

$> 1$

AND/OR

Intervention(s)  
or Comparison(s)

$> 1$

AND

Outcome(s)

$\geq 1$

- 1 population only:  
*broad overview with targeted population*
- 1 intervention only:  
*broad overview with targeted intervention*
- $>1$  population and  $>1$  intervention: *non-targeted broad overview*

Aim to answer narrow clinical questions

Identify and explore reasons for variation in SR results, interpretation, or conclusions

Can be completed more quickly

Less generalizable to different populations and settings

Aim to answer broad questions

Wider range of study populations, conditions, interventions, and contexts

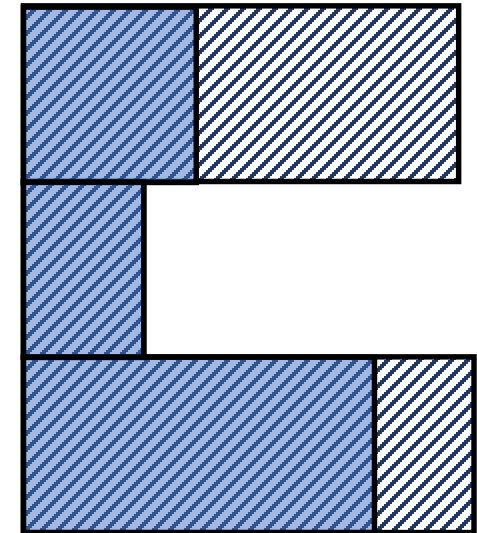
More resource intensive

Allow for policy relevance

## We defined topic overlap broadly as

- duplication of PICO eligibility criteria
- not an update
- not a replication

## Subsummation:



## Our taxonomy of 4 types of overlap

- Identical: PICO and aims were identical to another overview
- Nearly identical: PIC and one outcome were identical to another
- Partial: One component of PICO in common
- Subsumed: full scope of PIC and one outcome was fully covered by a second (broader) overview

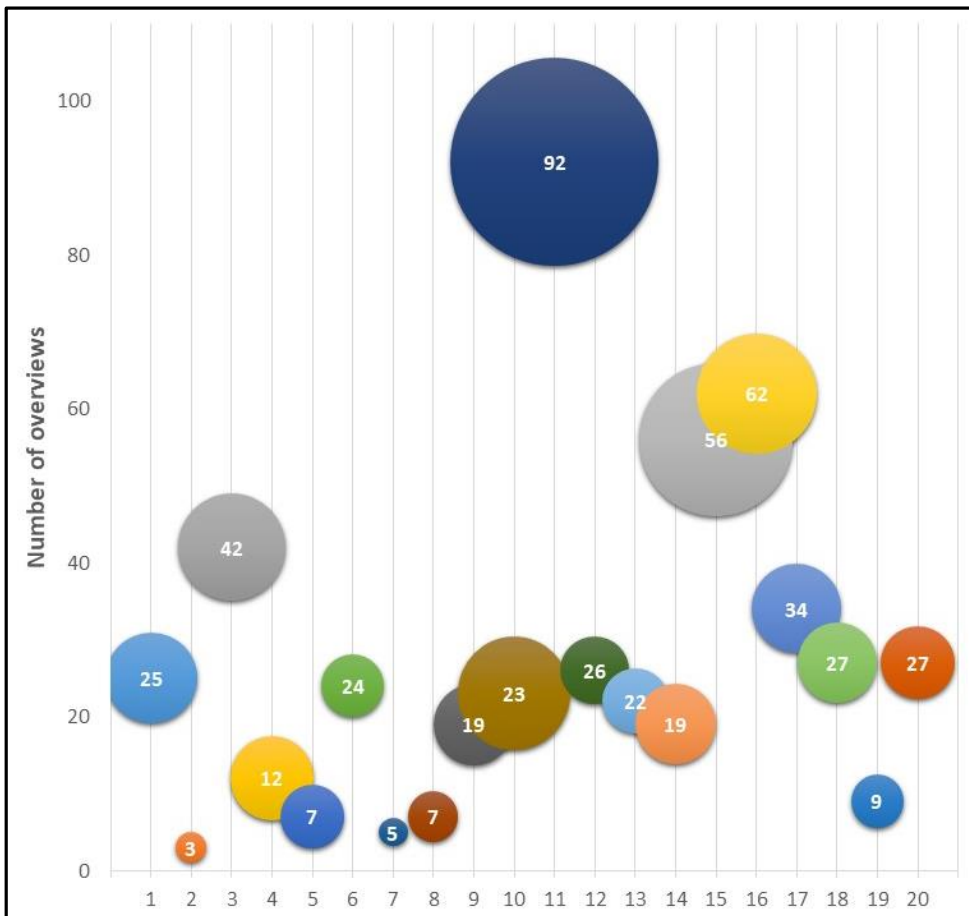


# Valid reasons for topic overlap

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- **Observed overlap in overviews can be justified for several reasons:**
  - **Differences in purpose**
  - **Out-of-dateness/ Emergence of new evidence**
  - **Inappropriate/invalid methods used**
  - **Low methodological quality**
  - **Existing overviews are narrow, therefore broader overview warranted**
  - **Replication by independent and conflict-free academics**

# Prevalence of overlap



541  
overviews  
examined

169 (31%) overlapped across  
similar PICO

20/22 WHO ICD-10 medical  
classifications

Overlap  
prevalence  
(n = 169)

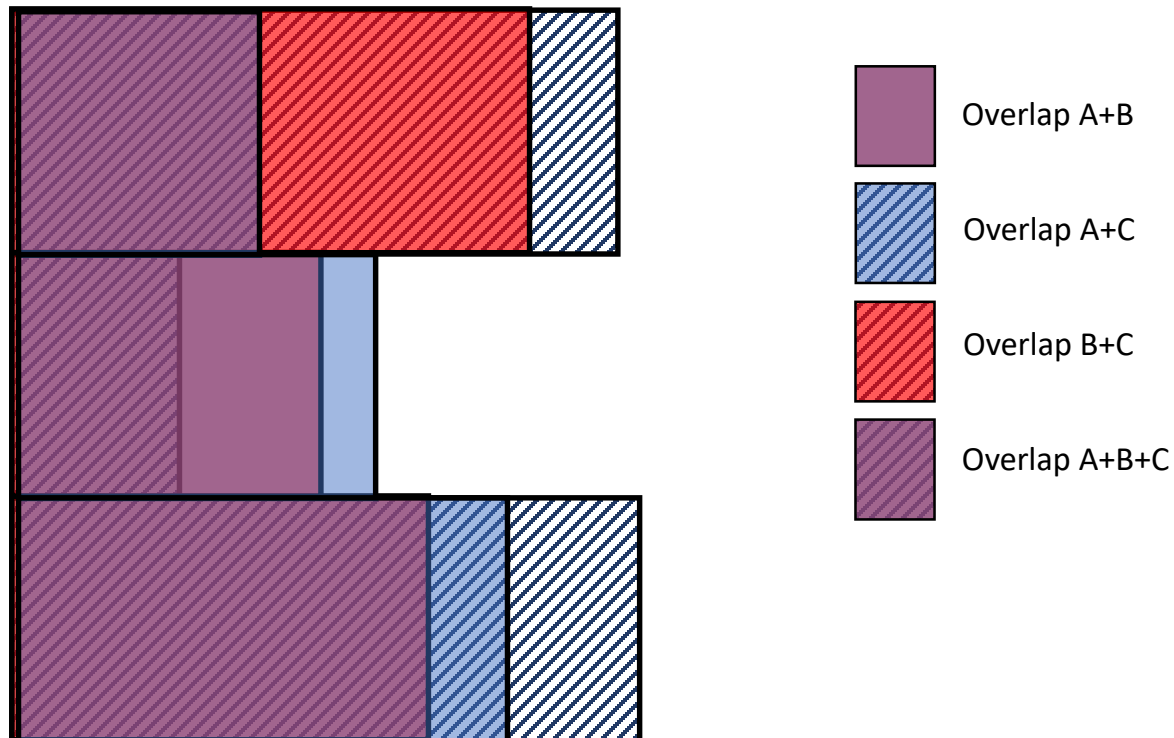
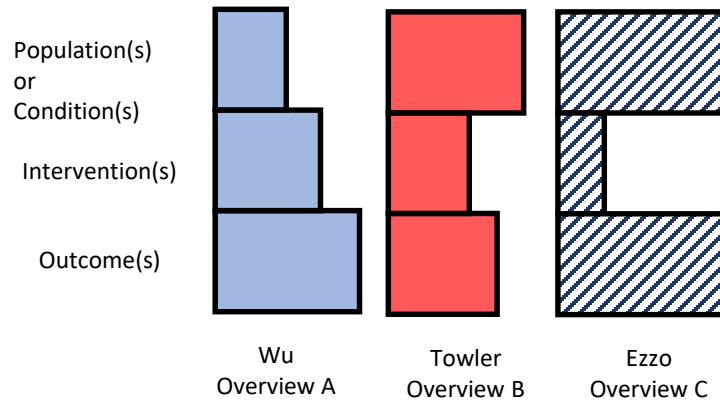
0 with identical aims and PICOs

15 (9%) nearly identical overlap

123 (73%) partial overlap

31 (18%) subsumed others

# Example of partial overlap: Acupuncture for palliative cancer



# Conclusions

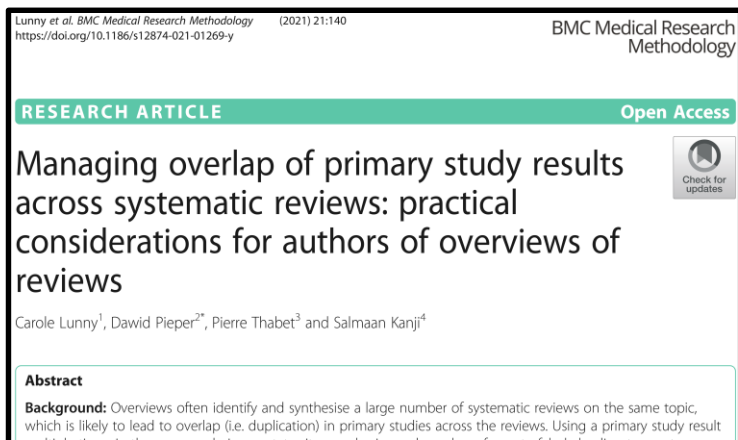
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- 31% of 541 overviews (2000-2018) overlapped across 20 WHO ICD-10 medical classifications and 62 subtopics
- Unnecessary overlap identified
- Taxonomy of overlap can be used across overviews, or systematic reviews
- Future research into overlap in other study types using our taxonomy is needed
- No dedicated registry for protocols of overviews and no MeSH term for overviews
- Authors can use our open access sample to identify topics that are already covered, and gaps in the evidence

# How to handle overlap in primary study data across systematic reviews (SRs) on the same topic



Authors: Carole Lunny, Dawid Pieper, Pierre Thabet and Salmaan Kanji



	Mitchell 2007	Henry 2008	Gray 2011	Nuyen 2018
Review 1	✓	✓		✓
Review 2	✓	✓	✓	✓
Review 3		✓	✓	

**Fig. Example of 3 SRs included in an overview**



# Background

## WHY IS OVERLAP A PROBLEM?

- Using a primary study result (ie. effect estimate) multiple times in the same analysis overstates its sample size and number of events, falsely leading to greater precision in the analysis

## HOW TO MANAGE OVERLAP?

- Select one SR based on eligibility criteria
- Visually and quantify overlap
- Select one SR at the data analysis stage

# Lesson learned

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- Approaches to manage overlap were illustrated using six case studies
- No one standard methodological approach to deal with overlap
- Overlap should be dealt with at the outcome level
- Choosing one review eliminates overlap but it may not represent the totality of evidence on the topic, and a loss of data may result.
- Examining potential reasons for different results or conclusions across reviews with high overlap can be highly informative and may resolve the overlap



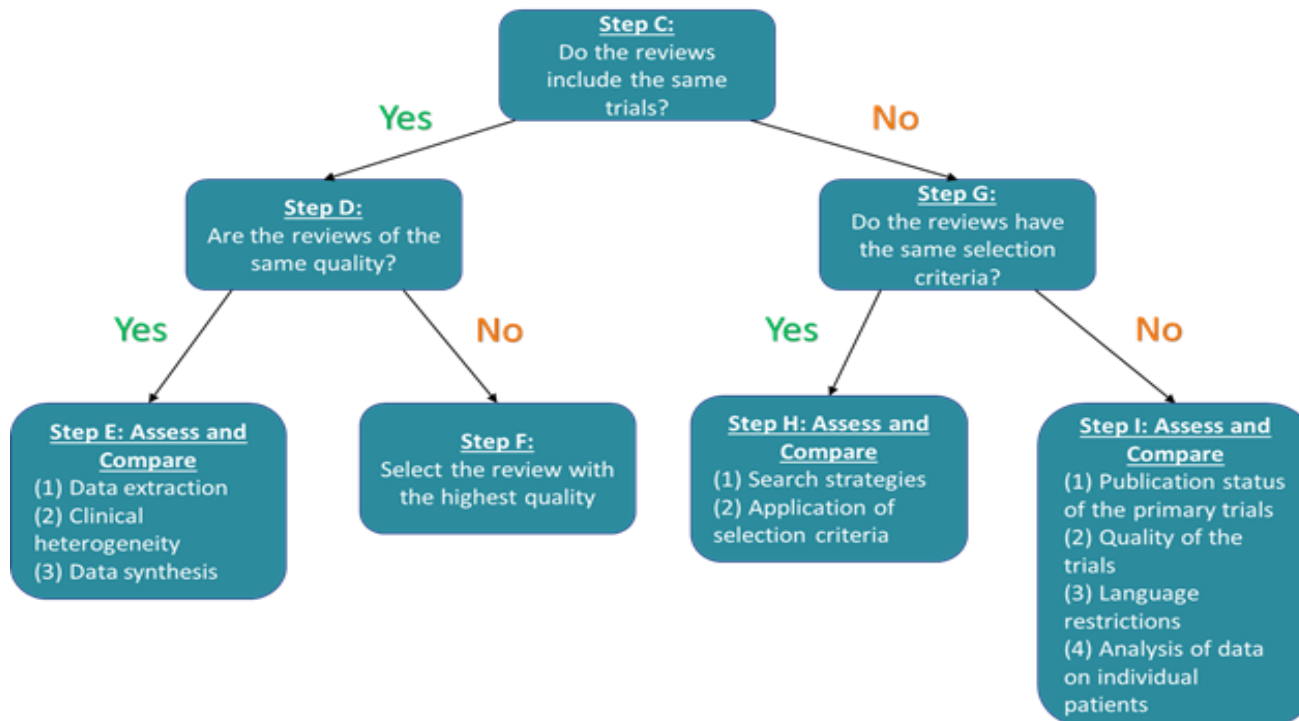
# Replication of the Jadad algorithm to assess discordance

Lunny, C., Whitelaw, S., Chi, Y., Zhang, J., Ferri, N., Kanji, S., Pieper, D., Shea, B., Veroniki, A-A., Arden, C., Pham, B., Reid, E.K., Bagheri, E., Tricco, A.C.



# Background

- Overlapping SRs are found on the same clinical, public health, or policy questions
- Conflicting results and/or confuse decision makers
- Algorithm published in 1997 by Jadad et al



# Objectives

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- Determine if the same SR(s) would be Identify Discordant Reviews that used the Jadad algorithm to address discordance;
- Replicate Jadad assessments done by authors to chosen

## Definitions

- **Discordance is when SRs with identical or nearly identical clinical, public health, or policy eligibility criteria (as expressed in PICO) report different results for the same outcome.**
- **Discordant reviews aim to assess discordance in results across multiple similar SRs**

# Methods

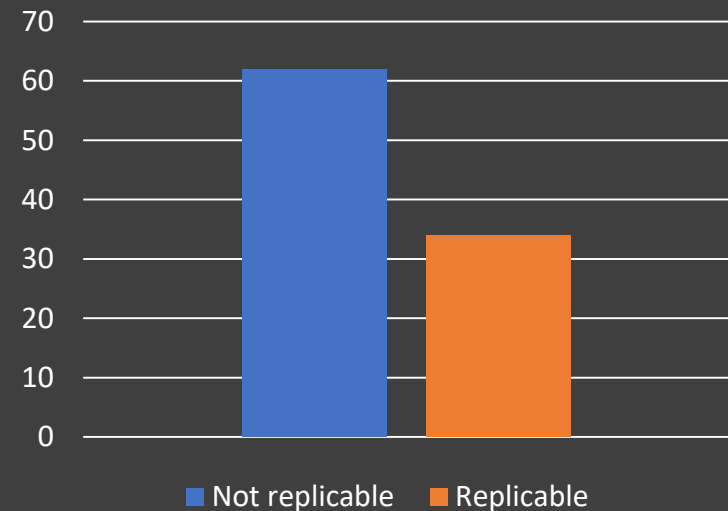
- Searched MEDLINE, Epistemonikos, and Cochrane Database of SRs
- Included any study using the Jadad algorithm with:
  - A minimum of two SRs with a meta-analysis of RCTs
- Two authors independently extracted the primary intervention and outcome
- Blinding process to delete content related to Jadad results

# Results



ST. MICHAEL'S  
UNITY HEALTH TORONTO

- 21 studies included that used the Jadad algorithm
- 62% not replicable and we chose a different SR (Fig.)
- 86% agreed in direction of effect despite 62% of these having chosen a different SR
- Some Jadad algorithm steps were vague in description, making it difficult to operationalise, interpret, and use



# Conclusions

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- Jadad algorithm is not reproducible
- Assess discordance using:
  - ✓ Relevance
  - ✓ Recency
  - ✓ Comprehensiveness (most trials)
  - ✓ Quality/ Risk of bias
- Extensive time, complexity, and expertise needed by researchers to manually assess and compare similar SRs that differ across their results and conclusions

# Survey of decision makers to determine how they compare and choose amongst competing systematic review on the same topic



Authors: Carole Lunny, Sera Whitelaw, Yuan Chi, Janet Zhang, Nicola Ferri, Sal Kanji, Dawid Pieper, Bev Shea, Argie Veroniki, Clare Arden, Ba' Pham, Emma Reid, Ebrahim Bagheri, Andrea Tricco

# Background

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- SRs are of importance to frontline clinicians, guideline developers, policymakers and commissioners of health research who need to make decisions about the most effective and safe interventions and policies for patient care
- Confusion arises when more than one SR is found on a given topic
- What variables or features do policymakers, practitioners and other types of decision makers (e.g. journal editors, students) choose when comparing multiple SRs?



# Objectives

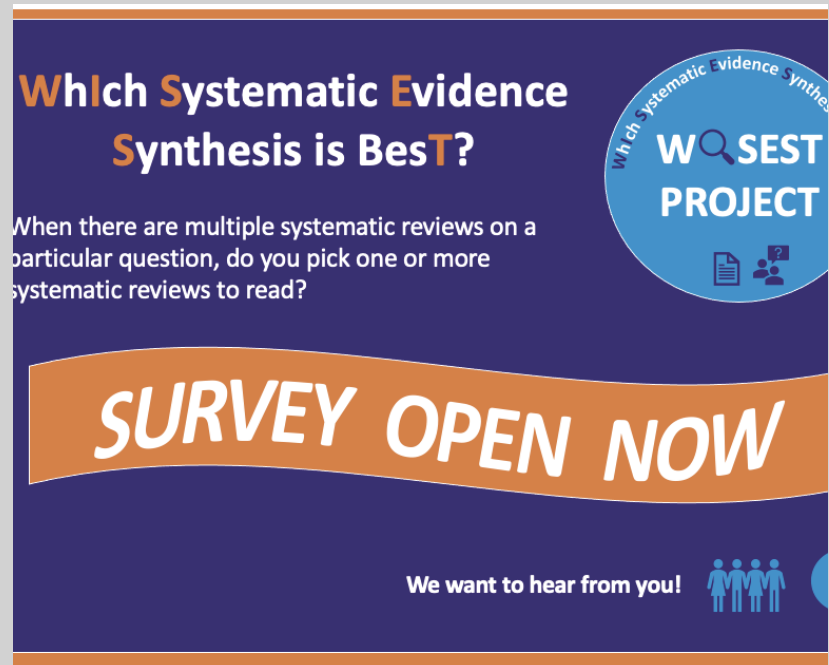
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- We surveyed decision makers to understand how they use and select one or more SRs and learn what features they consider when choosing from multiple SRs on the same topic.



# Methods

- Electronic cross-sectional survey
- 20 open and closed questions: (a) demographic info; (b) barriers and facilitators to the use of SRs, and (c) how users select SRs when multiple are encountered on the same topic
- Disseminated through social media and professional networks



# Results

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- 684 respondents: 25% were clinical practitioners, 9% policymakers, 39% researchers/academics
- They sometimes (32.6%) or often (64.5%) sought out SRs as a source of evidence in their decision making
- Sometimes (54.6%) or often (43.1%) faced a situation where they found more than one SR on a given topic of interest to them
- 40% struggled to choose the most valid and trustworthy SR
- Difficulties related to:
  - Lack of time (55.2%)
  - Skills and/or experience for quality appraisal (27.7%)
  - Difficulty comparing different SRs (54.3%)
- Features considered: relevance to their question of interest; recency of SR search date; and methodological quality/risk of bias

# Conclusions

- Not one best review in the real world to choose from
- Read and review all the SRs and assess their strengths and weaknesses
- Features important to decision makers will be used in WISEST



# Development of the WISEST AI tool to automatically quality assess and compare the PICO, methods and results across systematic reviews on the same topic

Authors: Carole Lunny, Sal Kanji, Bev Shea, Dawid Pieper,  
Sera Whitelaw, Yuan Chi, Janet Zhang, Nicola Ferri, Argie  
Veroniki, Clare Arden, Ba' Pham, Emma Reid, Ebrahim  
Bagheri, Andrea Tricco

# Background

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- Evidence-informed practice/policy and guideline development requires quality appraisal to choose the best evidence
- Skill, time and cost needed to manually assess systematic reviews (with tools like AMSTAR 2 or ROBIS)
- An automated method for comparing systematic reviews, and selecting the best evidence does not exist

# Objectives

We **aim** to develop an AI approach to model quality appraisals for systematic reviews (based on AMSTAR assessments), and to compare PICO criteria and other methods (called features) across systematic reviews

Our **objectives** are to:

- A. Select features that will be used to compare overlapping systematic reviews
- B. Create a labelled dataset of 10,000 systematic reviews that are clustered by topic;
- C. Train, test and validate Machine Learning models, comparing accuracy

### Test existing tool, and survey decision makers

- **Study 1:** Assessed the replicability of the Jadad algorithm
- **Algorithm not replicable**
- **Study 2:** Survey decision makers to determine how they compare and choose between systematic reviews on the same topic

Completed

### Select features to include in the models

- **Study 3:** Qualitative study of features extracted by researchers used to identify discordance
- **Features chosen based Studies 1-3**
- Quality indicators based on AMSTAR 2 items

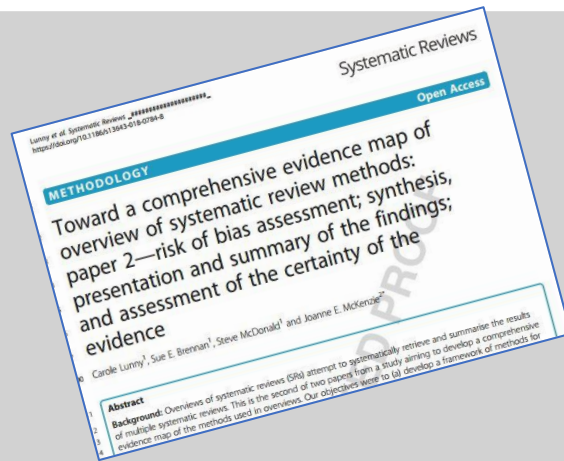
Completed



- **Study 1:** Lunny et al. How can clinicians choose between conflicting and discordant systematic reviews? A replication study of the Jadad algorithm. In process with *BMC Medical Research Methodology*
- **Study 2:** Lunny et al. Decision maker opinions on how to compare the strengths and weaknesses of systematic reviews on a similar topic: a cross-sectional study. Preprint.

- **Study 3:** Lunny et al. Features used by researchers to identify discordance across multiple systematic reviews on the same topic. Preprint.

# SR quality/ risk of bias tools



## Many tools exist

No specific recommendations for which tools to use  
Lack of empiric evidence to guide choice

We'll look at two tools  
AMSTAR 2 and ROBIS

Type of research study (design)	Number of tools	Number addressing all domains	Tools with rigorous development*
Systematic reviews with or without meta-analyses	57	2	AMSTAR 2, AMSTAR, ROBIS, OQAQ, Higgins



## AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews

Beverley J. Shea<sup>a,b,c,\*</sup>, Candyce Hamel<sup>a</sup>, George A. Wells<sup>d,e</sup>, Lex M. Bouter<sup>b</sup>, Elizabeth Kristjansson<sup>f</sup>, Jeremy Grimshaw<sup>g</sup>, David A. Henry<sup>h</sup>, Maarten Boers<sup>c</sup>

### Items

1. Was an 'a priori' design provided?
2. Was there duplicate study selection and data extraction?
3. Was a comprehensive literature search performed?
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?
5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies provided?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
9. Were the methods used to combine the findings of studies appropriate?
10. Was the likelihood of publication bias assessed?
11. Were potential conflicts of interest included?

### 11 questions

- judgement for each item reported as: yes, no, can't answer, n/a
- some authors provide a rationale for judgements
- some report a overall score, usually assigning equal weight to items (may be difficult to justify)
- some stratify reviews as high, medium, low quality (using cutoffs)

## MSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both

Deverley J Shea,<sup>1,2,3</sup> Barnaby C Reeves,<sup>4</sup> George Wells,<sup>3,5</sup> Micere Thuku,<sup>1,2</sup> Candyce Hamilton Moran,<sup>6</sup> David Moher,<sup>1,3</sup> Peter Tugwell,<sup>1,2,3,7</sup> Vivian Welch,<sup>2,3</sup> Elizabeth Kristjansdottir,<sup>8</sup> David A Henry<sup>9,10,11</sup>

The number of published systematic reviews of studies of healthcare interventions has increased rapidly and these are used extensively for clinical and policy decisions. Systematic

reviews assist decision makers in the identification of high quality systematic reviews, including those based on non-randomised studies of healthcare interventions.



ELSEVIER

Journal of Clinical Epidemiology ■ (2015) ■

**Journal of  
Clinical  
Epidemiology**

**ORIGINAL ARTICLE**

**ROBIS: A new tool to assess risk of bias in systematic reviews  
was developed**

Penny Whiting<sup>a,b,c,\*</sup>, Jelena Savović<sup>a,b</sup>, Julian P.T. Higgins<sup>a,d</sup>, Deborah M. Caldwell<sup>a</sup>,  
Barnaby C. Reeves<sup>e</sup>, Beverley Shea<sup>f</sup>, Philippa Davies<sup>a,b</sup>, Jos Kleijnen<sup>c,g</sup>, Rachel Churchill<sup>a</sup>,  
the ROBIS group

<sup>a</sup>*School of Social and Community Medicine, University of Bristol, Canynge Hall, 39 Whatley Road, Bristol BS8 2PS, UK*

<sup>b</sup>*The National Institute for Health Research Collaboration for Leadership in Applied Health Research and Care West at University Hospitals Bristol NHS  
Foundation Trust, 9th Floor, Whitefriars, Lewins Mead, Bristol BS1 2NT*

<sup>c</sup>*Kleijnen Systematic Reviews Ltd, Unit 6, Escrick Business Park, Riccall Road, Escrick, York YO19 6FD, UK*

<sup>d</sup>*Centre for Reviews and Dissemination, University of York, York YO10 5DD, UK*

<sup>e</sup>*School of Clinical Sciences, University of Bristol, Bristol Royal Infirmary, Level Queen's Building, 69 St Michael's Hill, Bristol BS2 8DZ, UK*

<sup>f</sup>*Community Information and Epidemiological Technologies Institute of Population Health, 1 Stewart Street, Room 319, Ottawa, Ontario, K1N 6N5, Canada*

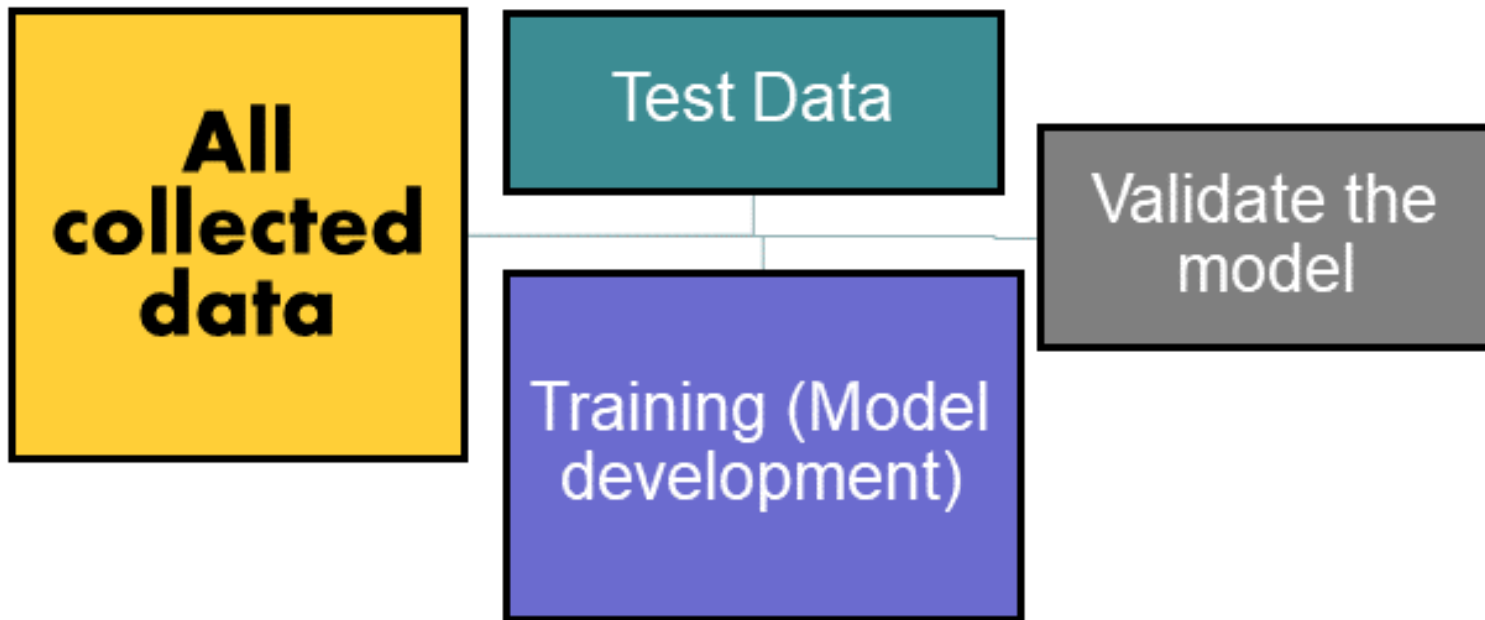
<sup>g</sup>*School for Public Health and Primary Care (CAPHRI), Maastricht University, PO Box 616, 6200 MD, Maastricht, The Netherlands*

Accepted 5 June 2015; Published online xxxx

“...authors wishing to assess risk of bias of systematic reviews may wish to use the more recently developed ROBIS tool”

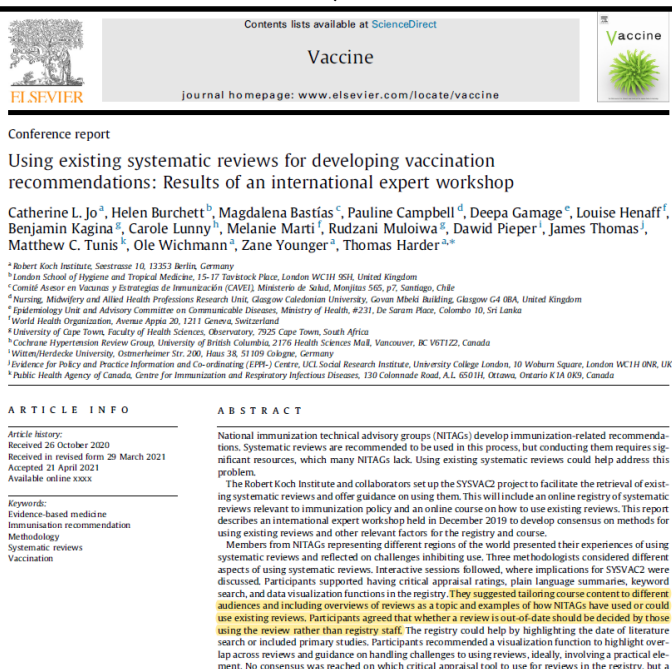
Uses a similar approach to the Cochrane tool for assessing RoB in randomised trials (domain based)

Name of organisation	Tool	Database	Number of assessments
University of Melbourne	AMSTAR 1	<a href="#">CrowdCARE</a>	500
McMaster University	AMSTAR 1	<a href="#">McMaster PLUS</a>	6000
Canadian Agency for Drugs and Technologies in Health (CADTH)	AMSTAR 1	Rx for Change	900
Robert Koch, WHO, and London School for Hygiene and Tropical Medicine	AMSTAR 2	<a href="#">SYSVAC</a>	1050
<b>TOTAL</b>			<b>8450</b>



- Extracted features (e.g. publication bias) will be used to **train** the models through a process known as supervised learning
- **Test** to determine accuracy
- **Validate** the model chosen using a separate dataset than the training/testing sets

## PDF of the systematic review publication



## Text extraction system for quality indicators

SR	Number of primary studies	Were PICO eligibility criteria unambiguous?	Was an appropriate range of databases searched?	Was risk of bias (or methodological quality) formally assessed
Tui 2018	7	+	?	+
<b>Participants</b>		Postnatal women (<12 months postpartum), postnatal women		
<b>Interventions</b>		Physical activity (PA) interventions, theory-based physical activity, control		
<b>Outcomes</b>		PA participation, walking for exercise, PA frequency, walking frequency		

- Users upload SRs as PDFs
- WISEST allows the user to see the rationale behind the AI's output
  - Comparison of SR quality indicators
  - Ranked choice of the best SRs

# Conclusions

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- WISEST impact:
  - Time saved compared to manual approaches (e.g. resources, money)
  - Broadened audience of decision makers who wouldn't habitually use manual tools (e.g. clinicians)
- Functionality to extract PICO, methods and other features
- Flexible approach tailored to the needs of the user
- Evaluate the relevance and validity of SRs
- Increase the uptake of applicable and high quality evidence
- Ultimately improving patient outcomes

# Overall conclusions

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High quality overviews give the best perspective of our current state of evidence for decision makers

Gaps in methods for overviews that we have addressed in our recent research included:

- Overlap taxonomy based on PICO eligibility criteria
- Management of primary study overlap across SRs
- Assessment of the Jadad algorithm for discordance
- Criteria that decision makers use to compare similar SRs

Many other important gaps exist related to the issues that are unique to overviews and we encourage groups to take on research to advance this methodological field



# Thank you and I welcome questions



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Twitter: @carole\_Lunny and use #overviews