

# “Narrative synthesis” of quantitative effect data in Cochrane reviews: current issues and ways forward

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# Conflict of Interest declaration

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## Funding

- Hilary Thomson and Mhairi Campbell are funded by the UK Medical Research Council and the Scottish Government Chief Scientist Office
- Hilary Thomson and Mhairi Campbell have received funding from Cochrane Strategic Methods Fund (Improving the Conduct and reporting of Narrative Synthesis of Quantitative data, ICONS-Quant, 2017-2019)
  - now known as **SWiM: Synthesis Without Meta-analysis**

## Other

- Hilary Thomson is joint co-ordinating editor of Cochrane Public Health, and co-investigator with the NIHR Complex Reviews Support Unit
- No other interests known to declare

# Webinar outline

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1. Definition and use of narrative synthesis
2. Reasons for using narrative synthesis
3. Common issues in narrative synthesis
4. Improving transparency in synthesis without meta-analysis  
From “narrative synthesis” to SWiM

# Poll 1

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Poll 1: Have you conducted a narrative synthesis?

Options:

- Never
- Once
- 2-4
- Many times

# Webinar outline

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- 1. Definition and use of narrative synthesis**
2. Reasons for using narrative synthesis
3. Common issues in narrative synthesis
4. Improving transparency in synthesis without meta-analysis  
From “narrative synthesis” to SWiM

# Narrative synthesis terminology

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- Generic term
  - Distinction from “Narrative review”: often used to describe non-systematic “traditional” review
- Many other terms used to describe review approaches
  - E.g. Critical interpretive synthesis, Framework synthesis, Meta-ethnography, Realist synthesis, Qualitative synthesis
  - Many of these use a narrative approach to synthesis
- Qualitative review OR review of qualitative data?
  - Qualitative review sometimes used to refer to narrative synthesis of quantitative data

Focus today: synthesis of **quantitative** data

# What is narrative synthesis?

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*“synthesis of findings from multiple studies that relies primarily on the use of words and text to summarise and explain the findings of the synthesis. **Whilst it can involve the manipulation of statistical data, the defining characteristic is that it adopts a textual approach to the process of synthesis to ‘tell the story’ of the findings from the included studies.**”*

**ESRC guidance on narrative synthesis: 2006**

# Narrative synthesis: what is it?

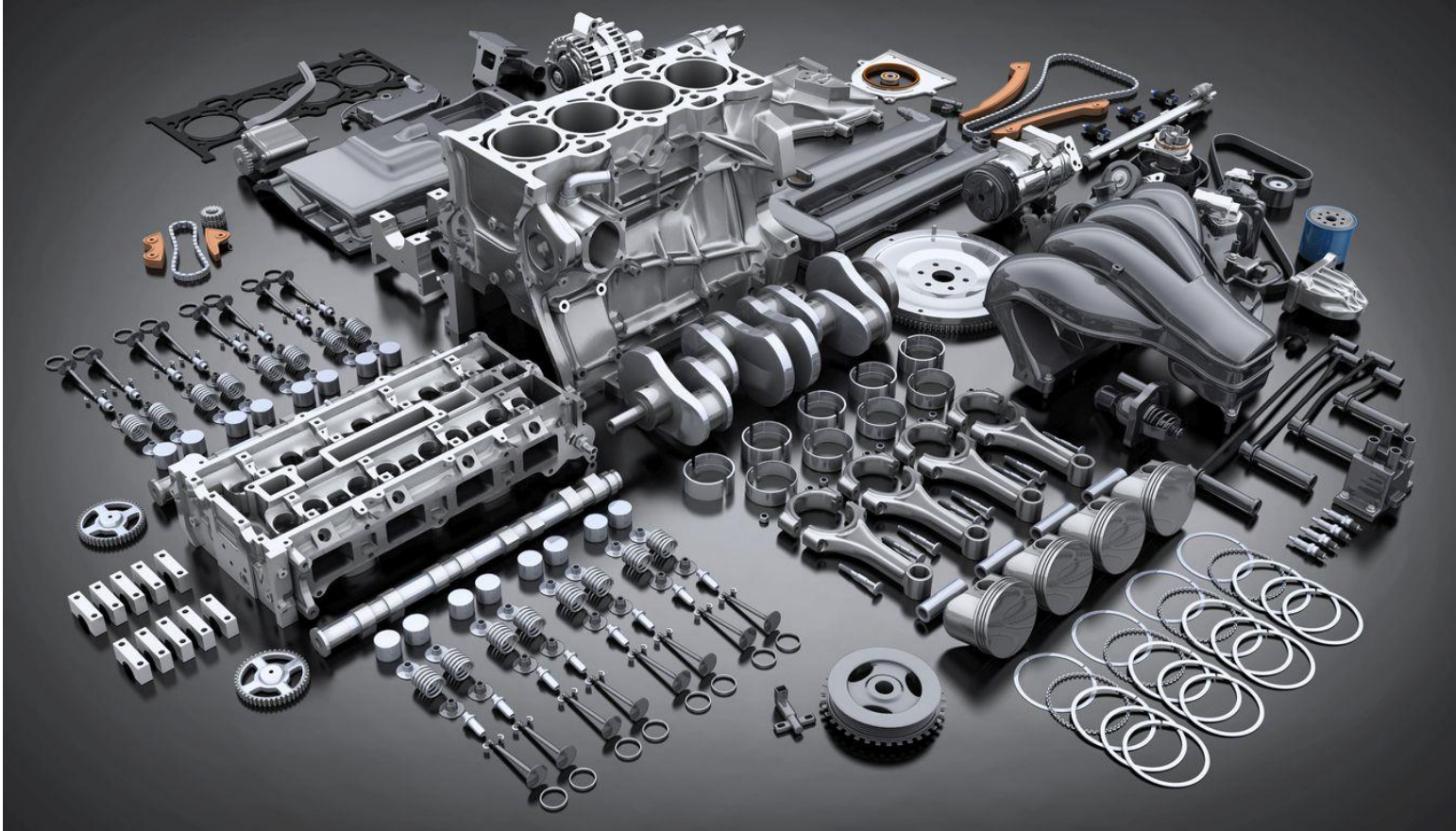
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- Term **synthesis** assumes level of commonality considered to merit synthesis- *bringing evidence from different sources together as a whole to gain greater value as whole than from single disparate studies*
- **Statistical synthesis:** statistical combining/pooling of standard effect sizes across studies to get an overall effect size estimate
  - often referred to as meta-analysis
  - NB: term meta-analysis may be used widely but often used to refer specifically to meta-analysis of effect sizes
- **Narrative synthesis:** textually describing the overall effect noting variations in study characteristics, implementation etc
  - end product is **more than a simple summary of one study after another**



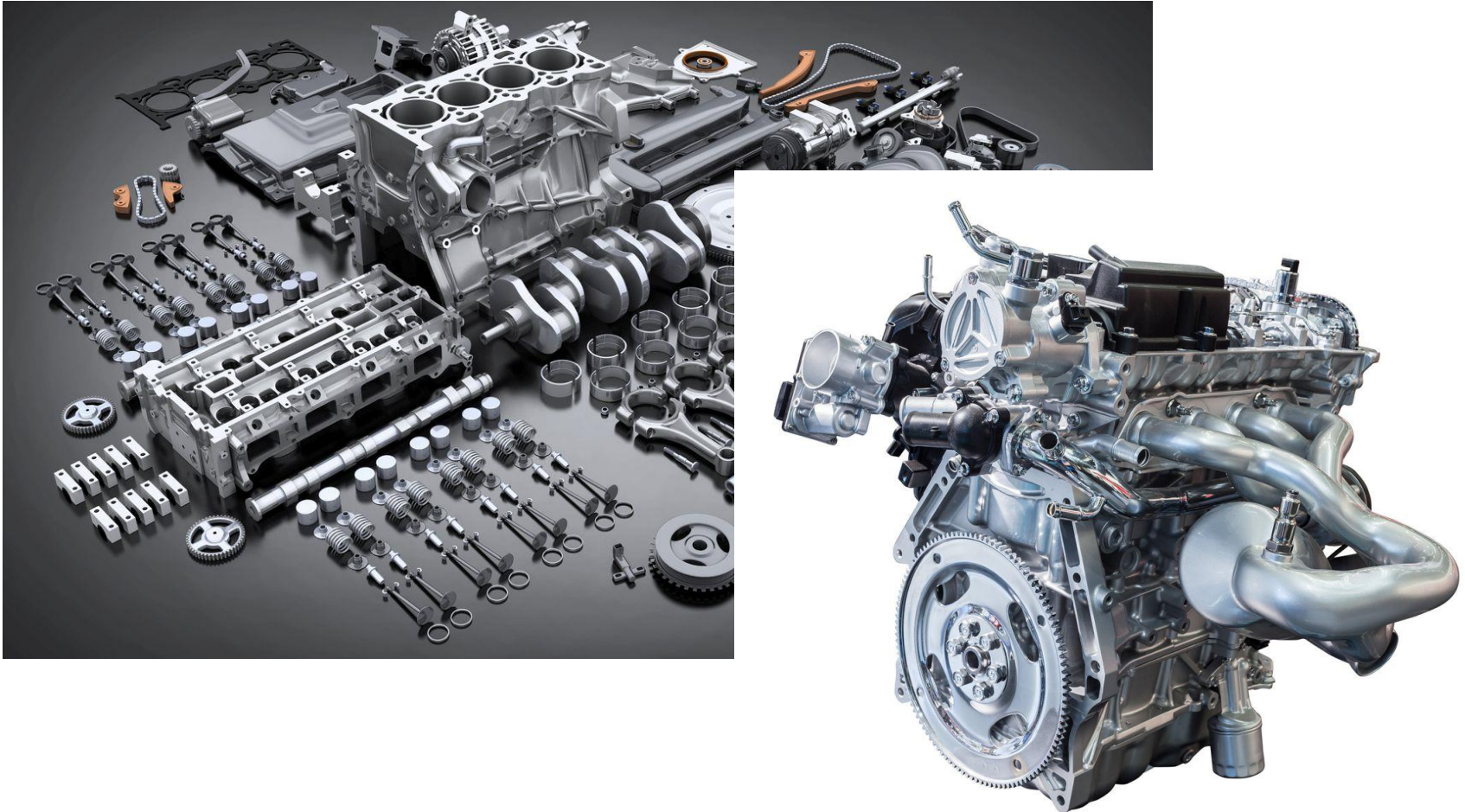
# Data extraction without synthesis: pretty

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# Data extraction without synthesis: pretty (useless)

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# Proportion of Cochrane reviews without meta-analysis

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- Using all Cochrane reviews published April 2016-April 2017 **n=714** (excluding empty/methods/DTA reviews)
  - 49% (347) **only** meta-analysis
  - 36% (254) mix of meta-analysis & narrative
  - **16% (113) only narrative/text**
- **Over half Cochrane reviews using narrative “approach”**: across most review groups
  - Greater use in topics which rely on data from non-randomised studies
  - May increase with move to incorporate more diverse sources of data

# Cinderella of synthesis?

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## What is narrative synthesis?

- Confusion and little guidance on terminology (narrative, qualitative, non-statistical...)
- Not clearly defined
- Near absence of guidance or discussion of conduct
- Is it a method?
- **Does it fit within a systematic review approach?**

## Poll 2

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Poll 2: Do you agree with this statement:  
“Narrative synthesis is commonly used but is not a method that fits within the systematic review approach?”

Options:

- Agree
- Disagree
- Unsure

# Webinar outline

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1. Definition and use of narrative synthesis
- 2. Reasons for using “narrative synthesis”  
(for not meta-analysing effect sizes)**
3. Common issues in narrative synthesis
4. Improving transparency in synthesis without meta-analysis  
From “narrative synthesis” to SWiM

# Reasons for doing a “narrative synthesis” of quantitative data? (or avoiding meta-analysis)

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- ~~Lack of statistical expertise on team~~

# Reasons for doing a “narrative synthesis” of quantitative data? (or avoiding meta-analysis)

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- ~~Lack of statistical expertise on team~~
- **Lack of data to calculate standardised effect sizes**
  - Meta-analysis at risk of under-representing body of evidence
  - For example, standardised effect sizes not available for 4/10 included studies



# Reasons for doing a “narrative synthesis” of quantitative data? (or avoiding meta-analysis)

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- **Lack of statistical expertise on team**
- **Lack of data to calculate standardised effect sizes**
  - Meta-analysis at risk of under-representing body of evidence
- **Response to heterogeneity in data**
  - *“High levels of heterogeneity contra-indicated meta-analysis; the data were synthesised narratively”*

# Sources of heterogeneity

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- **Statistical**

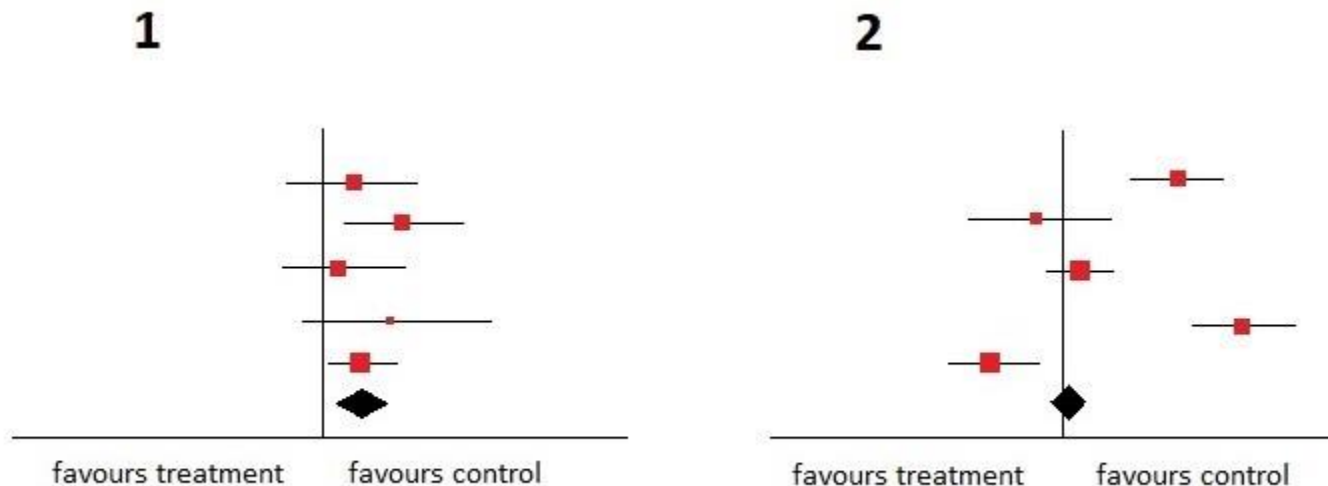
- inconsistency in effect sizes & direction ( $I^2$  test for)

- **Methodological**

- **Clinical diversity** in aspects of the PICO (Population, Intervention, Comparison, Outcome)

# Statistical heterogeneity

- Assessed by  $I^2$
- Considers how similar the reported effects
  - similarity of direction and amount of overlap
- Where there is high heterogeneity meta-analysis may be misleading or not meaningful
- Should be investigated and explained



# Sources of heterogeneity

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- **Statistical**

- inconsistency in effect sizes & direction ( $I^2$  test for)

- **Methodological**

- inclusion of RCTs & non-randomised studies; continuous and binary outcome measures

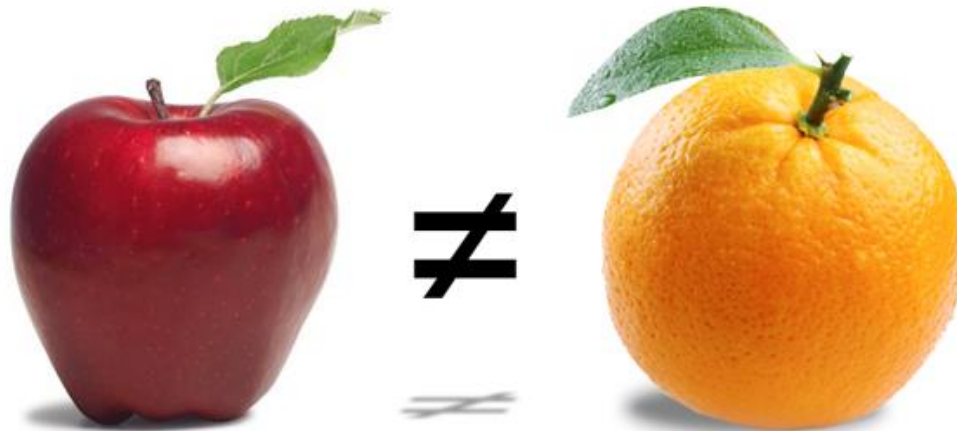
- **Clinical diversity** in aspects of the PICO (Population, Intervention, Comparison, Outcome)

- For example, different measures of respiratory health, wheeze, peak flow, cough etc

# Clinical (conceptual) heterogeneity

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- Principles of synthesis: combining outcomes/ interventions etc that are conceptually similar



- Decisions about what is appropriate to combine may depend on amount of data and usefulness to review consumer

# Synthesis heterogeneous data

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***But what about fruit salad?!***

If you are synthesising it is implied that there is a level of commonality to justify the synthesis- this needs to be made clear

# Avoiding meta-analysis due to heterogeneity

- Very common
- Different views about when not appropriate or useful to meta-analyse
- Some say perform meta-analysis on appropriate groups and interpret cautiously

## RESEARCH METHODOLOGY

### Reasons or excuses for avoiding meta-analysis in forest plots

Heterogeneous data are a common problem in meta-analysis. **John Ioannidis, Nikolaos Patsopoulos, and Hannah Rothstein** show that final synthesis is possible and desirable in most cases

Some systematic reviews simply assemble the eligible studies without performing meta-analysis. This may be a legitimate choice. However, an interesting situation arises when reviews present forest plots (quantitative effects and uncertainty per study) but do not calculate a summary estimate (the diamond at the bottom). These reviews imply that it is important to visualise the quantitative data but final synthesis is inappropriate. For example, a review of sexual abstinence programmes for HIV prevention claimed that owing to “data unavailability, lack of intention-to-treat analyses, and heterogeneity in programme and trial designs... a statistical meta-analysis would be inappropriate.”<sup>1</sup> As we discuss, options almost always exist for quantitative synthesis and sometimes they may offer useful insights. Reviewers and clinicians should be aware of these options, reflect carefully on their use, and understand their limitations.

#### Why meta-analysis is avoided

Of the 1739 systematic reviews that included at least one forest plot with at least two studies in issue 4 of the *Cochrane Database of Systematic Reviews* (2005), 135 reviews (8%) had 559 forest plots with no summary estimate.

The reasons provided for avoiding quantitative synthesis typically revolved around heterogeneity (table 1). The included studies were thought to be too different, either statistically or in clinical (including methodological) terms. Differences in interventions, metrics, outcomes, designs, participants, and settings were implied.

#### How large is too large heterogeneity?

This question of lumping versus splitting is difficult to answer objectively for clinical heterogeneity. Logic models based on the PICO (population-intervention-comparator-outcomes) framework may help to deal with the challenges of deciding what to include and

what not. Still, different reviewers, readers, and clinicians may disagree on the (dis)similarity of interventions, outcomes, designs, participant characteristics, and settings.

No widely accepted quantitative measure exists to grade clinical heterogeneity. Nevertheless, it may be better to examine clinical differences in a meta-analysis rather than use them as a reason for not conducting one. For example, a review identified 40 trials of diverse interventions to prevent falls in elderly people.<sup>2</sup> Despite large diversity in the trials, the authors did a meta-analysis and also examined the effectiveness of different interventions. The analysis suggested that evidence was stronger for multifactorial risk assessment and management programmes and exercise and more inconclusive for environmental modifications and education.

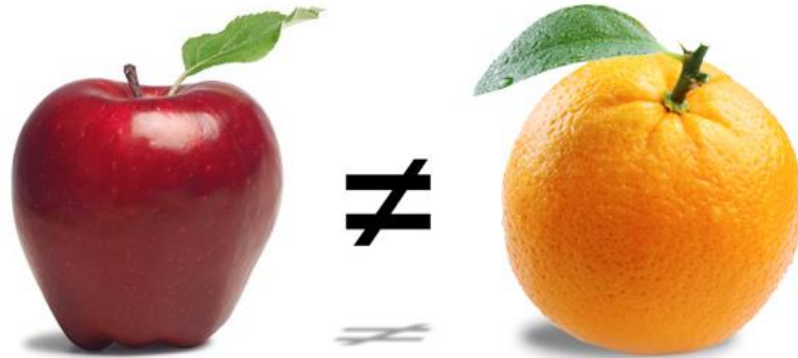
Statistical heterogeneity can be measured—for example, by calculating  $I^2$  and its uncertainty.<sup>3,4</sup>  $I^2$ , the proportion of variation between studies not due to chance, takes values from 0 to 100%. In the 22 forest plots including four or more studies that avoided synthesis because of heterogeneity,  $I^2$  ranged between 35% and 98% with a median of 71% (figure). Yet, 86 of the 1011 forest plots where reviewers had no hesitation in performing meta-analysis had  $I^2$  exceeding 71%.<sup>5</sup> The lower 95% confidence limit of  $I^2$  was <25% in 11 of the 22 non-summarised forest plots—that is, for half of them we cannot exclude that statistical heterogeneity is limited. Therefore, even for statistical heterogeneity, there is sub-

Table 1 | Reasons for not showing summary estimates in forest plots from systematic reviews in Cochrane database 2005 issue 4

Reason	No (%) of systematic reviews (n=135)*
Statistical heterogeneity too high	32 (24)
Different interventions compared	41 (30)
Different metrics or outcomes evaluated	26 (19)
Different metric of same outcome	7
Different outcome	20
Different study designs	21 (16)
Non-randomised studies	3
Other design issues	18

# Managing clinical (PICO) heterogeneity in reviews

- Very common for authors to treat small differences as too different to synthesise: splitting of studies to create multiple intervention/outcome groups each with one study

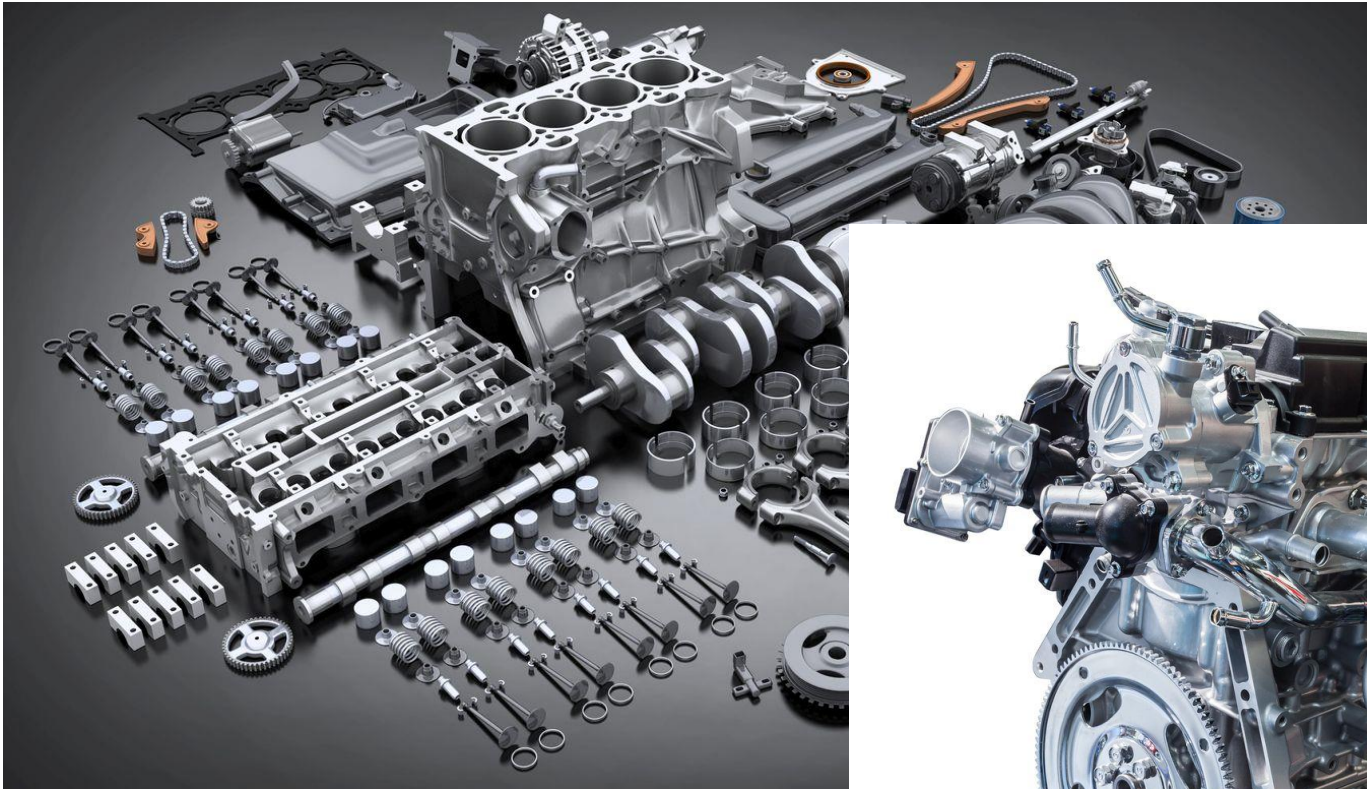


- 70% of Cochrane reviews which did not perform meta-analysis did not perform any type of synthesis
- Unable to draw conclusions aside from emphasising uncertainty



# Data extraction without synthesis: pretty (useless)

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# Heterogeneity can be valuable: the relationships between the data are what add value

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Source: Ursus Wehrli tidies up art [https://www.ted.com/talks/ursus\\_wehrli\\_tidies\\_up\\_art](https://www.ted.com/talks/ursus_wehrli_tidies_up_art)  
(Niki de Saint Phalle)

# Heterogeneity can be valuable: the relationships between the data are what add value

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Disaggregation can be meaningless (or worse) and useless

Source: Ursus Wehrli tidies up art [https://www.ted.com/talks/ursus\\_wehrli\\_tidies\\_up\\_art](https://www.ted.com/talks/ursus_wehrli_tidies_up_art)  
Reproduced with permission from artist (2020)

# Can synthesis of heterogeneous data be useful AND rigorous?

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*"We have extremely high quality, methodologically perfect reviews that are completely useless"*

Evidence User (PM06)

*"Whenever you're looking for evidence the Cochrane reviews are a must read... They are **not always very useful** because they are **so rigorous**. ... The level of rigour in a Cochrane review does take them down the road of saying, well, we're not sure, and that can make it difficult for us compiling the evidence base on whether it works or not."*

Evidence User (PM11)

# Synthesising effect data when you cannot meta-analyse: why?

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- Make use of best available evidence
  - avoids concluding that we know nothing about a topic just because there are no trials
  - incorporates all available evidence where not possible to calculate standardised effect size
  - especially useful where evidence from diverse study types, e.g. non-randomised studies

# Synthesising effect data when you cannot meta-analyse: why?

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  - avoids concluding that we know nothing about a topic just because there are no trials
  - incorporates all available evidence where not possible to calculate standardised effect size
  - especially useful where evidence from diverse study types, e.g. non-randomised studies
- Able to incorporate & make use of heterogeneity
  - Provides rich descriptions about mediating factors such as context etc
  - Identification of similarities & differences across studies-
    - Identification of commonality within heterogeneity is valuable to develop & refine theories of interventions
    - What works for who, in what circumstances
- Especially useful for reviews which incorporate complexity

# Synthesis without meta-analysis: answers a different question

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- **Meta-analysis:** Estimate of overall effect size- how big?

- **Narrative synthesis:**

*“Purpose of narrative synthesis is the organisation, description, exploration, and interpretation of study findings and the attempt to find explanations for (and moderators of) those findings.”*

Pope, Mays, Popay 2007. *Synthesizing qualitative and quantitative health evidence* (p104).

- Limited with respect to effectiveness
  - Focus is on existence, nature & direction of effect
  - Identify patterns & explanations for variation in effects
- Developments to allow this in meta-analysis too

## Poll 3

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Poll 3: Have you conducted a review where you were unable to include all the studies in a meta-analysis?

Options:

Yes

No



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From “narrative synthesis” to SWiM

### 3. Common issues in “narrative synthesis”

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- Criticism of “narrative synthesis”
- Current reporting of synthesis when cannot meta-analyse



# Criticism of “narrative synthesis”

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- Confusion – what is it?
  - Lack of agreement about terminology: narrative, qualitative, non-statistical etc
  - Near absence of guidance or discussion of conduct
  - What does it involve? Is it a method?
- *“Non-statistical syntheses of quantitative intervention effects (see Chapter 12) are challenging, however, because it is difficult to set out or describe results without being selective or emphasizing some findings over others. Ideally, authors should set out in the review protocol how they plan to use narrative synthesis to report the findings of primary studies.”*

**Cochrane Handbook (Chapter 24)**

# Current reporting when cannot meta-analyse

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- Confusion and lack of guidance ...
- Look at practice to discover what this method involves
- Examine
  - What methods are used?
  - What information is reported?
- Analysis of synthesis in samples of systematic reviews:
  - Systematic reviews of public health interventions  
(most not Cochrane)
  - Cochrane reviews

Detailed assessment of synthesis methods used in random samples of the above reviews

# Current reporting when cannot meta-analyse

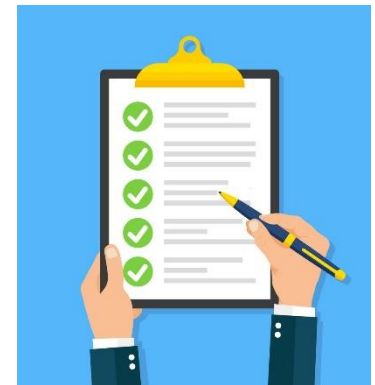
## Reporting issue

State synthesis method used

Report details of method used

Refer to methods guidance

Clear links between data & narrative



- data presented in tables/graphs
- transparent links between tables/graphs and text

# Current reporting when cannot meta-analyse

Reporting issue	Public health systematic reviews* n=75	Cochrane systematic reviews** n=60
State synthesis method used	27%	53%
Report details of method used	5%	18%
Refer to methods guidance	13%	10%
Clear links between data & narrative	57%	30%

\*Campbell M, Katikireddi SV, Sowden A, & Thomson H. (2019). Lack of transparency in reporting narrative synthesis of quantitative data: a methodological assessment of systematic reviews. *Journal of Clinical Epidemiology*.

\*\* Campbell M, McKenzie JE, Sowden A, Katikireddi SV, Brennan SE, Ellis S, Hartmann-Boyce J, Ryan R, Shepperd S, Thomas J, Welch V, Thomson H. (2020) Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline *BMJ*.

# The problem with unclear reporting when unable to meta-analyse

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# The problem with unclear reporting when unable to meta-analyse

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This is at odds with transparency required in systematic reviews



# Consequence of not reporting methods

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Lack of reporting methods



Reduces ability to assess what was done to synthesise the data



Do not know whether can trust the review findings

- Even if the methods are robust – if not clearly reported, the review user is unaware robust methods have been used
- Results in lack of trust in otherwise high quality reviews

# Improved reporting is needed

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## Poll 4

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Poll 4: 18% of Cochrane reviews that used a narrative approach reported the methods used. Does this surprise you?

Options:

Yes

No

# Webinar outline

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**From “narrative synthesis” to SWiM**

## 4. Improving transparency in synthesis without meta-analysis

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- Importance of transparency
- Introduce Synthesis Without Meta-analysis (SWiM) reporting guideline



# Transparency in synthesis

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## Principles of synthesis apply regardless of method:

- **Transparent**
  - Report methods
  - Clear links between the data & the text reporting conclusions
- **Combining conceptually similar outcomes from similar studies**
  - Synthesis needs to be carefully & transparently organized
  - Conceptually appropriate & useful for evidence users
- **Conclusions of synthesis should reflect quality of included data**

# Improving transparency when cannot meta-analyse

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## ICONS-Quant project (Improving Conduct and Reporting of Narrative Synthesis of Quantitative data)

- Mhairi Campbell,<sup>1</sup> Vittal Katikireddi,<sup>1</sup> Hilary Thomson<sup>1</sup>, Joanne McKenzie<sup>2</sup>, Amanda Sowden<sup>3</sup>  
<sup>1</sup>University of Glasgow; <sup>2</sup> Monash University; <sup>3</sup> University of York
- Collaborating Cochrane Groups:
  - Tobacco Addiction, Consumers & Communication, Effective Practice & Organisation of Care (EPOC), Public Health, Cochrane Training
- Funded by the Cochrane Strategic Methods Fund (May 2017 – May 2019)

Originally project about reporting narrative synthesis

# Developing reporting items: Delphi consensus exercise

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- Consulted expert panel, existing guidance, and assessment of current reporting, to draft provisional reporting items
- 3 rounds of online Delphi survey
  - Developed reporting items with accompanying guidance and illustrative examples (clinical and non-clinical)
- Consensus meeting with review experts to agree included items
- Items revised and finalised



# Narrative synthesis

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## Synthesis Without Meta-Analysis (SWiM)

- Promote clear reporting of synthesis methods
- Focus is on synthesis of quantitative effect data where meta-analysis of effect sizes is not conducted
- Using different term to emphasise focus of the guidance

# SWiM links to Cochrane Handbook

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- Links to six new Cochrane handbook chapters
  - **Chapter 12: Synthesis using other methods**
  - Chapter 2: Determining the scope and questions
  - Chapter 3: Inclusion criteria and grouping for the synthesis
  - Chapter 6: Effect measures
  - Chapter 9: Preparing for synthesis
  - Chapter 14: ‘Summary of findings’ tables and GRADE

Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019). Cochrane, 2019.

Available from [www.training.cochrane.org/handbook](http://www.training.cochrane.org/handbook)

# SWiM reporting items

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- Aim: to improve transparent reporting
  - Not prescriptive
  - Not conduct guidance
  - Not quality assessment measures of synthesis
- Transparent reporting of synthesis method and structure
  - Ideally set out in protocol but...
    - iterative changes are common (and often necessary) especially for complex questions and where meta-analysis was planned but not appropriate

# Promoting transparency in synthesis without meta-analysis

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- How studies are grouped
- The standardised metric used for the synthesis
- The synthesis method
- How data are presented
- A summary of the synthesis findings
- Limitations of the synthesis



# Reporting items

1. Grouping of studies
2. Describe standard used
3. Describe synthesis
4. Criteria used to pool
5. Investigation of heterogeneity
6. Certainty of evidence
7. Data presentation
8. Reporting results
9. Limitations of the

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Additional material is published online only. To view please visit the journal online.

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## Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline

Mhairi Campbell,<sup>1</sup> Joanne E McKenzie,<sup>2</sup> Amanda Sowden,<sup>3</sup> Srinivasa Vittal Katikireddi,<sup>1</sup> Sue E Brennan,<sup>2</sup> Simon Ellis,<sup>4</sup> Jamie Hartmann-Boyce,<sup>5</sup> Rebecca Ryan,<sup>6</sup> Sasha Shepperd,<sup>7</sup> James Thomas,<sup>8</sup> Vivian Welch,<sup>9</sup> Hilary Thomson<sup>1</sup>

In systematic reviews that lack data amenable to meta-analysis, alternative synthesis methods are commonly used, but these methods are rarely reported. This lack of transparency in the methods can cast doubt on the validity of the review findings. The Synthesis Without Meta-analysis (SWiM) guideline has been developed to guide clear reporting in reviews of interventions in which alternative synthesis methods to meta-analysis of effect estimates are used. This article describes the development of the SWiM guideline for the synthesis of quantitative data of intervention effects and presents the nine SWiM reporting items with accompanying explanations and examples.

Decision makers consider systematic reviews to be an essential source of evidence.<sup>1</sup> Complete and transparent reporting of the methods and results of reviews allows users to assess the validity of review findings. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; <http://www.prisma-statement.org/>)

item checklist, was developed to facilitate improved reporting of systematic reviews.<sup>2</sup> Extensions are available for different approaches to conducting reviews (for example, scoping reviews<sup>3</sup>), reviews with a particular focus (for example, harms<sup>4</sup>), and reviews that use specific methods (for example, network meta-analysis.<sup>5</sup>) However, PRISMA provides limited guidance on reporting certain aspects of the review, such as the methods for presentation and synthesis, and no reporting guideline exists for synthesis without meta-analysis of effect estimates. We estimate that 32% of health related systematic reviews of interventions do not do meta-analysis,<sup>6-8</sup> instead using alternative approaches to synthesis that typically rely on textual description of effects and are often referred to as narrative synthesis.<sup>9</sup> Recent work highlights serious shortcomings in the reporting of narrative synthesis, including a lack of description of the methods used, lack of transparent links between study level data and the text reporting the synthesis and its conclusions, and inadequate reporting of the limitations of the synthesis.<sup>7</sup> This suggests widespread lack of familiarity and misunderstanding around the requirements for transparent reporting of synthesis when meta-analysis is not used and indicates the need for a reporting guideline.

### Scope of SWiM reporting guideline

This paper presents the Synthesis Without Meta-analysis (SWiM) reporting guideline. The SWiM guideline is intended for use in systematic reviews examining the quantitative effects of interventions for which meta-analysis of effect estimates is not possible.

# Further information

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- Webinar 2 (4<sup>th</sup> March 2020)  
Reporting guideline for Synthesis Without Meta-analysis
- **SWiM website** <https://swim.sphsu.gla.ac.uk/>
  - Webinar 2 – further details
  - Virtual network – email discussion group
  - Key resources

Online training module Cochrane Training

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# Questions? Comments?

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