Online Advanced Methods for Cost-Effectiveness Analysis

Presentation 3: Populating decision models: effectiveness evidence
3.3: Meta-analysis: introduction

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Objectives

- Definition and principles of meta-analysis
- Why conduct a meta-analysis?
- Assumptions of meta-analysis

A definition of meta-analysis…

- A statistical method of quantitatively combining results from multiple studies which address a common scientific question to reveal the nature of relationships that exist among relevant variables

  ultimately, a meta-analysis aims at quantifying effect sizes and their uncertainty

In practice, meta-analysis …

- Pools estimates of *effect measures* across studies with consideration for within/between-study variability

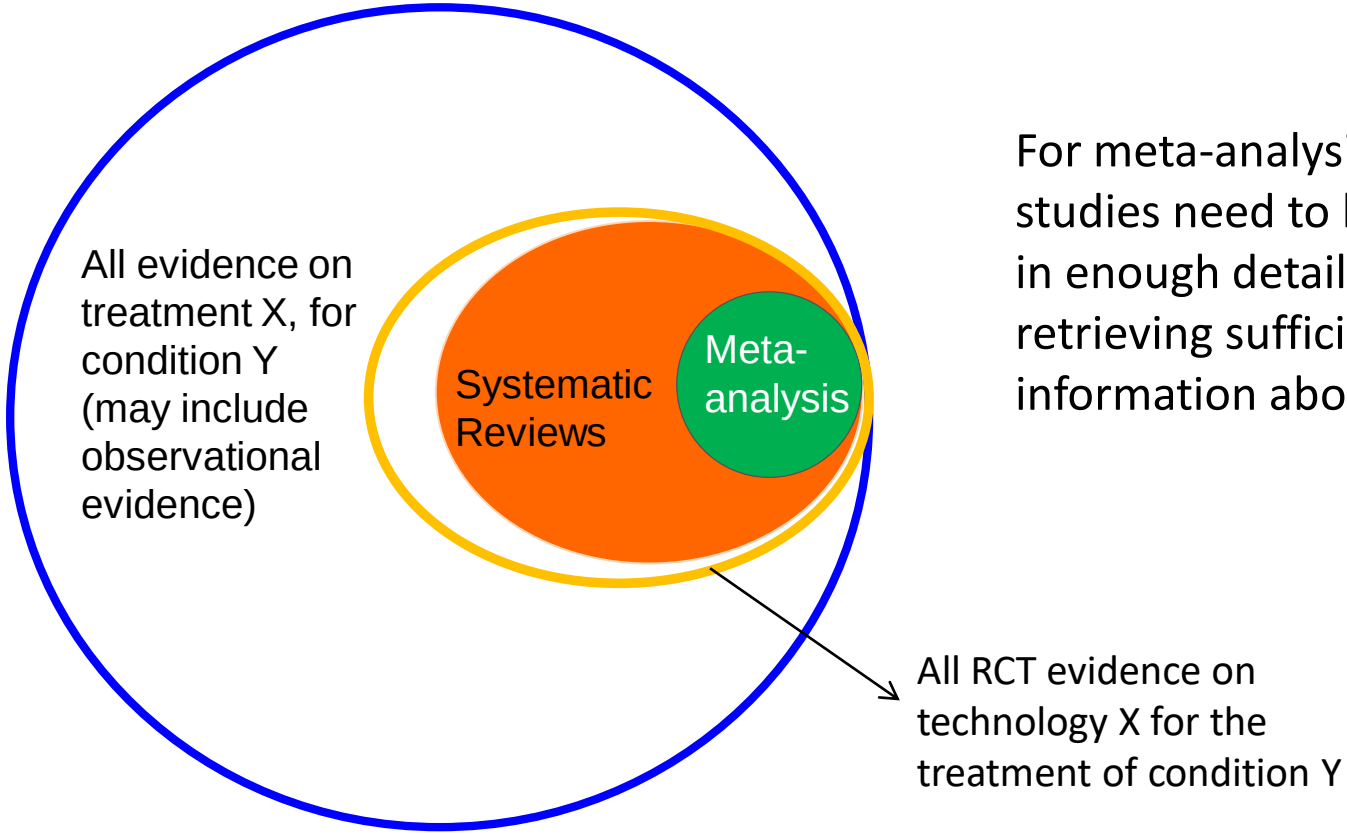
Why conduct meta-analyses?

THE EMERGENCE OF A NEW SPECIES:
THE PROFESSIONAL META-ANALYST

1. *'to obtain increased power'*
2. *'to obtain the best risk estimate from many, often conflicting or even bewildering, studies. In its best form, it is an attempt to clarify some of the heterogeneity between studies'*
3. *'to answer a question which the original studies were not aimed at'*

Source: Rosendaal 1994. *J Clin Epidemiol*; 47(12): 1325-1326

Evidence-base and evidence synthesis?



For meta-analysis, empirical studies need to be reported in enough detail to permit retrieving sufficient information about effects

What info is needed for meta-analysis?

For a particular effect measure, within each study one should extract summary information that can be used to calculate:

- a central/point estimate (e.g. in the format of a RR or OR)
- a measure of uncertainty (typically a standard error or confidence interval)

Note that, given most relative effect measures are ratios, their distribution is expected to be skewed. These are often transformed onto the log-scale (i.e. natural logarithm) for pooling

Important assumptions of meta-analysis …

- **Independence**: It is assumed that study samples are independent
- **Similarity**: It is assumed similarity across studies and some level of homogeneity in their findings

Summary points

- Meta-analysis combines studies estimating a common effect across studies
- Meta-analysis typically requires from studies a point estimate and a measure of uncertainty
- Independence and similarity of studies are key assumptions of meta-analysis

Meta-analysis with head-to-head trial data (standard pairwise MA)

- Focus on binary outcomes (e.g. dead or alive) with OR

- Fixed effect model
- Random effects model
- Subgroups and meta-regression