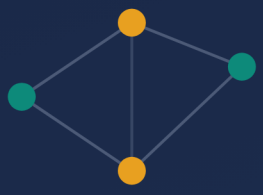
RESEARCH METHODS SERIES

Steps to Complete a Network Meta-Analysis

A practical reference guide to network geometry, statistical framework selection, and reviewer expectations.

- Network geometry & node definition
- Frequentist vs Bayesian frameworks
- SUCRA rankings & certainty ratings



Written from practitioner experience across published systematic reviews and meta-analyses, including network meta-analyses registered on INPLASY.

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HOW TO USE THIS GUIDE

This guide assumes NMA has already been confirmed as the right approach for your review question, the companion meta-analysis guide covers that upstream decision. Work through sequentially for a new NMA, or jump to the relevant section for specific guidance. Real reviewer feedback patterns are integrated throughout.

SCOPE

This guide covers **network** meta-analysis specifically. It assumes familiarity with pairwise meta-analysis fundamentals (effect measures, heterogeneity, GRADE), see the companion meta-analysis guide for that foundation.

1 What Network Meta-Analysis Requires

The decision chain that shapes everything reviewers will check

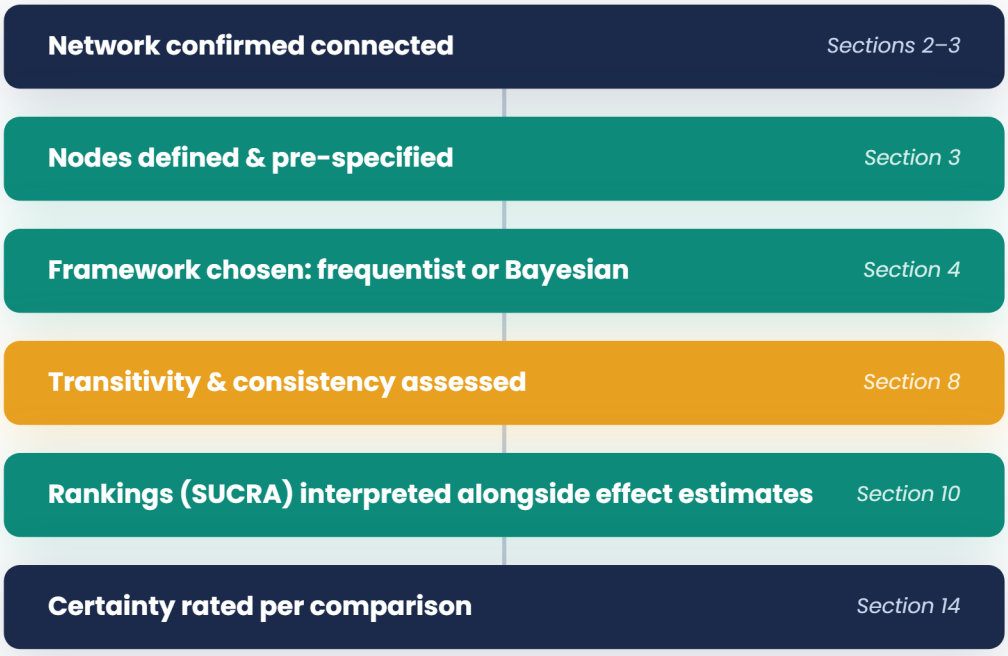
Network meta-analysis (NMA) extends pairwise meta-analysis to compare three or more interventions simultaneously, combining direct evidence (head-to-head trials) with indirect evidence (comparisons made through a shared comparator) into a single coherent set of estimates. It answers questions pairwise meta-analysis cannot: how does Intervention A compare with Intervention C, when the two have never been tested against each other directly but both have been tested against a common comparator?

This guide assumes you have already confirmed that NMA, rather than pairwise meta-analysis, is the right approach for your review question. If you have not made that decision yet, the companion guide to pairwise meta-analysis covers when to choose one over the other.

★ **KEY LESSON: THE CORE PRINCIPLE**

Every additional layer of complexity in NMA, more nodes, more indirect comparisons, a Bayesian framework, comes with additional assumptions that must be checked and reported, not simply additional statistical power. A well-conducted small network is more defensible than a poorly-assessed large one.

The Decision Chain Covered In This Guide



2 The Prerequisite for Any NMA

Every network must be checked for connectedness before any model is fitted

Before any statistical model is fitted, the network of evidence itself must be examined. A network meta-analysis can only be conducted across a single connected network, one where every included intervention is linked, directly or indirectly, to every other intervention through a chain of shared comparators.

CHECK CONNECTEDNESS FIRST

If a subset of interventions shares no common comparator with the rest of the network, that subset forms a disconnected island and cannot be analysed within the same NMA. Draw the network plot early, before committing to a full statistical workflow, specifically to check for this.

Table 2.1: Star-Shaped vs Complex Networks

FEATURE	STAR-SHAPED NETWORK	COMPLEX NETWORK
Structure	A single dominant reference comparator (e.g. usual care or placebo) at the centre, with every other intervention linked only to it	Multiple interventions connected to each other directly as well as through shared comparators
Evidence type	Every comparison between two active interventions is indirect, made only through the shared hub	Some comparisons are supported by both direct and indirect evidence
Consistency testing	Formal loop-based methods (node-splitting) are not applicable, there are no closed loops to split	Node-splitting or design-by-treatment interaction tests can be applied where closed loops exist
How common	Very common where a review has a dominant standard-of-care comparator	More common in densely studied treatment areas with many head-to-head trials

A STAR-SHAPED NETWORK IS NOT A METHODOLOGICAL FAILURE

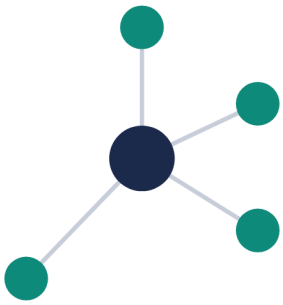
A star-shaped network simply reflects the reality of the literature when one comparator dominates the evidence base. It is not something to fix or apologise for. What matters is reporting the geometry clearly, with a network plot, and being transparent that formal consistency testing was not feasible as a result (see Section 8).

FURTHER READING

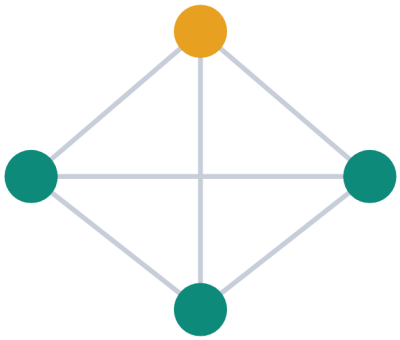
- Salanti, G. (2012), Indirect and mixed-treatment comparison, network, or multiple-treatments meta-analysis: many names, many benefits, many concerns for the next generation evidence synthesis tool. Res. Syn. Meth., 3: 80-97. https://doi.org/10.1002/jrsm.1037

Network Geometry & Connectedness

The prerequisite for any NMA



Star-shaped



Complex/Closed Loop

Both are valid, but they determine what can be tested later in the analysis.