

INTRODUCTION

The presentation of the network-plot in systematic reviews with network meta-analysis (NMA) publications should be clear and reproducible. (1-2)

AIMS

We aimed to adapt metrics from the social network analysis and graph theory literature and to test their usability to describe NMAs geometry.

METHODS

We performed a systematic search in PubMed and Scopus to gather published NMA on drug interventions. The network-plots of the included NMAs were replicated using Gephi 0.9.1. Eleven metrics considering number of nodes, edges, spatial distribution and connectivity of the network were proposed. Sensitivity analyses and the Spearman test for non-parametric correlation analyses and Bland-Altman and Lin's Concordance tests were performed (IBM SPSS Statistics 24.0).

RESULTS

From the 477 included NMAs, 249 (52.2%) stated to follow PRISMA-NMA checklist. However, only 167 graphs (35.0%) could be reproduced because authors provided enough information on the plot geometry (Figure 1). The median of nodes, edges and included studies in these networks were 8 (IQR 6-11); 10 (IQR 6-16) and 22 (IQR 13-35), respectively. We found that metrics such as density (mean 0.39), median thickness (median 2.0 with IQR 1.0-3.0), common comparators (median 68%) and strong edges (median 53%) can significantly contribute to the description of the NMAs geometry, including for networks with similar spatial structures (Figure 2 and Table 1). Sensitivity and correlation analyses showed that other metrics such as mean thickness, average weighted degree and average path length lead to misleading results.

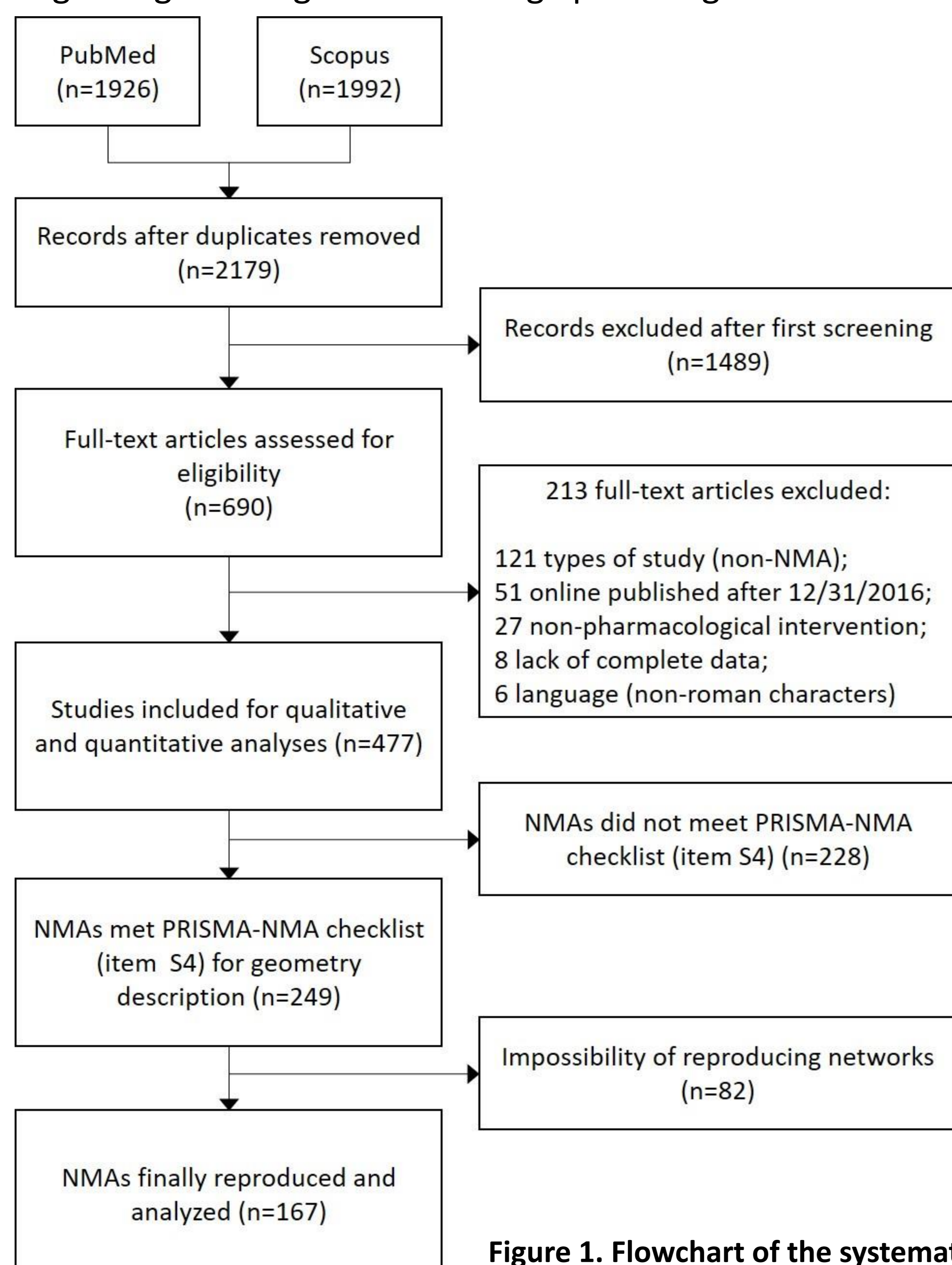


Figure 1. Flowchart of the systematic review

Table 1. Assessment of NMAs geometry

Descriptive analyses (n=167)	N. of nodes	N. of edges	N. of studies	Avg. degree	Avg. weight degree	Density	Common comparator %	Strong edges %	Mean thickness	Median Thickness	Avg. path length
Mean	8.83	12.0	30.23	2.63	7.98	0.43	68.0	53.0	2.95	2.17	1.73
SD	5.10	8.49	29.32	0.82	7.3	0.23	26.0	30.0	2.42	1.77	0.47
Median	8.00	10.00	22.00	2.55	5.67	0.39	7.3	55.0	2.18	2.0	1.69
IQR 25	6.00	6.00	13.00	2.00	3.50	0.26	50.0	29.0	1.50	1.0	1.50
IQR 75	11.00	16.00	35.00	3.00	9.33	0.53	89.0	75.0	3.54	3.00	1.89
Minimum	3.00	3.00	3.00	1.50	1.57	0.07	9.0	0.0	1.00	1.00	1.00
Maximum	42.00	66.00	157.0	5.14	50.00	1.00	100.0	100	20.00	13.00	5.25
Asymmetry	2.75	2.52	2.31	0.94	2.63	1.01	-0.52	-0.02	3.33	3.12	2.77
± error	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19	±0.19

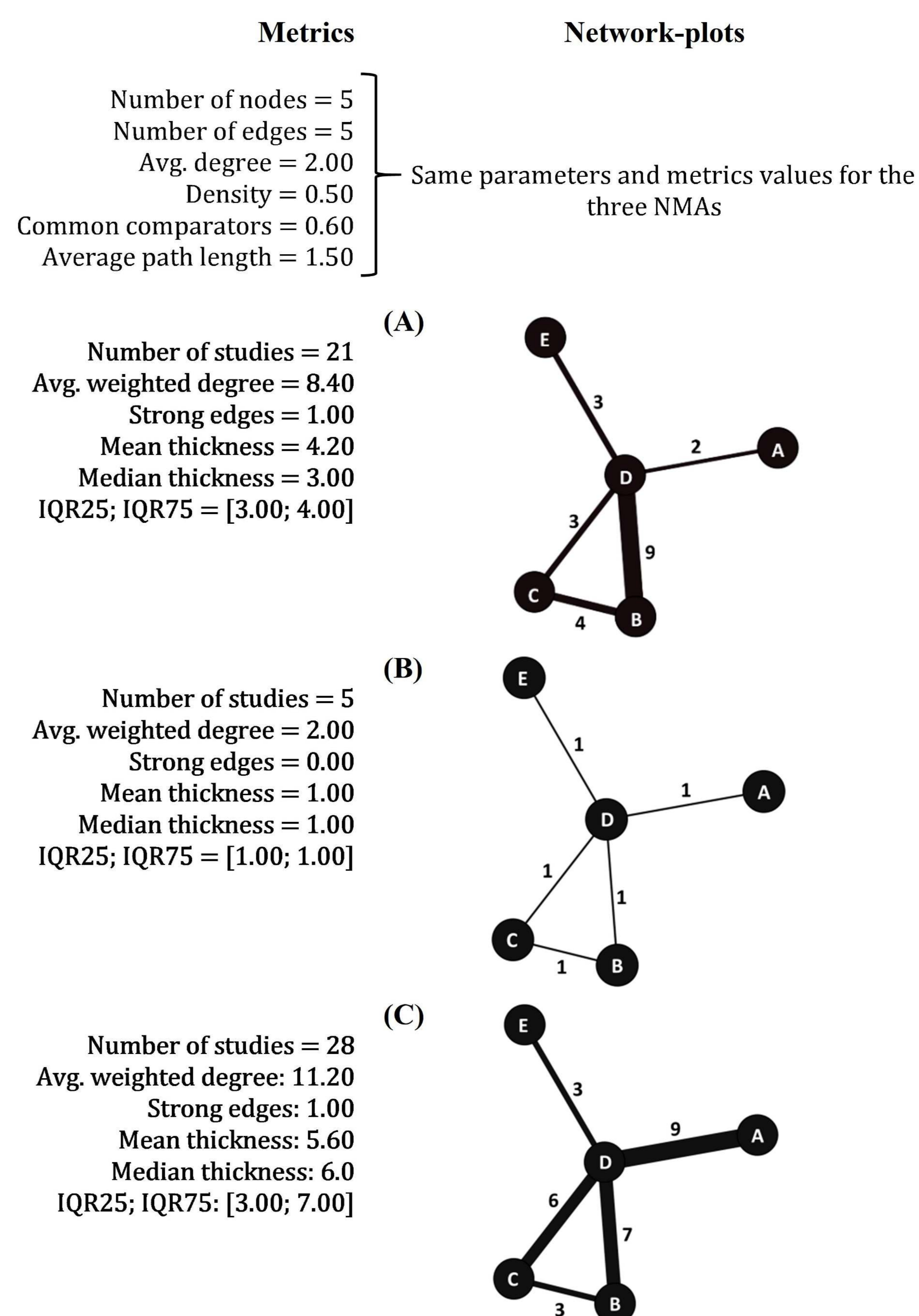


Figure 2. Sensitivity analyses for the assessment of NMAs with equal geometry and different numbers of studies. Examples of three networks-plots found in our systematic review

CONCLUSIONS

We suggest seven simple metrics to be incorporated during the report of NMAs geometry, contributing to data interpretation, and reproducibility. Guidelines and recommendations for NMAs conduct and reporting should be strictly followed before publication and require the display of a network-plot and its complete description based on geometry metrics.

REFERENCES

- Carroll K, Hemmings R. On the need for increased rigour and care in the conduct and interpretation of network meta-analyses in drug development. *Pharm Stat.* 2016;15:135-42.
- Salanti G et al. Exploring the geometry of treatment networks. *Ann Intern Med.* 2008;148:544-53.

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