



a fully interactive web-application for producing and
visualising network meta-analyses

Silvia Metelli

Joint work with Anna Chaimani

Université de Paris, Inserm Research Center of Epidemiology and Statistics, France

Cochrane Learning Live Webinar, 10th February 2022



1

Introduction & overview of NMAstudio functionalities

2

Live demonstration: built-in data and example of user data set

3

Final considerations and forthcoming updates

INTRO

A **web app** to enhance and facilitate interpretation of **Network Meta Analysis (NMA)**

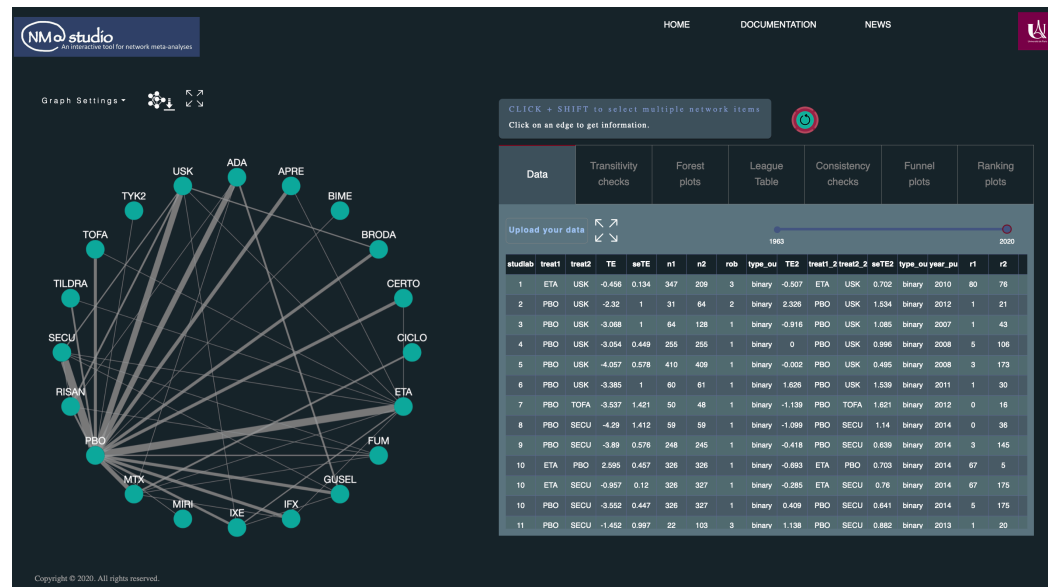
Core idea: ‘interactivity’ between the typical NMA network plot and the NMA outputs

1. Users upload data and interact with a [network plot](#) clicking treatments or comparisons
2. Based on their selection, different outputs and information are displayed

A **web app** to enhance and facilitate interpretation of **Network Meta Analysis (NMA)**

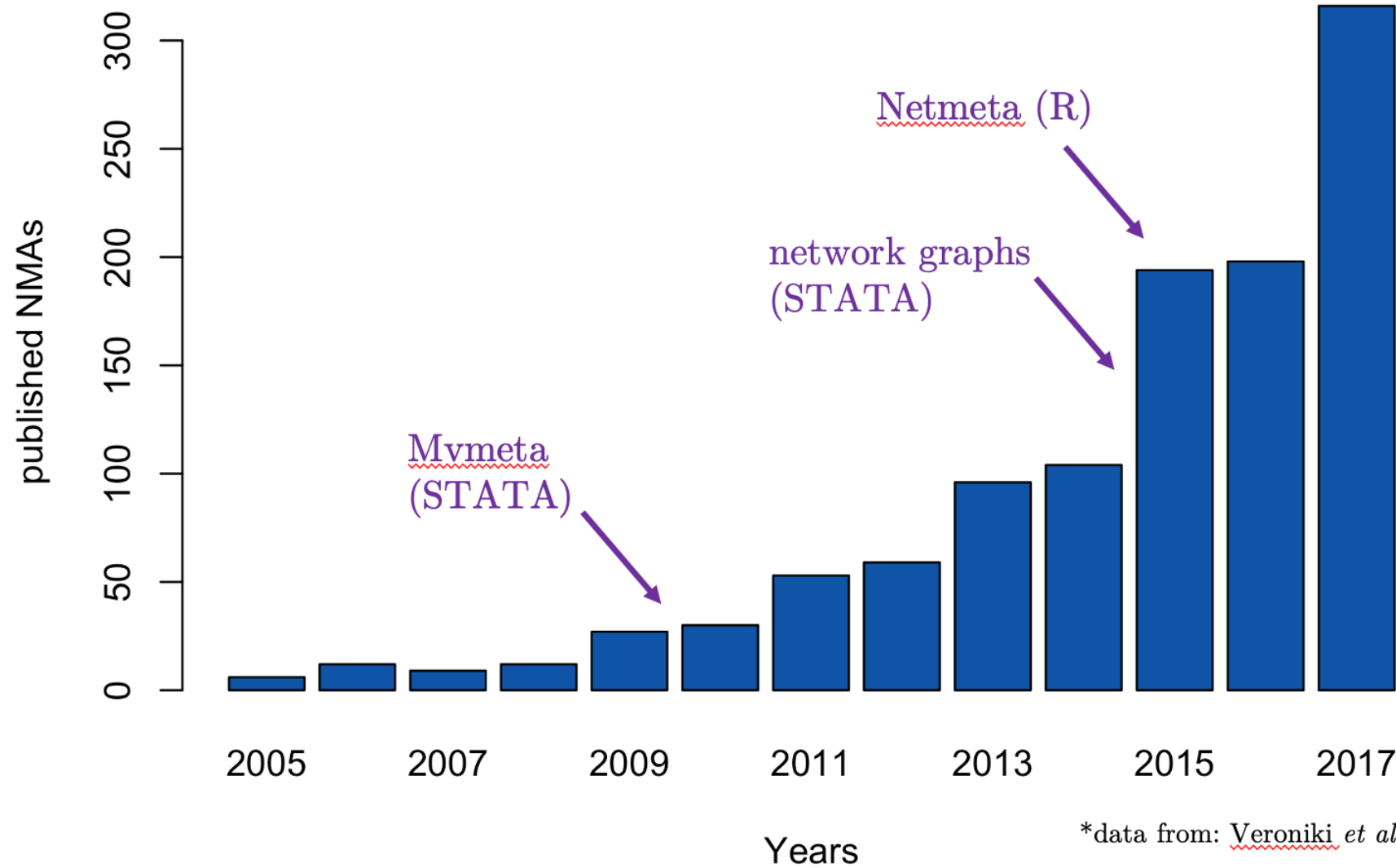
Core idea: ‘interactivity’ between the typical NMA network plot and the NMA outputs

1. Users upload data and interact with a **network plot** clicking treatments or comparisons
2. Based on their selection, different outputs and information are displayed



Webpage: <https://www.nmastudioapp.com>

- NMAs simultaneously compare multiple treatments → large number of results produced
- Visualisation is challenging, [especially with large networks](#)
- Think of the long Supplementary materials of published NMAs
- Software has played a role in the growth of published NMAs

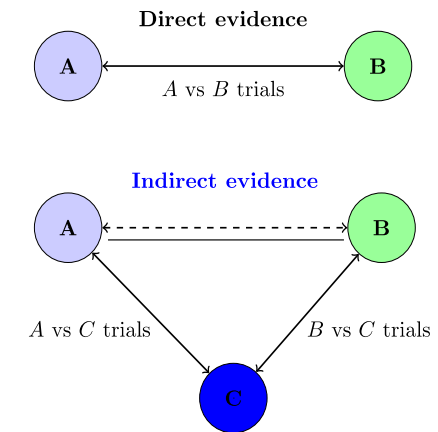


- NMAs simultaneously compare multiple treatments → large number of results produced
- Visualisation is challenging, [especially with large networks](#)
- Think of the long Supplementary materials of published NMAs
- Software has played a role in the growth of published NMAs

- NMAs simultaneously compare multiple treatments → large number of results produced
- Visualisation is challenging, [especially with large networks](#)
- Think of the long Supplementary materials of published NMAs
- Software has played a role in the growth of published NMAs
- Existing software not *fully* interactive
- We are moving to online/ living evidence (e.g. Covid evidence) → flexible, user-friendly software is needed to keep up with fast-production of new evidence

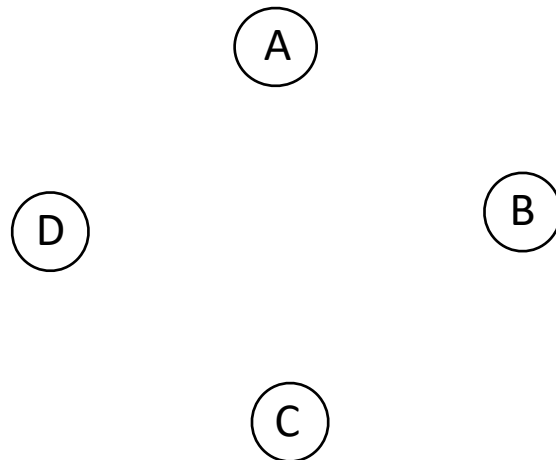
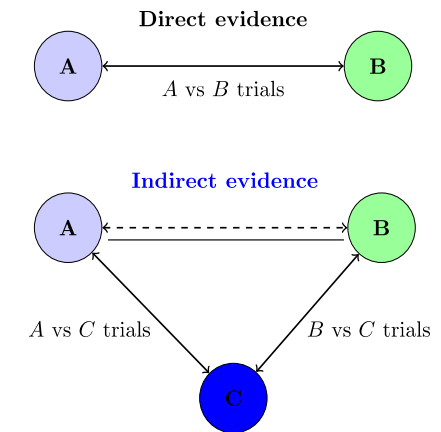
Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)



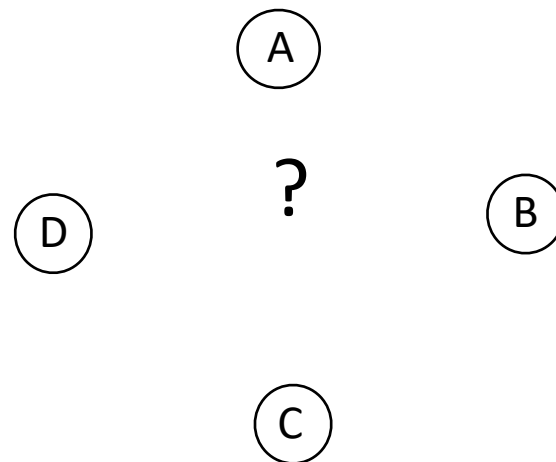
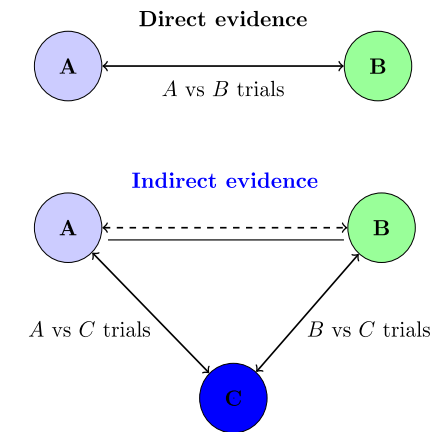
Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)



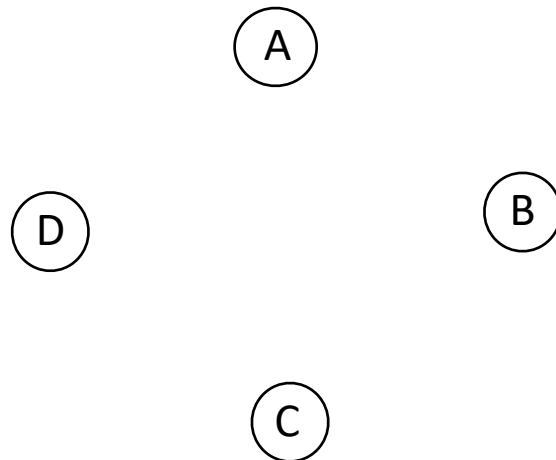
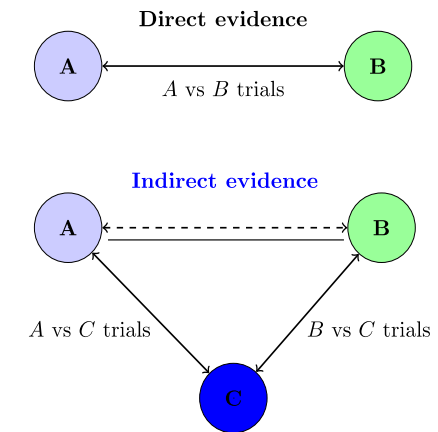
Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)



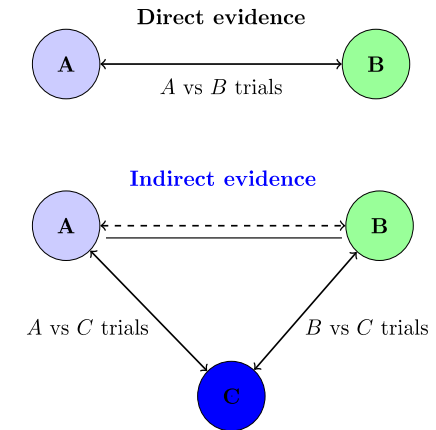
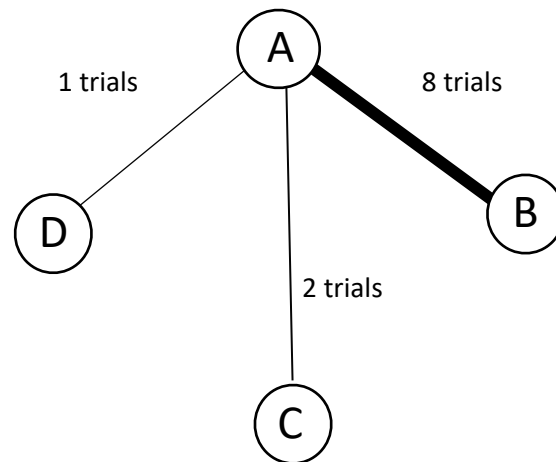
Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)



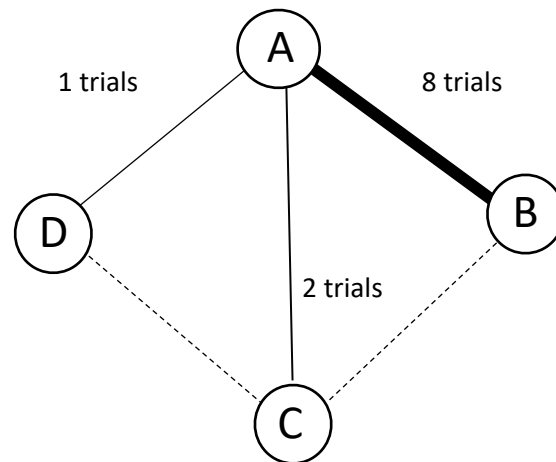
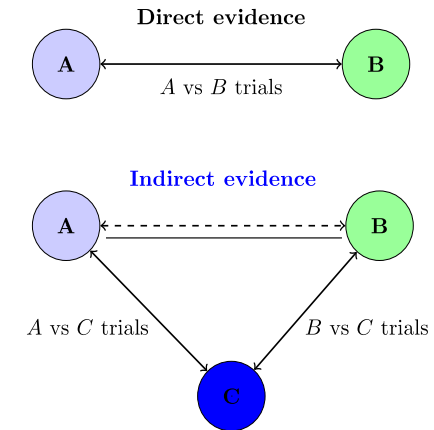
Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)

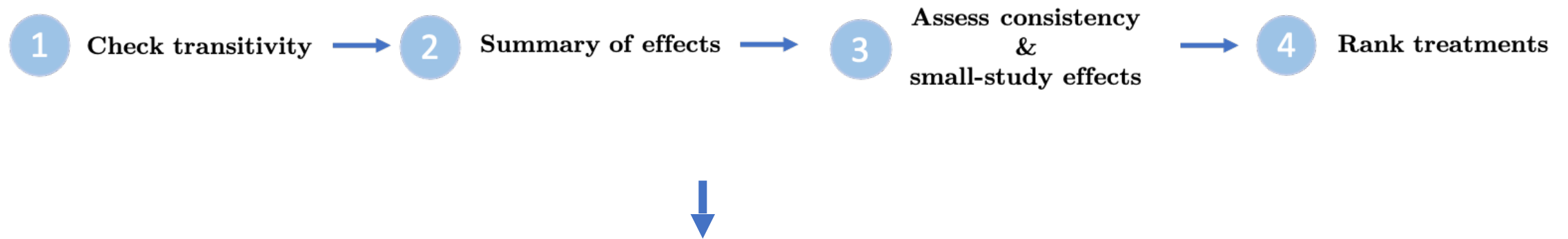


Simultaneous comparison of multiple treatments integrating **direct** with **indirect** evidence in a network of studies

Which treatment works best? (in terms of e.g. efficacy/safety)



Check that the underlying assumptions which make indirect evidence valid are met in your network



NMAstudio assists the user in each step of an NMA

How does it work?

- ❖ Fully built in Python (Dash environment, Plotly for visualisation)
- ❖ Connected to R-package `netmeta`¹ to produce NMA results
- ❖ Can analyse two outcomes at a time
- ❖ Can read-in CIneMA² report file to provide additional visualisations
- ❖ Flexibility on data formats, outcome type etc..
- ❖ A built-in example is permanently loaded (to ease exploration)
- ❖ Works with any browser but Chrome, Mozilla preferred

¹G. Rücker, U. Krahn, J. König, O. Efthimiou, A. Davies, T. Papakonstantinou & G. Schwarzer. `netmeta`: Network Meta-Analysis using Frequentist Methods, 2021. R package version 2.0-1. <https://CRAN.R-project.org/package=netmeta>.


²A. Nikolakopoulou, J.P.T. Higgins, T. Papakonstantinou, A. Chaimani, C. Del Giovane, M. Egger & G. Salanti. CIneMA: An approach for assessing confidence in the results of a network meta-analysis PLOS Medicine 2020 17 1-19

LIVE DEMONSTRATION



Two examples

1. Built-in example (chronic plaque psoriasis data)
2. A user data set (major depressive disorders data)

Two examples

1. Built-in example (chronic plaque psoriasis data)  To demonstrate main functionalities
2. A user data set (major depressive disorders data)

Two examples

1. Built-in example (chronic plaque psoriasis data)  To demonstrate main functionalities
2. A user data set (major depressive disorders data)  To demonstrate data upload process



Trusted evidence.
Informed decisions.
Better health.

Cochrane Database of Systematic Reviews

[Intervention Review]

Systemic pharmacological treatments for chronic plaque psoriasis: a network meta-analysis

158 RCTs comparing 20 drugs

Emilie Sbidian^{1,2,3}, Anna Chaimani^{4,5}, Ignacio Garcia-Doval⁶, Liz Doney⁷, Corinna Dressler⁸, Camille Hua^{1,3}, Carolyn Hughes⁹, Luigi Naldi¹⁰, Sivem Afach³, Laurence Le Cleach^{1,3}

¹Department of Dermatology, Hôpital Henri Mondor, Créteil, France. ²Clinical Investigation Centre, Hôpital Henri Mondor, Créteil, France. ³Epidemiology in Dermatology and Evaluation of Therapeutics (EpiDermE) - EA 7379, Université Paris Est Créteil (UPEC), Créteil, France. ⁴Université de Paris, Centre of Research in Epidemiology and Statistics (CRESS), INSERM, F-75004, Paris, France. ⁵Cochrane France, Paris, France. ⁶Department of Dermatology, Complejo Hospitalario Universitario de Vigo, Vigo, Spain. ⁷Centre of Evidence Based Dermatology, Cochrane Skin Group, The University of Nottingham, Nottingham, UK. ⁸Division of Evidence Based Medicine, Department of Dermatology, Venerology and Allergology, Charité – Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Berlin, Germany. ⁹Co Cochrane Skin Group, The University of Nottingham, Nottingham, UK. ¹⁰Centro Studi GISED (Italian Group for Epidemiologic Research in Dermatology) - FROM (Research Foundation of Ospedale Maggiore Bergamo), Padiglione Mazzoleni - Presidio Ospedaliero Matteo Rota, Bergamo, Italy

Two outcomes:

- **EFFICACY:** PASI 90 - Psoriasis Area and Severity Index (RR)
- **SAFETY:** SAE - Serious Adverse Events (RR)

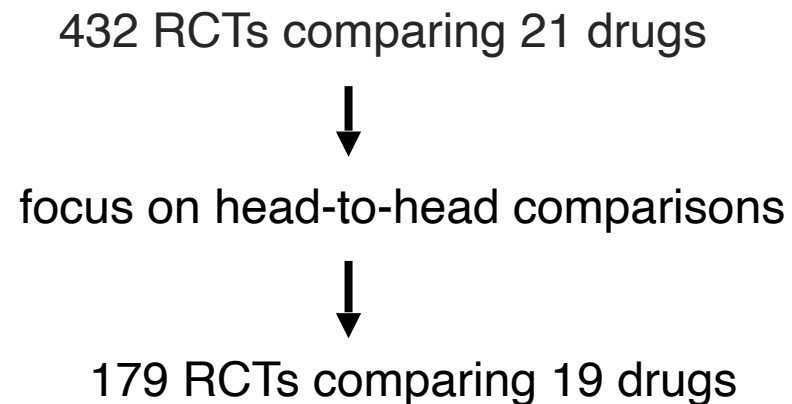


[Link to NMAstudio](#)

Outcome:

- **EFFICACY:** Response Rate as total n. of patients with $\geq 50\%$ reduction of the total score on a standardised observer-rating scale for depression (OR)

Articles



Comparative efficacy and acceptability of 21 antidepressant drugs for the acute treatment of adults with major depressive disorder: a systematic review and network meta-analysis



Andrea Cipriani, Toshi A Furukawa*, Georgia Salanti*, Anna Chaimani, Lauren Z Atkinson, Yusuke Ogawa, Stefan Leucht, Henricus G Ruhe, Erick H Turner, Julian P T Higgins, Matthias Egger, Nozomi Takeshima, Yu Hayasaka, Hissei Imai, Kiyomi Shinohara, Aran Tajika, John P A Ioannidis, John R Geddes



Summary

Background Major depressive disorder is one of the most common, burdensome, and costly psychiatric disorders worldwide in adults. Pharmacological and non-pharmacological treatments are available; however, because of inadequate resources, antidepressants are used more frequently than psychological interventions. Prescription of these agents should be informed by the best available evidence. Therefore, we aimed to update and expand our previous work to compare and rank antidepressants for the acute treatment of adults with unipolar major depressive disorder.

Lancet 2018; 391:1357-66

Published Online
February 21, 2018
[http://dx.doi.org/10.1016/S0140-6736\(17\)32802-7](http://dx.doi.org/10.1016/S0140-6736(17)32802-7)

See [Comment](#) page 1333

*Joint first authors

Methods We did a systematic review and network meta-analysis. We searched Cochrane Central Register of Controlled Trials, CINAHL, Embase, LILACS database, MEDLINE, MEDLINE In-Process, PsycINFO, the websites of regulatory agencies and international registers for published and unpublished double-blind randomised

Department of Psychiatry,
University of Oxford, Oxford,
United Kingdom

What you need:

1. A .csv file containing main data set
2. A .csv file containing CINeMA report (optional)

In the data selection process, you will choose:

- **Data Format:** long, wide, wide inverse variance (iv)
- **Outcome type:** continuous vs binary
- **Effect size:** OR, RR, MD, SMD

1. Data set: long-format

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	studyID	armID	manga	drug_name	Responders	Ntotal	age_mean	age_sd	pub_year	RoB	_Female	Dosing_sche	Dose_range	Sponso
2	8	1	0	agom	177	252	42	11	2008	I	1	Flexible	Licensed	Yes
3	8	2	0	fluo	164	263	43	12	2008	I	1	Flexible	Licensed	No
4	10	1	0	agom	106	167	43	14	2001	I		Fixed	Licensed	Yes
5	10	2	0	paro	120	168	42	13	2001	I		Fixed	Licensed	No
6	11	1	0	agom	113	137	40	10	2004	I	1	Fixed	Licensed	Yes
7	11	2	0	venl	111	140	42	10	2004	I	1	Flexible	Licensed	No
8	12	1	0	agom	127	213	69	6	2008	I		Flexible	Licensed	No
9	12	2	0	paro	118	199	68	6	2008	I		Flexible	Licensed	No
10	13	1	0	agom	205	314	39	13	2014	I	1	Flexible	Licensed	Yes
11	13	2	0	fluo	209	314	39	13	2014	I	1	Flexible	Licensed	No

2. CINeMA report (optional)

- as it is saved from CINeMA -

A	B	C
Comparison	Confidence rating	
agom:amit	Moderate	
agom:bupr	Moderate	
agom:cita	Moderate	
agom:clom	Moderate	
agom:dulo	Low	
agom:esci	Moderate	
agom:fluo	Low	

1. Data set: long-format

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	studyID	armID	manga	drug_name	Responders	Ntotal	age_mean	age_sd	pub_year	RoB	_Female	Dosing_sche	Dose_range	Sponso
2	8	1	0	agom	177	252	42	11	2008			1 Flexible	Licensed	Yes
3	8	2	0	fluo	164	263	43	12	2008			1 Flexible	Licensed	No
4	10	1	0	agom	106	167	43	14	2001			Fixed	Licensed	Yes
5	10	2	0	paro	120	168	42	13	2001			Fixed	Licensed	No
6	11	1	0	agom	113	137	40	10	2004			1 Fixed	Licensed	Yes
7	11	2	0	venl	111	140	42	10	2004			1 Flexible	Licensed	No
8	12	1	0	agom	127	213	69	6	2008			Flexible	Licensed	Yes
9	12	2	0	paro	118	199	68	6	2008			Flexible	Licensed	No
10	13	1	0	agom	205	314	39	13	2014			1 Flexible	Licensed	Yes
11	13	2	0	fluo	209	314	39	13	2014			1 Flexible	Licensed	No

2. CINeMA report (optional)

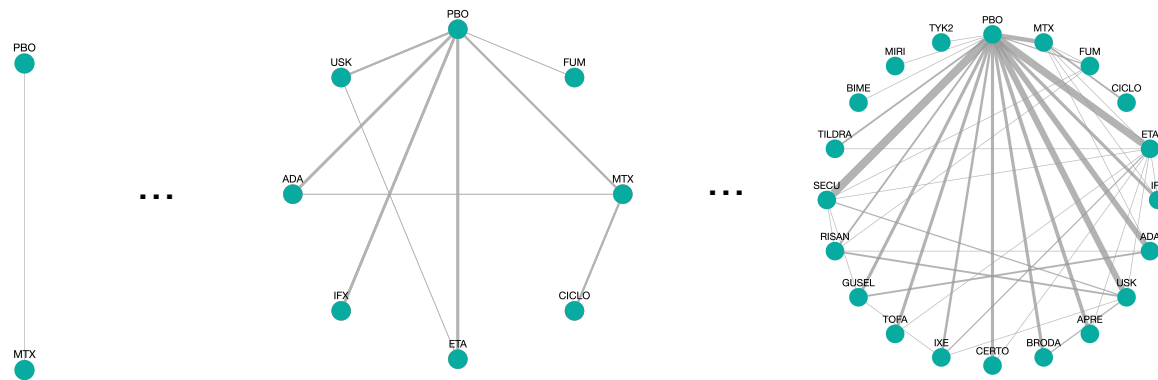
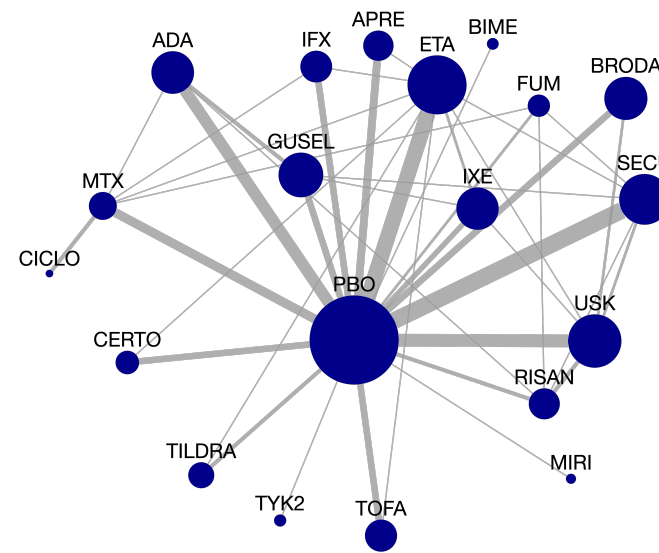
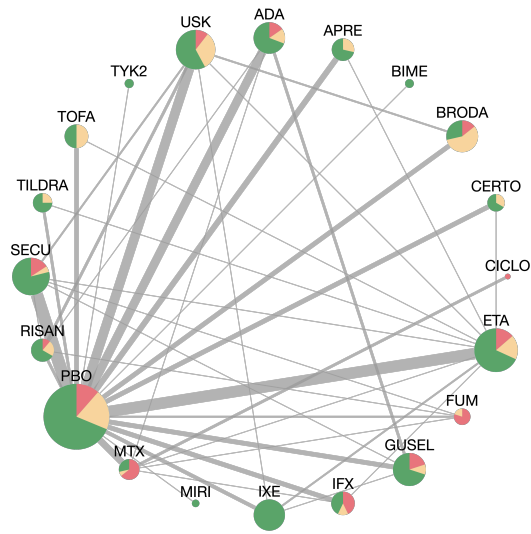
- as it is saved from CINeMA -

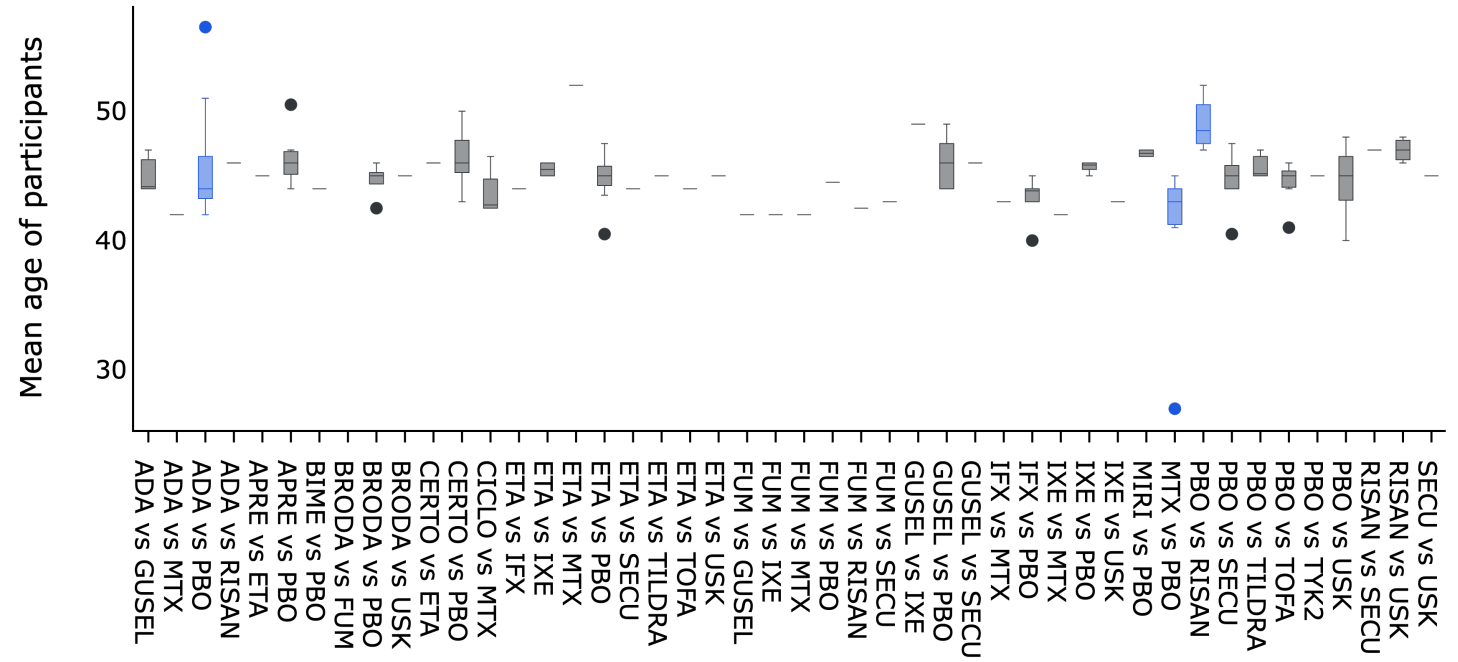
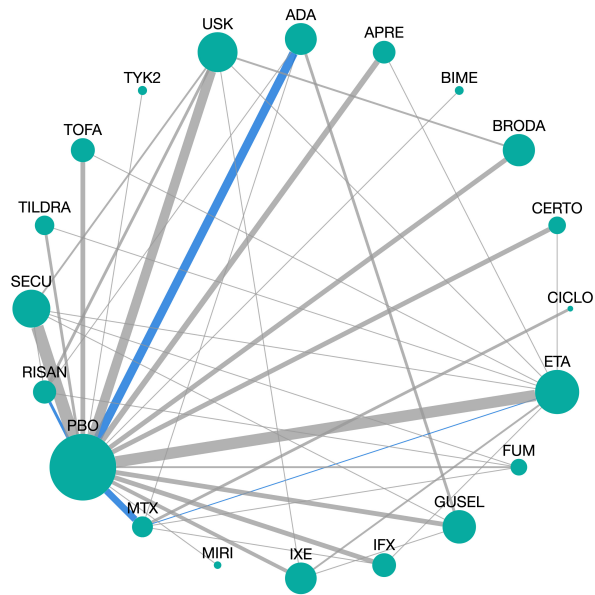
A	B	C
Comparison	Confidence rating	
agom:amit	Moderate	
agom:bupr	Moderate	
agom:cita	Moderate	
agom:clom	Moderate	
agom:dulo	Low	
agom:esci	Moderate	
agom:fluo	Low	

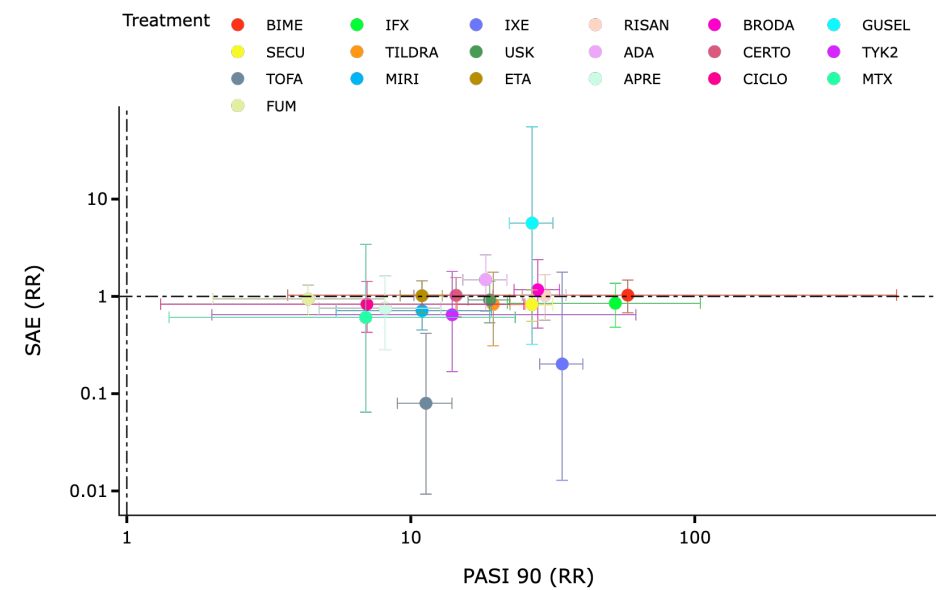
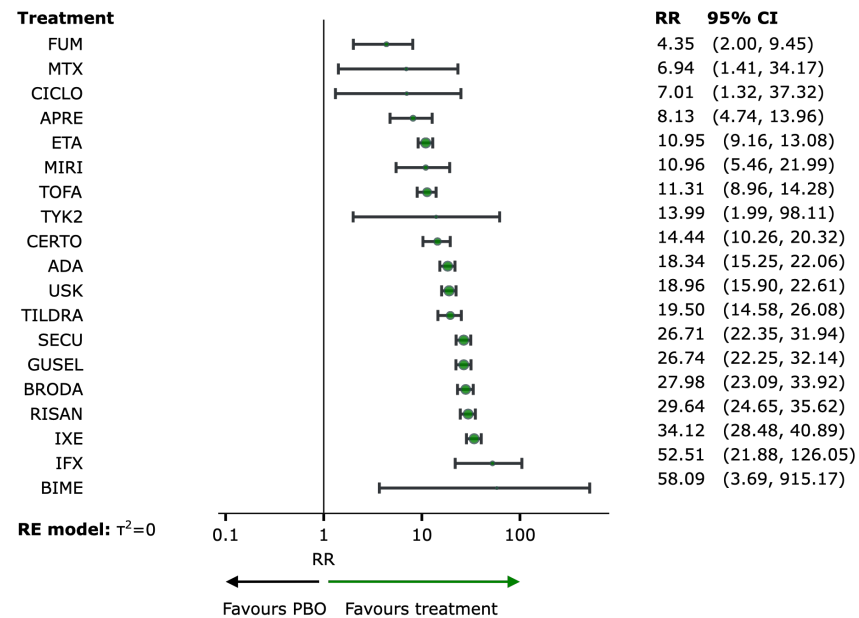
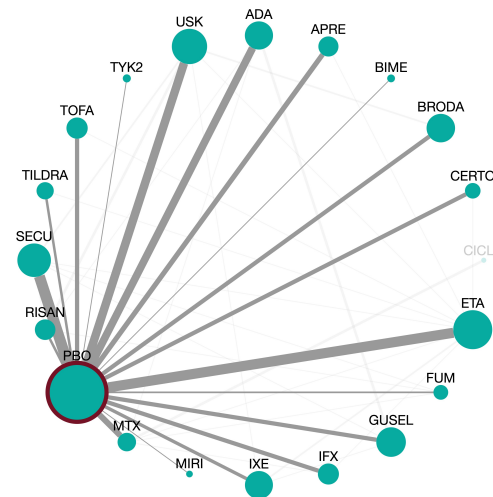


[Link to NMAstudio](#)

CONSIDERATIONS & FINAL REMARKS

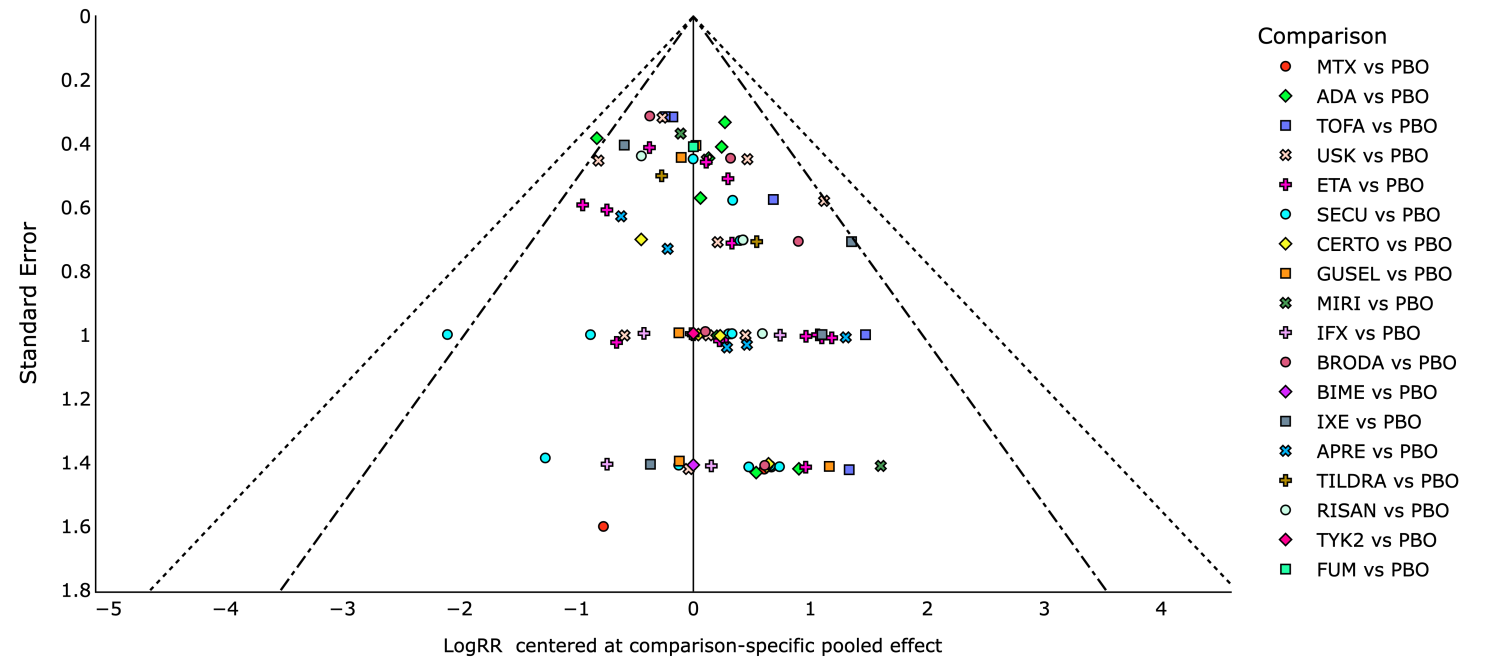


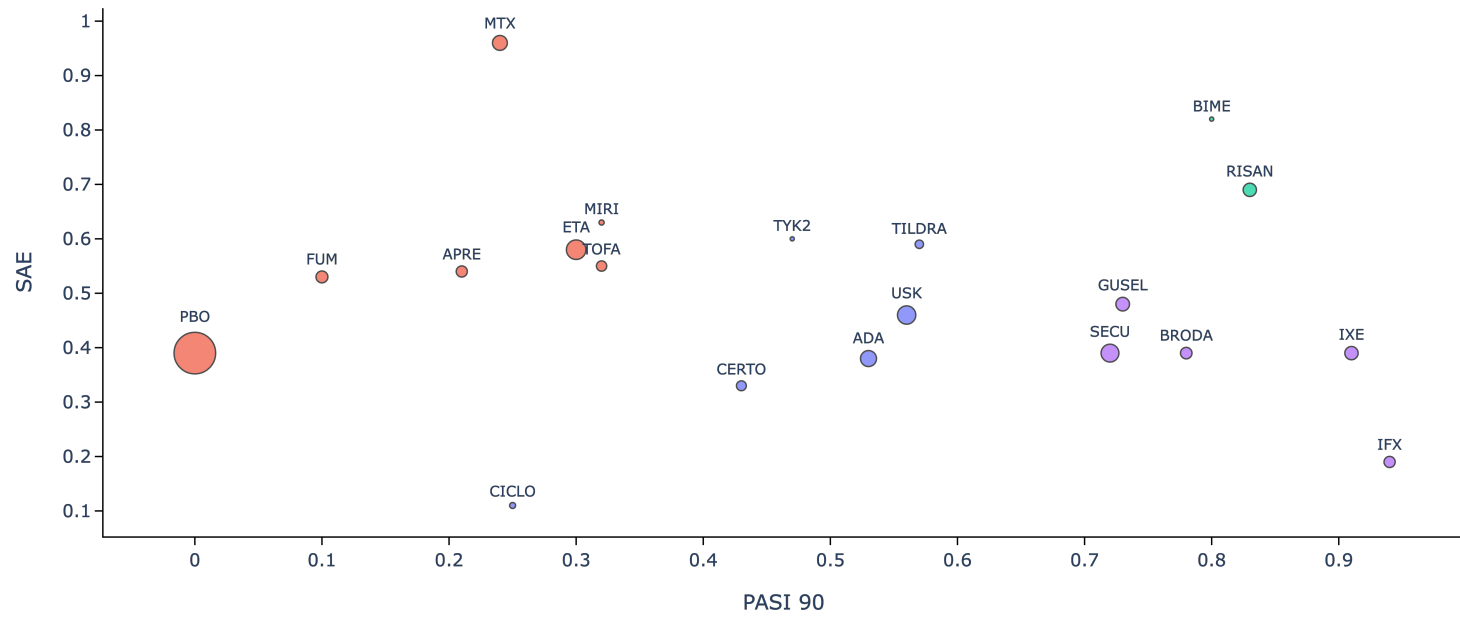
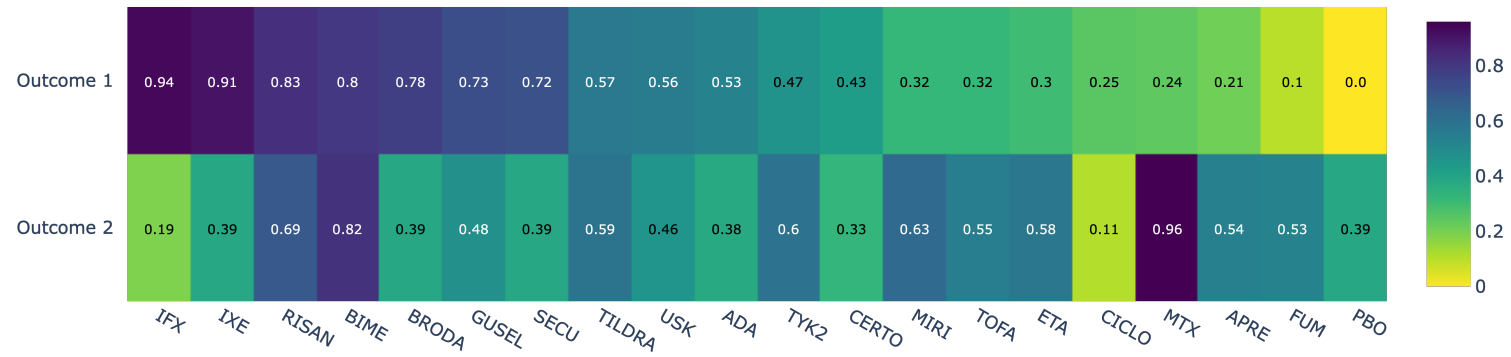




Treatment	IFX	IXE	RISAN	BIME	MIRI	SECU	GUSEL	BRODA	ADA	ETA	PBO
IFX	IFX	1.45 (0.59, 3.53)	2.08 (0.88, 4.96)	0.14 (0.01, 2.35)	2.29 (0.49, 10.61)	1.46 (0.63, 3.39)	0.62 (0.25, 1.55)	0.69 (0.27, 1.79)	0.69 (0.30, 1.62)	0.56 (0.24, 1.27)	1.48 (0.71, 3.10)
IXE	1.54 (0.63, 3.74)	IXE	1.44 (0.74, 2.80)	0.20 (0.01, 3.23)	1.58 (0.38, 6.65)	1.01 (0.53, 1.91)	0.90 (0.51, 1.57)	1.01 (0.46, 2.18)	1.00 (0.55, 1.85)	0.81 (0.46, 1.41)	1.03 (0.62, 1.70)
RISAN	1.77 (0.73, 4.31)	1.15 (1.01, 1.31)	RISAN	0.28 (0.02, 4.62)	0.91 (0.22, 3.75)	0.70 (0.42, 1.18)	1.29 (0.66, 2.54)	1.45 (0.70, 2.99)	1.45 (0.84, 2.49)	1.16 (0.64, 2.09)	1.41 (0.89, 2.21)
BIME	1.11 (0.06, 19.96)	1.70 (0.11, 26.98)	1.96 (0.12, 31.07)	BIME	0.31 (0.01, 6.67)	0.20 (0.01, 3.21)	0.22 (0.01, 3.63)	0.20 (0.01, 3.27)	5.10 (0.32, 82.47)	0.24 (0.02, 3.95)	0.20 (0.01, 3.16)
MIRI	4.79 (1.57, 14.67)	3.11 (1.52, 6.39)	0.37 (0.18, 0.76)	5.30 (0.31, 91.07)	MIRI	0.64 (0.16, 2.59)	1.42 (0.33, 6.04)	1.59 (0.37, 6.91)	1.59 (0.39, 6.49)	1.28 (0.31, 5.18)	0.65 (0.17, 2.48)
SECU	1.97 (0.81, 4.78)	1.28 (1.12, 1.45)	1.11 (1.00, 1.23)	2.17 (0.14, 34.45)	0.41 (0.20, 0.84)	SECU	0.90 (0.46, 1.76)	1.01 (0.50, 2.03)	1.01 (0.58, 1.78)	0.81 (0.47, 1.41)	0.98 (0.65, 1.48)
GUSEL	0.51 (0.21, 1.24)	0.78 (0.72, 0.85)	0.90 (0.79, 1.02)	2.17 (0.14, 34.43)	2.44 (1.19, 5.01)	1.00 (0.88, 1.14)	GUSEL	1.12 (0.50, 2.50)	1.12 (0.63, 1.98)	0.90 (0.48, 1.70)	0.92 (0.53, 1.58)
BRODA	0.53 (0.22, 1.30)	0.82 (0.71, 0.95)	0.94 (0.83, 1.08)	2.08 (0.13, 32.92)	2.55 (1.24, 5.26)	1.05 (0.94, 1.17)	1.05 (0.90, 1.22)	BRODA	1.00 (0.49, 2.05)	1.25 (0.61, 2.54)	1.03 (0.57, 1.87)
ADA	0.35 (0.14, 0.85)	0.54 (0.48, 0.60)	0.62 (0.55, 0.69)	0.32 (0.02, 5.00)	1.67 (0.81, 3.44)	0.69 (0.60, 0.78)	0.69 (0.63, 0.75)	0.66 (0.56, 0.77)	ADA	1.25 (0.71, 2.19)	1.03 (0.68, 1.56)
ETA	0.21 (0.09, 0.51)	0.32 (0.29, 0.36)	0.37 (0.32, 0.43)	5.31 (0.33, 84.05)	1.00 (0.49, 2.05)	0.41 (0.36, 0.47)	0.41 (0.36, 0.47)	2.56 (2.19, 2.99)	1.67 (1.45, 1.94)	ETA	0.83 (0.55, 1.23)
PBO	52.51 (21.88, 126.05)	34.12 (28.48, 40.89)	0.03 (0.03, 0.04)	58.09 (3.69, 915.12)	10.96 (5.46, 21.99)	0.04 (0.03, 0.04)	26.74 (22.25, 32.14)	27.98 (23.09, 33.92)	18.34 (15.25, 22.06)	10.95 (9.16, 13.08)	PBO

Comparison	direct	indirect	p-value
ADA vs GUSEL	0.678	0.737	0.5124
ADA vs PBO	15.1776	19.7713	0.2054
BRODA vs PBO	31.5189	27.255	0.5679
ETA vs IXE	0.3276	0.3074	0.6193
ETA vs TOFA	0.8968	1.3581	0.0989
IXE vs PBO	39.5201	33.6765	0.6337
IXE vs USK	1.7263	1.8419	0.6201
PBO vs TOFA	0.1125	0.0777	0.1367





NMAstudio

- is *fully* interactive, flexible web application
- simplifies the whole NMA process and assists in interpretation of findings

- Can ease analyses for people with no programming skills
- But also, can ease visualisations for people with programming skills

Recommendations

- We recommend to follow guidelines provided in the tutorial/online material
- We recommend to use NMAstudio following advice from experienced statisticians

In the near future:

- More options for the graph customisation
- more alerts/warnings in general (e.g. for transitivity/consistency)
- R console
- sensitivity analyses (e.g. by RoB, year of publication)
- Option for uploading analyses results and only perform visualisation

❖ **Python package: 'nmastudio'**
(under development)



In a bit further future:

- option for Bayesian NMA analyses (linking NMAstudio to R + JAGS or Stan)
- permanent link to your project
-not restricted to this list!

Any ideas/suggestions are very welcome, your feedback is important

please email me at silvia.metelli@u-paris.fr if you want to get in touch

APP: <https://www.nmastudioapp.com>

TUTORIAL/ DOCUMENTATION: <https://www.nmastudioapp.com/doc>

NEWS: <https://www.cer-methods.com/>

THANK YOU!

(special thanks to netmeta and CINeMA developers)



NMastudio
An interactive tool for network meta-analyses