

Presenting results in Network Meta-Analysis

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Presenting the results

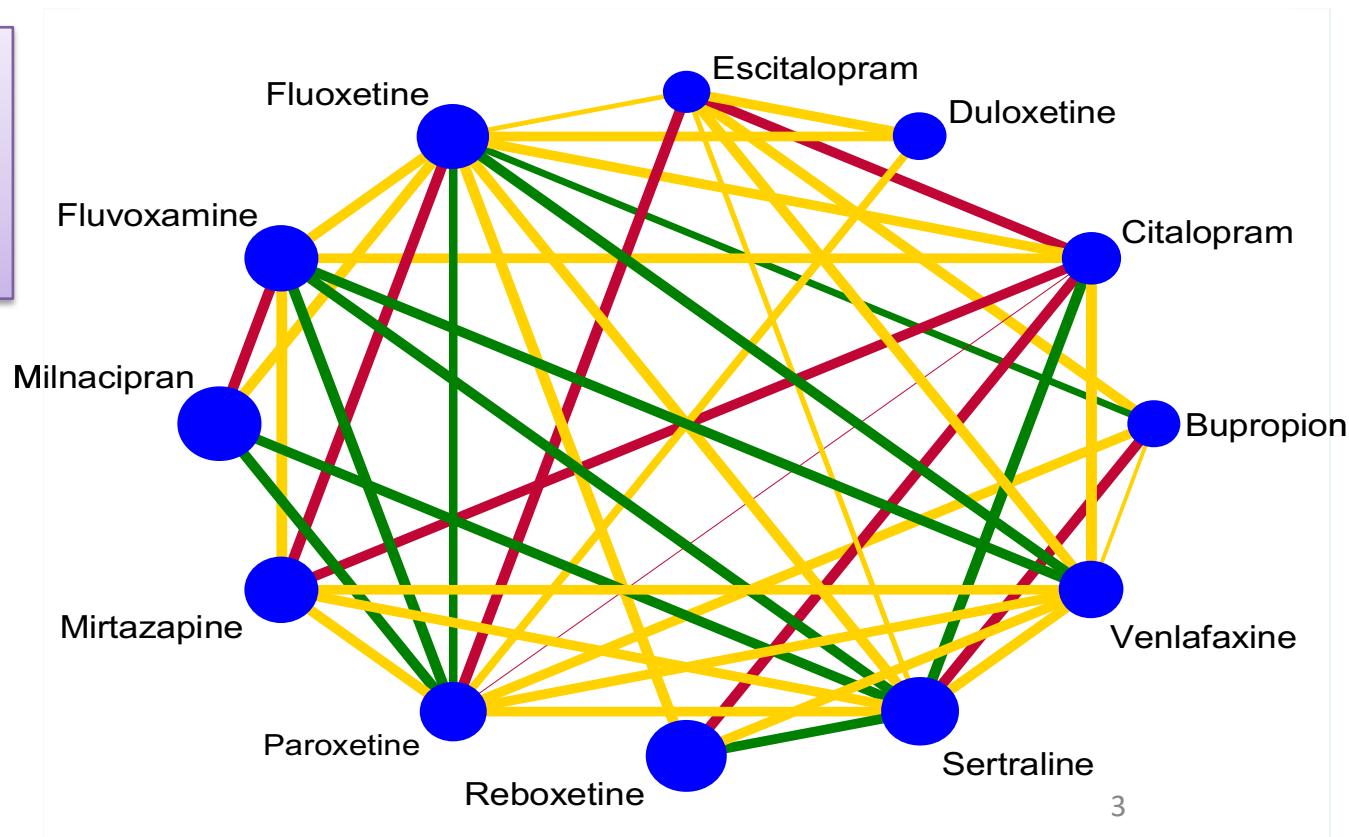
- Typically effect sizes (and their uncertainty) for all pairwise comparisons are reported
- With many treatments judgments based on pairwise effect sizes are difficult to make
- Example: Antidepressants

Example comparing 12 antidepressants

Cipriani et al Lancet 2009

- Network diagrams can give information on several study-level characteristics

Inappropriate allocation concealment
a potentially important study design limitation



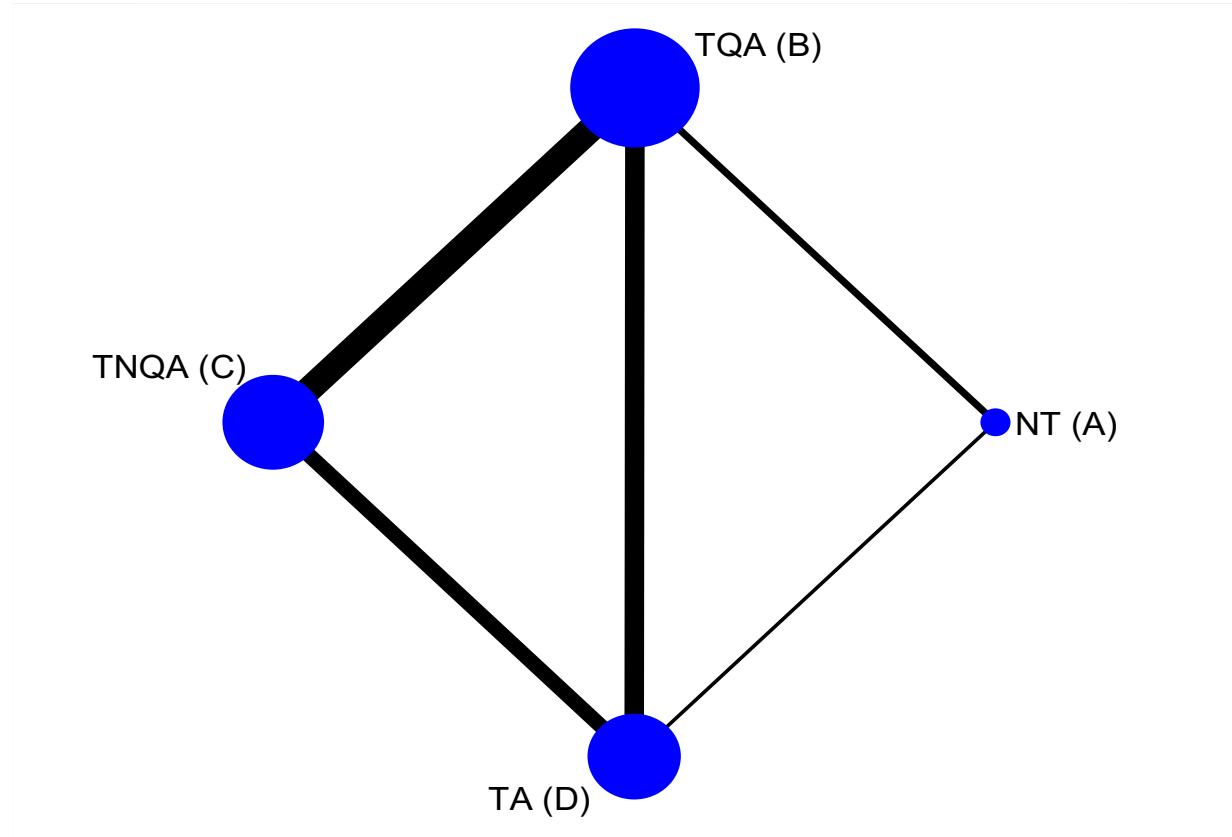
Cipriani et al Lancet 2009

Example: Efficacy and acceptability of antidepressants

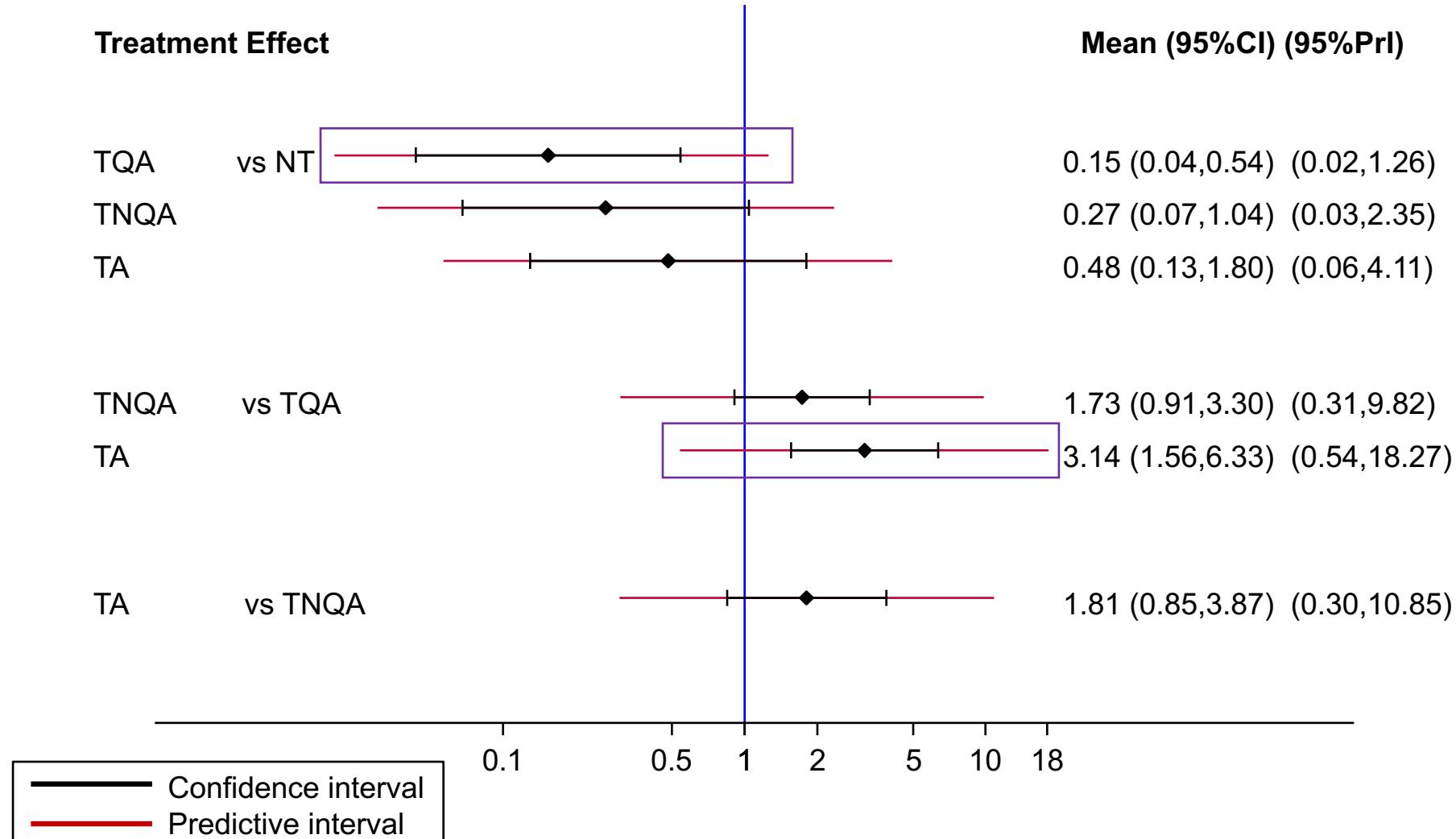
	Efficacy (response rate) (95% CI)	Comparison	Acceptability (dropout rate) (95% CI)								
BUP	1.00 (0.78-1.28)	0.75 (0.55-1.01)	1.06 (0.86-1.32)	0.89 (0.74-1.08)	0.73 (0.53-1.00)	0.87 (0.58-1.24)	0.87 (0.66-1.14)	0.81 (0.65-1.00)	0.62 (0.45-0.86)	1.01 (0.82-1.27)	0.84 (0.68-1.02)
0.98 (0.78-1.23)	CIT	0.75 (0.55-1.02)	1.07 (0.86-1.31)	0.90 (0.73-1.09)	0.73 (0.54-0.99)	0.87 (0.60-1.24)	0.87 (0.66-1.15)	0.81 (0.65-1.01)	0.62 (0.45-0.84)	1.02 (0.81-1.28)	0.84 (0.67-1.06)
1.09 (0.83-1.43)	1.12 (0.87-1.44)	DUL	1.43 (1.09-1.85)	1.19 (0.91-1.57)	0.98 (0.67-1.41)	1.16 (0.77-1.73)	1.16 (0.83-1.61)	1.08 (0.84-1.40)	0.83 (0.57-1.22)	1.36 (1.01-1.83)	1.12 (0.84-1.50)
0.82 (0.67-1.01)	0.84 (0.70-1.01)	0.75 (0.60-0.93)	ESC	0.84 (0.70-1.01)	0.69 (0.50-0.94)	0.81 (0.55-1.15)	0.81 (0.62-1.07)	0.76 (0.62-0.93)	0.58 (0.43-0.81)	0.95 (0.77-1.19)	0.78 (0.64-0.97)
1.08 (0.90-1.29)	1.10 (0.93-1.31)	0.99 (0.79-1.24)	1.32 (1.12-1.55)	FLU	0.82 (0.62-1.07)	0.97 (0.69-1.32)	0.97 (0.77-1.21)	0.91 (0.79-1.05)	0.70 (0.53-0.92)	1.14 (0.96-1.36)	0.94 (0.81-1.09)
1.10 (0.83-1.47)	1.13 (0.86-1.47)	1.01 (0.74-1.38)	1.35 (1.02-1.76)	1.02 (0.81-1.30)	FVX	1.18 (0.76-1.75)	1.18 (0.87-1.61)	1.10 (0.84-1.47)	0.85 (0.57-1.26)	1.38 (1.03-1.89)	1.14 (0.86-1.54)
1.07 (0.77-1.48)	1.09 (0.78-1.50)	0.97 (0.69-1.38)	1.30 (0.95-1.78)	0.99 (0.74-1.31)	0.97 (0.68-1.37)	MIL	0.99 (0.69-1.53)	0.94 (0.68-1.31)	0.72 (0.48-1.10)	1.17 (0.84-1.72)	0.97 (0.69-1.40)
0.79 (0.72-1.00)	0.80 (0.63-1.01)	0.72 (0.54-0.94)	0.96 (0.76-1.19)	0.73 (0.60-0.88)	0.71 (0.55-0.92)	0.74 (0.53-1.01)	MIR	0.93 (0.75-1.17)	0.72 (0.51-1.03)	1.17 (0.91-1.51)	0.97 (0.76-1.23)
1.06 (0.87-1.30)	1.08 (0.90-1.30)	0.97 (0.78-1.20)	1.30 (1.10-1.53)	0.98 (0.86-1.12)	0.96 (0.76-1.23)	1.00 (0.74-1.33)	1.35 (1.11-1.64)	PAR	0.77 (0.56-1.05)	1.25 (1.04-1.52)	1.03 (0.86-1.24)
1.60 (1.20-2.16)	1.63 (1.25-2.14)	1.46 (1.05-2.02)	1.95 (1.47-2.59)	1.48 (1.16-1.90)	1.45 (1.03-2.02)	1.50 (1.03-2.18)	2.03 (1.52-2.78)	1.50 (1.16-1.98)	REB	1.63 (1.19-2.24)	1.34 (0.99-1.83)
0.87 (0.72-1.05)	0.88 (0.72-1.07)	0.79 (0.62-1.01)	1.06 (0.88-1.27)	0.80 (0.69-0.93)	0.79 (0.61-1.01)	0.81 (0.60-1.11)	1.10 (0.90-1.36)	0.82 (0.69-0.96)	0.54 (0.41-0.71)	SER	0.82 (0.67-1.00)
0.85 (0.70-1.01)	0.86 (0.71-1.05)	0.77 (0.60-0.99)	1.03 (0.86-1.24)	0.78 (0.68-0.90)	0.77 (0.59-0.99)	0.79 (0.58-1.08)	1.08 (0.87-1.33)	0.79 (0.67-0.94)	0.53 (0.40-0.69)	0.98 (0.82-1.16)	VEN

OR>1 means the treatment in top-left is better

Topical antibiotics for chronically discharging ears



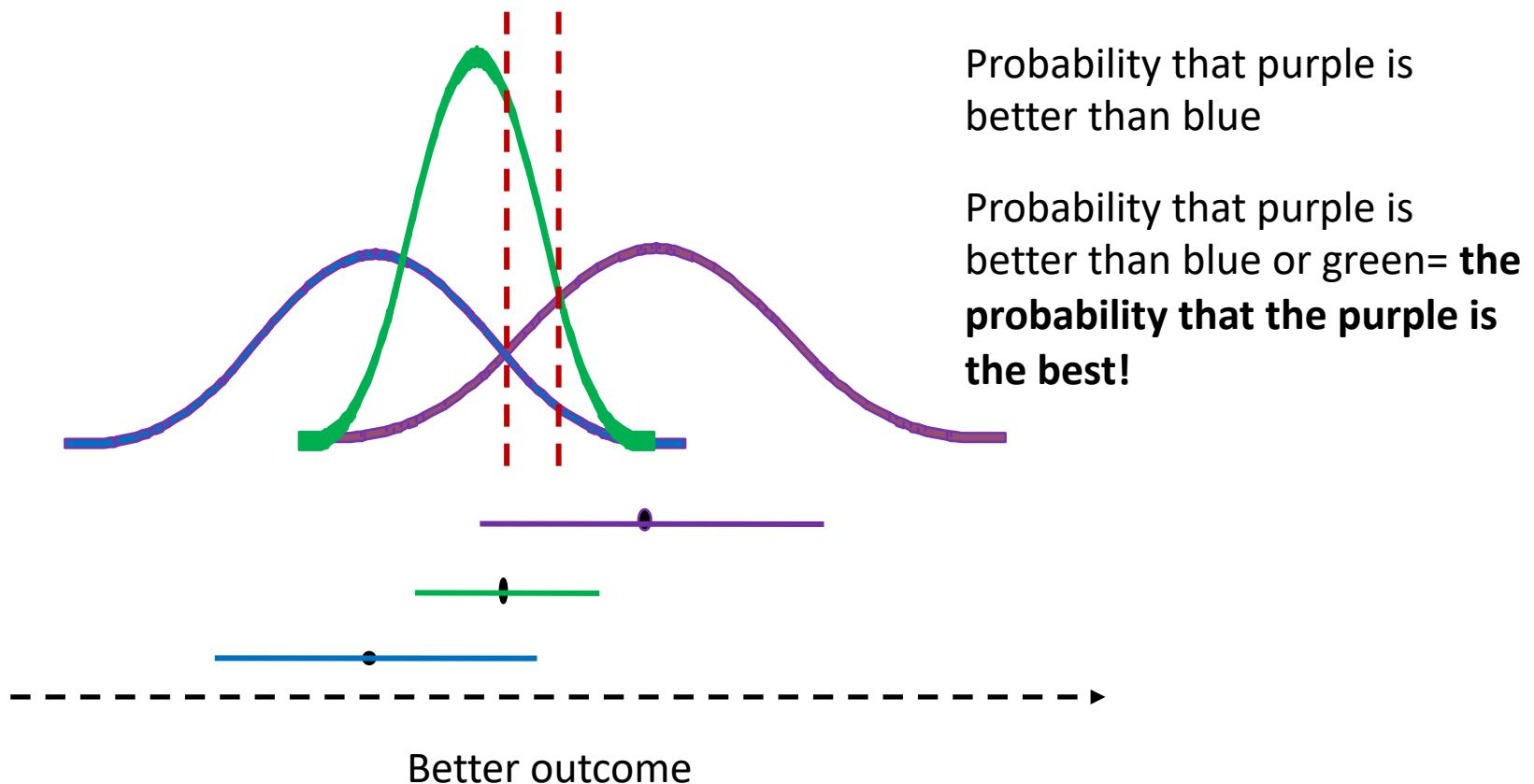
Example: Topical antibiotics for chronically discharging ears



Ranking probabilities

- Estimate for each treatment **the probability of being the best**
- This is straightforward within a Bayesian framework
 - In each MCMC cycle rank the treatments
 - Run 1,000 000 cycles
 - $(\#J=1)/ 1,000 000$ is the probability that J is the best treatment
- You can do the same in frequentist framework using a re-sampling method (e.g. bootstrap)
- But this does not convey the entire picture...

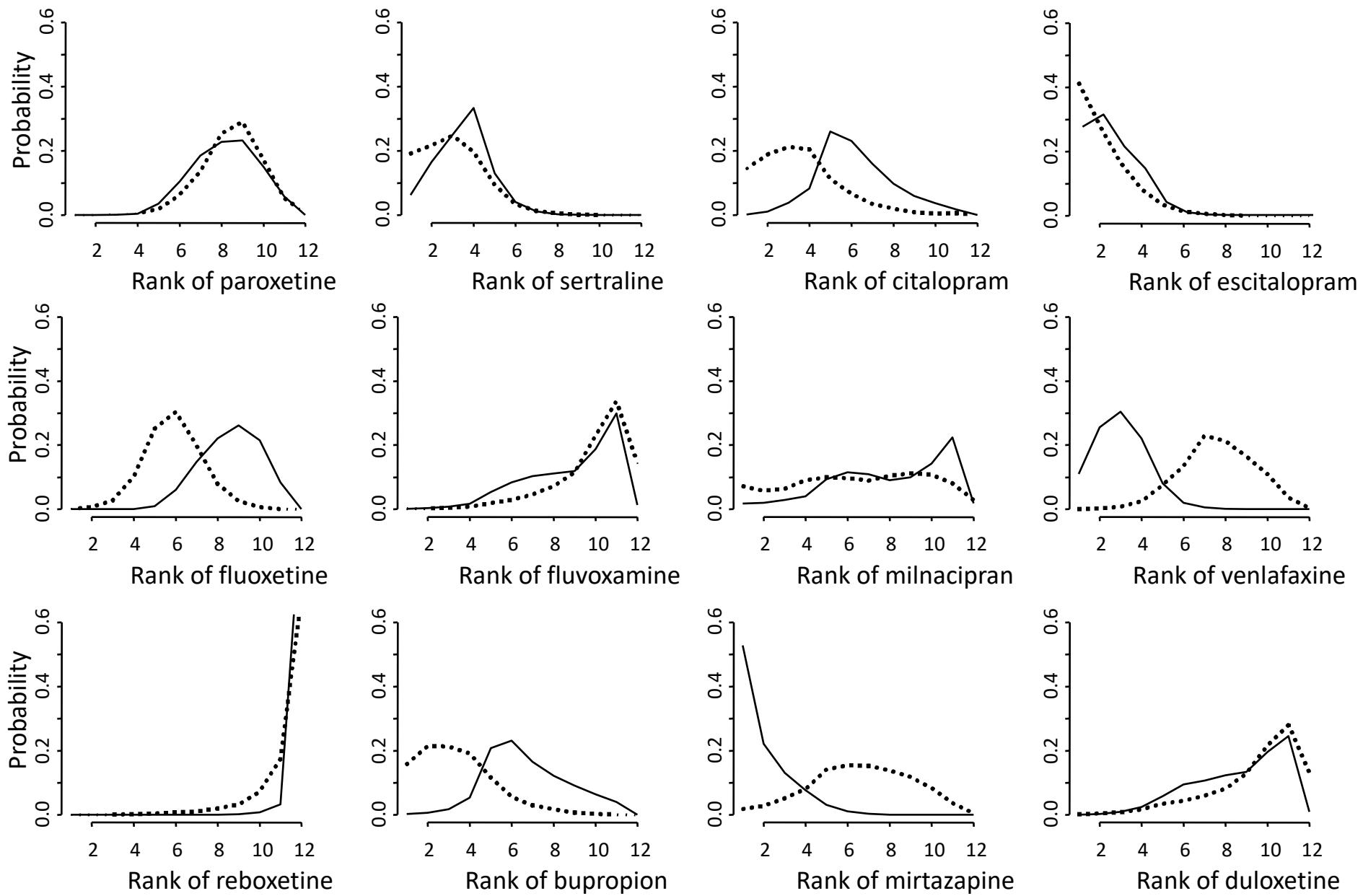
Ranking three hypothetical treatments



% probability	A	B	C	D
$j=1$	0.25	0.50	0.25	0.00

% probability	A	B	C	D
$j=1$	0.25	0.50	0.25	0.00
$j=2$	0.25	0.25	0.50	0.00
$j=3$	0.25	0.25	0.25	0.25
$j=4$	0.25	0	0	0.75

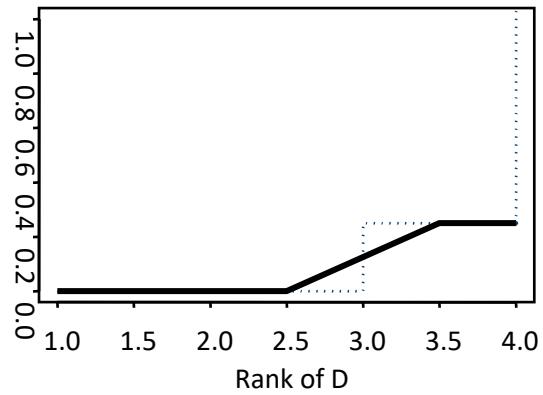
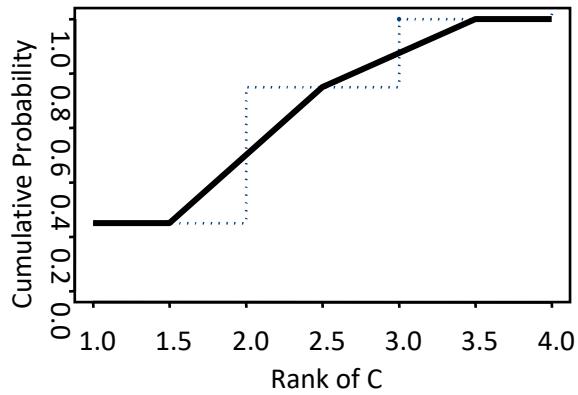
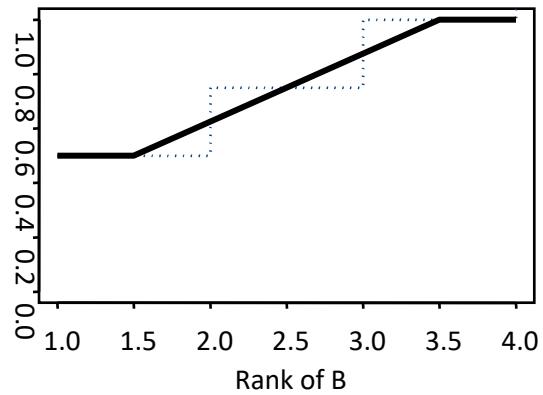
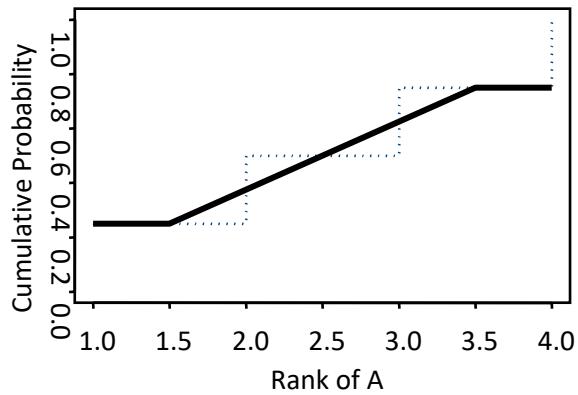
i =A,B,C,D the treatment
j the rank



Ranking for efficacy (solid line) and acceptability (dotted line). Ranking: probability to be the best treatment, to be the second best, the third best and so on, among the 12 comparisons).

% cumulative probability	A	B	C	D
j=1	0.25	0.50	0.25	0.00
j=2	0.50	0.75	0.75	0.00
j=3	0.75	1.00	1.00	0.25
j=4	1.00	1.00	1.00	1.00

i =A,B,C,D the treatment
j the rank



The areas under the cumulative curves for the four treatments of the example above are

$$A=0.5$$

$$B=0.75$$

$$C=0.67$$

$$D=0.08$$

Surface Under the Cumulative RAnking curve (SUCRA)

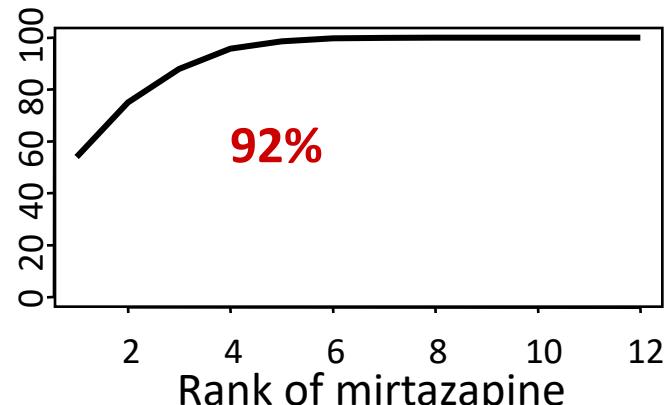
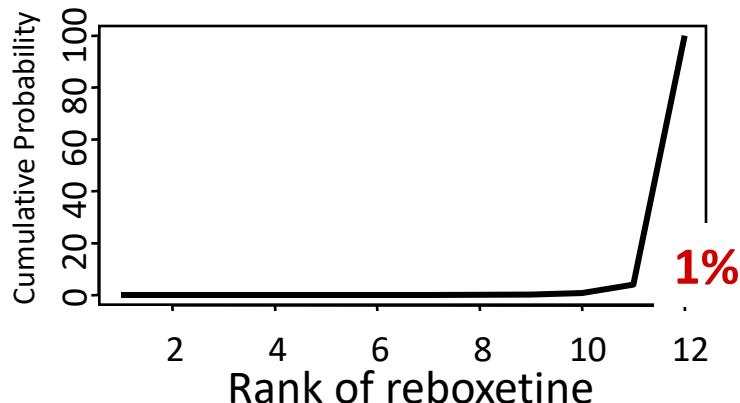
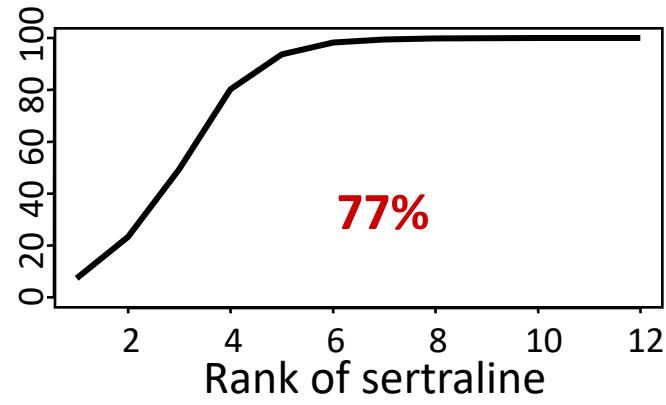
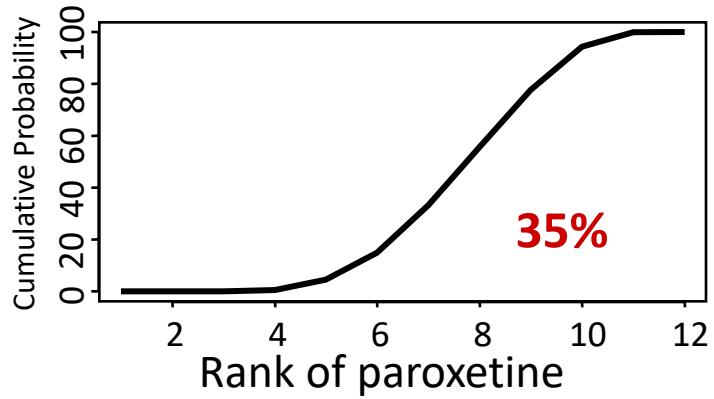
Use posterior (cumulative) probabilities for each treatment to be among the n -best options

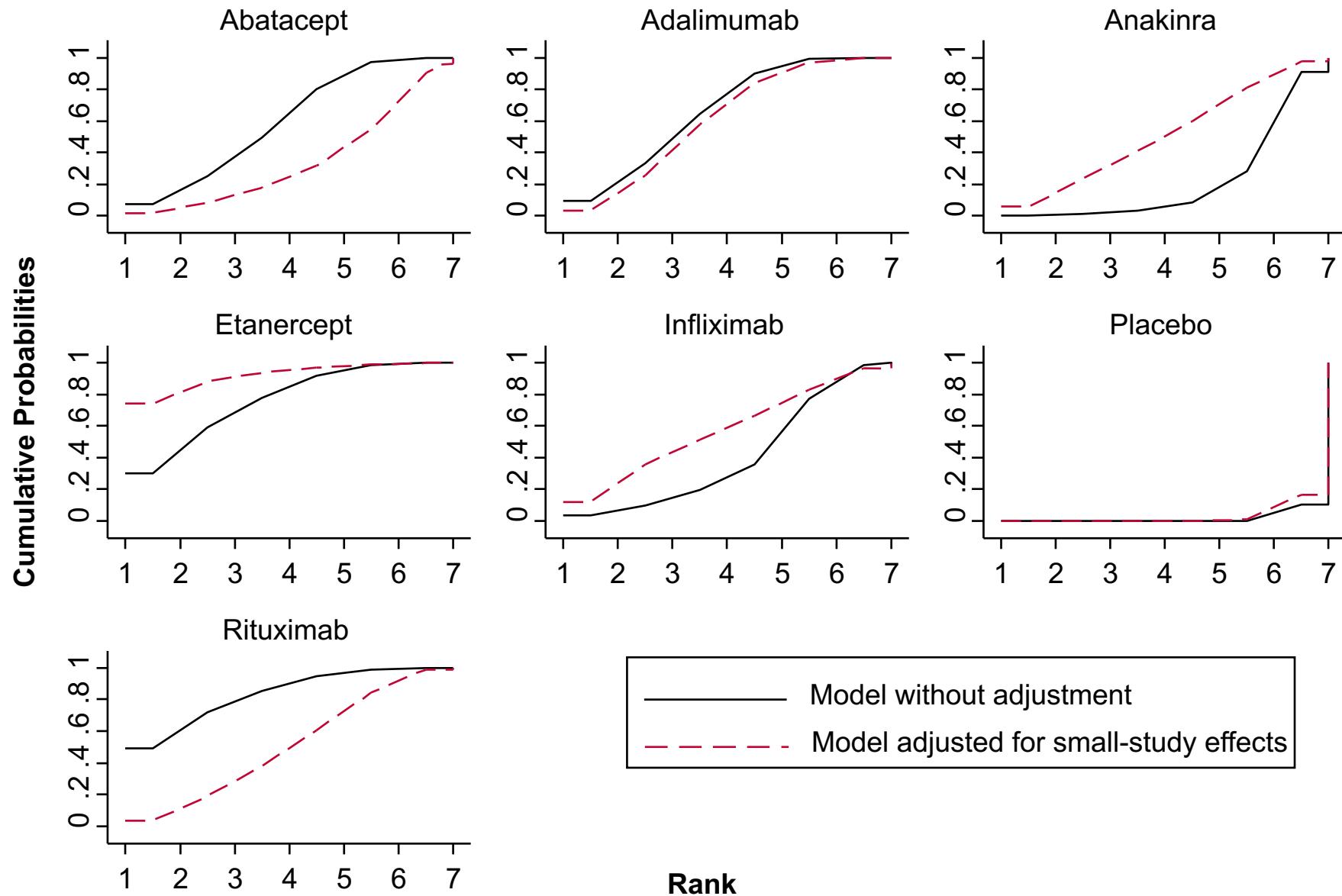
$$SUCRA_j = \frac{\sum_{l=1}^{T-1} cump_{j,l}}{T - 1}$$

The diagram illustrates the components of the SUCRA formula. It shows the formula $SUCRA_j = \frac{\sum_{l=1}^{T-1} cump_{j,l}}{T - 1}$. An arrow points from the term $cump_{j,l}$ to the text "Treatments j Ranks l ". Another arrow points from the term $T - 1$ to the text "Total number of treatments T ".

$SUCRA_j$ = The percentage of the effectiveness/safety of a treatment that would be ranked first without any uncertainty

Surface Under the Cumulative RAnking curve (SUCRA)





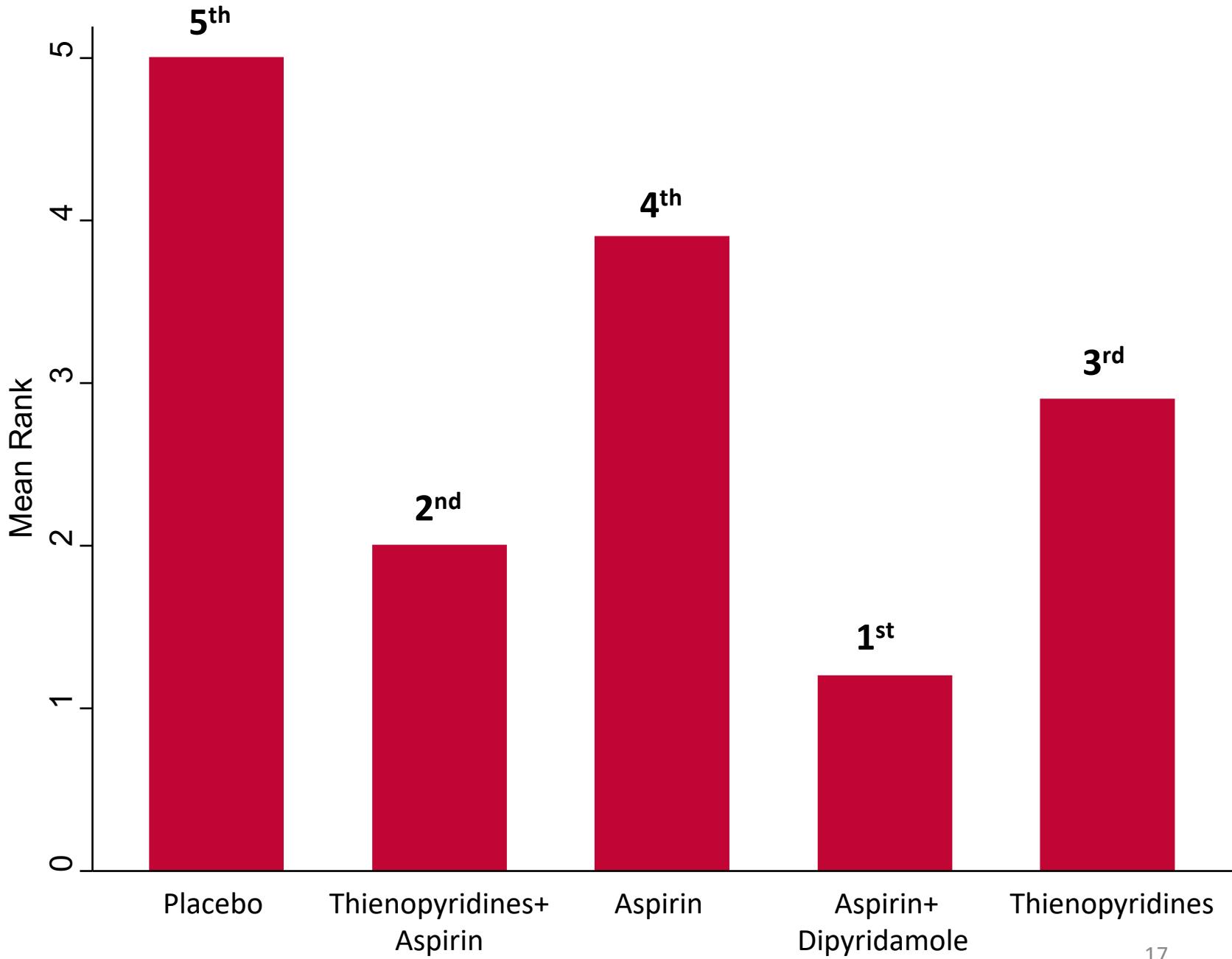
Mean Ranks

Use the weighted average of all possible ranks with weights the ranking probabilities for each treatment

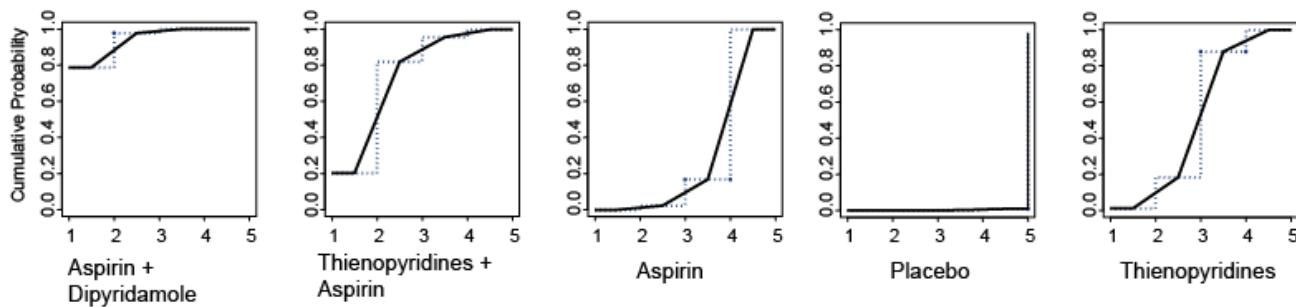
$$\text{Mean rank}_j = \sum_{l=1}^T (p_{j,l} \times l)$$

The diagram illustrates the formula for Mean rank_j. It shows three components: 'Total number of treatments T' pointing to the upper limit of the summation, 'Treatments j Ranks l' pointing to the variable l inside the summation, and the summation symbol itself.

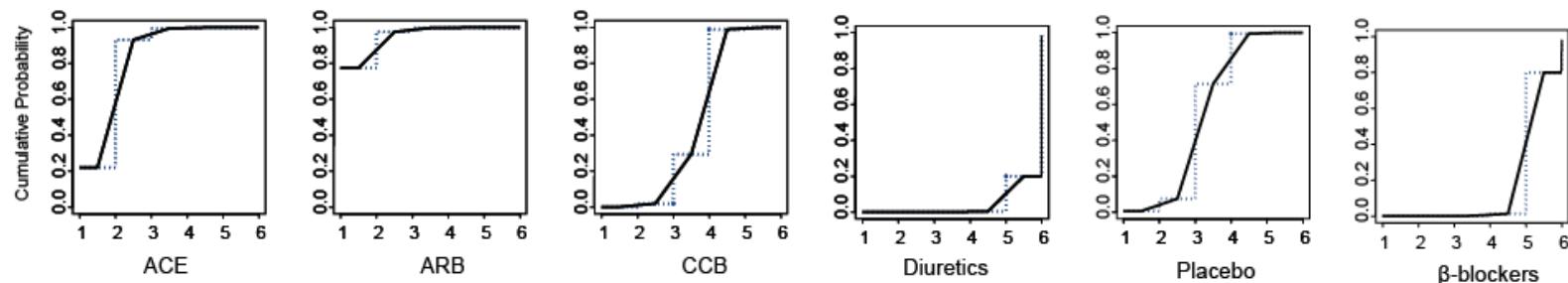
Smaller mean rank values correspond to more effective/safer treatments



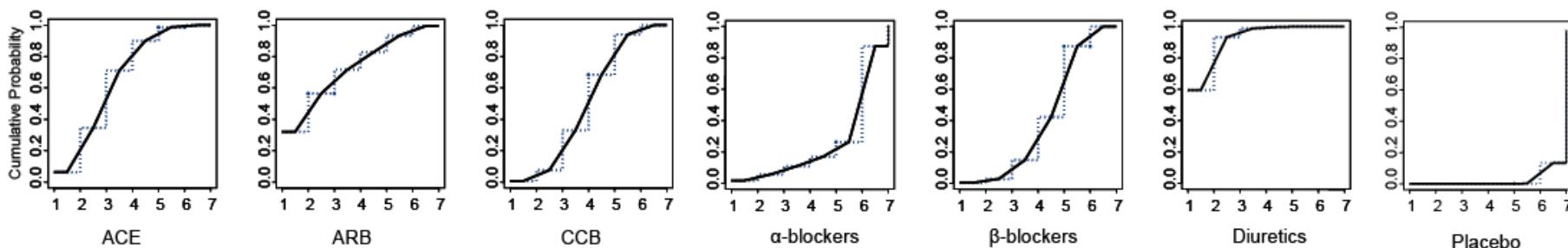
Serious vascular events with antiplatelet regimens



Incident diabetes with antihypertensive drugs

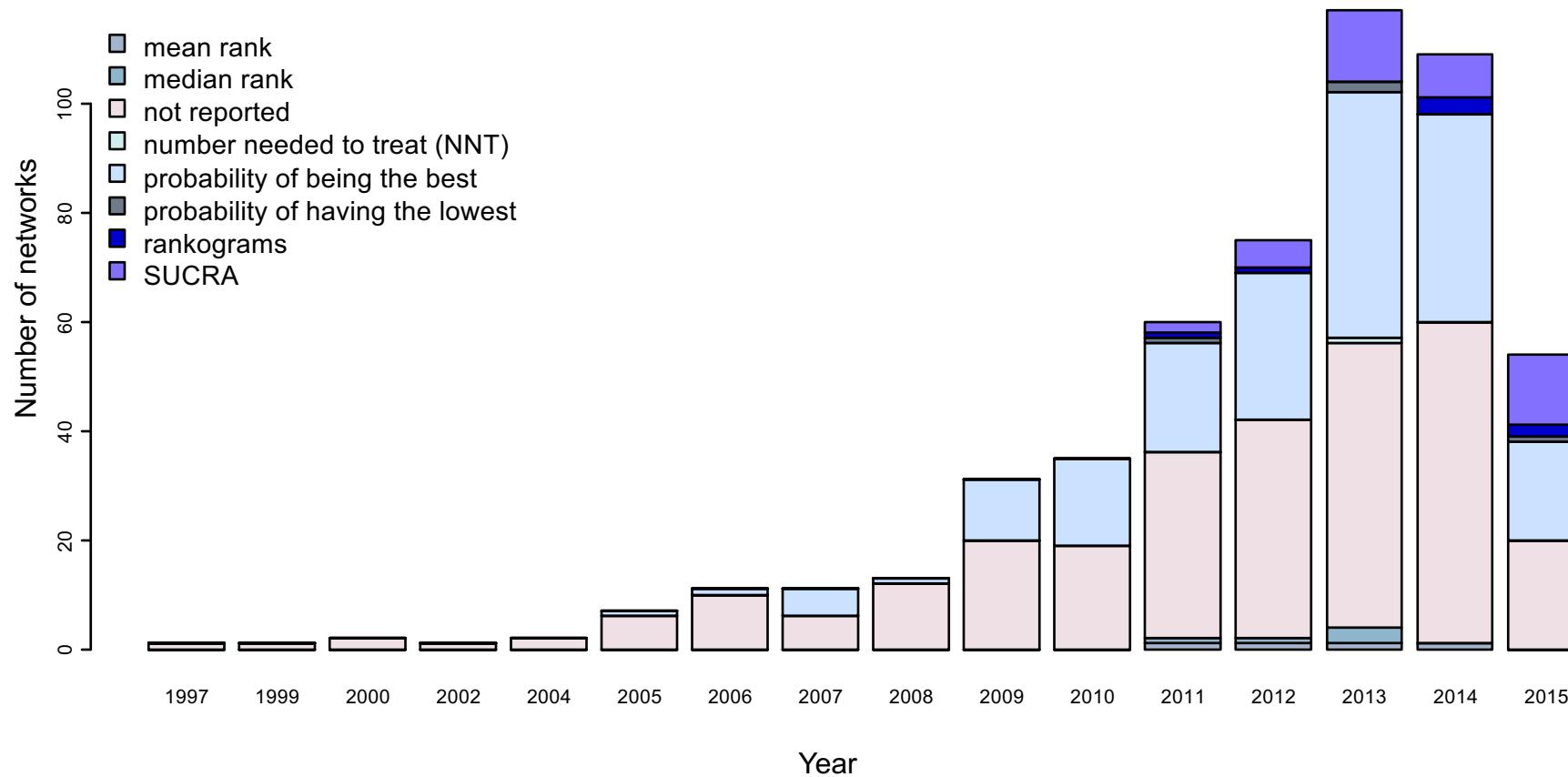


Serious cardiovascular event with antihypertensive drugs



Warning: measures based on probabilities are attractive, but can be unstable and should be presented along with the effect sizes!

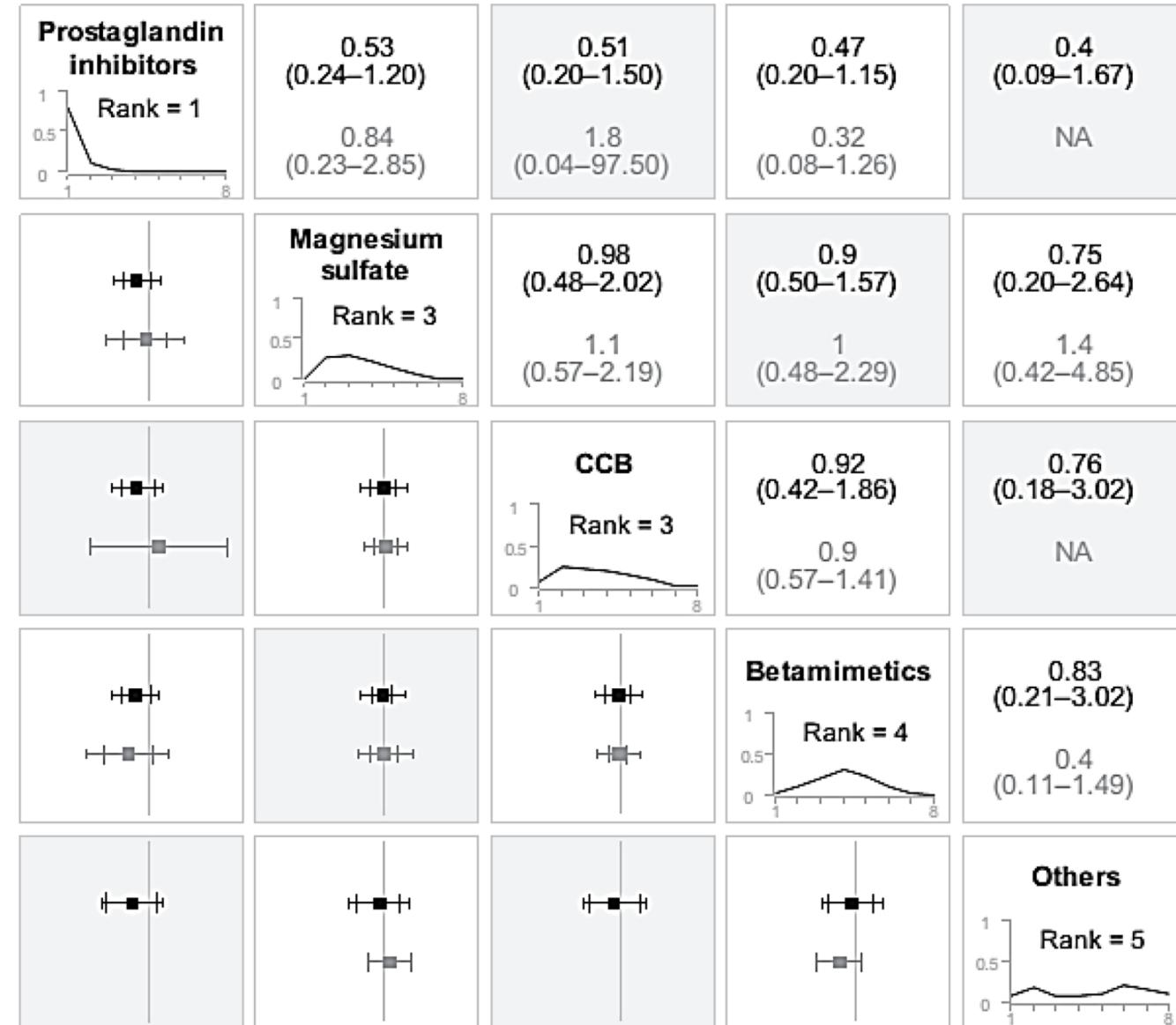
Figure 6



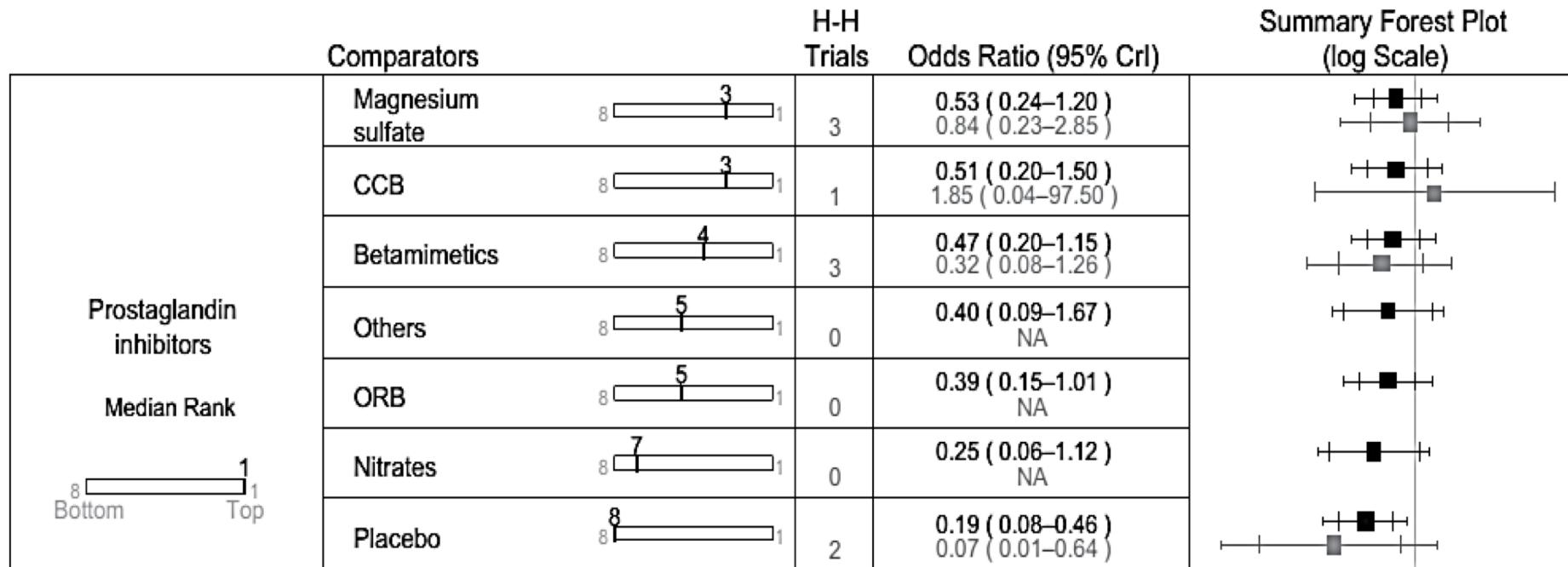
Ranking based on probabilities

- Using $P(\text{best})$ to rank treatments can be misleading!
- Ranking based on SUCRAs or Mean Ranks accounts better for the uncertainty in relative ranking
- Ranking measures are conditional on the set of treatments being compared
 - This means SUCRAs, Mean ranks and possibly the ranking will change if a subset of the treatments are compared
- Ranking measures are not a substitute for relative treatment effects!

Example: Tocolytic therapy for preterm child delivery



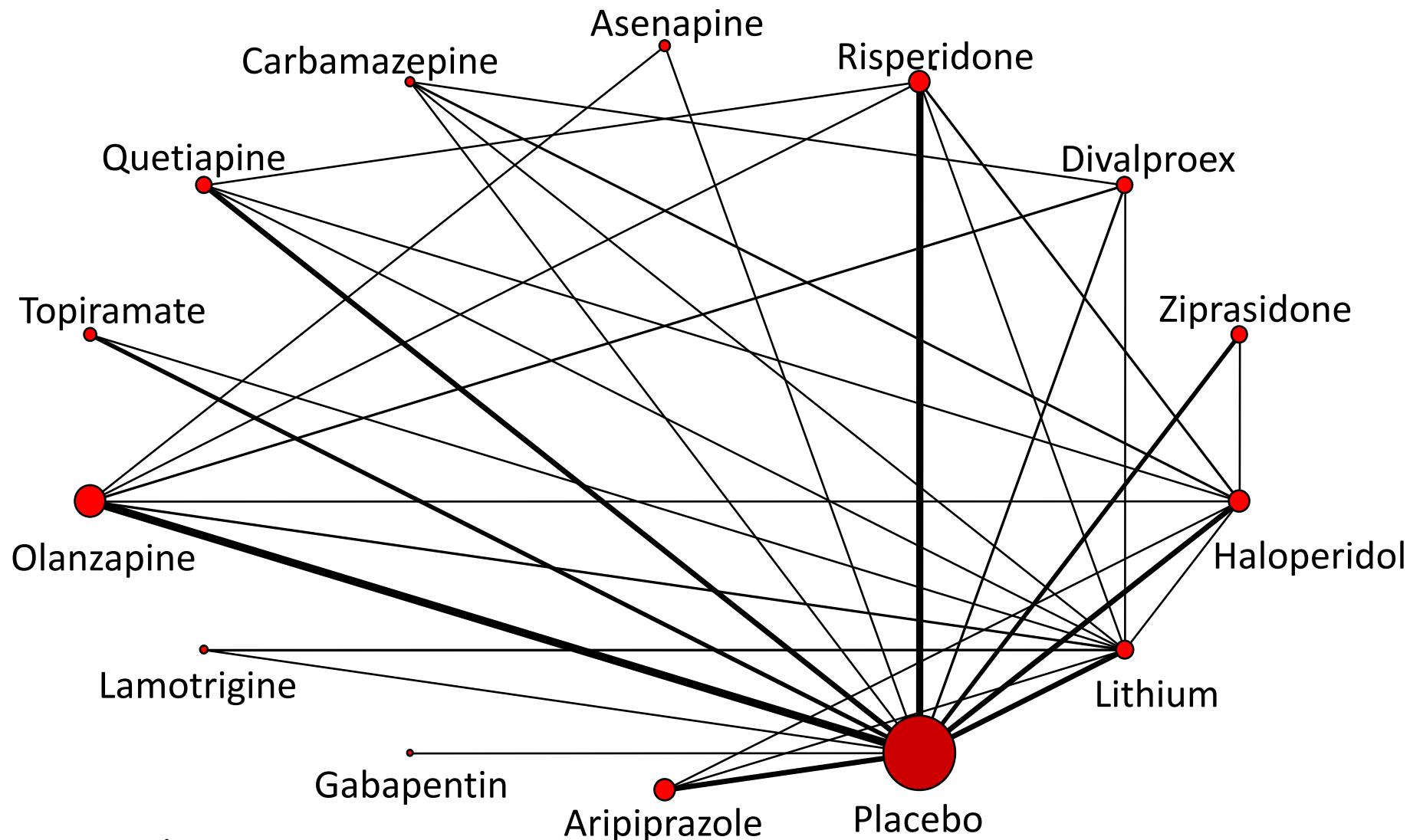
Example: Tocolytic therapy for preterm child delivery



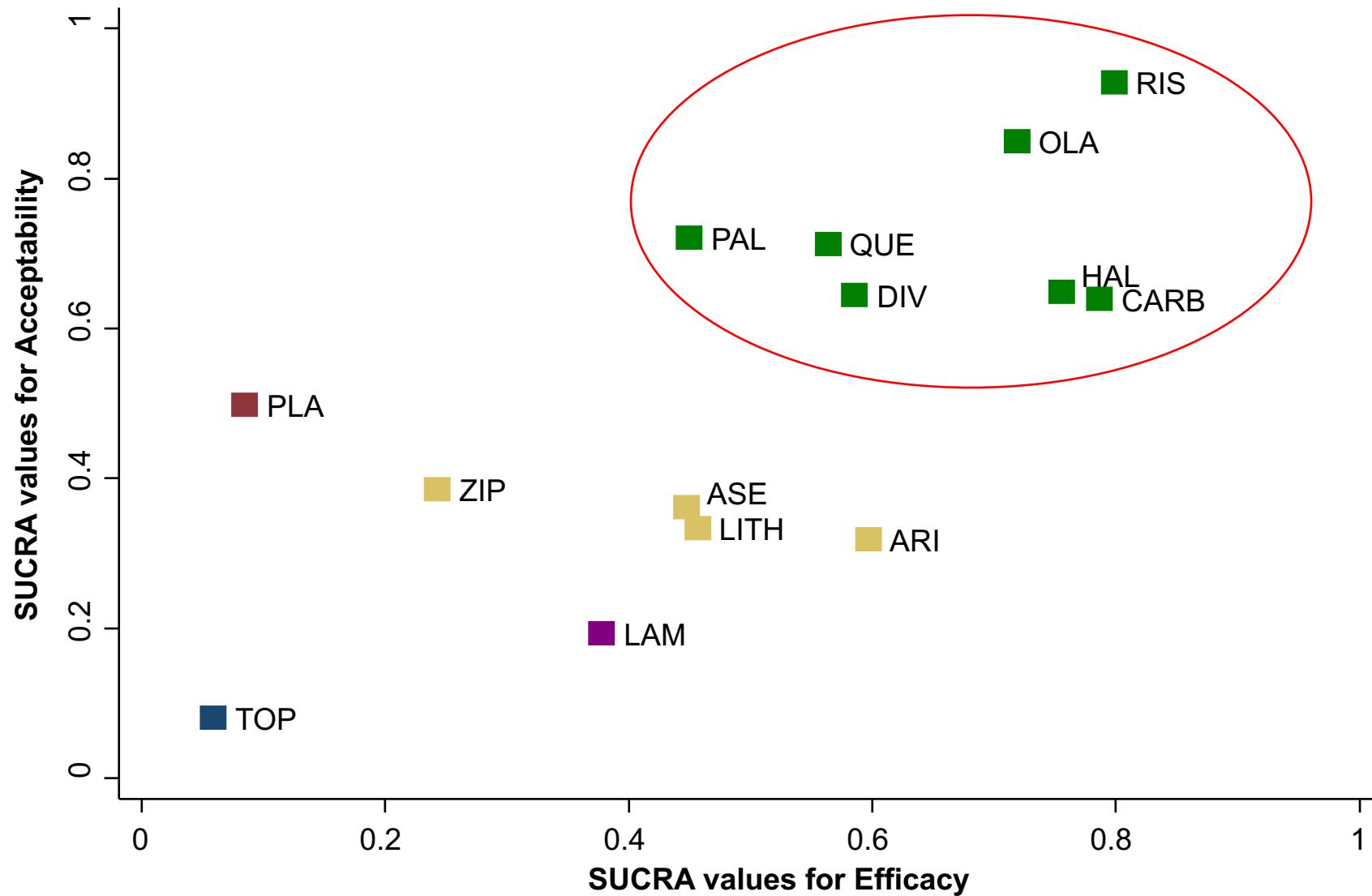
Presenting the results

- Present relative effects and relative ranking jointly
- Consider the findings for more than one (competing) outcomes when drawing conclusions

Example: Treatments for acute mania



Relative ranking for two outcomes



References

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