



Comparison of Network Meta-analysis (NMA) Using The Bayesian and Frequentist Approach



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Disclaimer

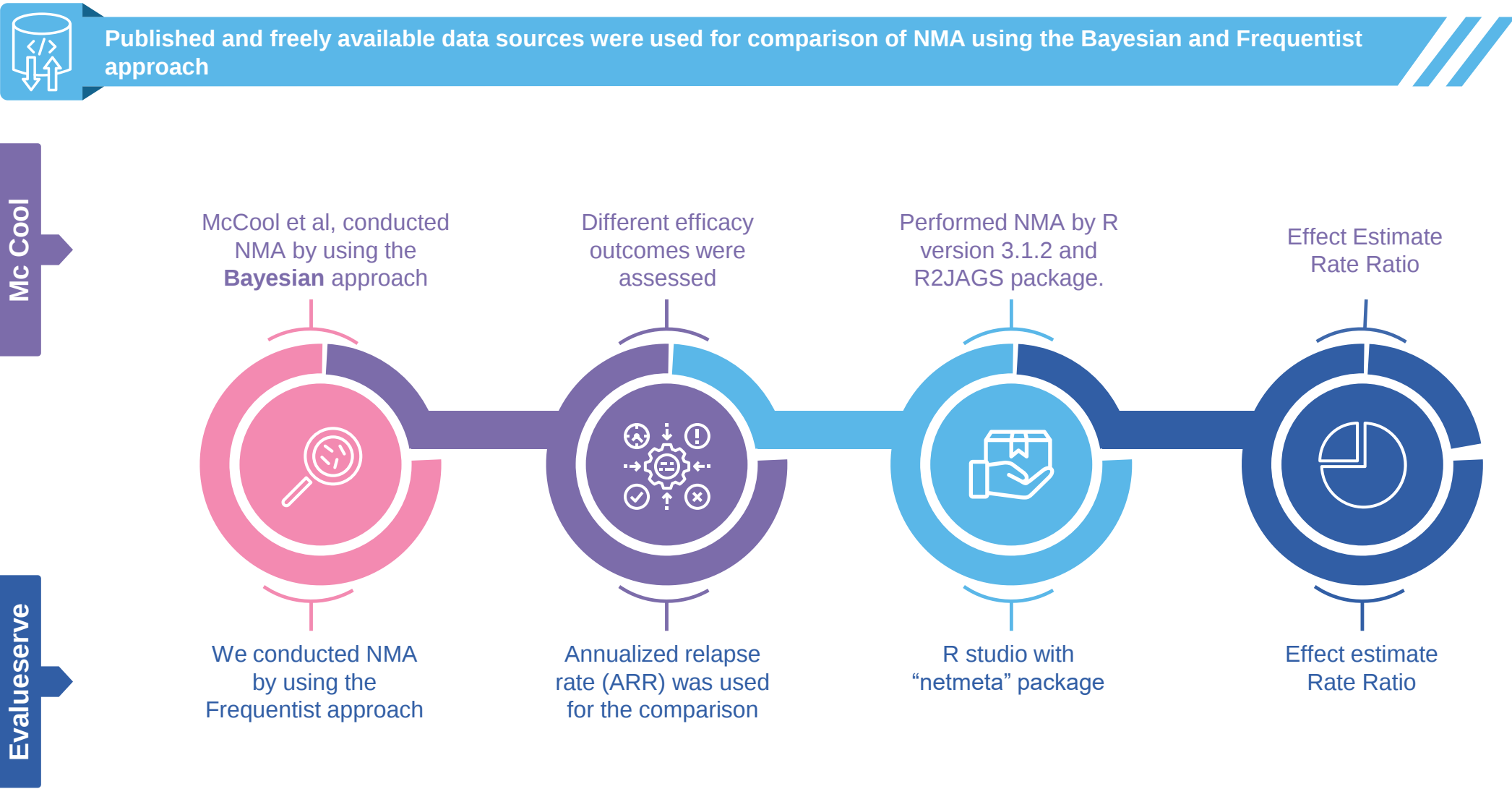
All authors are employees of Evalueserve

None of the manufacturer of the drug analysed in the NMAs were involved in this research

Is High Noon Really Necessary?

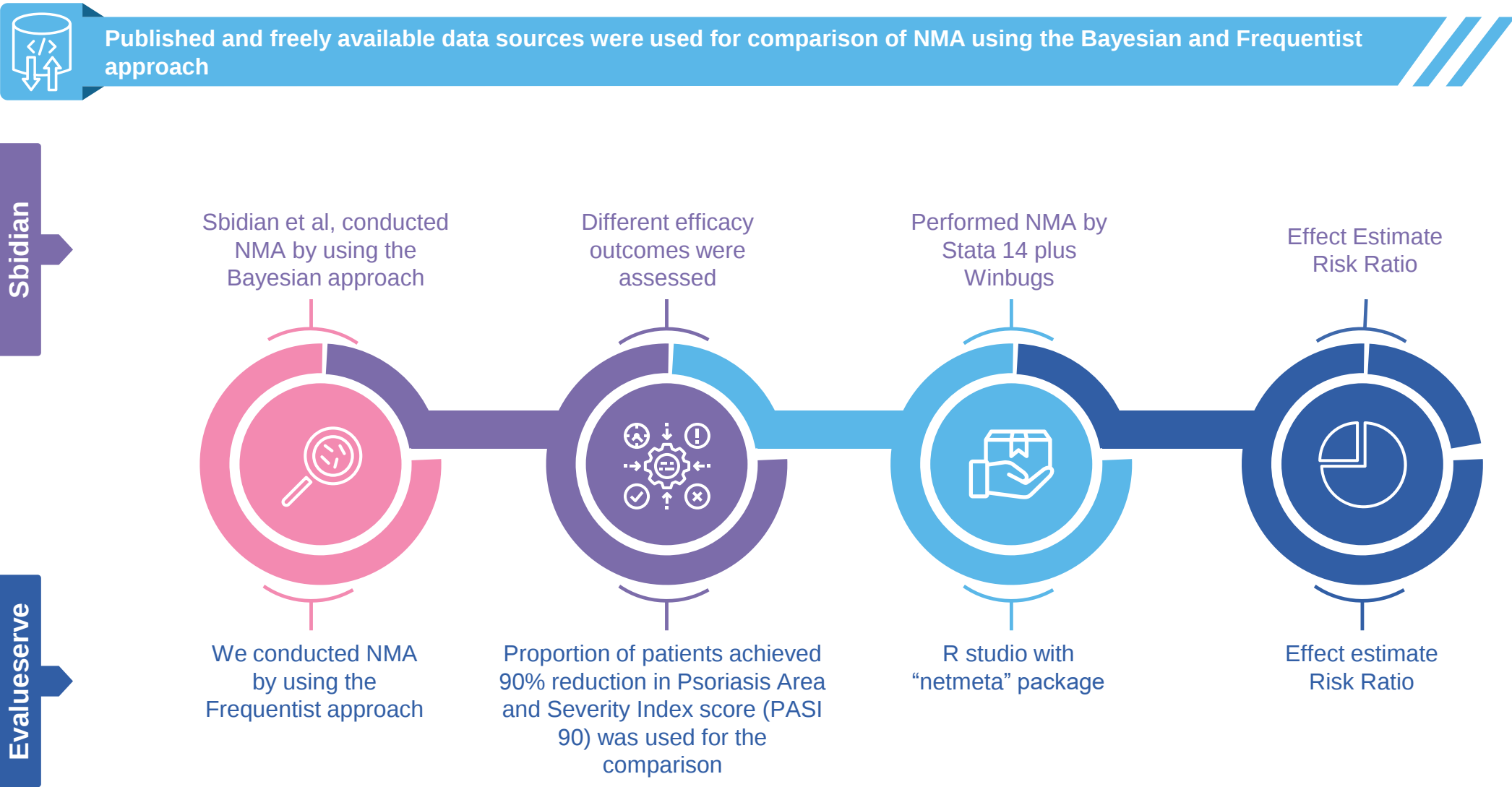


Data Sources for Relapsing Remitting Multiple Sclerosis (RRMS)



McCool R, Wilson K, Arber M, Fleetwood K, Toupin S, Thom H, Bennett I, Edwards S. Systematic review and network meta-analysis comparing ocrelizumab with other treatments for relapsing multiple sclerosis. Mult Scler Relat Disord. 2019Apr;29:55-61

Data Sources for Plaque Psoriasis (PP)



Sbidian E, Chaimani A, Garcia-Doval I, Do G, Hua C, Mazaud C, Droitcourt C, Hughes C, Ingram JR, Naldi L, Chosidow O, Le Cleach L. Systemic pharmacological treatments for chronic plaque psoriasis: a network meta-analysis. Cochrane Database Syst Rev. 2017 Dec 22;12:CD011535

Software and Approaches

Frequentist:
For both NMAs
(RRMS & PP) R
plus netmeta
package was
used.



Bayesian:
RRMS: R plus
R2JAGS package
PP: Stata 14 plus
Winbugs

Risk Ratio Bayesian vs Frequentist for RRMS

Outcomes Parameter ARR (Annualised Relapse Rate)

- 16 treatments were analysed
 - RR min for Alemtuzumab: 0.28
 - RR max for Teriflunomid 7mg: 0.78

- 8 treatments => no difference between Bayesian and Frequentist

- 8 treatments => a minimal difference of 0.006 and maximal difference of 0.025 was observed.

SUCRA vs P Score for Relapsing Remitting Multiple Sclerosis

Treatment	Bayesian SUCRA	Frequentist p-Score	Absolute difference B-F
Alemtuzumab	0.98	0.98	0.00
Natalizumab	0.93	0.93	0.00
Ocrelizumab	0.89	0.89	0.00
Cladribine 3.5mg	0.75	0.75	0.00
Daclizumab	0.70	0.70	0.00
Cladribine 5.25mg	0.70	0.70	0.00
Fingolimod	0.68	0.68	0.00
Dimethyl fumarate	0.60	0.60	0.00
Interferon beta 1a 44myg	0.40	0.40	0.00
Pegylated Ifn beta 1a	0.37	0.37	0.00
Glatiramer acetat 40mg	0.34	0.34	0.00
Teriflunomide 14mg	0.34	0.34	0.00
Glatimer acetat 20mg	0.33	0.33	0.00
Interferon beta 1b	0.27	0.28	-0.01
Teriflunomide 7mg	0.13	0.13	0.00
Placebo	0.00	0.00	0.00

RR Bayesian vs Frequentist for Plaque Psoriasis

Outcomes Parameter PASI 90

Name of the Intervention	Bayesian	Frequentist	Absolute difference (B-F)	Relative difference (B-F)/B in %
Acitretin	0.98	0.98	0.00	0.00%
Adalimumab	14.87	14.88	-0.01	-0.07%
Alefacept	4.39	4.37	0.02	0.46%
Apremilast	7.66	7.66	0.00	0.00%
Brodalumab	25.45	25.62	-0.17	-0.66%
Certolizumab	24.58	24.58	0.00	0.00%
Ciclosporin	3.99	3.99	0.00	0.00%
Etanercept	10.79	10.80	-0.01	-0.09%
Fumaric acid esters	4.09	4.09	0.00	0.00%
Guselkumab	21.03	21.00	0.03	0.14%
Infliximab	11.18	11.15	0.03	0.27%
Itolizumab	12.26	12.16	0.10	0.82%
Ixekizumab	32.45	32.62	-0.17	-0.52%
Methotrexate	3.91	3.90	0.01	0.26%
Ponesimod	6.6	6.60	0.00	0.00%
Secukinumab	26.55	26.59	-0.04	-0.15%
Tildrakizumab	15.63	15.63	0.00	0.00%
Tofacitinib	8.50	8.45	0.05	0.59%
Ustekinumab	19.91	20.00	-0.09	-0.45%

SUCRA vs P-Score for Plaque Psoriasis

Outcomes Parameter PASI 90

Name of the Intervention	Bayesian SUCRA	Bayesian rank	Frequentist rank	Frequentist p-Score	Absolute difference (B-F)
Acitretin	0.10	1	1	0.10	0.00
Methotrexate	0.20	2	2	0.20	0.00
Ciclosporin	0.21	3	3	0.21	0.00
Fumaric acid esters	0.22	4	4	0.22	0.00
Alefacept	0.25	5	5	0.25	0.00
Ponesimod	0.37	6	6	0.37	0.00
Apremilast	0.40	7	7	0.40	0.00
Tofacitinib	0.43	8	8	0.43	0.00
Infliximab	0.53	9	9	0.53	0.00
Etanercept	0.53	9	9	0.53	0.00
Itolizumab	0.56	10	10	0.56	0.00
Adalimumab	0.63	11	11	0.63	0.00
Tildrakizumab	0.64	12	12	0.64	0.00
Ustekinumab	0.73	13	13	0.73	0.00
Certolizumab	0.76	14	14	0.76	0.00
Guselkumab	0.77	15	15	0.77	0.00
Brodalumab	0.84	16	16	0.85	0.01
Secukinumab	0.87	17	17	0.87	0.00
Ixekizumab	0.94	18	18	0.94	0.00

Differences

RRMS



The observed differences are minor and results of both NMAs are almost identical.

R and R packages were used for both NMAs.

PP



The observed differences are significant for the RR and the ranking.

Different software programs Stata 14 with Winbugs and R with NMA packages were used.

Summary

- **Results of Network Meta-Analyses using the Bayesian and Frequentist approaches are similar. Conclusions are identical, independent from the method used.**
- **Numerical differences in the outcome are smaller between R/R compared to R/Stata14 NMAs.**
- **Differences in the results may be greater between software packages than between methods used of the same software.**
- **Further comparison of different software packages is necessary to investigate this in more detail.**
- **Standardized data sets for the comparison should be developed for further analyses of differences.**
- **Much shorter running time is a major advantage of Frequentist.**
- **Results of Frequentist are independent of the Gibbs Sampler.**

Thank You

Q&A