



Novel Presentational Approaches for Reporting Network Meta-Analysis

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Outline

- Review – Presentational Approaches used in reporting Mixed Treatment Comparisons (MTC) in Health Technology Assessment (HTA) reports
 - MTC = NMA
- Novel Graphical Displays Developed



REVIEW OF PRESENTATIONAL APPROACHES USED IN REPORTING MTC IN HTA

Review of presentational approaches

- Objectives:
 - Understand current practice of reporting MTC in HTA reports
 - Assist development of graphical tools
- Data sources:
 - UK National Institute for Health Research HTA reports from 1997 to 2011 that used indirect or mixed treatment comparisons (IC/MTC)
- Results:
 - Out of 205 reports, 19 reports were identified and reviewed

Results

- In terms of the presentation of IC/MTC results
 - Different tables were used, namely:
 - Matrix Table (MT)
 - Relative Effects Table
 - Absolute Effects Table
 - Graphics:
 - Summary Forest Plot (SFP) – An adaption of forest plot that contain only the summary estimates of meta-analysis. [Anzures-Cabrera J, Higgins JPT. *Research Synthesis Methods*. 2010]

Tables

Matrix Table (MT)

		Mixed Treatment Comparison			
Standard Meta-Analysis	Intervention A	OR _{A-B_MTC} (95% CrI)	OR _{A-C_MTC} (95% CrI)	OR _{A-D_MTC} (95% CrI)	
	OR _{A-B_MA} (95% CrI)	Intervention B	OR _{B-C_MTC} (95% CrI)	OR _{B-D_MTC} (95% CrI)	
	OR _{A-C_MA} (95% CrI)	OR _{B-C_MA} (95% CrI)	Intervention C	OR _{C-D_MTC} (95% CrI)	
	Not calculable	OR _{B-D_MA} (95% CrI)	OR _{C-D_MA} (95% CrI)	Intervention D	

Pairwise Meta-analysis Results
(From Head-to-Head Trials)

Mixed Treatment
Comparison Results

Relative Effects Table

Treatment Comparators		Mixed Treatment Comparison		Standard Meta-Analysis	
		Mean	95% CrI	Mean	95% CrI
Intervention A	Intervention B	OR _{A-B_MTC}	(95% CrI)	OR _{A-B_MA}	(95% CrI)
Intervention A	Intervention C	OR _{A-C_MTC}	(95% CrI)	OR _{A-C_MA}	(95% CrI)
Intervention A	Intervention D	OR _{A-D_MTC}	(95% CrI)	Not calculable	Not calculable
Intervention B	Intervention C	OR _{B-C_MTC}	(95% CrI)	OR _{B-C_MA}	(95% CrI)
Intervention B	Intervention D	OR _{B-D_MTC}	(95% CrI)	OR _{B-D_MA}	(95% CrI)
Intervention C	Intervention D	OR _{C-D_MTC}	(95% CrI)	OR _{C-D_MA}	(95% CrI)

Absolute Effects Table

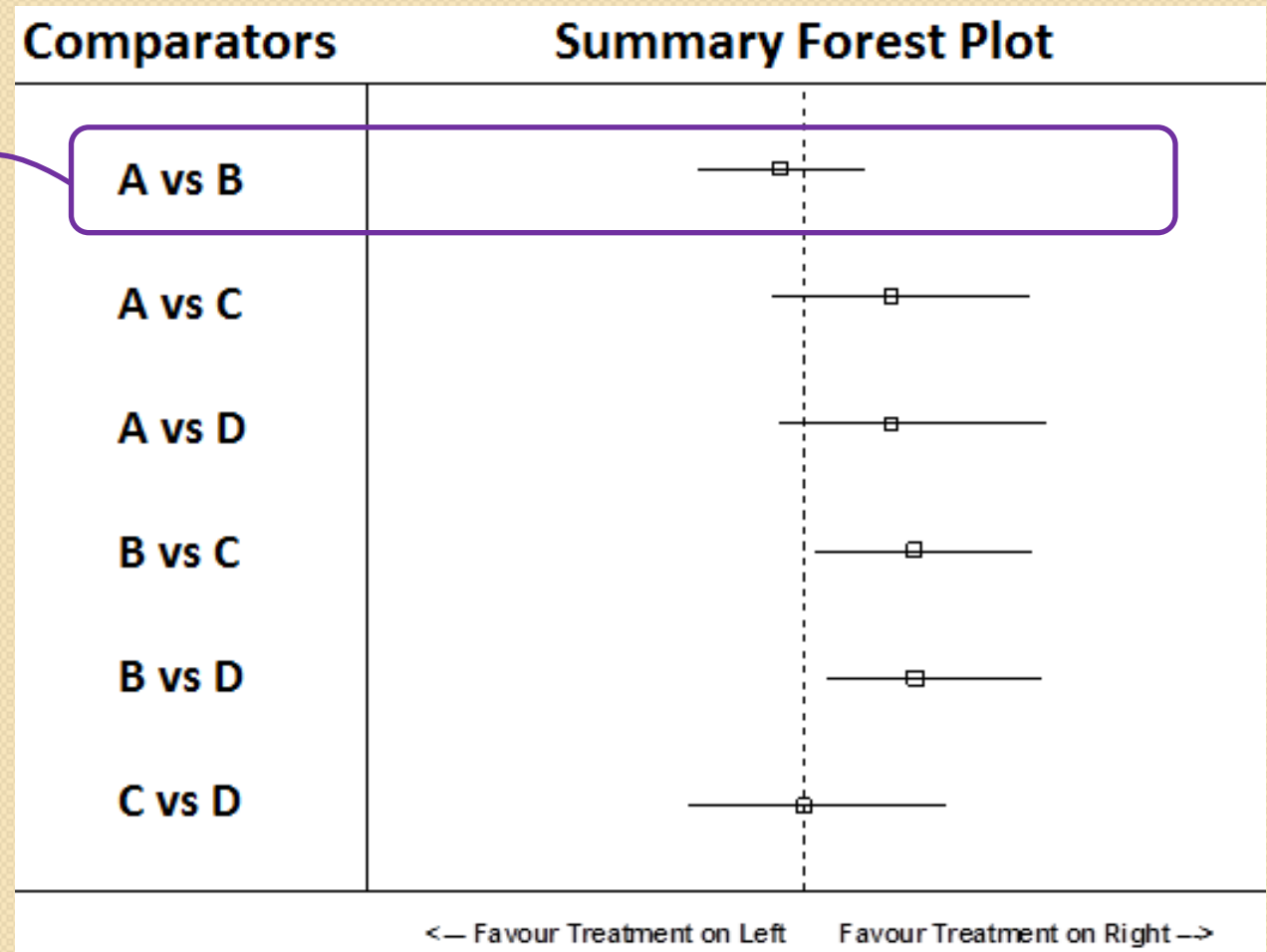
Treatments	Mixed Treatment Comparison		Standard Meta-Analysis	
	Mean	95% CrI	Mean	95% CrI
Intervention A	Eff _{A_MTC}	(95% CrI)	Eff _{A_MA}	(95% CrI)
Intervention B	Eff _{B_MTC}	(95% CrI)	Eff _{B_MA}	(95% CrI)
Intervention C	Eff _{C_MTC}	(95% CrI)	Eff _{C_MA}	(95% CrI)
Intervention D	Eff _{D_MTC}	(95% CrI)	Eff _{D_MA}	(95% CrI)

Summary Forest Plot (SFP)

Summary estimates
for Comparative
Pair of Treatments

instead of

Individual RCT
estimates

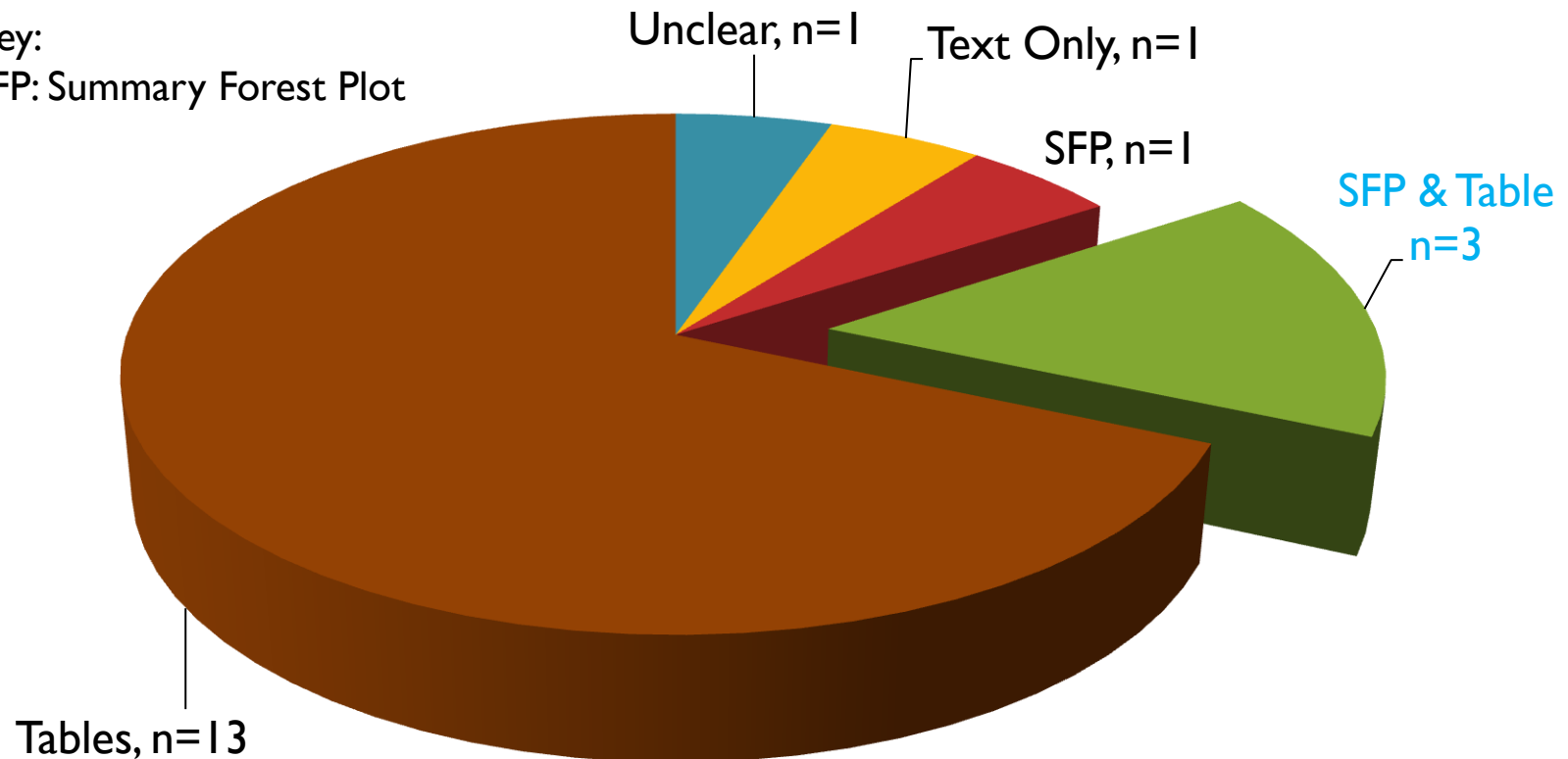


Presentation of MTC Results

HTA review Results

Key:

SFP: Summary Forest Plot



Reports with tables and/or SFP also presented results as text in main report

Conclusions of Review

- MTC is increasing being used
 - Great variation in the tables and graphs formats used
 - Appears to have no standard use of graph
- Network can be very large
 - Large number of potential results presented in large tables and graphs
- Limitation in number of tables and figures in most Journals
 - Reporting of other endpoints, e.g. Adverse events (AEs), Quality of Life
 - 6 of the reports reviewed also used IC/MTC for the analysis of AEs.



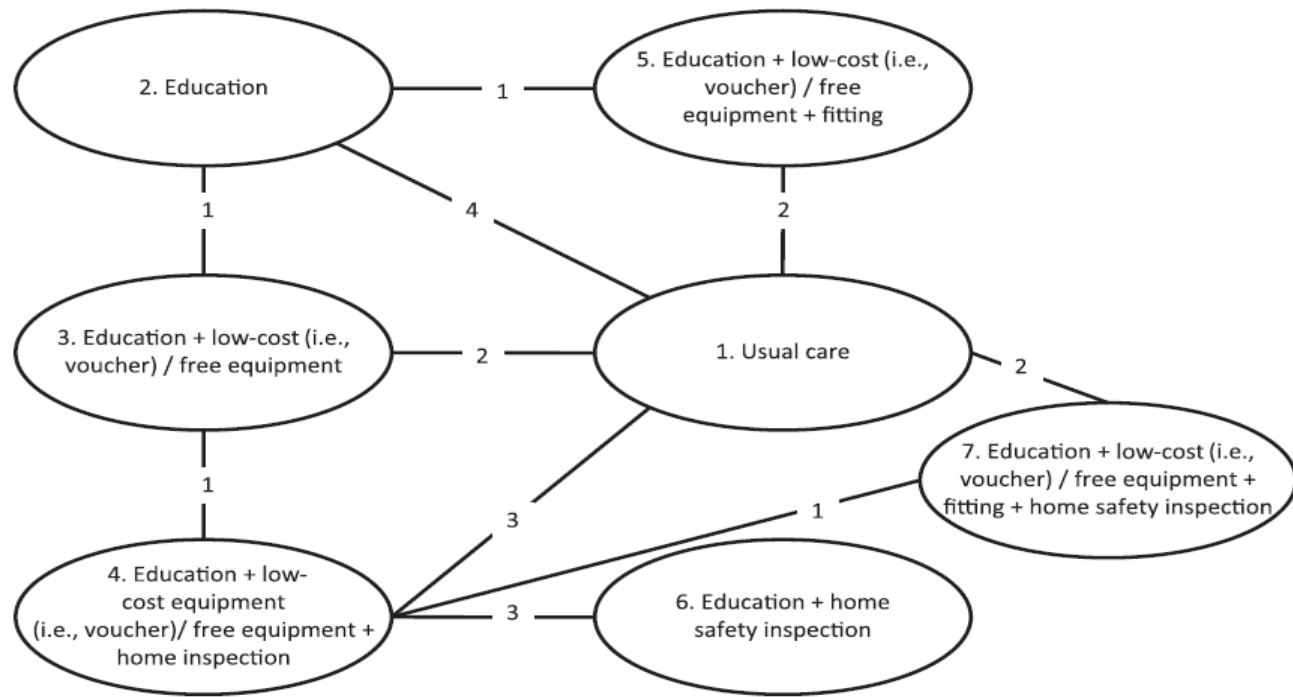
DEVELOPMENT OF GRAPHICAL TOOLS

Graphical tools – Motivations

- Develop new reporting tools for MTC
 - that combines the strength of each individual presentational tools
 - Retaining transparency
 - Maximising interpretation
- Cater for different audiences
 - (eg. Statisticians, Analyst, academics, decision makers, etc.)
 - Different needs and focus
- Develop user-friendly software

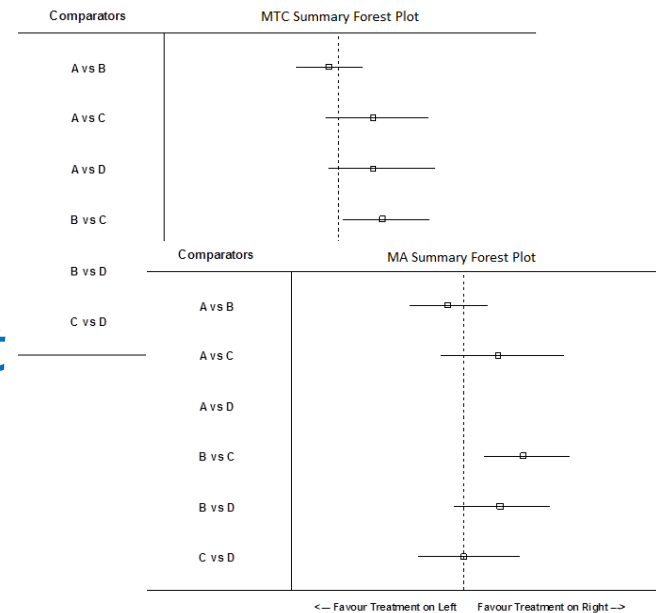
Data used in Graph development

- Effectiveness data of 7 interventions aimed to increase the uptake of smoke alarms use in household with children



Graphical tools development – Process

- Plot that contains
 - MTC + Pairwise Meta-Analysis *Summary Forest Plot*
 - Graphical visualisation of comparative treatment effects
 - MTC + Pairwise Meta-Analysis *estimates*
 - Matrix Table
 - MTC + Pairwise Meta-Analysis *side-by-side*
 - Assess consistency of the results easily



Mixed Treatment Comparison				
Standard Meta-Analysis	Intervention A	OR _{A-B_MTC} (95% CrI)	OR _{A-C_MTC} (95% CrI)	OR _{A-D_MTC} (95% CrI)
	OR _{A-B_MA} (95% CrI)	Intervention B	OR _{B-C_MTC} (95% CrI)	OR _{B-D_MTC} (95% CrI)
	OR _{A-C_MA} (95% CrI)	OR _{B-C_MA} (95% CrI)	Intervention C	OR _{C-D_MTC} (95% CrI)
	Not calculable	OR _{B-D_MA} (95% CrI)	OR _{C-D_MA} (95% CrI)	Intervention D

Graphical tools development – Desirable Components

MTC estimates

Treatment Comparators		Mixed Treatment Comparison	
		Mean	95% CrI
Intervention A	Intervention B	OR _{A-B_MTC}	(95% CrI)
Intervention A	Intervention C	OR _{A-C_MTC}	(95% CrI)
Intervention A	Intervention D	OR _{A-D_MTC}	(95% CrI)
Intervention B	Intervention C	OR _{B-C_MTC}	(95% CrI)
Intervention B	Intervention D	OR _{B-D_MTC}	(95% CrI)
Intervention C	Intervention D	OR _{C-D_MTC}	(95% CrI)

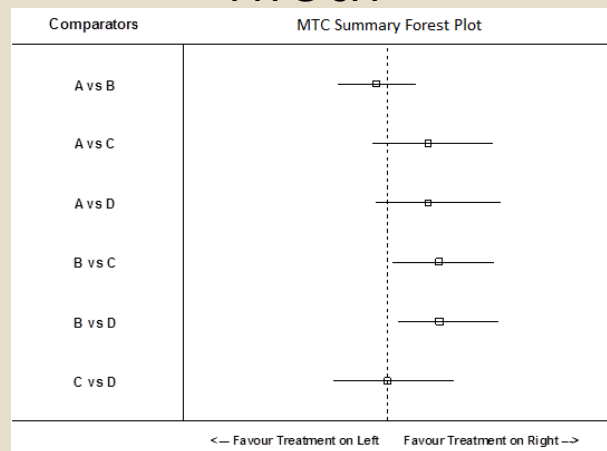
Probability Best

Treatment	Probability Best
Intervention A	Pbest _{A_MTC}
Intervention B	Pbest _{B_MTC}
Intervention C	Pbest _{C_MTC}
Intervention D	Pbest _{D_MTC}

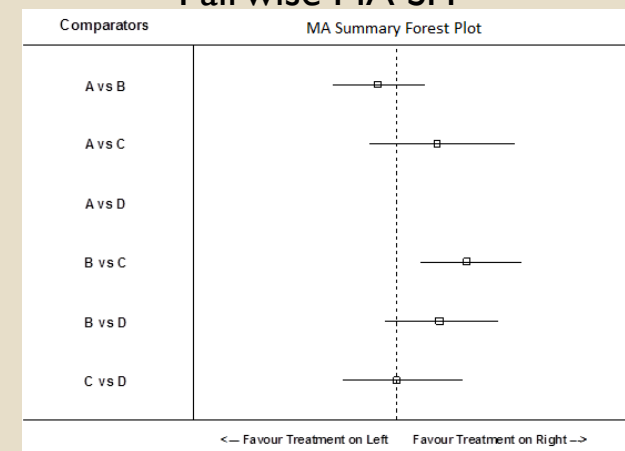
Pairwise MA estimates

Treatment Comparators		Standard Meta-Analysis	
		Mean	95% CrI
Intervention A	Intervention B	OR _{A-B_MA}	(95% CrI)
Intervention A	Intervention C	OR _{A-C_MA}	(95% CrI)
Intervention A	Intervention D	Not calculable	Not calculable
Intervention B	Intervention C	OR _{B-C_MA}	(95% CrI)
Intervention B	Intervention D	OR _{B-D_MA}	(95% CrI)
Intervention C	Intervention D	OR _{C-D_MA}	(95% CrI)

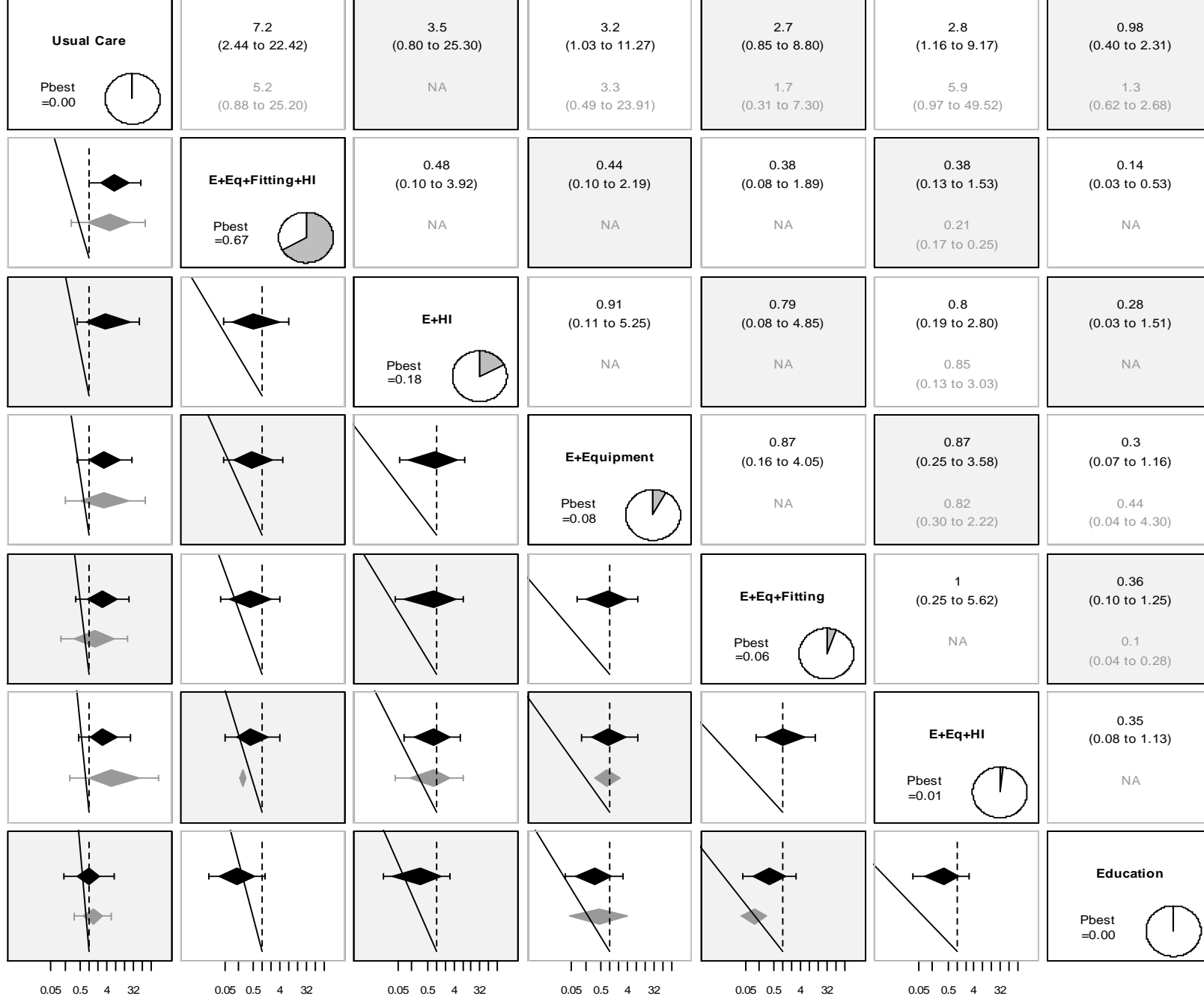
MTC SFP



Pairwise MA SFP



Summary Forest Plot Matrix

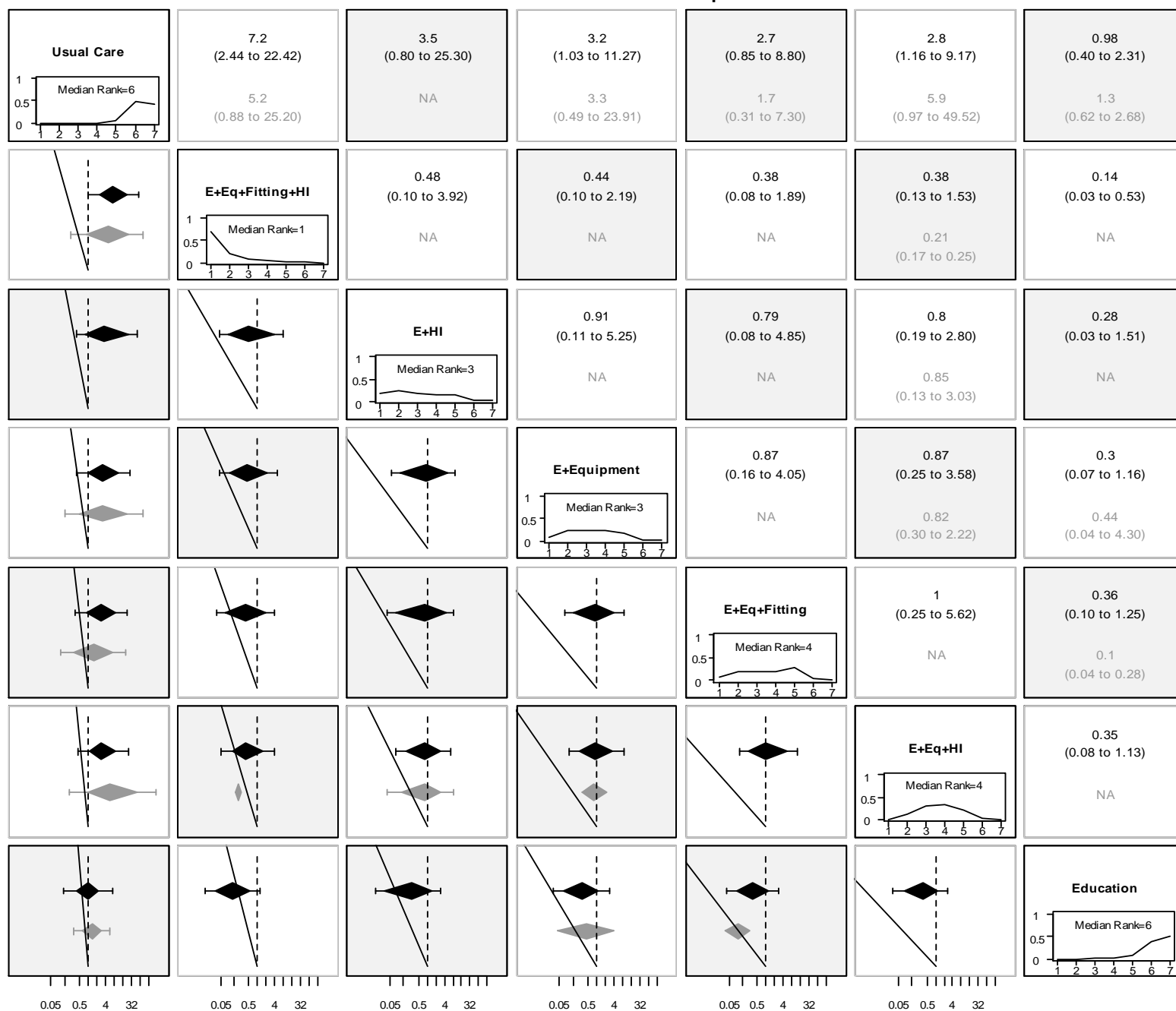


Key:

Odds Ratio with 95% CrI & 95% PI (log scale)
NMA results in black; Pairwise MA results in grey. 95% CrI and PI presented as diamond and error bars respectively.
A total of 7 interventions were compared in this NMA.
Interventions are displayed sorted by median rank.

Heterogeneity: between-study variance
= 0.59; 95% CrI (0.123 to 2.201)

SFP Matrix: Rank-o-grams

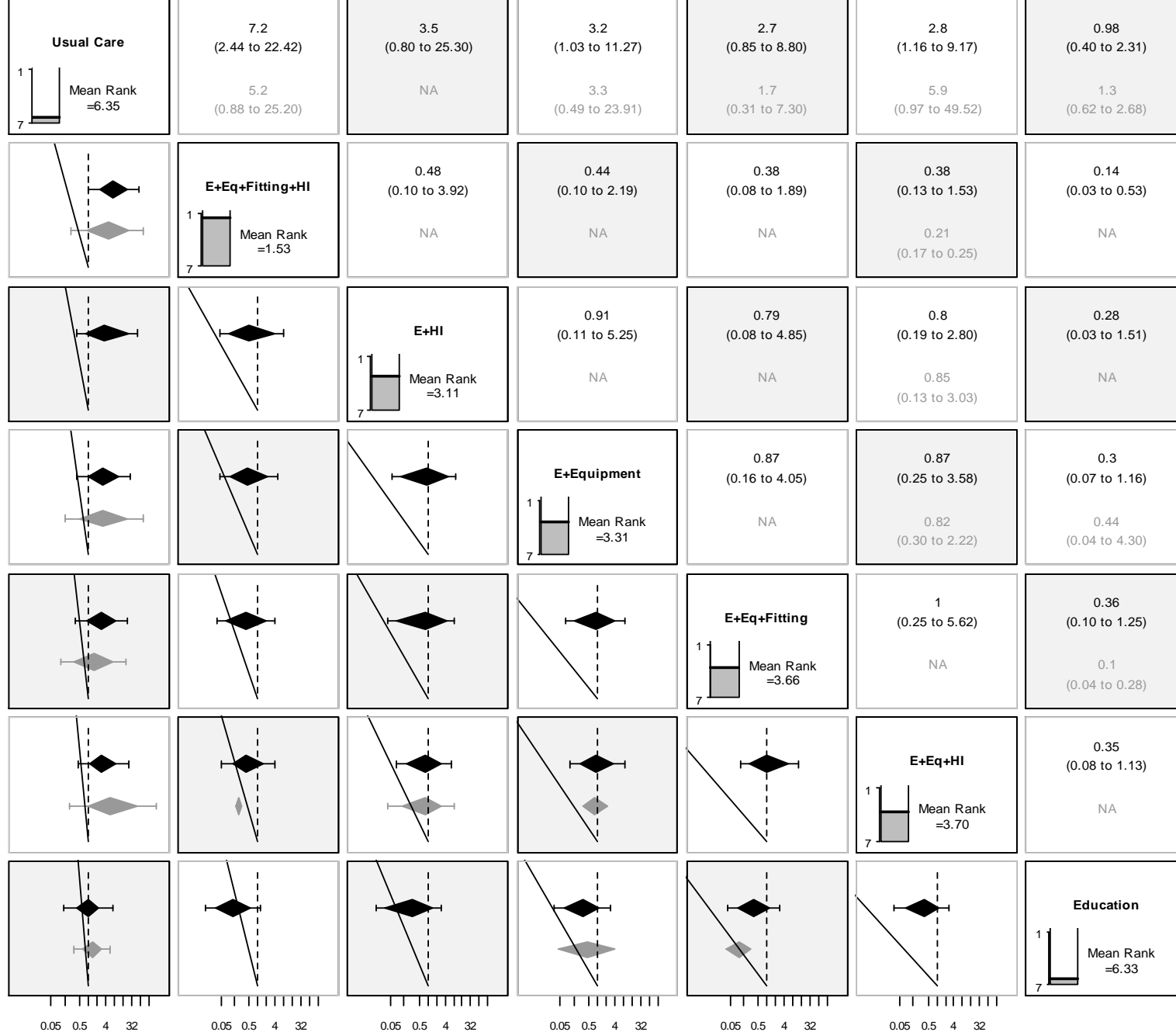


Key:

Odds Ratio with 95% CrI & 95% PI (log scale)
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 A total of 7 interventions were compared in this NMA.
 Interventions are displayed sorted by median rank.

Heterogeneity: between-study variance
 = 0.59; 95% CrI (0.123 to 2.201)

SFP Matrix: Mean Rank

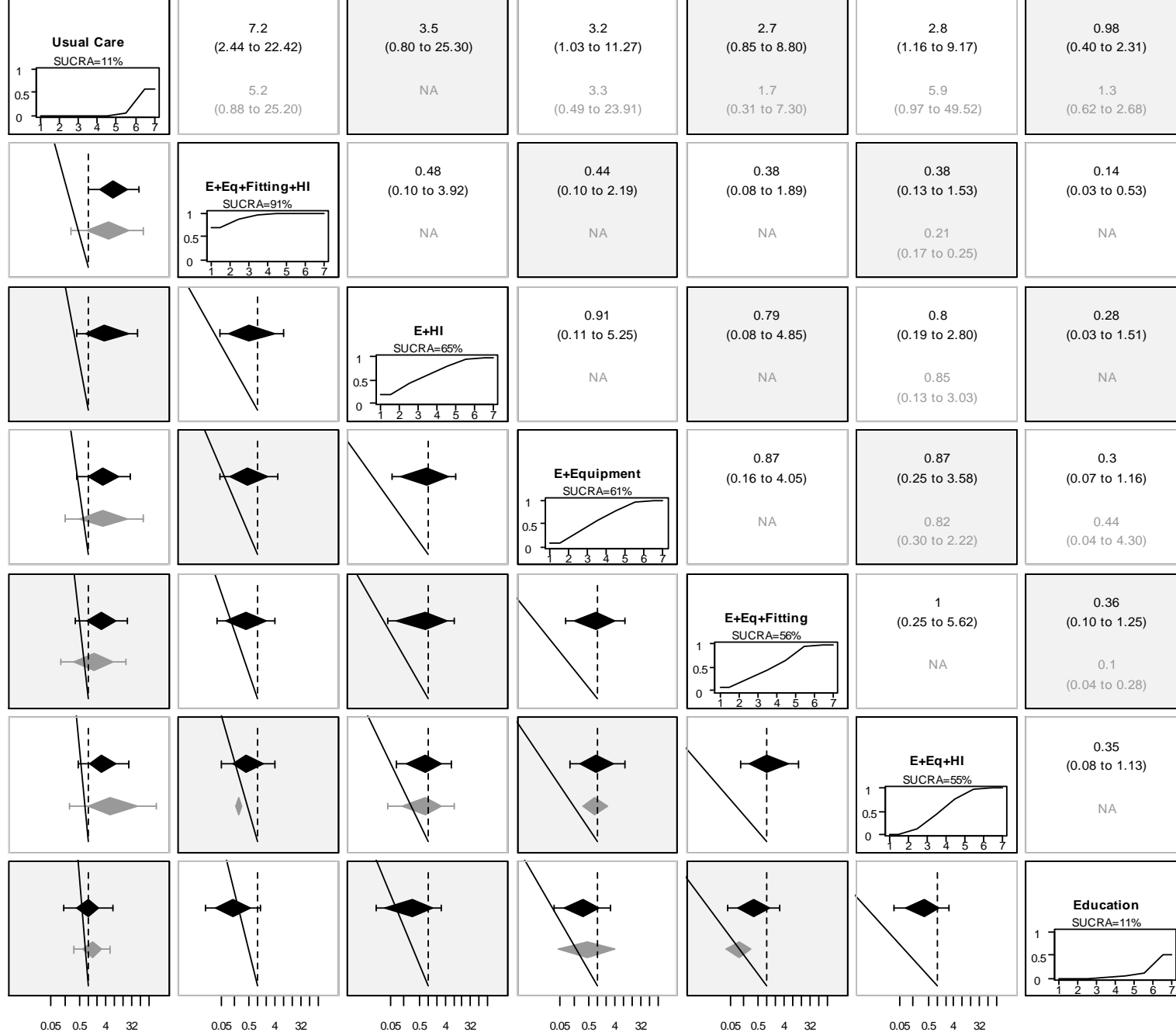


Key:

NMA results in black; Pairwise MA results in grey. 95% CrI and PI presented as diamond and error bars respectively.
 A total of 7 interventions were compared in this NMA.
 Interventions are displayed sorted by median rank.

Heterogeneity: between-study variance = 0.59; 95% CrI (0.123 to 2.201)

SFP Matrix: SUCRA



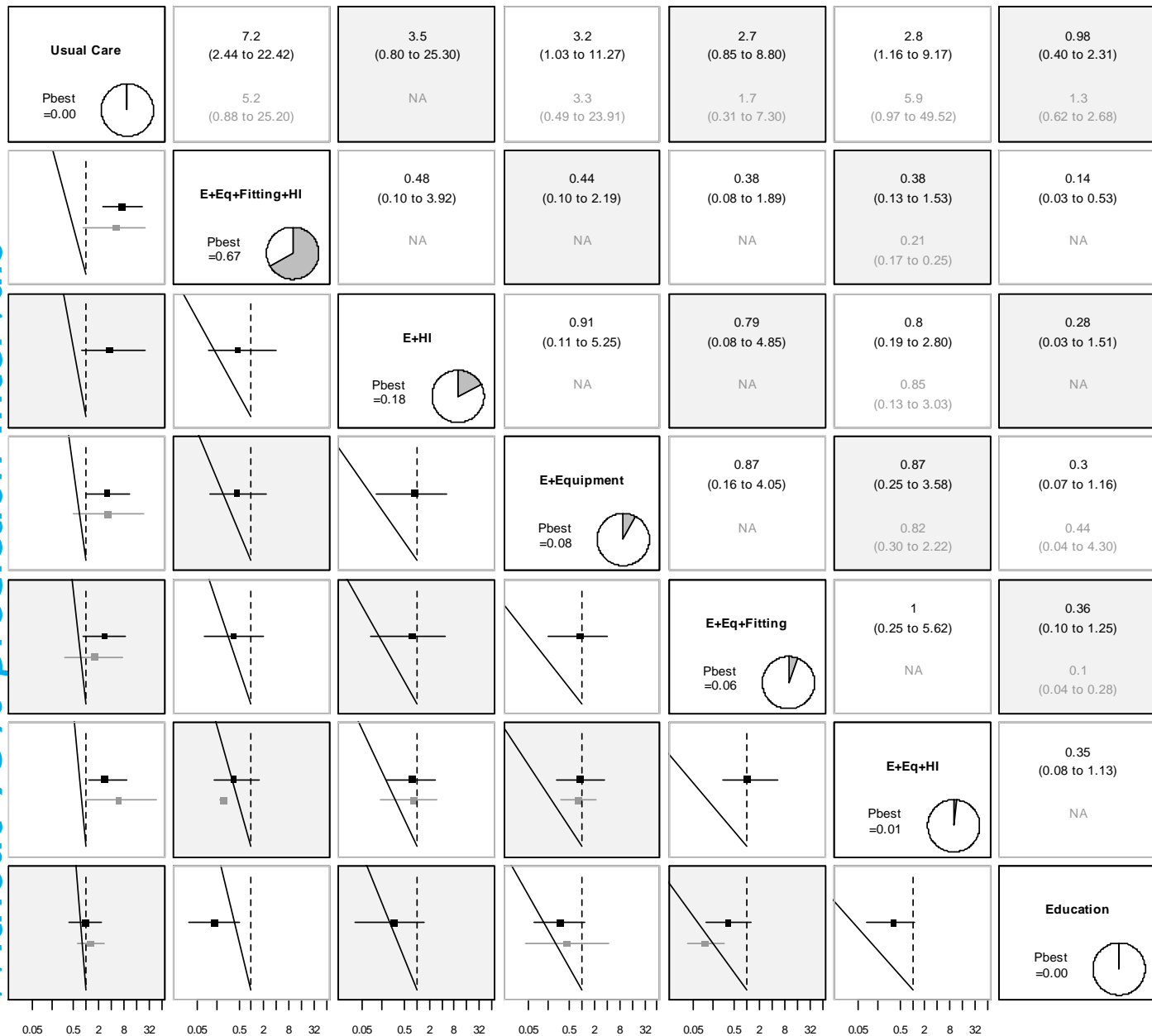
Key:

Odds Ratio with 95% CrI & 95% PI (log scale)
 NMA results in black; Pairwise MA results in grey. 95% CrI and PI presented as diamond and error bars respectively.
 A total of 7 interventions were compared in this NMA.
 Interventions are displayed sorted by median rank.

Heterogeneity: between-study variance
 = 0.59; 95% CrI (0.123 to 2.201)

Summary Forest Plot Matrix

Without 95% prediction Intervals



Summary Forest Plot Table

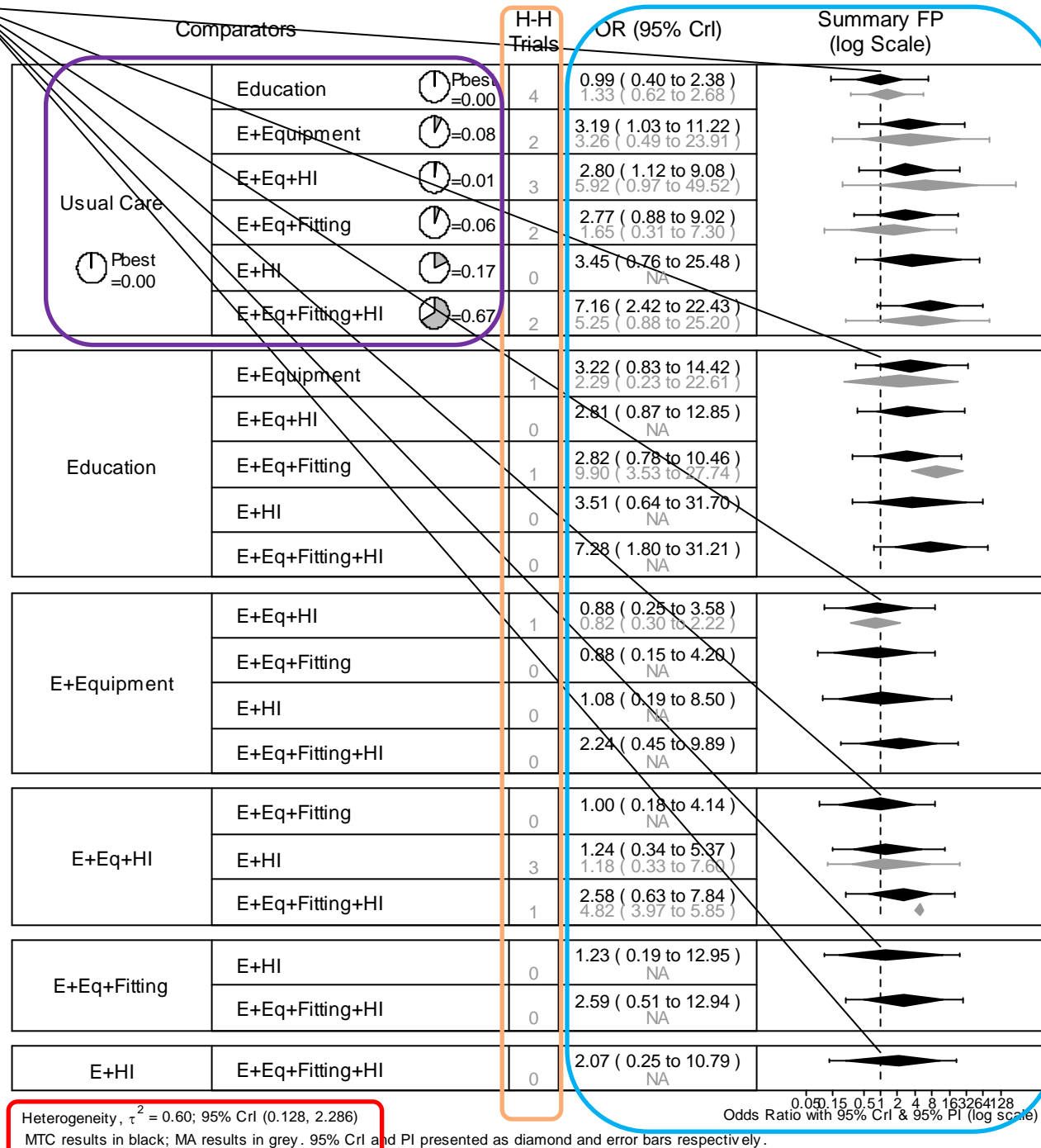
MTC & pairwise
MA estimates and
plots on the same
graph

Probability best

Heterogeneity
estimate presented

Column showing
Head-to-Head Trial
counts

Graph can extend
easily to another
page



Summary Forest Plot Table

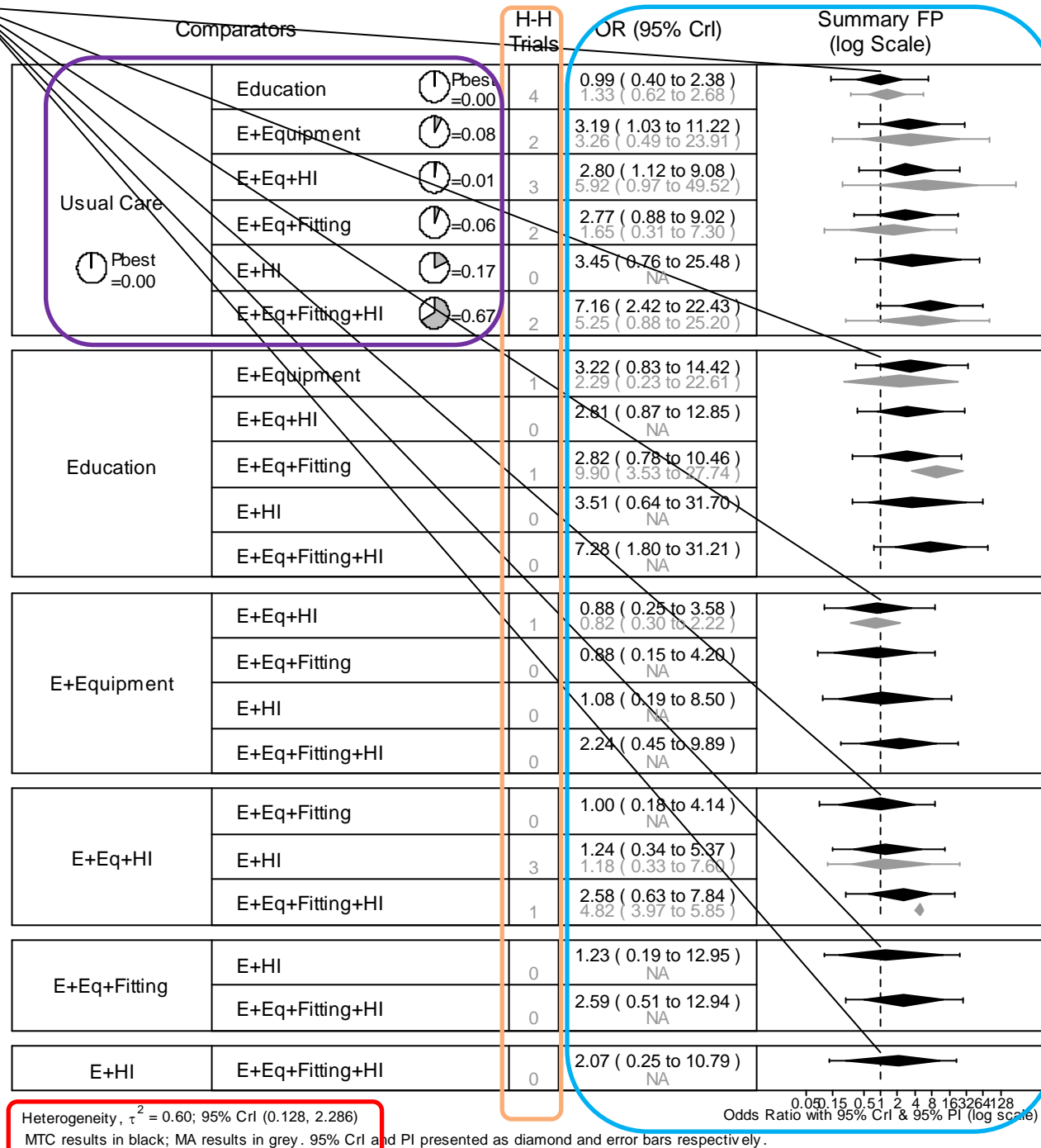
MTC & pairwise
MA estimates and
plots on the same
graph

Probability best

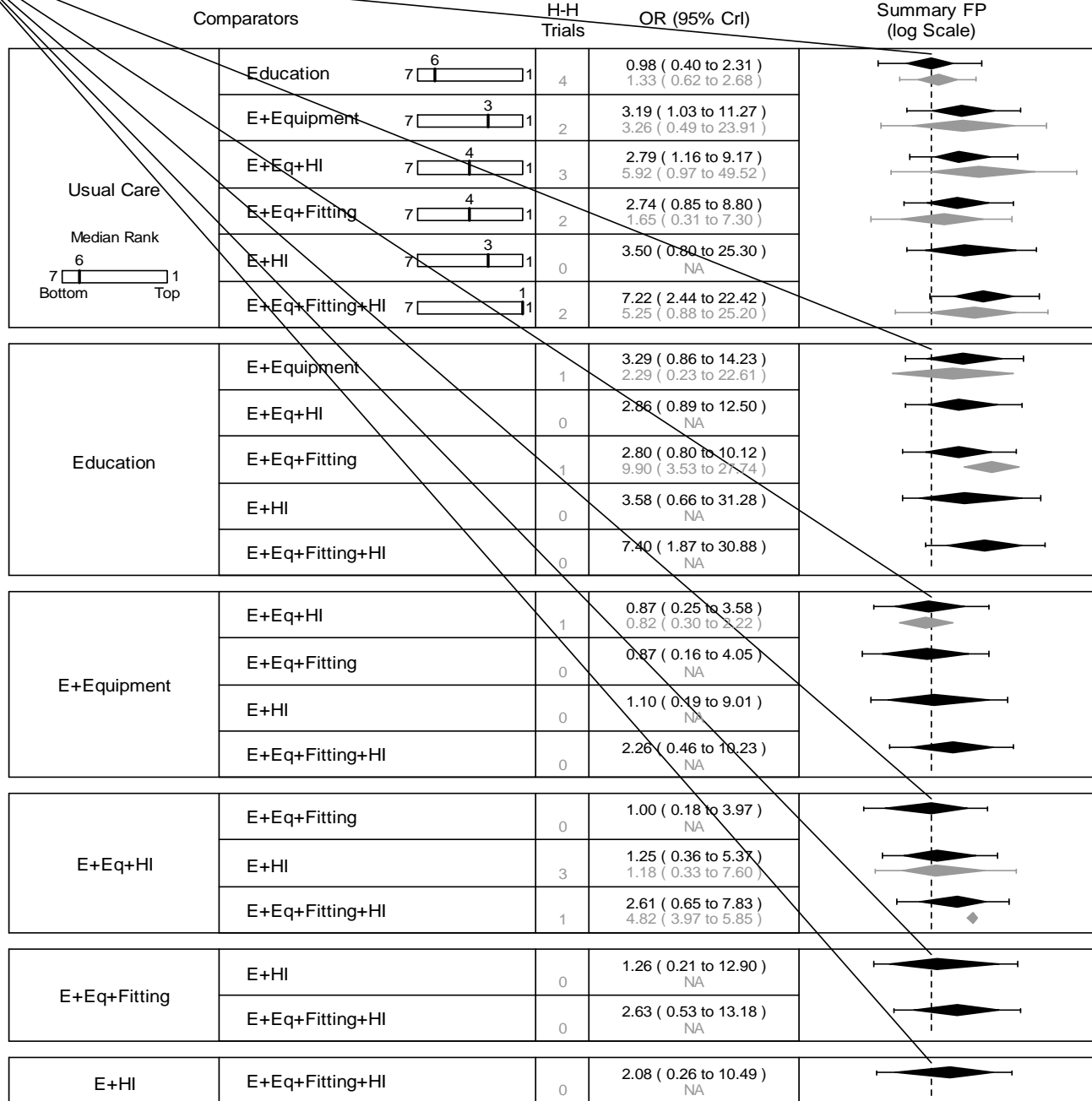
Heterogeneity
estimate presented

Column showing
Head-to-Head Trial
counts

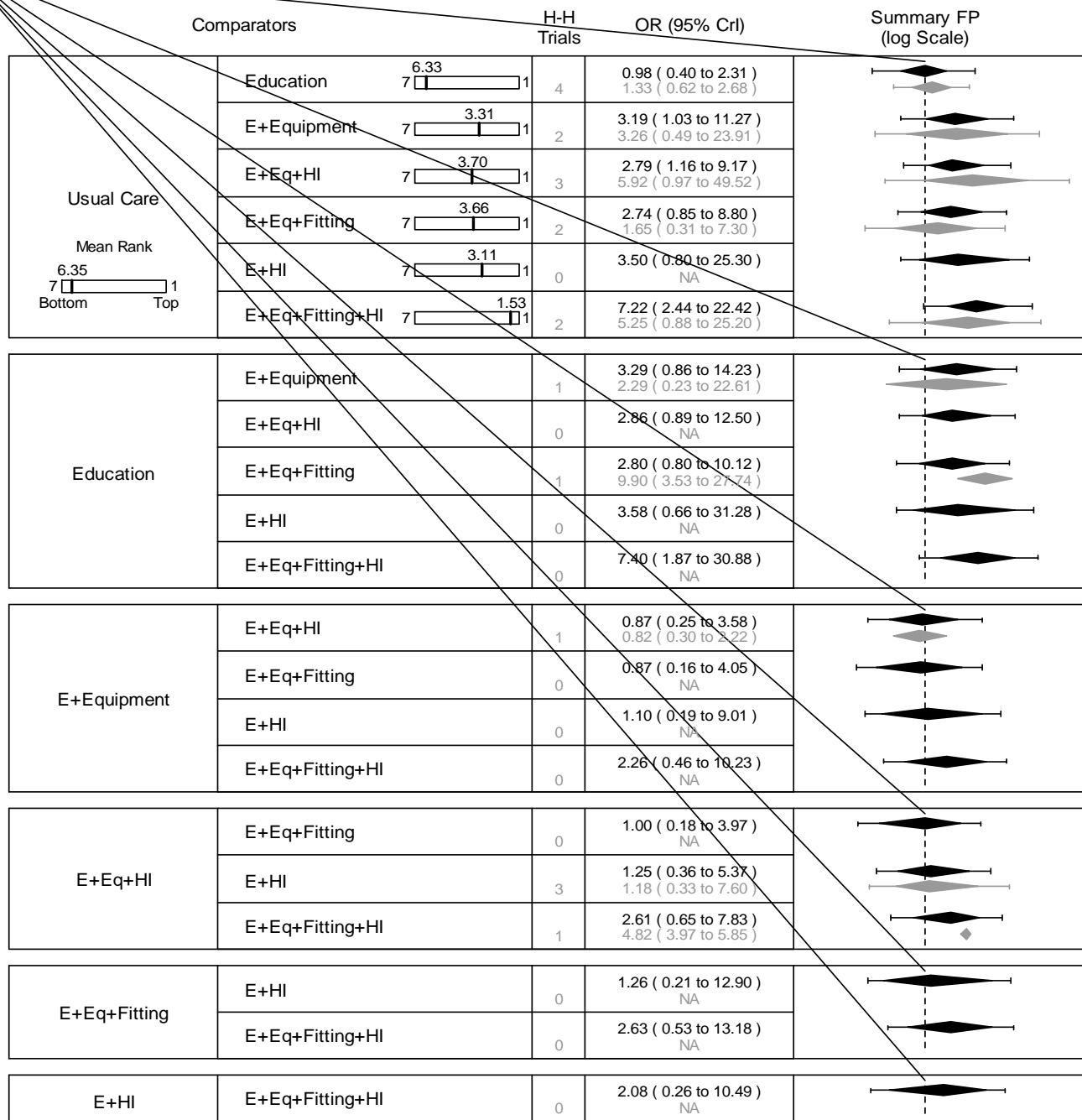
Graph can extend
easily to another
page



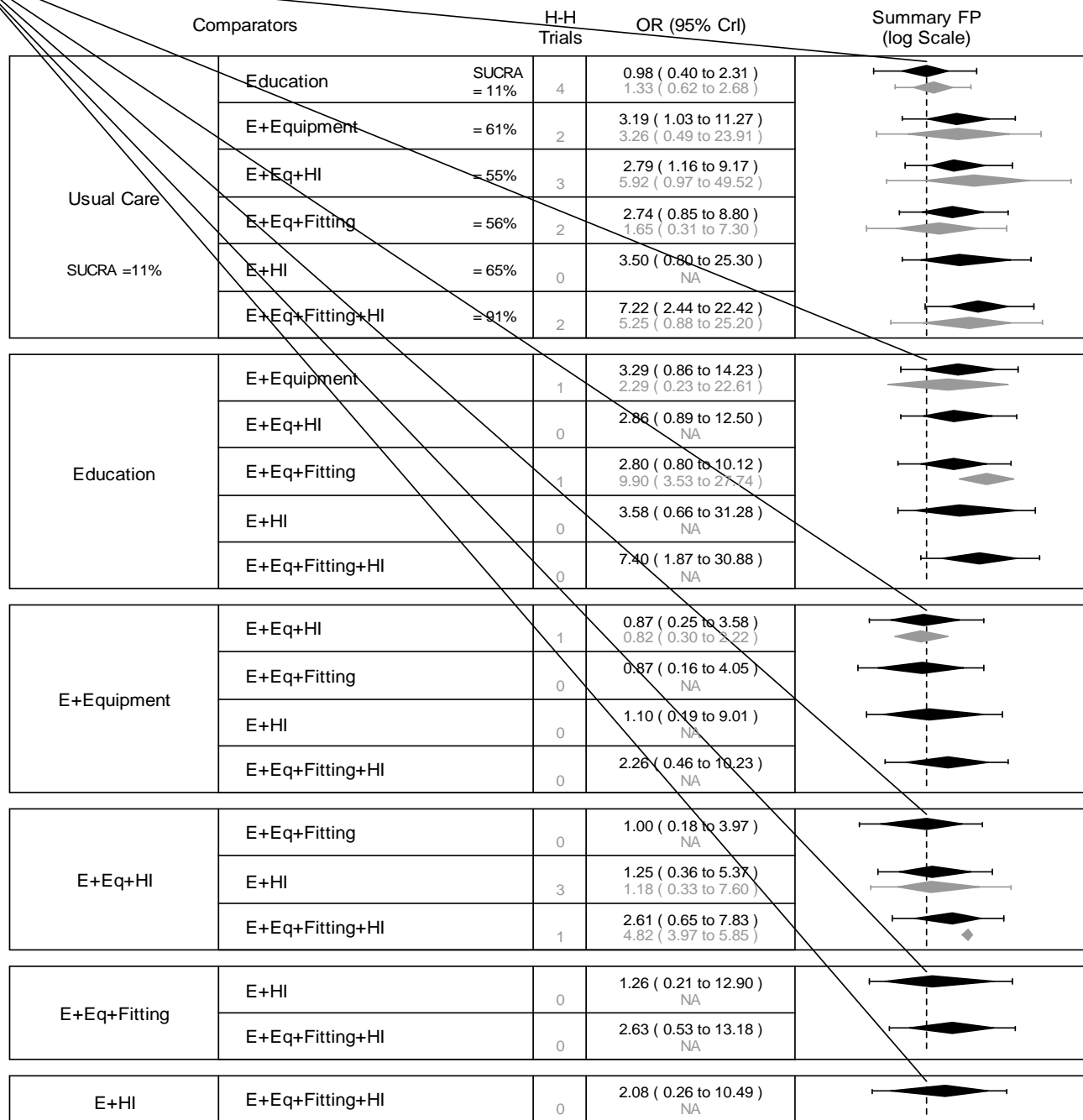
SFP Table: Median Rank



SFP Table: Mean Rank



SFP Table: SUCRA



Heterogeneity : between-study variance = 0.59; 95% CrI (0.123 to 2.201)

Key : NMA results in black ; Pairwise MA results in grey . 95% CrI and PI presented as diamond and error bars respectively .

A total of 7 interventions were compared in this NMA..

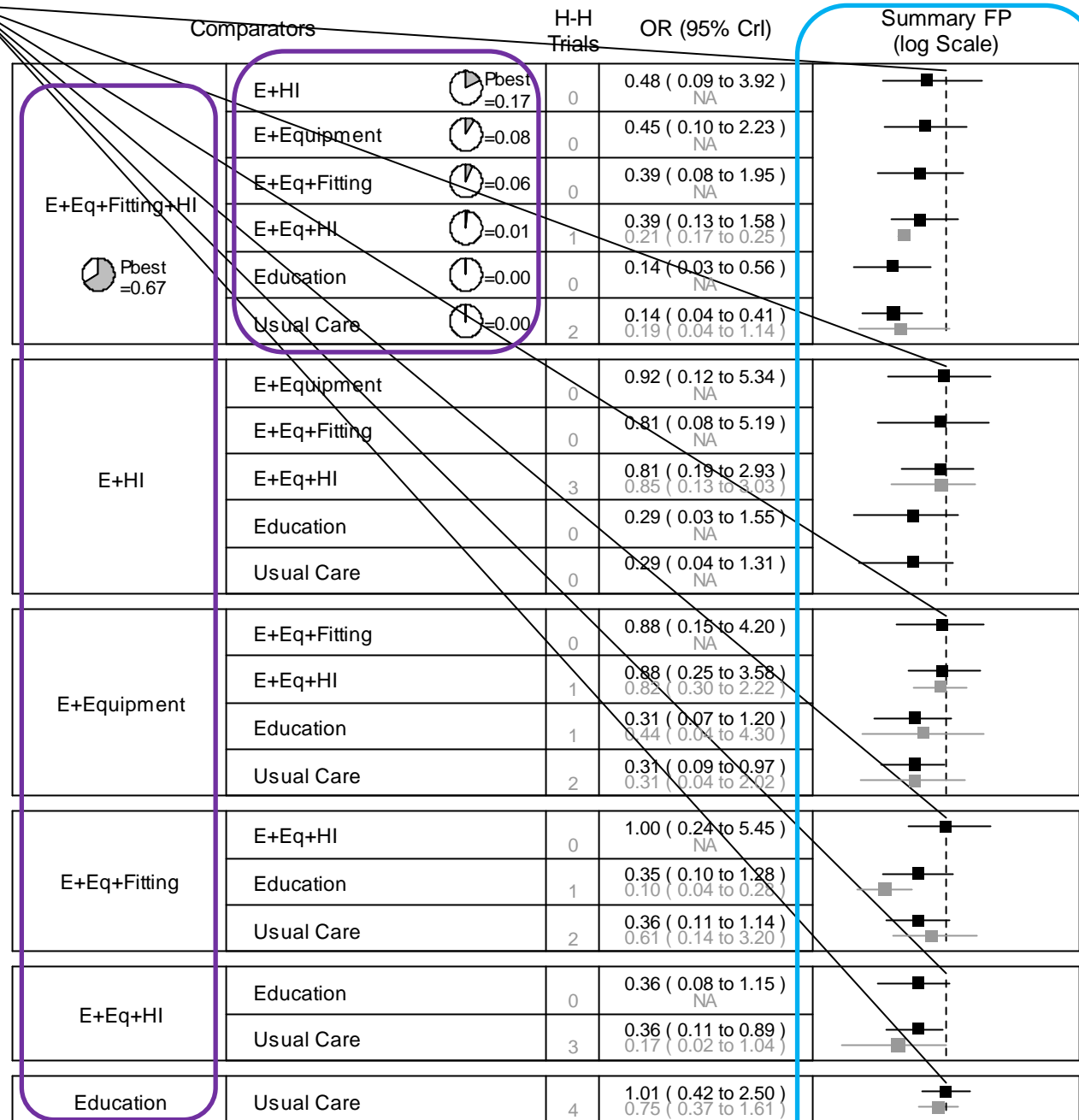
Interventions are displayed in the order that they were entered in the analysis.

0.05 0.15 0.5 1 2 4 8 16 32 64
Odds Ratio with 95% CrI & 95% PI (log scale)

Summary Forest Plot Table

Without
95%
prediction
Interval

Sorted by
Probability
Best
Statistics



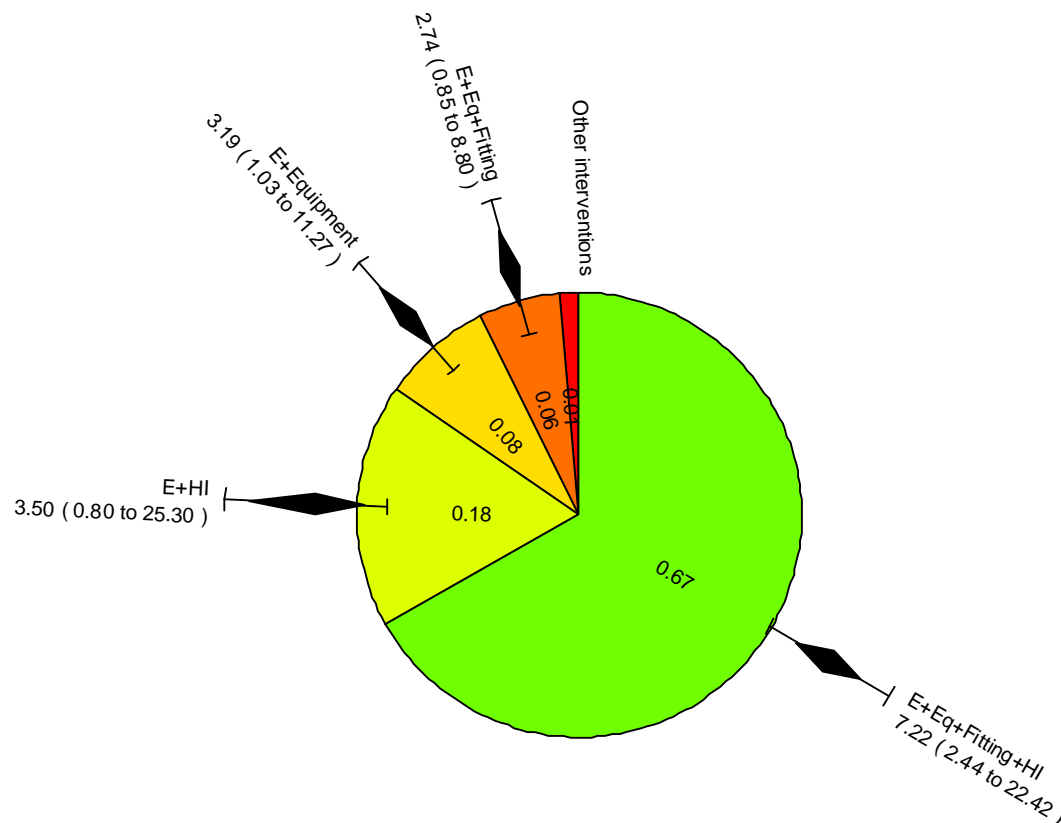
Heterogeneity, $\tau^2 = 0.60$; 95% CrI (0.128, 2.286)

MTC results in black; MA results in grey.

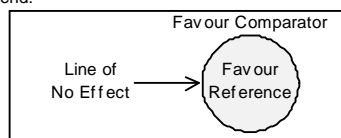
0.05 0.15 0.5 1 2 4 8 16 32 64
Odds Ratio with 95% CrI (log scale)

Summary Forest Plot Pie

Heterogeneity: between-study variance
= 0.59; 95% CrI (0.123 to 2.201)



Legend:



Size of Wedge
Probability Best



Relative Effect,
95% Credible Interval
& 95% Prediction Interval



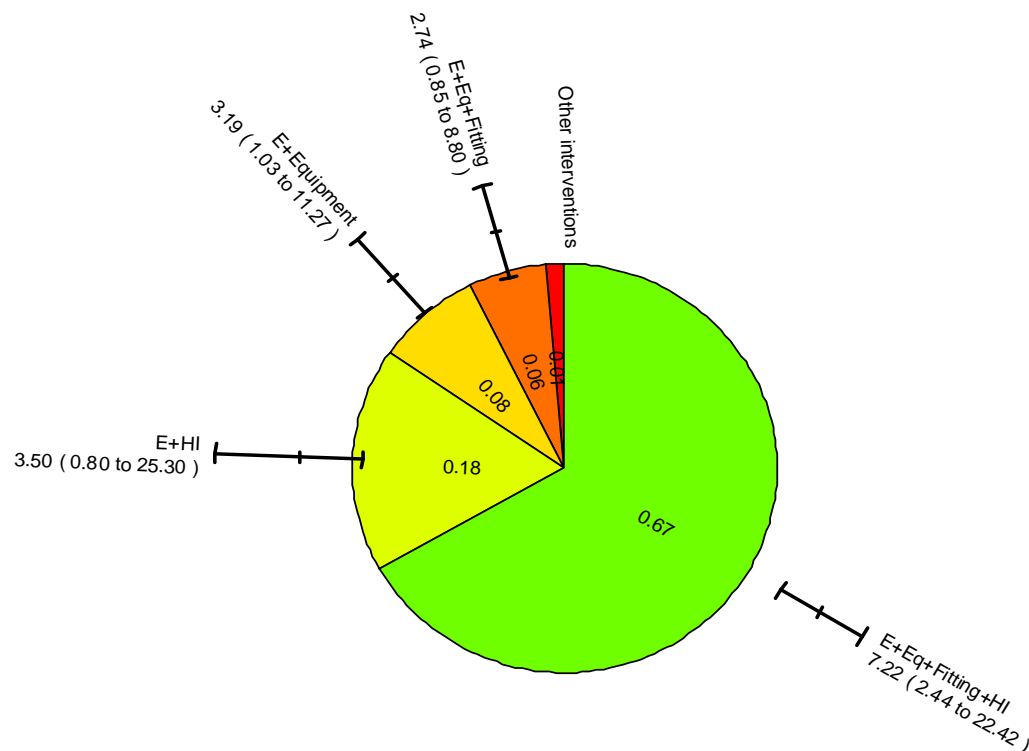
Key:

A total of 7 interventions were compared in this NMA, with Usual Care as the reference intervention.
Interventions with probability best < 0.05 are not presented individually but grouped as 'Other Interventions'.
'Other Interventions' include the following interventions: E+Eq+HI; Education; Usual Care

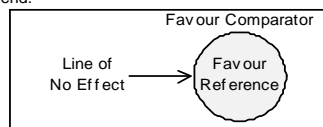
Summary Forest Plot Pie

SPF Pie for Smoke Alarm Uptake

Heterogeneity: between-study variance
= 0.59; 95% CrI (0.123 to 2.201)



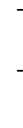
Legend:



Size of Wedge
Probability Best



Relative Effect
& 95%
Credible Interval



Key:

A total of 7 interventions were compared in this NMA, with Usual Care as the reference intervention. Interventions with probability best < 0.05 are not presented individually but grouped as 'Other Interventions'. 'Other Interventions' include the following interventions: E+Eq+HI; Education; Usual Care

Median Rank Chart

Median Rank Chart for Smoke Alarm Uptake

1

E+Eq+Fitting+HI

2

3

E+Equipment
E+HI

4

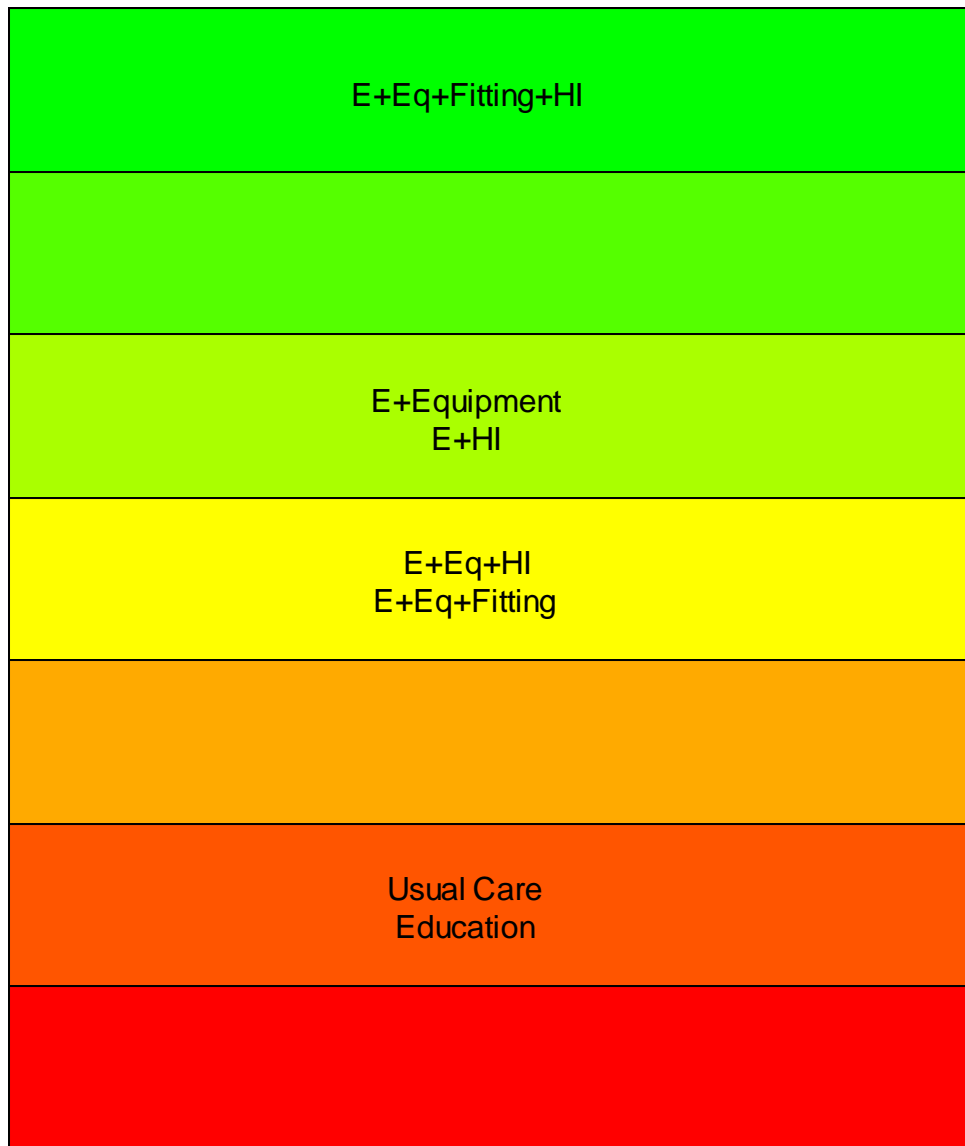
E+Eq+HI
E+Eq+Fitting

5

6

Usual Care
Education

7



Median Rank Chart (GreyScale)

Median Rank Chart for Smoke Alarm Uptake

1

E+Eq+Fitting+HI

2

3

E+Equipment
E+HI

4

E+Eq+HI
E+Eq+Fitting

5

6

Usual Care
Education

7

	E+Eq+Fitting+HI
	E+Equipment E+HI
	E+Eq+HI E+Eq+Fitting
	Usual Care Education

Characteristics/Objectives

- Summary Forest Plot Matrix (SFP Matrix)
 - achieve *comprehensive* coverage of MTC results
- Summary Forest Plot Table (SFP Table)
 - reporting style that is good for *very large network*
- Summary Forest Plot Pie (SFP Pie) and Median Rank Chart
 - highlight comparisons of *worthwhile* or *high-ranking* interventions to a reference intervention

References

Cooper NJ, Kendrick D, Achana F, et al. Network meta-analysis to evaluate the effectiveness of interventions to increase the uptake of smoke alarms. *Epidemiologic reviews*. 2012;34(1):32-45.

Anzures-Cabrera J, Higgins JPT. Graphical displays for meta-analysis: An overview with suggestions for practice *Research Synthesis Methods*. 2010;1(1):66-80.

Altman DG, Bland JM. Presentation of numerical data. *Bmj*. 1996;312(7030):572. Epub 1996/03/02.

Salanti G, Ades AE, Ioannidis JP. Graphical methods and summaries for presenting results from multiple-treatment meta-analysis: an overview and tutorial. *J. Clin. Epidemiol.* 2011;64:163-171.

Tan SH, Bujkiewicz S, Sutton AJ et al. Presentational approaches used in the UK for reporting evidence synthesis using indirect and mixed treatment comparisons. *J Health Serv Res Policy* (in press)