Results simulation study DelayedGSD

October 26, 2023

1 Rejection rate

1.1 2 stages

Power by method (columns) and scenario (rows): (nominal level 80%)

scenario	n.sim	missing	binding	fixC	ar	method 1	method 2	method 3
1	10000	TRUE	TRUE	FALSE	10	81.00%	80.93%	80.43%
3	10000	TRUE	TRUE	FALSE	5	80.53%	80.53%	80.14%
5	10000	TRUE	TRUE	TRUE	10	80.15%	80.35%	80.43%
7	10000	TRUE	TRUE	TRUE	5	80.08%	80.20%	80.14%
9	10000	TRUE	FALSE	TRUE	10	79.86%	80.12%	80.26%
11	10000	TRUE	FALSE	TRUE	5	79.93%	80.04%	80.06%
13	10000	TRUE	FALSE	FALSE	10	80.50%	80.44%	80.26%
15	10000	TRUE	FALSE	FALSE	5	80.37%	80.36%	80.06%
17	10000	FALSE	TRUE	FALSE	5	80.31%	80.30%	79.92%

Type 1 error by method (columns) and scenario (rows): (nominal level 2.5%)

scenario	n.sim	missing	binding	fixC	ar	method 1	method 2	method 3
2	10000	TRUE	TRUE	FALSE	10	2.42%	2.39%	2.37%
4	10000	TRUE	TRUE	FALSE	5	2.40%	2.40%	2.35%
6	10000	TRUE	TRUE	TRUE	10	2.24%	2.22%	2.37%
8	10000	TRUE	TRUE	TRUE	5	2.32%	2.31%	2.35%
10	10000	TRUE	FALSE	TRUE	10	2.45%	2.47%	2.57%
12	10000	TRUE	FALSE	TRUE	5	2.63%	2.64%	2.66%
14	10000	TRUE	FALSE	FALSE	10	2.53%	2.53%	2.57%
16	10000	TRUE	FALSE	FALSE	5	2.68%	2.68%	2.66%
18	10000	FALSE	TRUE	FALSE	5	2.46%	2.46%	2.45%

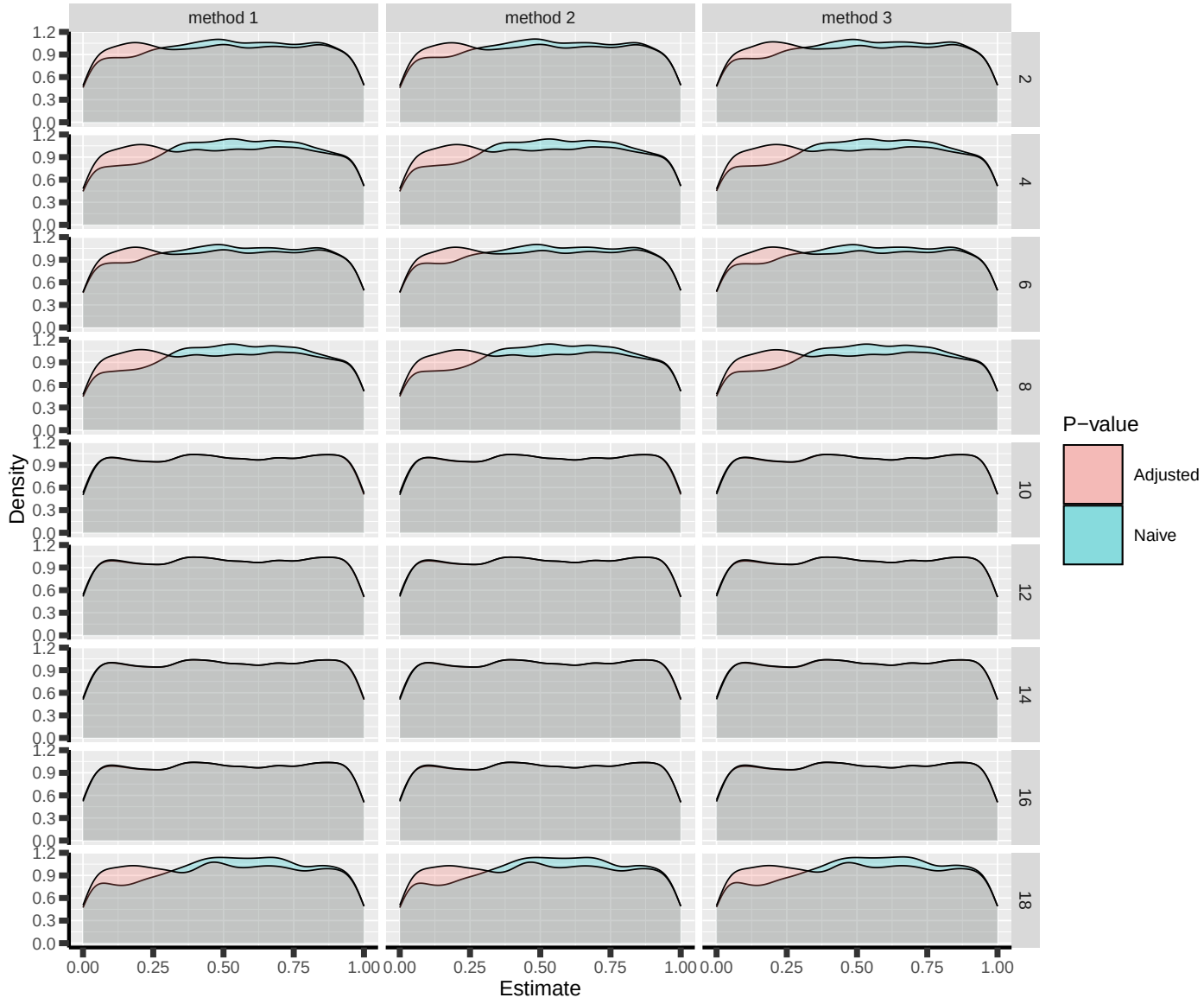

Figure 1: Naive and adjusted p-value distribution over all simulations under the null. Each row correspond to a different scenario

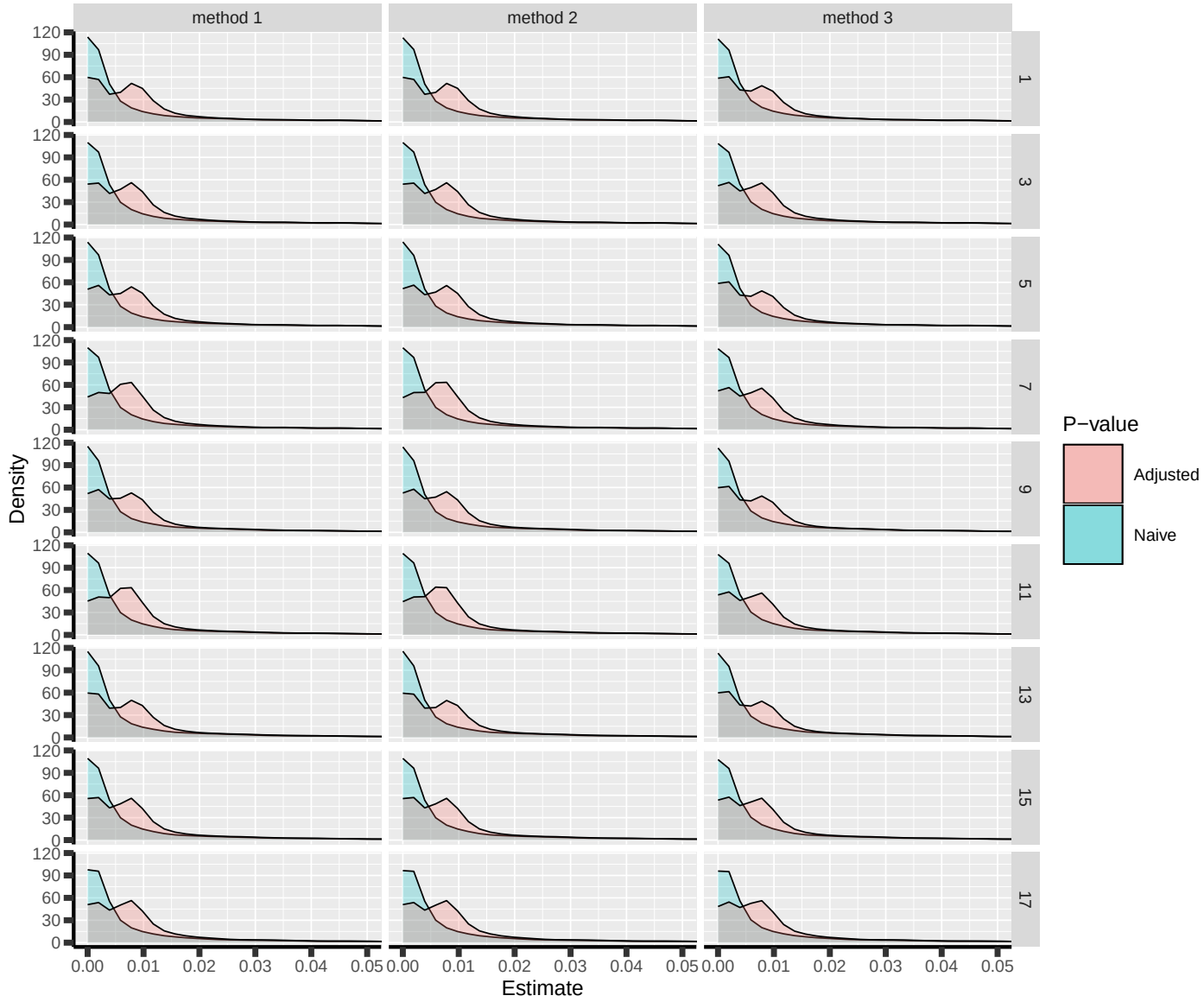

Figure 2: Naive and adjusted p-value distribution over all simulations under the alternative. Each row correspond to a different scenario

1.2 3 stages

Power by method (columns) and scenario (rows): (nominal level 80%)

scenario	n.sim	missing	binding	fixC	ar	method 1	method 2	method 3
1	10000	TRUE	TRUE	FALSE	10	80.87%	80.79%	80.14%
3	9921	TRUE	TRUE	FALSE	5	80.57%	80.56%	80.08%
5	10000	TRUE	TRUE	TRUE	10	79.84%	80.05%	80.14%
7	9921	TRUE	TRUE	TRUE	5	79.98%	80.08%	80.08%
9	10000	TRUE	FALSE	TRUE	10	79.58%	79.94%	80.06%
11	10000	TRUE	FALSE	TRUE	5	79.92%	80.15%	79.96%
13	10000	TRUE	FALSE	FALSE	10	80.52%	80.44%	80.06%
15	10000	TRUE	FALSE	FALSE	5	80.44%	80.42%	79.96%
17	10000	FALSE	TRUE	FALSE	5	80.23%	80.21%	79.80%

Type 1 error by method (columns) and scenario (rows): (nominal level 2.5%)

scenario	n.sim	missing	binding	fixC	ar	method 1	method 2	method 3
2	10000	TRUE	TRUE	FALSE	10	2.50%	2.48%	2.38%
4	10000	TRUE	TRUE	FALSE	5	2.42%	2.43%	2.40%
6	10000	TRUE	TRUE	TRUE	10	2.31%	2.33%	2.38%
8	10000	TRUE	TRUE	TRUE	5	2.37%	2.36%	2.40%
10	10000	TRUE	FALSE	TRUE	10	2.44%	2.42%	2.52%
12	10000	TRUE	FALSE	TRUE	5	2.48%	2.48%	2.54%
14	10000	TRUE	FALSE	FALSE	10	2.54%	2.53%	2.52%
16	10000	TRUE	FALSE	FALSE	5	2.61%	2.61%	2.54%
18	10000	FALSE	TRUE	FALSE	5	2.57%	2.57%	2.48%

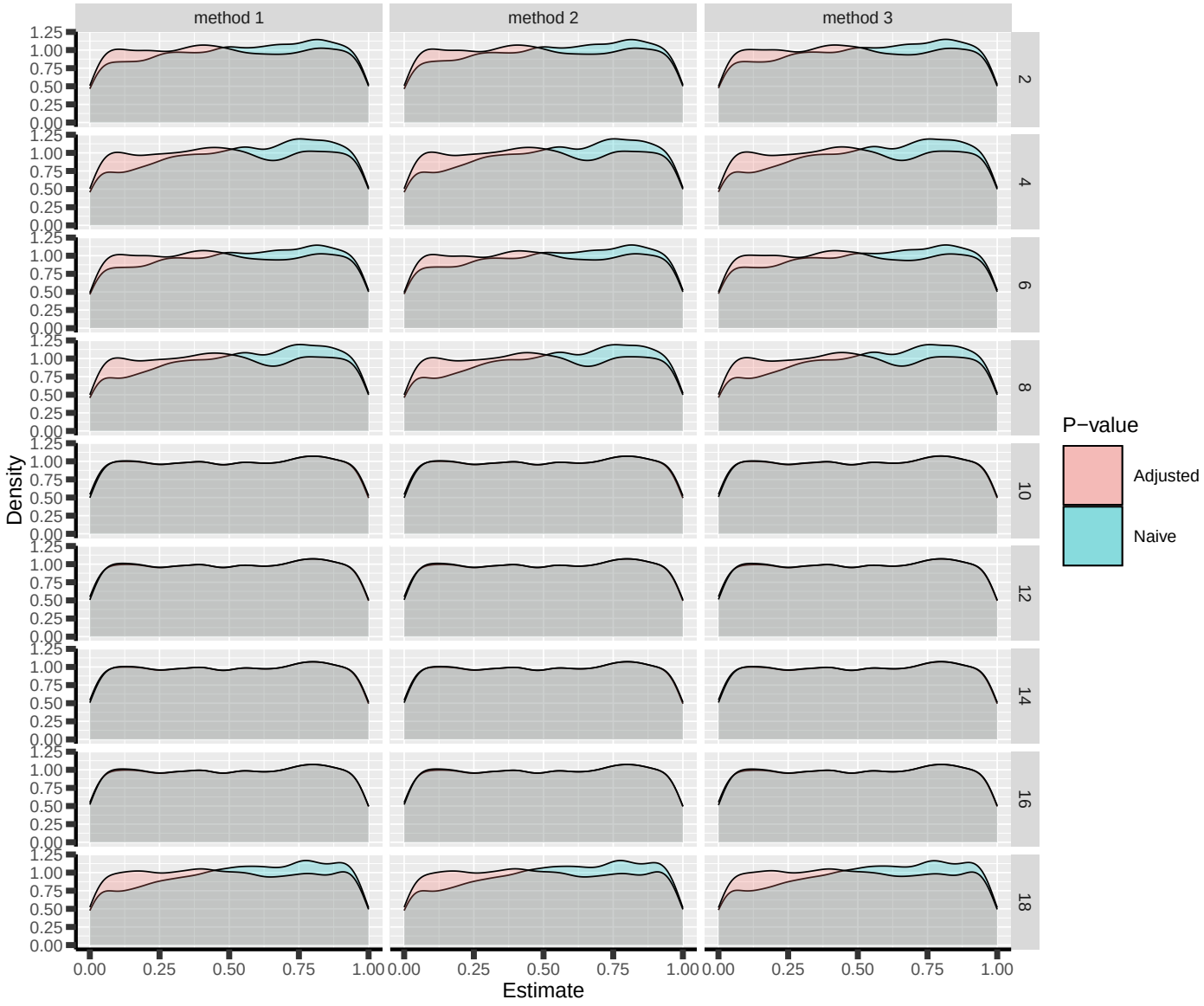

Figure 3: Naive and adjusted p-value distribution over all simulations under the null. Each row correspond to a different scenario

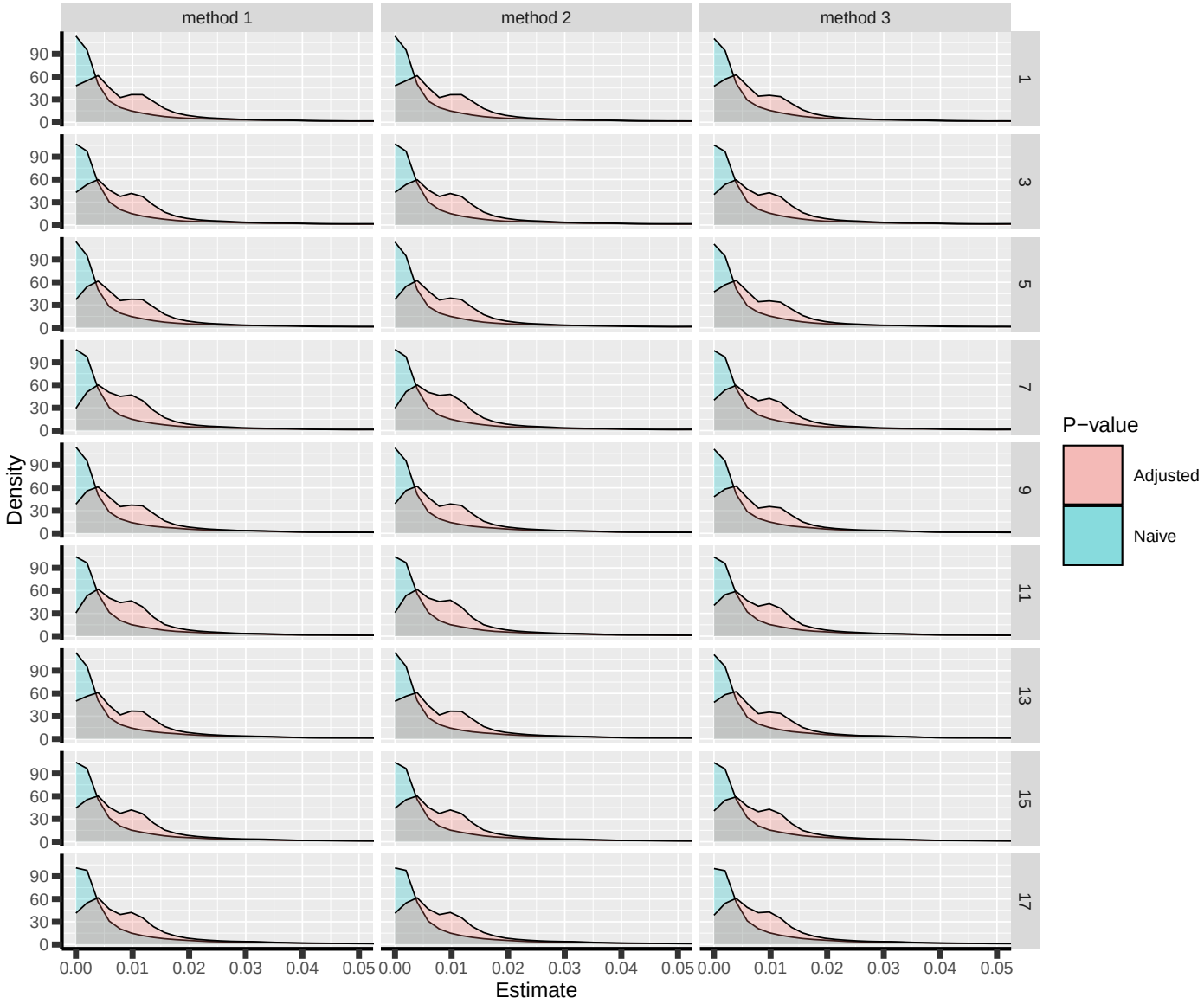

Figure 4: Naive and adjusted p-value distribution over all simulations under the alternative. Each row correspond to a different scenario

2 Conclusion of the trial

2.1 2 stages

Relative frequency of stopping for efficacy/futility at decision/final

- Method 1

	N	missing	hypo	binding	fixC	ar	decision.eff	decision.fut	final.eff	final.fut
1:	10000	TRUE	power	TRUE	FALSE	10	37.79%	5.93%	43.21%	13.07%
2:	10000	TRUE	typeI	TRUE	FALSE	10	0.80%	71.13%	1.62%	26.45%
3:	10000	TRUE	power	TRUE	FALSE	5	35.74%	5.98%	44.79%	13.49%
4:	10000	TRUE	typeI	TRUE	FALSE	5	0.74%	69.32%	1.66%	28.28%
5:	10000	TRUE	power	TRUE	TRUE	10	36.94%	6.78%	43.21%	13.07%
6:	10000	TRUE	typeI	TRUE	TRUE	10	0.62%	71.31%	1.62%	26.45%
7:	10000	TRUE	power	TRUE	TRUE	5	35.29%	6.43%	44.79%	13.49%
8:	10000	TRUE	typeI	TRUE	TRUE	5	0.66%	69.40%	1.66%	28.28%
9:	10000	TRUE	power	FALSE	TRUE	10	38.05%	6.57%	41.81%	13.57%
10:	10000	TRUE	typeI	FALSE	TRUE	10	0.61%	0.20%	1.84%	97.35%
11:	10000	TRUE	power	FALSE	TRUE	5	36.35%	6.15%	43.58%	13.92%
12:	10000	TRUE	typeI	FALSE	TRUE	5	0.70%	0.06%	1.93%	97.31%
13:	10000	TRUE	power	FALSE	FALSE	10	38.69%	5.93%	41.81%	13.57%
14:	10000	TRUE	typeI	FALSE	FALSE	10	0.69%	0.12%	1.84%	97.35%
15:	10000	TRUE	power	FALSE	FALSE	5	36.79%	5.71%	43.58%	13.92%
16:	10000	TRUE	typeI	FALSE	FALSE	5	0.75%	0.01%	1.93%	97.31%
17:	10000	FALSE	power	TRUE	FALSE	5	33.98%	5.33%	46.33%	14.36%
18:	10000	FALSE	typeI	TRUE	FALSE	5	0.74%	67.48%	1.72%	30.06%

Method 2:

	N	missing	hypo	binding	fixC	ar	decision.eff	decision.fut	final.eff	final.fut
1:	10000	TRUE	power	TRUE	FALSE	10	37.85%	6.19%	43.08%	12.88%
2:	10000	TRUE	typeI	TRUE	FALSE	10	0.79%	71.64%	1.60%	25.97%
3:	10000	TRUE	power	TRUE	FALSE	5	35.77%	5.99%	44.76%	13.48%
4:	10000	TRUE	typeI	TRUE	FALSE	5	0.74%	69.38%	1.66%	28.22%
5:	10000	TRUE	power	TRUE	TRUE	10	36.69%	6.24%	43.66%	13.41%
6:	10000	TRUE	typeI	TRUE	TRUE	10	0.59%	69.61%	1.63%	28.17%
7:	10000	TRUE	power	TRUE	TRUE	5	35.02%	6.05%	45.18%	13.75%
8:	10000	TRUE	typeI	TRUE	TRUE	5	0.63%	68.36%	1.68%	29.33%
9:	10000	TRUE	power	FALSE	TRUE	10	37.85%	6.04%	42.27%	13.84%
10:	10000	TRUE	typeI	FALSE	TRUE	10	0.61%	0.19%	1.86%	97.34%
11:	10000	TRUE	power	FALSE	TRUE	5	36.18%	5.84%	43.86%	14.12%
12:	10000	TRUE	typeI	FALSE	TRUE	5	0.69%	0.06%	1.95%	97.30%
13:	10000	TRUE	power	FALSE	FALSE	10	38.70%	6.09%	41.74%	13.47%
14:	10000	TRUE	typeI	FALSE	FALSE	10	0.69%	0.12%	1.84%	97.35%
15:	10000	TRUE	power	FALSE	FALSE	5	36.82%	5.75%	43.54%	13.89%
16:	10000	TRUE	typeI	FALSE	FALSE	5	0.75%	0.01%	1.93%	97.31%
17:	10000	FALSE	power	TRUE	FALSE	5	34.03%	5.36%	46.27%	14.34%
18:	10000	FALSE	typeI	TRUE	FALSE	5	0.74%	67.55%	1.72%	29.99%

Method 3:

	N	missing	hypo	binding	fixC	ar	decision.eff	decision.fut	final.eff	final.fut
1:	10000	TRUE	power	TRUE	FALSE	10	40.58%	6.53%	39.85%	13.04%
2:	10000	TRUE	typeI	TRUE	FALSE	10	0.74%	68.79%	1.63%	28.84%
3:	10000	TRUE	power	TRUE	FALSE	5	36.54%	6.30%	43.60%	13.56%
4:	10000	TRUE	typeI	TRUE	FALSE	5	0.69%	68.41%	1.66%	29.24%
5:	10000	TRUE	power	TRUE	TRUE	10	40.58%	6.53%	39.85%	13.04%
6:	10000	TRUE	typeI	TRUE	TRUE	10	0.74%	68.79%	1.63%	28.84%
7:	10000	TRUE	power	TRUE	TRUE	5	36.54%	6.30%	43.60%	13.56%
8:	10000	TRUE	typeI	TRUE	TRUE	5	0.69%	68.41%	1.66%	29.24%
9:	10000	TRUE	power	FALSE	TRUE	10	41.34%	6.20%	38.92%	13.54%
10:	10000	TRUE	typeI	FALSE	TRUE	10	0.77%	0.33%	1.80%	97.10%
11:	10000	TRUE	power	FALSE	TRUE	5	37.71%	6.03%	42.35%	13.91%
12:	10000	TRUE	typeI	FALSE	TRUE	5	0.73%	0.09%	1.93%	97.25%
13:	10000	TRUE	power	FALSE	FALSE	10	41.34%	6.20%	38.92%	13.54%
14:	10000	TRUE	typeI	FALSE	FALSE	10	0.77%	0.33%	1.80%	97.10%
15:	10000	TRUE	power	FALSE	FALSE	5	37.71%	6.03%	42.35%	13.91%
16:	10000	TRUE	typeI	FALSE	FALSE	5	0.73%	0.09%	1.93%	97.25%
17:	10000	FALSE	power	TRUE	FALSE	5	34.65%	5.59%	45.27%	14.49%
18:	10000	FALSE	typeI	TRUE	FALSE	5	0.68%	66.54%	1.77%	31.01%

Relative frequency of stopping for with a threshold below 1.96:

	scenario	missing	method	binding	fixC	ar	hypo	N	rejection	rejectionBelow196
1:	1	TRUE	1	TRUE	FALSE	10	power	10000	81.00%	0.85%
2:	1	TRUE	2	TRUE	FALSE	10	power	10000	80.93%	0.84%
3:	2	TRUE	1	TRUE	FALSE	10	typeI	10000	2.42%	0.18%
4:	2	TRUE	2	TRUE	FALSE	10	typeI	10000	2.39%	0.17%
5:	3	TRUE	1	TRUE	FALSE	5	power	10000	80.53%	0.45%
6:	3	TRUE	2	TRUE	FALSE	5	power	10000	80.53%	0.45%
7:	4	TRUE	1	TRUE	FALSE	5	typeI	10000	2.40%	0.08%
8:	4	TRUE	2	TRUE	FALSE	5	typeI	10000	2.40%	0.08%
9:	13	TRUE	1	FALSE	FALSE	10	power	10000	80.50%	0.64%
10:	13	TRUE	2	FALSE	FALSE	10	power	10000	80.44%	0.64%
11:	14	TRUE	1	FALSE	FALSE	10	typeI	10000	2.53%	0.08%
12:	14	TRUE	2	FALSE	FALSE	10	typeI	10000	2.53%	0.08%
13:	15	TRUE	1	FALSE	FALSE	5	power	10000	80.37%	0.44%
14:	15	TRUE	2	FALSE	FALSE	5	power	10000	80.36%	0.44%
15:	16	TRUE	1	FALSE	FALSE	5	typeI	10000	2.68%	0.05%
16:	16	TRUE	2	FALSE	FALSE	5	typeI	10000	2.68%	0.05%
17:	17	FALSE	1	TRUE	FALSE	5	power	10000	80.31%	0.42%
18:	17	FALSE	2	TRUE	FALSE	5	power	10000	80.30%	0.43%
19:	18	FALSE	1	TRUE	FALSE	5	typeI	10000	2.46%	0.08%
20:	18	FALSE	2	TRUE	FALSE	5	typeI	10000	2.46%	0.08%

2.2 3 stages

Relative frequency of stopping for efficacy/futility at decision/final

- Method 1

	N	missing	hypo	binding	fixC	ar	dec1.eff	dec1.fut	dec2.eff	dec2.fut	final.eff	final.fut
1:	10000		TRUE	power	TRUE	FALSE	10	19.91%	2.95%	29.31%	5.36%	31.65%	10.82%
2:	10000		TRUE	typeI	TRUE	FALSE	10	0.38%	46.24%	0.67%	35.38%	1.45%	15.88%
3:	9921		TRUE	power	TRUE	FALSE	5	18.33%	2.79%	28.75%	5.42%	33.48%	11.22%
4:	10000		TRUE	typeI	TRUE	FALSE	5	0.36%	44.03%	0.59%	36.50%	1.47%	17.05%
5:	10000		TRUE	power	TRUE	TRUE	10	19.39%	3.47%	28.80%	5.87%	31.65%	10.82%
6:	10000		TRUE	typeI	TRUE	TRUE	10	0.30%	46.32%	0.56%	35.49%	1.45%	15.88%
7:	9921		TRUE	power	TRUE	TRUE	5	18.07%	3.05%	28.42%	5.75%	33.48%	11.22%
8:	10000		TRUE	typeI	TRUE	TRUE	5	0.34%	44.05%	0.56%	36.53%	1.47%	17.05%
9:	10000		TRUE	power	FALSE	TRUE	10	20.80%	3.52%	27.86%	5.59%	30.92%	11.31%
10:	10000		TRUE	typeI	FALSE	TRUE	10	0.31%	0.10%	0.51%	0.63%	1.62%	96.83%
11:	10000		TRUE	power	FALSE	TRUE	5	19.31%	3.03%	28.11%	5.68%	32.50%	11.37%
12:	10000		TRUE	typeI	FALSE	TRUE	5	0.31%	0.04%	0.52%	0.10%	1.65%	97.38%
13:	10000		TRUE	power	FALSE	FALSE	10	21.28%	3.04%	28.32%	5.13%	30.92%	11.31%
14:	10000		TRUE	typeI	FALSE	FALSE	10	0.35%	0.06%	0.57%	0.57%	1.62%	96.83%
15:	10000		TRUE	power	FALSE	FALSE	5	19.50%	2.84%	28.44%	5.35%	32.50%	11.37%
16:	10000		TRUE	typeI	FALSE	FALSE	5	0.35%	0	0.61%	0.01%	1.65%	97.38%
17:	10000		FALSE	power	TRUE	FALSE	5	17.63%	2.93%	28.90%	5.11%	33.70%	11.73%
18:	10000		FALSE	typeI	TRUE	FALSE	5	0.48%	42.39%	0.71%	36.38%	1.38%	18.66%

- Method 2

	N	missing	hypo	binding	fixC	ar	dec1.eff	dec1.fut	dec2.eff	dec2.fut	final.eff	final.fut
1:	10000		TRUE	power	TRUE	FALSE	10	19.94%	2.99%	29.32%	5.69%	31.53%	10.53%
2:	10000		TRUE	typeI	TRUE	FALSE	10	0.38%	46.48%	0.66%	35.66%	1.44%	15.38%
3:	9921		TRUE	power	TRUE	FALSE	5	18.34%	2.82%	28.81%	5.44%	33.40%	11.18%
4:	10000		TRUE	typeI	TRUE	FALSE	5	0.36%	44.08%	0.59%	36.47%	1.48%	17.02%
5:	10000		TRUE	power	TRUE	TRUE	10	19.17%	3.16%	28.74%	5.67%	32.14%	11.12%
6:	10000		TRUE	typeI	TRUE	TRUE	10	0.29%	44.63%	0.56%	36.01%	1.48%	17.03%
7:	9921		TRUE	power	TRUE	TRUE	5	17.92%	2.97%	28.25%	5.36%	33.91%	11.58%
8:	10000		TRUE	typeI	TRUE	TRUE	5	0.34%	43.09%	0.54%	36.68%	1.48%	17.87%
9:	10000		TRUE	power	FALSE	TRUE	10	20.72%	3.21%	27.71%	5.29%	31.51%	11.56%
10:	10000		TRUE	typeI	FALSE	TRUE	10	0.29%	0.10%	0.50%	0.49%	1.63%	96.99%
11:	10000		TRUE	power	FALSE	TRUE	5	19.19%	2.94%	28.01%	5.23%	32.95%	11.68%
12:	10000		TRUE	typeI	FALSE	TRUE	5	0.31%	0.04%	0.50%	0.09%	1.67%	97.39%
13:	10000		TRUE	power	FALSE	FALSE	10	21.30%	3.09%	28.33%	5.27%	30.81%	11.20%
14:	10000		TRUE	typeI	FALSE	FALSE	10	0.35%	0.06%	0.57%	0.58%	1.61%	96.83%
15:	10000		TRUE	power	FALSE	FALSE	5	19.51%	2.84%	28.44%	5.39%	32.47%	11.35%

16:	10000	TRUE	typeI	FALSE	FALSE	5	0.35%	0	0.61%	0.01%	1.65%	97.38%
17:	10000	FALSE	power	TRUE	FALSE	5	17.68%	2.94%	28.89%	5.17%	33.64%	11.68%
18:	10000	FALSE	typeI	TRUE	FALSE	5	0.48%	42.46%	0.71%	36.41%	1.38%	18.56%

- Method 3

	N	missing	hypo	binding	fixC	ar	dec1.eff	dec1.fut	dec2.eff	dec2.fut	final.eff	final.fut
1:	10000	TRUE	power	TRUE	FALSE	10	21.49%	3.26%	29.79%	5.96%	28.86%	10.64%
2:	10000	TRUE	typeI	TRUE	FALSE	10	0.32%	44.14%	0.60%	35.96%	1.46%	17.52%
3:	9921	TRUE	power	TRUE	FALSE	5	18.55%	3.10%	28.93%	5.47%	32.61%	11.34%
4:	10000	TRUE	typeI	TRUE	FALSE	5	0.37%	43.25%	0.56%	36.60%	1.47%	17.75%
5:	10000	TRUE	power	TRUE	TRUE	10	21.49%	3.26%	29.79%	5.96%	28.86%	10.64%
6:	10000	TRUE	typeI	TRUE	TRUE	10	0.32%	44.14%	0.60%	35.96%	1.46%	17.52%
7:	9921	TRUE	power	TRUE	TRUE	5	18.55%	3.10%	28.93%	5.47%	32.61%	11.34%
8:	10000	TRUE	typeI	TRUE	TRUE	5	0.37%	43.25%	0.56%	36.60%	1.47%	17.75%
9:	10000	TRUE	power	FALSE	TRUE	10	22.78%	3.32%	28.92%	5.74%	28.36%	10.88%
10:	10000	TRUE	typeI	FALSE	TRUE	10	0.33%	0.14%	0.65%	0.81%	1.54%	96.53%
11:	10000	TRUE	power	FALSE	TRUE	5	19.70%	3.12%	28.62%	5.49%	31.64%	11.43%
12:	10000	TRUE	typeI	FALSE	TRUE	5	0.32%	0.06%	0.59%	0.13%	1.63%	97.27%
13:	10000	TRUE	power	FALSE	FALSE	10	22.78%	3.32%	28.92%	5.74%	28.36%	10.88%
14:	10000	TRUE	typeI	FALSE	FALSE	10	0.33%	0.14%	0.65%	0.81%	1.54%	96.53%
15:	10000	TRUE	power	FALSE	FALSE	5	19.70%	3.12%	28.62%	5.49%	31.64%	11.43%
16:	10000	TRUE	typeI	FALSE	FALSE	5	0.32%	0.06%	0.59%	0.13%	1.63%	97.27%
17:	10000	FALSE	power	TRUE	FALSE	5	18.08%	3.12%	29.02%	5.26%	32.70%	11.82%
18:	10000	FALSE	typeI	TRUE	FALSE	5	0.41%	41.65%	0.68%	36.42%	1.39%	19.45%

Relative frequency of stopping for with a threshold below 1.96:

	scenario	missing	method	binding	fixC	ar	hypo	N	rejection	rejectionBelow196
1:	1	TRUE	1	TRUE	FALSE	10	power	10000	80.87%	1.03%
2:	1	TRUE	2	TRUE	FALSE	10	power	10000	80.79%	0.96%
3:	2	TRUE	1	TRUE	FALSE	10	typeI	10000	2.50%	0.19%
4:	2	TRUE	2	TRUE	FALSE	10	typeI	10000	2.48%	0.17%
5:	3	TRUE	1	TRUE	FALSE	5	power	9921	80.57%	0.58%
6:	3	TRUE	2	TRUE	FALSE	5	power	9921	80.56%	0.58%
7:	4	TRUE	1	TRUE	FALSE	5	typeI	10000	2.42%	0.05%
8:	4	TRUE	2	TRUE	FALSE	5	typeI	10000	2.43%	0.05%
9:	13	TRUE	1	FALSE	FALSE	10	power	10000	80.52%	0.94%
10:	13	TRUE	2	FALSE	FALSE	10	power	10000	80.44%	0.92%
11:	14	TRUE	1	FALSE	FALSE	10	typeI	10000	2.54%	0.10%
12:	14	TRUE	2	FALSE	FALSE	10	typeI	10000	2.53%	0.10%
13:	15	TRUE	1	FALSE	FALSE	5	power	10000	80.44%	0.52%
14:	15	TRUE	2	FALSE	FALSE	5	power	10000	80.42%	0.50%
15:	16	TRUE	1	FALSE	FALSE	5	typeI	10000	2.61%	0.13%
16:	16	TRUE	2	FALSE	FALSE	5	typeI	10000	2.61%	0.13%
17:	17	FALSE	1	TRUE	FALSE	5	power	10000	80.23%	0.52%
18:	17	FALSE	2	TRUE	FALSE	5	power	10000	80.21%	0.51%
19:	18	FALSE	1	TRUE	FALSE	5	typeI	10000	2.57%	0.18%
20:	18	FALSE	2	TRUE	FALSE	5	typeI	10000	2.57%	0.18%

3 Bias (True effect: 0.6 under the alternative)

3.1 2 stages

Bias per estimator and method[1]:

	hypo	missing	binding	fixC	ar	biasMLE1	biasMLE2	biasMLE3	biasMUE1	biasMUE2	biasMUE3
1:	power	TRUE	TRUE	FALSE	10	0.01345	0.01315	0.01468	0.00598	0.00566	-0.00286
2:	typeI	TRUE	TRUE	FALSE	10	-0.01794	-0.01784	-0.01856	-0.00453	-0.00448	-0.00513
3:	power	TRUE	TRUE	FALSE	5	0.02257	0.02255	0.02358	0.01044	0.01047	0.00364
4:	typeI	TRUE	TRUE	FALSE	5	-0.03034	-0.03031	-0.03065	-0.01186	-0.01182	-0.01244
5:	power	TRUE	TRUE	TRUE	10	0.01345	0.01403	0.01468	-0.01482	-0.01515	-0.00286
6:	typeI	TRUE	TRUE	TRUE	10	-0.01794	-0.01871	-0.01856	-0.00553	-0.00619	-0.00513
7:	power	TRUE	TRUE	TRUE	5	0.02257	0.02309	0.02358	-0.01511	-0.01521	0.00364
8:	typeI	TRUE	TRUE	TRUE	5	-0.03034	-0.03085	-0.03065	-0.01249	-0.01307	-0.01244
9:	power	TRUE	FALSE	TRUE	10	0.01433	0.01490	0.01529	0.01725	0.01500	0.02897
10:	typeI	TRUE	FALSE	TRUE	10	0.00019	0.00019	0.00051	-0.00087	-0.00079	0.00073
11:	power	TRUE	FALSE	TRUE	5	0.02366	0.02402	0.02438	0.01667	0.01524	0.03653
12:	typeI	TRUE	FALSE	TRUE	5	0.00091	0.00085	0.00101	0.00033	0.00027	0.00086
13:	power	TRUE	FALSE	FALSE	10	0.01433	0.01416	0.01529	0.03552	0.03589	0.02897
14:	typeI	TRUE	FALSE	FALSE	10	0.00019	0.00019	0.00051	-0.00020	-0.00021	0.00073
15:	power	TRUE	FALSE	FALSE	5	0.02366	0.02365	0.02438	0.04186	0.04202	0.03653
16:	typeI	TRUE	FALSE	FALSE	5	0.00091	0.00091	0.00101	0.00087	0.00087	0.00086
17:	power	FALSE	TRUE	FALSE	5	0.02284	0.02277	0.02381	0.01197	0.01196	0.00412
18:	typeI	FALSE	TRUE	FALSE	5	-0.02952	-0.02945	-0.02992	-0.01111	-0.01106	-0.01172

Median bias [2] per estimator and method:

	hypo	missing	binding	fixC	ar	mbiasMLE1	mbiasMLE2	mbiasMLE3	mbiasMUE1	mbiasMUE2	mbiasMUE3
1:	power	TRUE	TRUE	FALSE	10	0.0261	0.0260	0.0301	-0.00240	-0.00250	-0.00545
2:	typeI	TRUE	TRUE	FALSE	10	-0.0173	-0.0170	-0.0202	0.00100	0.00075	-0.00015
3:	power	TRUE	TRUE	FALSE	5	0.0405	0.0405	0.0432	-0.00345	-0.00335	-0.00545
4:	typeI	TRUE	TRUE	FALSE	5	-0.0330	-0.0329	-0.0345	0.00055	0.00055	0.00065
5:	power	TRUE	TRUE	TRUE	10	0.0261	0.0265	0.0301	-0.01110	-0.01050	-0.00545
6:	typeI	TRUE	TRUE	TRUE	10	-0.0173	-0.0197	-0.0202	0.00100	-0.00065	-0.00015
7:	power	TRUE	TRUE	TRUE	5	0.0405	0.0407	0.0432	-0.00865	-0.00755	-0.00545
8:	typeI	TRUE	TRUE	TRUE	5	-0.0330	-0.0346	-0.0345	0.00055	0.00075	0.00065
9:	power	TRUE	FALSE	TRUE	10	0.0326	0.0332	0.0327	0.02719	0.02475	0.02804
10:	typeI	TRUE	FALSE	TRUE	10	-0.0009	-0.0009	-0.0009	-0.00190	-0.00185	-0.00025
11:	power	TRUE	FALSE	TRUE	5	0.0462	0.0459	0.0489	0.02568	0.02469	0.02799
12:	typeI	TRUE	FALSE	TRUE	5	-0.0009	-0.0010	-0.0009	-0.00130	-0.00140	-0.00015
13:	power	TRUE	FALSE	FALSE	10	0.0326	0.0324	0.0327	0.03094	0.03184	0.02804
14:	typeI	TRUE	FALSE	FALSE	10	-0.0009	-0.0009	-0.0009	-0.00150	-0.00140	-0.00025
15:	power	TRUE	FALSE	FALSE	5	0.0462	0.0464	0.0489	0.02832	0.02865	0.02799

[1] e.g. `biasMLE1` mixed model estimator (treatment effect), method 1 (boundaries)

[2] Relative frequency at which the estimate is greater than the truth minus 0.5

```
16: typeI    TRUE   FALSE FALSE  5   -0.0009   -0.0009   -0.0009  -0.00105  -0.00105  -0.00015
17: power   FALSE    TRUE FALSE  5    0.0383    0.0383    0.0400  -0.00265  -0.00255  -0.00485
18: typeI   FALSE    TRUE FALSE  5   -0.0329   -0.0327   -0.0353   0.00420   0.00420   0.00330
```

3.2 3 stages

Bias per estimator and method[3]:

	hypo	missing	binding	fixC	ar	biasMLE1	biasMLE2	biasMLE3	biasMUE1	biasMUE2	biasMUE3
1:	power	TRUE	TRUE	FALSE	10	0.0228	0.0226	0.0248	0.01623	0.01605	0.0063
2:	typeI	TRUE	TRUE	FALSE	10	-0.0340	-0.0338	-0.0340	-0.01485	-0.01470	-0.0161
3:	power	TRUE	TRUE	FALSE	5	0.0345	0.0345	0.0357	0.02047	0.02041	0.0121
4:	typeI	TRUE	TRUE	FALSE	5	-0.0522	-0.0522	-0.0527	-0.02540	-0.02533	-0.0258
5:	power	TRUE	TRUE	TRUE	10	0.0228	0.0234	0.0248	-0.00558	-0.00569	0.0063
6:	typeI	TRUE	TRUE	TRUE	10	-0.0340	-0.0341	-0.0340	-0.01603	-0.01691	-0.0161
7:	power	TRUE	TRUE	TRUE	5	0.0345	0.0348	0.0357	-0.00620	-0.00639	0.0121
8:	typeI	TRUE	TRUE	TRUE	5	-0.0522	-0.0527	-0.0527	-0.02588	-0.02642	-0.0258
9:	power	TRUE	FALSE	TRUE	10	0.0223	0.0230	0.0246	0.03980	0.03755	0.0524
10:	typeI	TRUE	FALSE	TRUE	10	0.0011	0.0010	0.0014	-0.00021	-0.00038	0.0016
11:	power	TRUE	FALSE	TRUE	5	0.0343	0.0348	0.0351	0.03931	0.03719	0.0579
12:	typeI	TRUE	FALSE	TRUE	5	0.0017	0.0016	0.0019	0.00065	0.00066	0.0014
13:	power	TRUE	FALSE	FALSE	10	0.0223	0.0222	0.0246	0.05767	0.05820	0.0524
14:	typeI	TRUE	FALSE	FALSE	10	0.0011	0.0011	0.0014	0.00058	0.00057	0.0016
15:	power	TRUE	FALSE	FALSE	5	0.0343	0.0343	0.0351	0.06492	0.06503	0.0579
16:	typeI	TRUE	FALSE	FALSE	5	0.0017	0.0017	0.0019	0.00170	0.00170	0.0014
17:	power	FALSE	TRUE	FALSE	5	0.0346	0.0346	0.0360	0.02204	0.02206	0.0139
18:	typeI	FALSE	TRUE	FALSE	5	-0.0491	-0.0491	-0.0492	-0.02218	-0.02221	-0.0228

Median bias [4] per estimator and method:

	hypo	missing	binding	fixC	ar	mbiasMLE1	mbiasMLE2	mbiasMLE3	mbiasMUE1	mbiasMUE2	mbiasMUE3
1:	power	TRUE	TRUE	FALSE	10	0.0359	0.0358	0.0374	-0.0037	-0.0040	-0.0095
2:	typeI	TRUE	TRUE	FALSE	10	-0.0367	-0.0365	-0.0380	0.0104	0.0100	0.0089
3:	power	TRUE	TRUE	FALSE	5	0.0551	0.0551	0.0565	-0.0045	-0.0043	-0.0087
4:	typeI	TRUE	TRUE	FALSE	5	-0.0556	-0.0557	-0.0574	0.0088	0.0088	0.0089
5:	power	TRUE	TRUE	TRUE	10	0.0359	0.0355	0.0374	-0.0166	-0.0172	-0.0095
6:	typeI	TRUE	TRUE	TRUE	10	-0.0367	-0.0379	-0.0380	0.0099	0.0090	0.0088
7:	power	TRUE	TRUE	TRUE	5	0.0551	0.0547	0.0565	-0.0167	-0.0168	-0.0087
8:	typeI	TRUE	TRUE	TRUE	5	-0.0556	-0.0569	-0.0574	0.0087	0.0088	0.0089
9:	power	TRUE	FALSE	TRUE	10	0.0321	0.0326	0.0358	0.0286	0.0250	0.0366
10:	typeI	TRUE	FALSE	TRUE	10	-0.0056	-0.0060	-0.0056	-0.0073	-0.0077	-0.0053
11:	power	TRUE	FALSE	TRUE	5	0.0498	0.0494	0.0502	0.0297	0.0259	0.0347
12:	typeI	TRUE	FALSE	TRUE	5	-0.0061	-0.0061	-0.0061	-0.0069	-0.0067	-0.0060
13:	power	TRUE	FALSE	FALSE	10	0.0321	0.0322	0.0358	0.0367	0.0376	0.0366
14:	typeI	TRUE	FALSE	FALSE	10	-0.0056	-0.0056	-0.0056	-0.0068	-0.0066	-0.0054
15:	power	TRUE	FALSE	FALSE	5	0.0498	0.0498	0.0502	0.0397	0.0398	0.0349
16:	typeI	TRUE	FALSE	FALSE	5	-0.0061	-0.0061	-0.0061	-0.0063	-0.0064	-0.0061
17:	power	FALSE	TRUE	FALSE	5	0.0573	0.0576	0.0595	0.0073	0.0074	0.0016

[3] e.g. `biasMLE1` mixed model estimator (treatment effect), method 1 (boundaries)

[4] Relative frequency at which the estimate is greater than the truth minus 0.5

```
18: typeI   FALSE    TRUE FALSE  5   -0.0529   -0.0528   -0.0540    0.0097    0.0093    0.0100
```

4 Distribution of the estimates

4.1 2 stages

Distribution of the estimates:

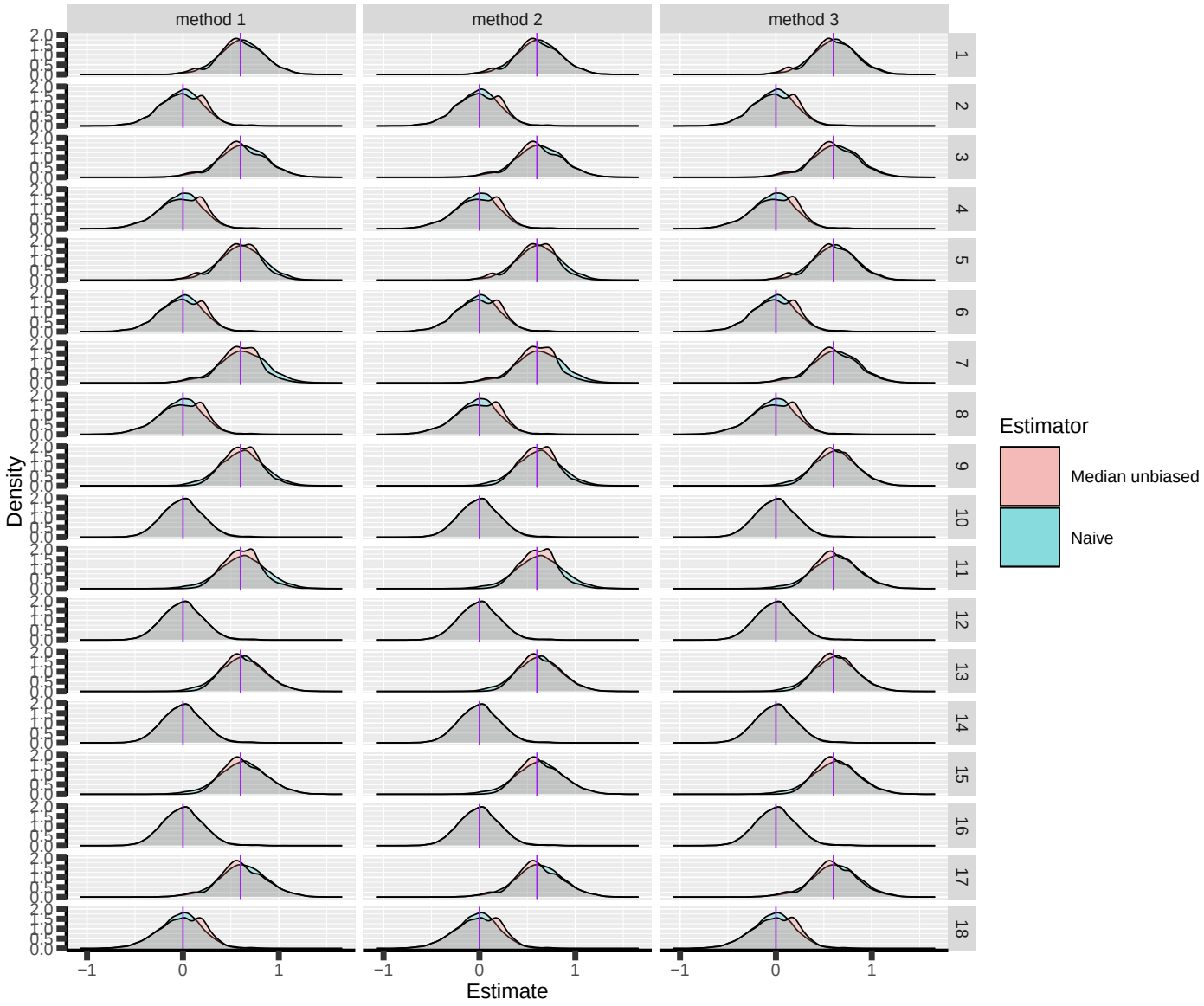

Figure 5: Naive and Median unbiased estimate distribution over all simulations. Each row correspond to a different scenario

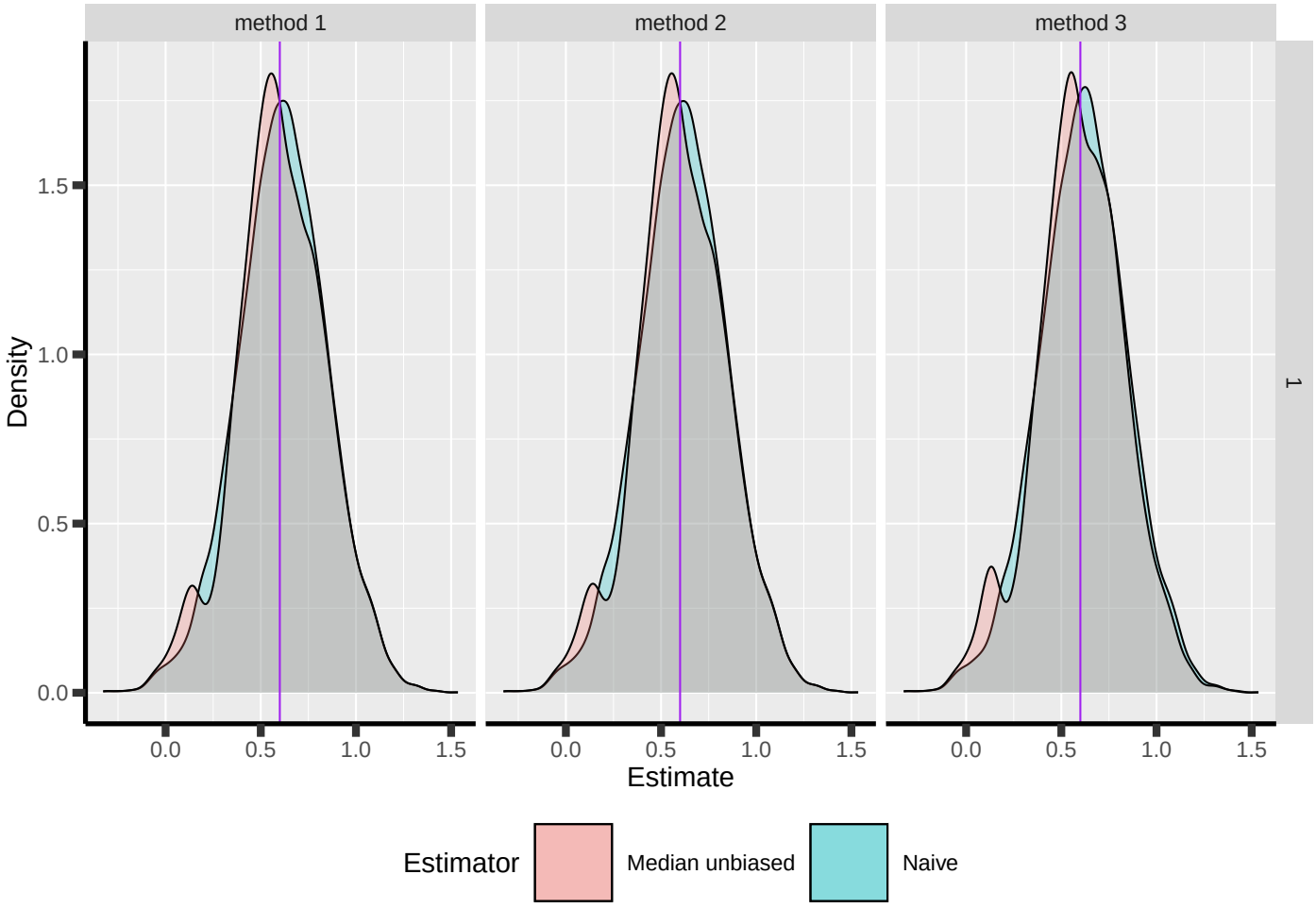

Figure 6: Same but specific to scenario 1

Distribution of the median unbiased estimate conditional to the stage:

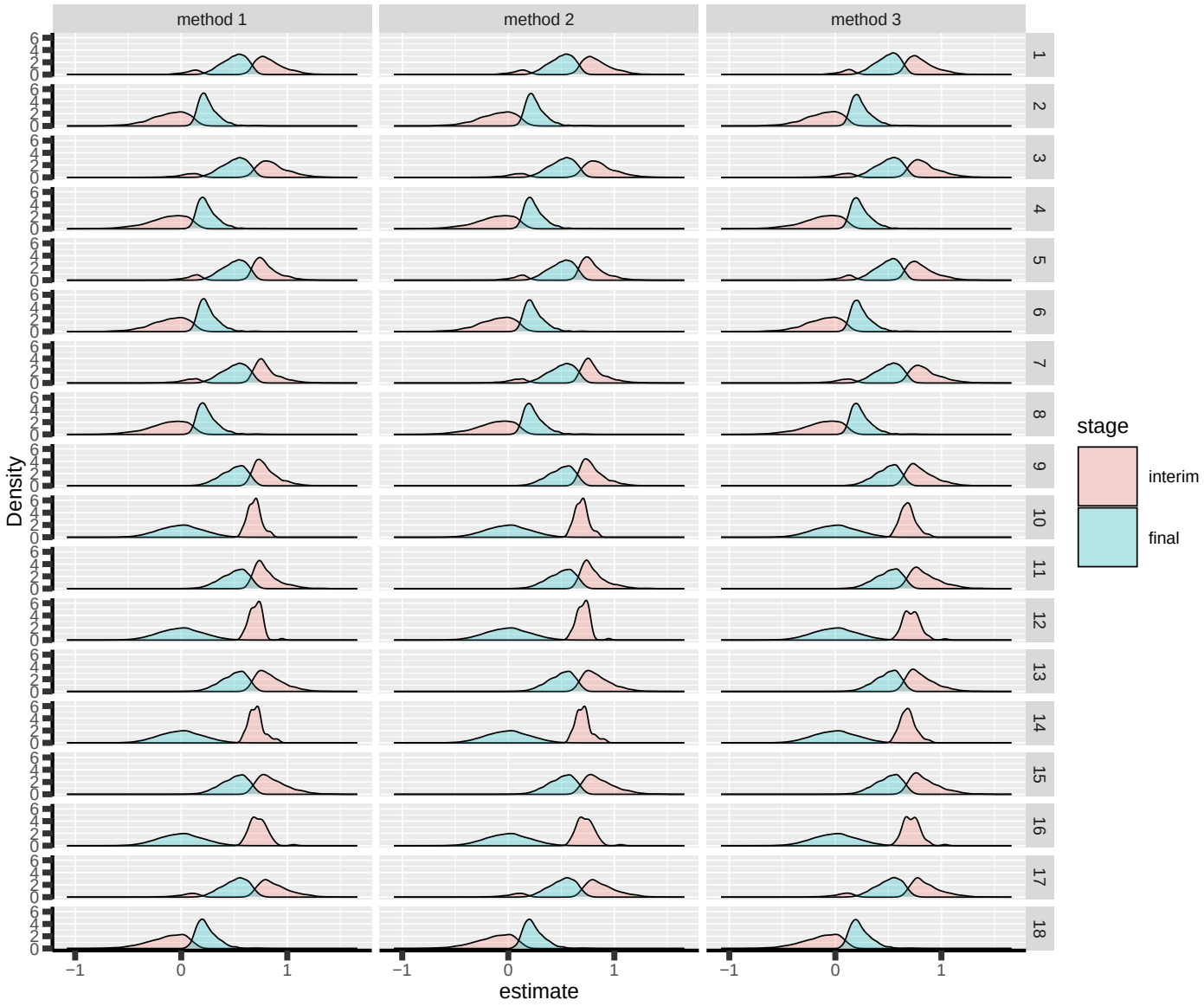

Figure 7: Median unbiased estimate distribution conditional to the stage. Each row correspond to a different scenario.

4.2 3 stages

Distribution of the estimates:

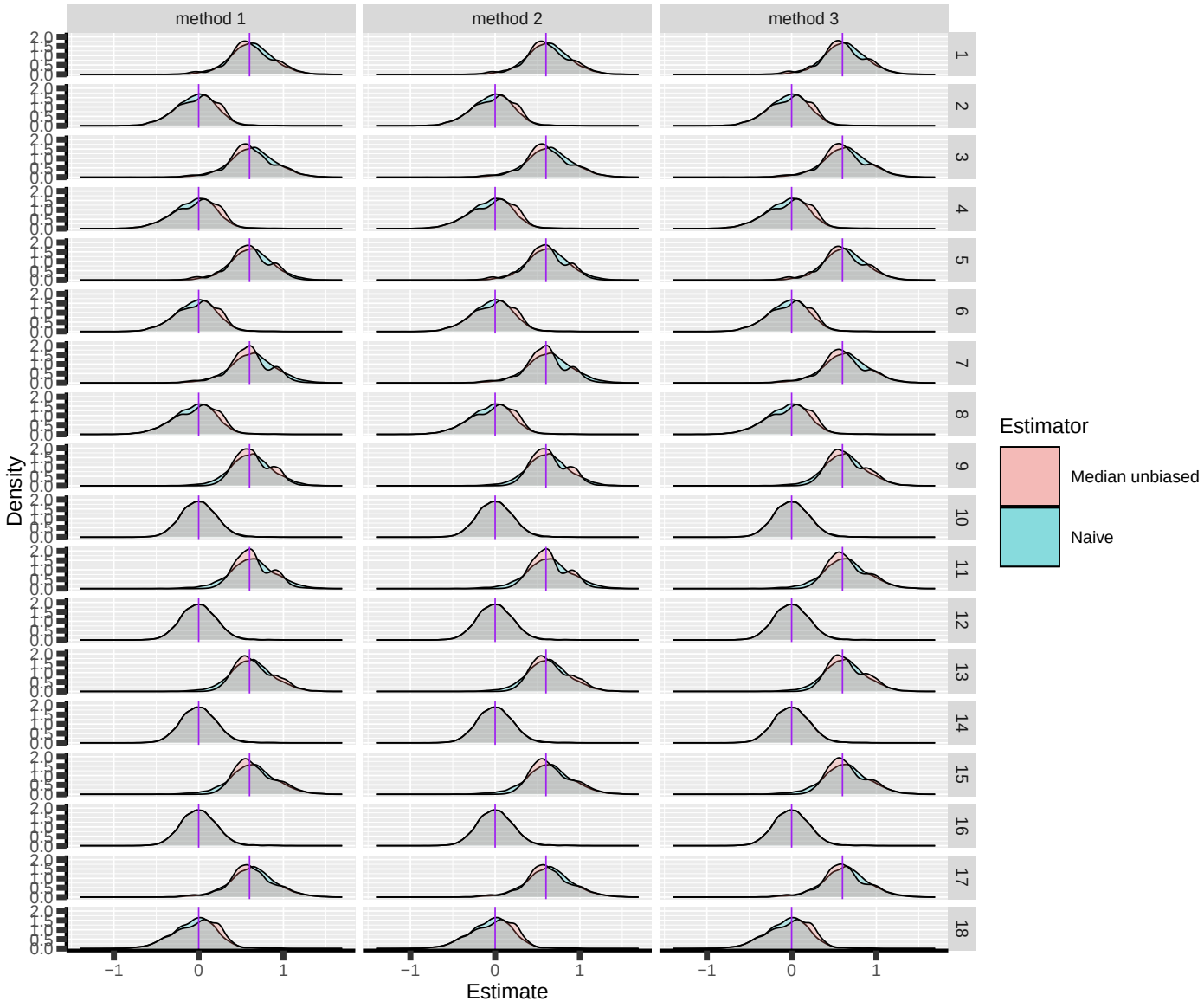

Figure 8: Naive and Median unbiased estimate distribution over all simulations. Each row correspond to a different scenario

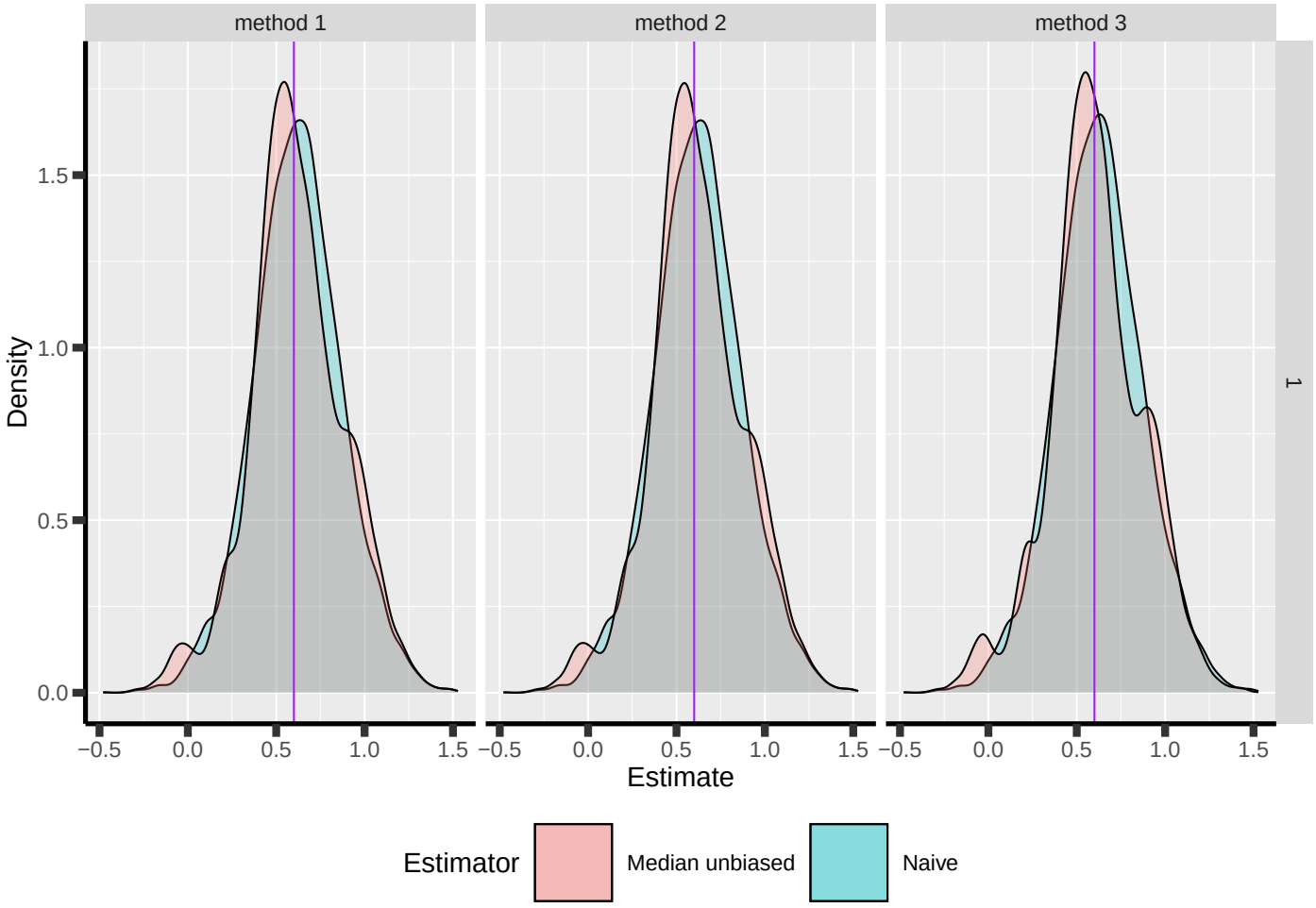

Figure 9: Same but specific to scenario 1

Distribution of the median unbiased estimate conditional to the stage:

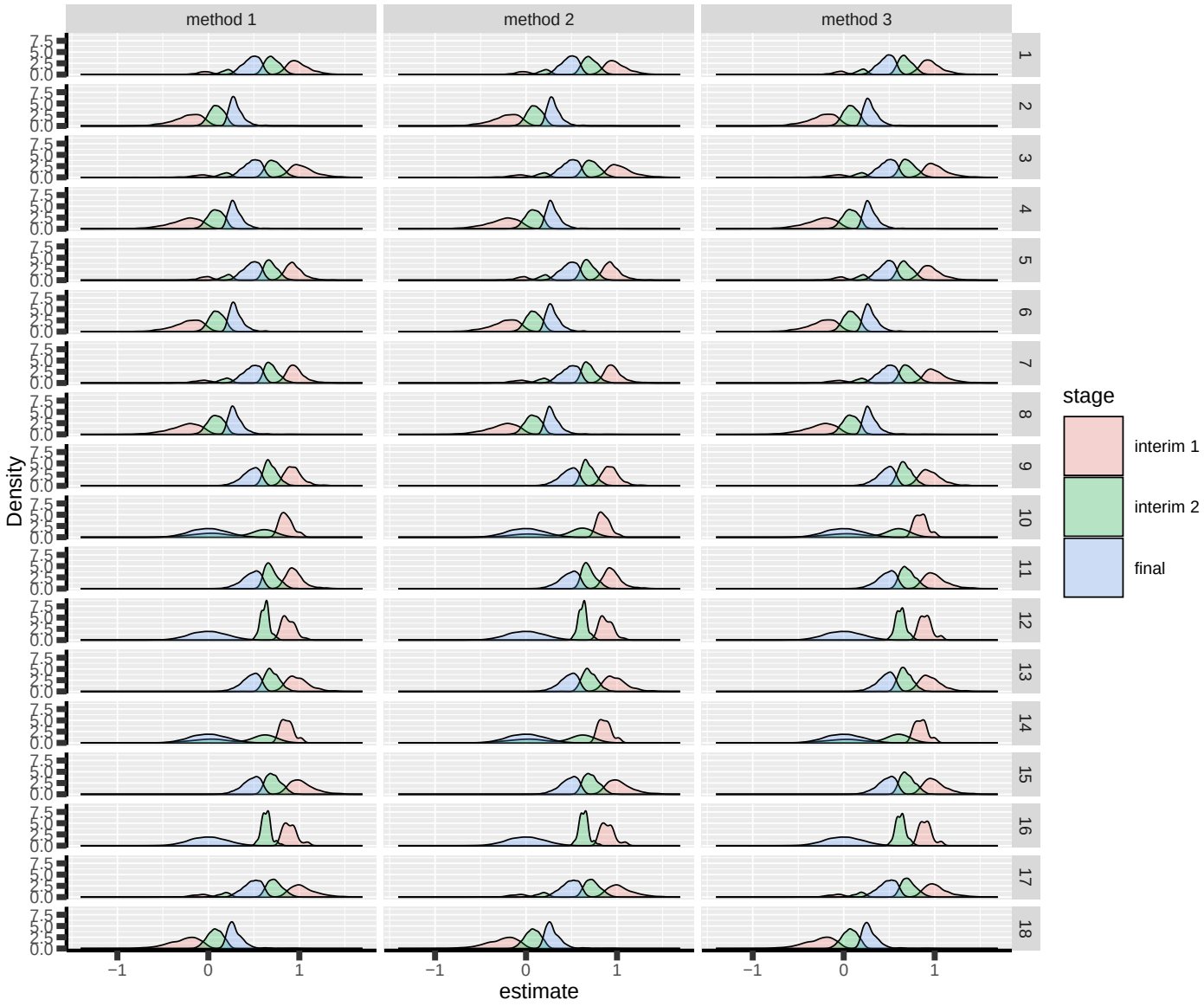

Figure 10: Median unbiased estimate distribution conditional to the stage. Each row correspond to a different scenario.

5 Special cases

5.1 2 stages

Reason for stopping (efficacy, futility, Imax reached), continuing the trial (decreasing information, no boundary crossed), or concluding (stop for futility at interim):

	scenario	1	2	3	4	5	6	7	8
reason	method								
decreasing information	1	0	0	1	1	0	0	1	1
	2	0	0	1	1	0	0	1	1
	3	0	0	1	1	0	0	1	1
efficacy	1	3739	81	3573	74	3739	81	3573	74
	2	3744	81	3576	74	3718	79	3545	71
	3	4165	108	3721	82	4165	108	3721	82
futility	1	632	7111	599	6932	632	7111	599	6932
	2	659	7161	600	6938	574	6940	562	6828
	3	545	6844	563	6828	545	6844	563	6828
Imax reached	1	1	1	0	0	1	1	0	0
	2	1	1	0	0	1	1	0	0
	3	1	1	0	0	1	1	0	0
no boundary crossed	1	5628	2807	5828	2994	5628	2807	5828	2994
	2	5596	2757	5824	2988	5707	2980	5893	3101
	3	5289	3047	5716	3090	5289	3047	5716	3090
stop for futility at interim	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	11	1	2	0	11	1	2	0

	scenario	9	10	11	12	13	14	15	16	17	18
reason	method										
efficacy	1	3849	81	3680	76	3849	81	3680	76	3396	74
	2	3829	80	3661	75	3850	81	3683	76	3400	74
	3	4238	110	3831	82	4238	110	3831	82	3528	80
futility	1	613	7122	570	6945	613	7122	570	6945	535	6748
	2	560	6975	541	6838	629	7164	574	6950	539	6755
	3	516	6890	543	6842	516	6890	543	6842	496	6642
no boundary crossed	1	5538	2797	5750	2979	5538	2797	5750	2979	6069	3178
	2	5611	2945	5798	3087	5521	2755	5743	2974	6061	3171
	3	5246	3000	5626	3076	5246	3000	5626	3076	5976	3278
stop for futility at interim	1	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0
	3	8	0	0	0	8	0	0	0	1	0

5.2 3 stages

Reason for stopping (efficacy, futility, Imax reached), continuing the trial (decreasing information, no boundary crossed), or concluding (stop for futility at interim):

	scenario	1	2	3	4	5	6	7	8
reason	method								
decreasing information	1	0	0	0	1	0	0	0	1
	2	0	0	0	1	0	0	0	1
	3	0	0	0	1	0	0	0	1
efficacy	1	4871	107	4668	100	4871	107	4668	100
	2	4873	107	4674	100	4846	105	4636	98
	3	5264	136	4787	105	5264	136	4787	105
futility	1	854	8147	818	8048	854	8147	818	8048
	2	890	8198	824	8050	805	8034	772	7967
	3	761	7951	774	7973	761	7951	774	7973
Imax reached	1	28	13	0	0	28	13	0	0
	2	31	13	0	0	23	10	0	0
	3	25	15	0	0	25	15	0	0
no boundary crossed	1	11961	7071	12260	7413	11961	7071	12260	7413
	2	11913	6996	12244	7406	12093	7359	12361	7592
	3	11475	7452	12133	7560	11475	7452	12133	7560
stop for futility at interim	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	28	2	1	0	28	2	1	0

	scenario	9	10	11	12	13	14	15	16	17
reason	method									
decreasing information	1	0	0	1	0	0	0	1	0	0
	2	0	0	1	0	0	0	1	0	0
	3	0	0	1	0	0	0	1	0	0
efficacy	1	4912	112	4794	97	4912	112	4794	97	4643
	2	4890	109	4771	94	4914	112	4797	97	4648
	3	5311	149	4921	110	5311	149	4921	110	4780
futility	1	841	12703	819	12404	841	12703	819	12404	814
	2	785	12441	766	12253	860	12774	821	12416	820
	3	741	12311	772	12273	741	12311	772	12273	768
Imax reached	1	24	43	0	0	24	43	0	0	0
	2	18	29	0	0	25	44	0	0	0
	3	24	44	0	0	24	44	0	0	0
no boundary crossed	1	11791	7101	12153	7464	11791	7101	12153	7464	12487
	2	11914	7382	12250	7618	11762	7029	12147	7452	12470
	3	11314	7449	12025	7579	11314	7449	12025	7579	12332
stop for futility at interim	1	0	0	0	0	0	0	0	0	0

2	0	0	0	0	0	0	0	0	0
3	26	0	1	0	26	0	1	0	3

6 Reversal probability

6.1 2 stages

Percentage of time we observe a reversal:

	N	hypo	missing	ar	binding	fixC	fu2eff_1	fu2eff_2	fu2eff_3	eff2fu_1	eff2fu_2	eff2fu_3
1:	10000	power	TRUE	10	TRUE	FALSE	0.57%	0.61%	0	0.17%	0.20%	1.07%
2:	10000	typeI	TRUE	10	TRUE	FALSE	0.10%	0.09%	0	0.11%	0.11%	0.34%
3:	10000	power	TRUE	5	TRUE	FALSE	0.08%	0.08%	0	0.07%	0.07%	0.67%
4:	10000	typeI	TRUE	5	TRUE	FALSE	0.02%	0.02%	0	0.02%	0.02%	0.13%
5:	10000	power	TRUE	10	TRUE	TRUE	0.22%	0.16%	0	0.67%	0.65%	1.07%
6:	10000	typeI	TRUE	10	TRUE	TRUE	0.02%	0.01%	0	0.21%	0.21%	0.34%
7:	10000	power	TRUE	5	TRUE	TRUE	0.02%	0.02%	0	0.46%	0.45%	0.67%
8:	10000	typeI	TRUE	5	TRUE	TRUE	0	0	0	0.08%	0.08%	0.13%
9:	10000	power	TRUE	10	FALSE	TRUE	0.14%	0.11%	0	0.58%	0.55%	1.04%
10:	10000	typeI	TRUE	10	FALSE	TRUE	0	0	0	0.20%	0.19%	0.33%
11:	10000	power	TRUE	5	FALSE	TRUE	0.01%	0.01%	0	0.46%	0.44%	0.60%
12:	10000	typeI	TRUE	5	FALSE	TRUE	0	0	0	0.06%	0.06%	0.09%
13:	10000	power	TRUE	10	FALSE	FALSE	0.41%	0.42%	0	0.21%	0.22%	1.04%
14:	10000	typeI	TRUE	10	FALSE	FALSE	0	0	0	0.12%	0.12%	0.33%
15:	10000	power	TRUE	5	FALSE	FALSE	0.03%	0.03%	0	0.04%	0.04%	0.60%
16:	10000	typeI	TRUE	5	FALSE	FALSE	0	0	0	0.01%	0.01%	0.09%
17:	10000	power	FALSE	5	TRUE	FALSE	0.06%	0.07%	0	0.04%	0.04%	0.63%
18:	10000	typeI	FALSE	5	TRUE	FALSE	0.01%	0.01%	0	0.01%	0.01%	0.12%

6.2 3 stages

Percentage of time we observe a reversal:

	N	hypo	missing	ar	binding	fixC	fu2eff_1	fu2eff_2	fu2eff_3	eff2fu_1	eff2fu_2	eff2fu_3
1:	10000	power	TRUE	10	TRUE	FALSE	0.68%	0.69%	0	0.39%	0.41%	1.55%
2:	10000	typeI	TRUE	10	TRUE	FALSE	0.12%	0.11%	0	0.14%	0.14%	0.44%
3:	9921	power	TRUE	5	TRUE	FALSE	0.13%	0.14%	0	0.10%	0.10%	0.78%
4:	10000	typeI	TRUE	5	TRUE	FALSE	0	0	0	0.05%	0.05%	0.12%
5:	10000	power	TRUE	10	TRUE	TRUE	0.36%	0.32%	0	1.10%	1.06%	1.55%
6:	10000	typeI	TRUE	10	TRUE	TRUE	0.04%	0.03%	0	0.25%	0.23%	0.44%
7:	9921	power	TRUE	5	TRUE	TRUE	0.01%	0.01%	0	0.56%	0.56%	0.78%
8:	10000	typeI	TRUE	5	TRUE	TRUE	0	0	0	0.10%	0.10%	0.12%
9:	10000	power	TRUE	10	FALSE	TRUE	0.36%	0.32%	0	1.00%	0.94%	1.60%
10:	10000	typeI	TRUE	10	FALSE	TRUE	0	0	0	0.30%	0.30%	0.51%
11:	10000	power	TRUE	5	FALSE	TRUE	0.02%	0.02%	0	0.54%	0.53%	0.89%
12:	10000	typeI	TRUE	5	FALSE	TRUE	0	0	0	0.14%	0.13%	0.19%
13:	10000	power	TRUE	10	FALSE	FALSE	0.68%	0.69%	0	0.38%	0.39%	1.60%
14:	10000	typeI	TRUE	10	FALSE	FALSE	0	0	0	0.20%	0.20%	0.51%
15:	10000	power	TRUE	5	FALSE	FALSE	0.11%	0.10%	0	0.11%	0.12%	0.89%
16:	10000	typeI	TRUE	5	FALSE	FALSE	0	0	0	0.01%	0.01%	0.19%
17:	10000	power	FALSE	5	TRUE	FALSE	0.15%	0.14%	0	0.05%	0.05%	0.70%
18:	10000	typeI	FALSE	5	TRUE	FALSE	0.06%	0.06%	0	0.03%	0.03%	0.17%

7 Logical consistency of p-values/CIs

7.1 Mismatch p-value / boundaries

7.1.1 2 stages

When concluding for futility:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0	0	0
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0	0	0
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0	0	0
10:	typeI	TRUE	10	FALSE	TRUE	0	0	0
11:	power	TRUE	5	FALSE	TRUE	0	0	0
12:	typeI	TRUE	5	FALSE	TRUE	0	0	0
13:	power	TRUE	10	FALSE	FALSE	0	0	0
14:	typeI	TRUE	10	FALSE	FALSE	0	0	0
15:	power	TRUE	5	FALSE	FALSE	0	0	0
16:	typeI	TRUE	5	FALSE	FALSE	0	0	0
17:	power	FALSE	5	TRUE	FALSE	0	0	0
18:	typeI	FALSE	5	TRUE	FALSE	0	0	0

When concluding for efficacy:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0	0	0
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0	0	0
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0	0	0
10:	typeI	TRUE	10	FALSE	TRUE	0	0	0
11:	power	TRUE	5	FALSE	TRUE	0	0	0
12:	typeI	TRUE	5	FALSE	TRUE	0	0	0
13:	power	TRUE	10	FALSE	FALSE	0	0	0
14:	typeI	TRUE	10	FALSE	FALSE	0	0	0

```
15: power    TRUE  5   FALSE FALSE        0        0        0
16: typeI    TRUE  5   FALSE FALSE        0        0        0
17: power   FALSE  5    TRUE FALSE        0        0        0
18: typeI   FALSE  5    TRUE FALSE        0        0        0
```

7.1.2 3 stages

When concluding for futility:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0	0.05%	0
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0	0	0
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0	0.05%	0
10:	typeI	TRUE	10	FALSE	TRUE	0	0	0
11:	power	TRUE	5	FALSE	TRUE	0	0	0
12:	typeI	TRUE	5	FALSE	TRUE	0	0	0.01%
13:	power	TRUE	10	FALSE	FALSE	0	0	0
14:	typeI	TRUE	10	FALSE	FALSE	0	0	0
15:	power	TRUE	5	FALSE	FALSE	0	0	0.05%
16:	typeI	TRUE	5	FALSE	FALSE	0	0	0.01%
17:	power	FALSE	5	TRUE	FALSE	0	0	0
18:	typeI	FALSE	5	TRUE	FALSE	0	0	0

Largest mismatch:

```
[1] 0.02499569043
```

When concluding for efficacy:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0	0	0
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0	0	0
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0.01%
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0	0	0
10:	typeI	TRUE	10	FALSE	TRUE	0	0	0
11:	power	TRUE	5	FALSE	TRUE	0	0	0
12:	typeI	TRUE	5	FALSE	TRUE	0	0	0
13:	power	TRUE	10	FALSE	FALSE	0	0.01%	0.01%
14:	typeI	TRUE	10	FALSE	FALSE	0	0	0
15:	power	TRUE	5	FALSE	FALSE	0	0	0

```
16: typeI    TRUE  5   FALSE FALSE        0        0        0
17: power   FALSE  5    TRUE FALSE        0        0        0
18: typeI   FALSE  5    TRUE FALSE        0        0    0.40%
```

Largest mismatch:

```
[1] 0.02500297183
```

7.2 Mismatch confidence intervals / boundaries

7.2.1 2 stages

When concluding for futility:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0	0	0 (NA: 0.05%)
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0	0	0 (NA: 0.05%)
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0 (NA: 32.62%)	0 (NA: 30.38%)	0 (NA: 31.41%)
10:	typeI	TRUE	10	FALSE	TRUE	0 (NA: 0.21%)	0 (NA: 0.19%)	0 (NA: 0.34%)
11:	power	TRUE	5	FALSE	TRUE	0 (NA: 30.64%)	0 (NA: 29.26%)	0 (NA: 30.24%)
12:	typeI	TRUE	5	FALSE	TRUE	0 (NA: 0.06%)	0 (NA: 0.06%)	0 (NA: 0.09%)
13:	power	TRUE	10	FALSE	FALSE	0 (NA: 30.41%)	0 (NA: 31.13%)	0 (NA: 31.41%)
14:	typeI	TRUE	10	FALSE	FALSE	0 (NA: 0.12%)	0 (NA: 0.12%)	0 (NA: 0.34%)
15:	power	TRUE	5	FALSE	FALSE	0 (NA: 29.09%)	0 (NA: 29.28%)	0 (NA: 30.24%)
16:	typeI	TRUE	5	FALSE	FALSE	0 (NA: 0.01%)	0 (NA: 0.01%)	0 (NA: 0.09%)
17:	power	FALSE	5	TRUE	FALSE	0	0	0
18:	typeI	FALSE	5	TRUE	FALSE	0	0	0

When concluding for efficacy:

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	TRUE	10	TRUE	FALSE	0 (NA: 0.02%)	0 (NA: 0.02%)	0 (NA: 0.01%)
2:	typeI	TRUE	10	TRUE	FALSE	0	0	0
3:	power	TRUE	5	TRUE	FALSE	0	0	0
4:	typeI	TRUE	5	TRUE	FALSE	0	0	0
5:	power	TRUE	10	TRUE	TRUE	0 (NA: 0.02%)	0 (NA: 0.02%)	0 (NA: 0.01%)
6:	typeI	TRUE	10	TRUE	TRUE	0	0	0
7:	power	TRUE	5	TRUE	TRUE	0	0	0
8:	typeI	TRUE	5	TRUE	TRUE	0	0	0
9:	power	TRUE	10	FALSE	TRUE	0 (NA: 0.03%)	0 (NA: 0.02%)	0 (NA: 0.01%)
10:	typeI	TRUE	10	FALSE	TRUE	0	0	0
11:	power	TRUE	5	FALSE	TRUE	0 (NA: 0.01%)	0 (NA: 0.02%)	0 (NA: 0.02%)
12:	typeI	TRUE	5	FALSE	TRUE	0	0	0
13:	power	TRUE	10	FALSE	FALSE	0 (NA: 0.02%)	0 (NA: 0.02%)	0 (NA: 0.01%)
14:	typeI	TRUE	10	FALSE	FALSE	0	0	0
15:	power	TRUE	5	FALSE	FALSE	0 (NA: 0.01%)	0 (NA: 0.01%)	0 (NA: 0.02%)
16:	typeI	TRUE	5	FALSE	FALSE	0	0	0

```
17: power   FALSE  5    TRUE FALSE 0 (NA: 0.02%) 0 (NA: 0.02%) 0 (NA: 0.03%)
18: typeI   FALSE  5    TRUE FALSE             0             0             0
```

7.2.2 3 stages

When concluding for futility:

```
     hypo missing ar binding  fixC           method 1           method 2          method 3
 1: power    TRUE 10    TRUE FALSE                  0                  0     0 (NA: 0.60%)
 2: typeI    TRUE 10    TRUE FALSE                  0                  0     0 (NA: 0.02%)
 3: power    TRUE  5    TRUE FALSE                  0                  0 0.05% (NA: 0.10%)
 4: typeI    TRUE  5    TRUE FALSE                  0                  0                 0
 5: power    TRUE 10    TRUE  TRUE      0 (NA: 0.30%)      0 (NA: 0.45%)     0 (NA: 0.60%)
 6: typeI    TRUE 10    TRUE  TRUE      0 (NA: 0.02%)      0 (NA: 0.02%)     0 (NA: 0.02%)
 7: power    TRUE  5    TRUE  TRUE      0 (NA: 0.05%)  0.05% (NA: 0.05%)     0 (NA: 0.10%)
 8: typeI    TRUE  5    TRUE  TRUE                  0                  0                 0
 9: power    TRUE 10   FALSE  TRUE     0 (NA: 44.32%)     0 (NA: 42.22%)    0 (NA: 45.19%)
10: typeI    TRUE 10   FALSE  TRUE      0 (NA: 0.31%)      0 (NA: 0.33%)     0 (NA: 0.52%)
11: power    TRUE  5   FALSE  TRUE 0.09% (NA: 43.38%)     0 (NA: 41.16%)    0 (NA: 42.96%)
12: typeI    TRUE  5   FALSE  TRUE      0 (NA: 0.14%)      0 (NA: 0.13%) 0.01% (NA: 0.19%)
13: power    TRUE 10   FALSE FALSE     0 (NA: 41.63%)     0 (NA: 42.43%)    0 (NA: 45.19%)
14: typeI    TRUE 10   FALSE FALSE      0 (NA: 0.21%)      0 (NA: 0.23%)     0 (NA: 0.52%)
15: power    TRUE  5   FALSE FALSE 0.09% (NA: 41.87%) 0.09% (NA: 42.03%)    0 (NA: 42.96%)
16: typeI    TRUE  5   FALSE FALSE      0 (NA: 0.01%)      0 (NA: 0.01%)     0 (NA: 0.19%)
17: power   FALSE  5    TRUE FALSE                  0                  0     0 (NA: 0.20%)
18: typeI   FALSE  5    TRUE FALSE                  0                  0                 0
```

Largest mismatch:

```
[1] 0.002466353937
```

When concluding for efficacy:

```
     hypo missing ar binding  fixC          method 1          method 2          method 3
 1: power    TRUE 10    TRUE FALSE     0 (NA: 0.04%)     0 (NA: 0.04%)                 0
 2: typeI    TRUE 10    TRUE FALSE                 0                 0                 0
 3: power    TRUE  5    TRUE FALSE     0 (NA: 0.01%)     0 (NA: 0.03%)     0 (NA: 0.01%)
 4: typeI    TRUE  5    TRUE FALSE                 0             0.41%                 0
 5: power    TRUE 10    TRUE  TRUE     0 (NA: 0.04%)     0 (NA: 0.02%)                 0
 6: typeI    TRUE 10    TRUE  TRUE                 0                 0                 0
 7: power    TRUE  5    TRUE  TRUE     0 (NA: 0.01%)     0 (NA: 0.03%)     0 (NA: 0.01%)
 8: typeI    TRUE  5    TRUE  TRUE                 0                 0                 0
 9: power    TRUE 10   FALSE  TRUE 0.01% (NA: 0.01%)     0 (NA: 0.01%) 0.01% (NA: 0.01%)
10: typeI    TRUE 10   FALSE  TRUE                 0                 0                 0
11: power    TRUE  5   FALSE  TRUE     0 (NA: 0.01%)     0 (NA: 0.01%)     0 (NA: 0.01%)
```

```
12: typeI    TRUE  5   FALSE  TRUE                0                 0                 0
13: power    TRUE 10   FALSE FALSE 0.01% (NA: 0.01%) 0.01% (NA: 0.01%) 0.01% (NA: 0.01%)
14: typeI    TRUE 10   FALSE FALSE                0                 0                 0
15: power    TRUE  5   FALSE FALSE     0 (NA: 0.01%)     0 (NA: 0.01%) 0.01% (NA: 0.01%)
16: typeI    TRUE  5   FALSE FALSE                0                 0                 0
17: power   FALSE  5    TRUE FALSE     0 (NA: 0.01%)     0 (NA: 0.01%) 0.01% (NA: 0.01%)
18: typeI   FALSE  5    TRUE FALSE             0.39%                 0                 0
```

```
[1] -0.005759153782
```

7.3 Range of p-values

7.3.1 2 stages

```
   missing binding  fixC ar  hypo       method 1       method 2       method 3
 1:    TRUE    TRUE FALSE 10 power     [0;0.9147]     [0;0.9147]     [0;0.9147]
 2:    TRUE    TRUE FALSE 10 typeI [1e-04;0.9999] [1e-04;0.9999] [1e-04;0.9999]
 3:    TRUE    TRUE FALSE  5 power     [0;0.9015]     [0;0.9015]     [0;0.9015]
 4:    TRUE    TRUE FALSE  5 typeI [1e-04;0.9998] [1e-04;0.9998] [1e-04;0.9998]
 5:    TRUE    TRUE  TRUE 10 power     [0;0.9147]     [0;0.9147]     [0;0.9147]
 6:    TRUE    TRUE  TRUE 10 typeI [2e-04;0.9999] [2e-04;0.9999] [1e-04;0.9999]
 7:    TRUE    TRUE  TRUE  5 power     [0;0.9015]     [0;0.9015]     [0;0.9015]
 8:    TRUE    TRUE  TRUE  5 typeI [3e-04;0.9998] [3e-04;0.9998] [1e-04;0.9998]
 9:    TRUE   FALSE  TRUE 10 power          [0;1]          [0;1]          [0;1]
10:    TRUE   FALSE  TRUE 10 typeI      [1e-04;1]      [1e-04;1]      [1e-04;1]
11:    TRUE   FALSE  TRUE  5 power          [0;1]          [0;1]          [0;1]
12:    TRUE   FALSE  TRUE  5 typeI      [2e-04;1]      [2e-04;1]      [1e-04;1]
13:    TRUE   FALSE FALSE 10 power          [0;1]          [0;1]          [0;1]
14:    TRUE   FALSE FALSE 10 typeI      [1e-04;1]      [1e-04;1]      [1e-04;1]
15:    TRUE   FALSE FALSE  5 power          [0;1]          [0;1]          [0;1]
16:    TRUE   FALSE FALSE  5 typeI          [0;1]          [0;1]      [1e-04;1]
17:   FALSE    TRUE FALSE  5 power     [0;0.9642]     [0;0.9642]     [0;0.9642]
18:   FALSE    TRUE FALSE  5 typeI          [0;1]          [0;1]      [1e-04;1]
```

7.3.2 3 stages

	missing	binding	fixC	ar	hypo	method 1	method 2	method 3
1:	TRUE	TRUE	FALSE	10	power	[0;0.9547]	[0;0.9547]	[0;0.9547]
2:	TRUE	TRUE	FALSE	10	typeI	[2e-04;0.9999]	[2e-04;0.9999]	[4e-04;0.9999]
3:	TRUE	TRUE	FALSE	5	power	[0;0.9954]	[0;0.9954]	[0;0.9954]
4:	TRUE	TRUE	FALSE	5	typeI	[1e-04;1]	[1e-04;1]	[1e-04;1]
5:	TRUE	TRUE	TRUE	10	power	[0;0.9547]	[0;0.9547]	[0;0.9547]
6:	TRUE	TRUE	TRUE	10	typeI	[6e-04;0.9999]	[6e-04;0.9999]	[4e-04;0.9999]
7:	TRUE	TRUE	TRUE	5	power	[0;0.9954]	[0;0.9954]	[0;0.9954]
8:	TRUE	TRUE	TRUE	5	typeI	[5e-04;1]	[5e-04;1]	[1e-04;1]
9:	TRUE	FALSE	TRUE	10	power	[0;1]	[0;1]	[0;1]
10:	TRUE	FALSE	TRUE	10	typeI	[6e-04;1]	[6e-04;1]	[3e-04;1]
11:	TRUE	FALSE	TRUE	5	power	[0;1]	[0;1]	[0;1]
12:	TRUE	FALSE	TRUE	5	typeI	[6e-04;1]	[6e-04;1]	[1e-04;1]
13:	TRUE	FALSE	FALSE	10	power	[0;1]	[0;1]	[0;1]
14:	TRUE	FALSE	FALSE	10	typeI	[2e-04;1]	[2e-04;1]	[3e-04;1]
15:	TRUE	FALSE	FALSE	5	power	[0;1]	[0;1]	[0;1]
16:	TRUE	FALSE	FALSE	5	typeI	[1e-04;1]	[1e-04;1]	[1e-04;1]
17:	FALSE	TRUE	FALSE	5	power	[0;0.9812]	[0;0.9812]	[0;0.9812]
18:	FALSE	TRUE	FALSE	5	typeI	[4e-04;1]	[4e-04;1]	[4e-04;1]

8 Coverage

8.1 2 stages

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	94.79% (NA: 0.02%)	94.79% (NA: 0.02%)	95.31% (NA: 0.02%)
2:	power	TRUE	5	FALSE	FALSE	95.86% (NA: 5.72%)	95.86% (NA: 5.76%)	95.97% (NA: 5.48%)
3:	power	TRUE	5	FALSE	TRUE	97.77% (NA: 6.16%)	97.76% (NA: 5.86%)	95.97% (NA: 5.48%)
4:	power	TRUE	5	TRUE	FALSE	94.73%	94.73%	95.13%
5:	power	TRUE	5	TRUE	TRUE	96.28%	96.32%	95.13%
6:	power	TRUE	10	FALSE	FALSE	95.90% (NA: 5.95%)	95.89% (NA: 6.11%)	96.07% (NA: 5.30%)
7:	power	TRUE	10	FALSE	TRUE	97.38% (NA: 6.59%)	97.45% (NA: 6.06%)	96.07% (NA: 5.30%)
8:	power	TRUE	10	TRUE	FALSE	94.84% (NA: 0.02%)	94.82% (NA: 0.02%)	95.34% (NA: 0.02%)
9:	power	TRUE	10	TRUE	TRUE	96.26% (NA: 0.02%)	96.31% (NA: 0.02%)	95.34% (NA: 0.02%)
10:	typeI	FALSE	5	TRUE	FALSE	95.13% (NA: 0.15%)	95.13% (NA: 0.15%)	95.14% (NA: 0.17%)
11:	typeI	TRUE	5	FALSE	FALSE	94.87% (NA: 0.01%)	94.87% (NA: 0.01%)	94.96% (NA: 0.09%)
12:	typeI	TRUE	5	FALSE	TRUE	94.92% (NA: 0.06%)	94.91% (NA: 0.06%)	94.96% (NA: 0.09%)
13:	typeI	TRUE	5	TRUE	FALSE	94.81% (NA: 0.14%)	94.81% (NA: 0.14%)	94.86% (NA: 0.14%)
14:	typeI	TRUE	5	TRUE	TRUE	94.89% (NA: 0.14%)	94.90% (NA: 0.12%)	94.86% (NA: 0.14%)
15:	typeI	TRUE	10	FALSE	FALSE	95.01% (NA: 0.12%)	95.01% (NA: 0.12%)	95.29% (NA: 0.33%)
16:	typeI	TRUE	10	FALSE	TRUE	95.09% (NA: 0.20%)	95.07% (NA: 0.19%)	95.29% (NA: 0.33%)
17:	typeI	TRUE	10	TRUE	FALSE	95.16% (NA: 0.09%)	95.19% (NA: 0.10%)	95.20% (NA: 0.13%)
18:	typeI	TRUE	10	TRUE	TRUE	95.34% (NA: 0.09%)	95.36% (NA: 0.07%)	95.20% (NA: 0.13%)

Average width of the confidence intervals

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	1.0517	1.0517	1.053
2:	power	TRUE	5	FALSE	FALSE	1.0355	1.0355	1.036
3:	power	TRUE	5	FALSE	TRUE	1.0410	1.0414	1.036
4:	power	TRUE	5	TRUE	FALSE	1.0512	1.0512	1.052
5:	power	TRUE	5	TRUE	TRUE	1.0573	1.0571	1.052
6:	power	TRUE	10	FALSE	FALSE	1.0465	1.0463	1.046
7:	power	TRUE	10	FALSE	TRUE	1.0531	1.0541	1.046
8:	power	TRUE	10	TRUE	FALSE	1.0623	1.0625	1.061
9:	power	TRUE	10	TRUE	TRUE	1.0700	1.0697	1.061
10:	typeI	FALSE	5	TRUE	FALSE	1.0427	1.0427	1.046
11:	typeI	TRUE	5	FALSE	FALSE	0.9995	0.9994	1.012
12:	typeI	TRUE	5	FALSE	TRUE	0.9994	0.9995	1.012
13:	typeI	TRUE	5	TRUE	FALSE	1.0412	1.0411	1.045
14:	typeI	TRUE	5	TRUE	TRUE	1.0413	1.0420	1.045
15:	typeI	TRUE	10	FALSE	FALSE	0.9927	0.9926	1.040
16:	typeI	TRUE	10	FALSE	TRUE	0.9926	0.9935	1.040
17:	typeI	TRUE	10	TRUE	FALSE	1.0456	1.0450	1.056
18:	typeI	TRUE	10	TRUE	TRUE	1.0457	1.0475	1.056

Average ratio between the length of the MUE CIs vs. the ML CIs

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	1.0553	1.0553	1.056
2:	power	TRUE	5	FALSE	FALSE	1.0476	1.0476	1.049
3:	power	TRUE	5	FALSE	TRUE	1.0530	1.0529	1.049
4:	power	TRUE	5	TRUE	FALSE	1.0555	1.0556	1.056
5:	power	TRUE	5	TRUE	TRUE	1.0608	1.0605	1.056
6:	power	TRUE	10	FALSE	FALSE	1.0534	1.0533	1.053
7:	power	TRUE	10	FALSE	TRUE	1.0601	1.0605	1.053
8:	power	TRUE	10	TRUE	FALSE	1.0640	1.0643	1.062
9:	power	TRUE	10	TRUE	TRUE	1.0710	1.0706	1.062
10:	typeI	FALSE	5	TRUE	FALSE	1.0489	1.0488	1.053
11:	typeI	TRUE	5	FALSE	FALSE	0.9994	0.9994	1.013
12:	typeI	TRUE	5	FALSE	TRUE	0.9995	0.9996	1.013
13:	typeI	TRUE	5	TRUE	FALSE	1.0478	1.0478	1.052
14:	typeI	TRUE	5	TRUE	TRUE	1.0479	1.0487	1.052
15:	typeI	TRUE	10	FALSE	FALSE	0.9928	0.9926	1.041
16:	typeI	TRUE	10	FALSE	TRUE	0.9928	0.9937	1.041
17:	typeI	TRUE	10	TRUE	FALSE	1.0492	1.0486	1.060
18:	typeI	TRUE	10	TRUE	TRUE	1.0493	1.0511	1.060

8.2 3 stages

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	94.91% (NA: 0.01%)	94.91% (NA: 0.01%)	95.52% (NA: 0.01%)
2:	power	TRUE	5	FALSE	FALSE	96.43% (NA: 8.21%)	96.46% (NA: 8.25%)	96.25% (NA: 7.78%)
3:	power	TRUE	5	FALSE	TRUE	98.42% (NA: 8.73%)	98.43% (NA: 8.19%)	96.26% (NA: 7.78%)
4:	power	TRUE	5	TRUE	FALSE	95.36% (NA: 0.02%)	95.33% (NA: 0.03%)	95.90% (NA: 0.03%)
5:	power	TRUE	5	TRUE	TRUE	97.20% (NA: 0.02%)	97.21% (NA: 0.03%)	95.90% (NA: 0.03%)
6:	power	TRUE	10	FALSE	FALSE	96.08% (NA: 8.13%)	96.08% (NA: 8.32%)	95.68% (NA: 7.49%)
7:	power	TRUE	10	FALSE	TRUE	98.03% (NA: 9.06%)	98.06% (NA: 8.48%)	95.68% (NA: 7.49%)
8:	power	TRUE	10	TRUE	FALSE	95.30% (NA: 0.03%)	95.28% (NA: 0.03%)	95.67% (NA: 0.05%)
9:	power	TRUE	10	TRUE	TRUE	96.81% (NA: 0.04%)	96.75% (NA: 0.05%)	95.67% (NA: 0.05%)
10:	typeI	FALSE	5	TRUE	FALSE	95.14% (NA: 0.10%)	95.12% (NA: 0.11%)	95.21% (NA: 0.11%)
11:	typeI	TRUE	5	FALSE	FALSE	94.97% (NA: 0.03%)	95.00% (NA: 0.03%)	95.10% (NA: 0.21%)
12:	typeI	TRUE	5	FALSE	TRUE	95.09% (NA: 0.16%)	95.10% (NA: 0.15%)	95.11% (NA: 0.21%)
13:	typeI	TRUE	5	TRUE	FALSE	95.08% (NA: 0.08%)	95.08% (NA: 0.08%)	95.10% (NA: 0.08%)
14:	typeI	TRUE	5	TRUE	TRUE	95.13% (NA: 0.08%)	95.14% (NA: 0.07%)	95.10% (NA: 0.08%)
15:	typeI	TRUE	10	FALSE	FALSE	95.05% (NA: 0.20%)	95.11% (NA: 0.22%)	95.41% (NA: 0.51%)
16:	typeI	TRUE	10	FALSE	TRUE	95.15% (NA: 0.30%)	95.21% (NA: 0.32%)	95.43% (NA: 0.51%)
17:	typeI	TRUE	10	TRUE	FALSE	94.89% (NA: 0.16%)	94.91% (NA: 0.16%)	95.01% (NA: 0.22%)
18:	typeI	TRUE	10	TRUE	TRUE	95.08% (NA: 0.18%)	95.06% (NA: 0.16%)	95.01% (NA: 0.22%)

Average width of the confidence intervals

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	1.0729	1.0729	1.073
2:	power	TRUE	5	FALSE	FALSE	1.0547	1.0548	1.055
3:	power	TRUE	5	FALSE	TRUE	1.0588	1.0588	1.055
4:	power	TRUE	5	TRUE	FALSE	1.0723	1.0724	1.072
5:	power	TRUE	5	TRUE	TRUE	1.0765	1.0760	1.073
6:	power	TRUE	10	FALSE	FALSE	1.0794	1.0793	1.079
7:	power	TRUE	10	FALSE	TRUE	1.0860	1.0865	1.079
8:	power	TRUE	10	TRUE	FALSE	1.0984	1.0984	1.097
9:	power	TRUE	10	TRUE	TRUE	1.1052	1.1040	1.097
10:	typeI	FALSE	5	TRUE	FALSE	1.0752	1.0751	1.079
11:	typeI	TRUE	5	FALSE	FALSE	0.9957	0.9956	1.012
12:	typeI	TRUE	5	FALSE	TRUE	0.9954	0.9955	1.012
13:	typeI	TRUE	5	TRUE	FALSE	1.0718	1.0718	1.076
14:	typeI	TRUE	5	TRUE	TRUE	1.0719	1.0724	1.076
15:	typeI	TRUE	10	FALSE	FALSE	0.9873	0.9881	1.053
16:	typeI	TRUE	10	FALSE	TRUE	0.9870	0.9875	1.053
17:	typeI	TRUE	10	TRUE	FALSE	1.0976	1.0972	1.109
18:	typeI	TRUE	10	TRUE	TRUE	1.0977	1.0983	1.109

Average ratio between the length of the MUE CIs vs. the ML CIs

	hypo	missing	ar	binding	fixC	method 1	method 2	method 3
1:	power	FALSE	5	TRUE	FALSE	1.0752	1.0753	1.075
2:	power	TRUE	5	FALSE	FALSE	1.0654	1.0654	1.066
3:	power	TRUE	5	FALSE	TRUE	1.0685	1.0682	1.066
4:	power	TRUE	5	TRUE	FALSE	1.0755	1.0756	1.076
5:	power	TRUE	5	TRUE	TRUE	1.0782	1.0776	1.076
6:	power	TRUE	10	FALSE	FALSE	1.0846	1.0844	1.085
7:	power	TRUE	10	FALSE	TRUE	1.0907	1.0905	1.085
8:	power	TRUE	10	TRUE	FALSE	1.0985	1.0985	1.097
9:	power	TRUE	10	TRUE	TRUE	1.1039	1.1027	1.097
10:	typeI	FALSE	5	TRUE	FALSE	1.0820	1.0818	1.086
11:	typeI	TRUE	5	FALSE	FALSE	0.9955	0.9954	1.013
12:	typeI	TRUE	5	FALSE	TRUE	0.9955	0.9956	1.013
13:	typeI	TRUE	5	TRUE	FALSE	1.0792	1.0792	1.084
14:	typeI	TRUE	5	TRUE	TRUE	1.0793	1.0797	1.084
15:	typeI	TRUE	10	FALSE	FALSE	0.9873	0.9882	1.054
16:	typeI	TRUE	10	FALSE	TRUE	0.9873	0.9878	1.054
17:	typeI	TRUE	10	TRUE	FALSE	1.1025	1.1021	1.115
18:	typeI	TRUE	10	TRUE	TRUE	1.1026	1.1030	1.115

9 Percentage of missing values (2 stages)

At the first interim

- `pc.all` percentage of observations with full data (with respect to all observations, i.e. patients with baseline measurement)
- `pc.missing3` percentage of observations missing the final outcome but with intermediate outcome value and baseline.
- `pc.missing23` percentage of observations with only baseline value

Here only for method 1 - values are very similar between different methods:

	method	missing	ar	hypo	fixC	binding	N	pc.all	pc.missing3	pc.missing23
1:	1	TRUE	5	power	FALSE	TRUE	10000	79.52	9.591	10.888
2:	1	TRUE	5	typeI	FALSE	TRUE	10000	79.52	9.591	10.888
3:	1	TRUE	5	power	TRUE	TRUE	10000	79.52	9.591	10.888
4:	1	TRUE	5	typeI	TRUE	TRUE	10000	79.52	9.591	10.888
5:	1	TRUE	5	power	TRUE	FALSE	10000	79.64	9.442	10.914
6:	1	TRUE	5	typeI	TRUE	FALSE	10000	79.64	9.442	10.914
7:	1	TRUE	5	power	FALSE	FALSE	10000	79.64	9.442	10.914
8:	1	TRUE	5	typeI	FALSE	FALSE	10000	79.64	9.442	10.914
9:	1	FALSE	5	power	FALSE	TRUE	10000	87.79	6.090	6.121
10:	1	FALSE	5	typeI	FALSE	TRUE	10000	87.79	6.090	6.121
11:	1	TRUE	10	power	FALSE	TRUE	10000	71.60	13.354	15.049
12:	1	TRUE	10	typeI	FALSE	TRUE	10000	71.60	13.354	15.049
13:	1	TRUE	10	power	TRUE	TRUE	10000	71.60	13.354	15.049
14:	1	TRUE	10	typeI	TRUE	TRUE	10000	71.60	13.354	15.049
15:	1	TRUE	10	power	TRUE	FALSE	10000	71.80	13.162	15.042
16:	1	TRUE	10	typeI	TRUE	FALSE	10000	71.80	13.162	15.042
17:	1	TRUE	10	power	FALSE	FALSE	10000	71.80	13.162	15.042
18:	1	TRUE	10	typeI	FALSE	FALSE	10000	71.80	13.162	15.042

10 Information

10.1 2 stages

Percentage of information for method 1[5]:

scenario	missing	binding	fixC	ar	interim	decision	final
1	TRUE	TRUE	FALSE	10	54.64	75.34	102.70
2	TRUE	TRUE	FALSE	10	54.64	74.98	102.37
3	TRUE	TRUE	FALSE	5	53.27	64.04	102.74
4	TRUE	TRUE	FALSE	5	53.27	63.58	102.37
13	TRUE	FALSE	FALSE	10	54.50	74.96	102.54
14	TRUE	FALSE	FALSE	10	54.50	75.17	103.13
15	TRUE	FALSE	FALSE	5	53.16	63.72	102.63
16	TRUE	FALSE	FALSE	5	53.16	64.61	103.13
17	FALSE	TRUE	FALSE	5	52.07	63.77	99.97
18	FALSE	TRUE	FALSE	5	52.07	63.22	99.63

Similar results for other methods.

10.2 3 stages

Percentage of information for method 1[6]:

scenario	missing	binding	fixC	ar	interim1	decision1	interim2	decision2	final3
1	TRUE	TRUE	FALSE	10	38.86	59.57	64.51	85.16	102.36
2	TRUE	TRUE	FALSE	10	38.86	59.16	64.31	84.25	102.24
3	TRUE	TRUE	FALSE	5	37.56	48.40	63.18	73.86	102.46
4	TRUE	TRUE	FALSE	5	37.56	48.00	62.95	73.10	102.23
13	TRUE	FALSE	FALSE	10	38.82	59.12	64.30	84.50	102.19
14	TRUE	FALSE	FALSE	10	38.82	60.66	64.58	90.57	103.04
15	TRUE	FALSE	FALSE	5	37.54	48.15	62.99	73.43	102.29
16	TRUE	FALSE	FALSE	5	37.54	50.04	63.24	74.77	103.11
17	FALSE	TRUE	FALSE	5	36.91	48.66	61.76	73.28	99.66
18	FALSE	TRUE	FALSE	5	36.91	48.19	61.53	72.56	99.38

[5] average over the reached stages
[6] average over the reached stages