Validate Power: d3.3

December 27, 2021

Design: Cluster RCT, with 3 levels, and randomization done at level 3 (district level).

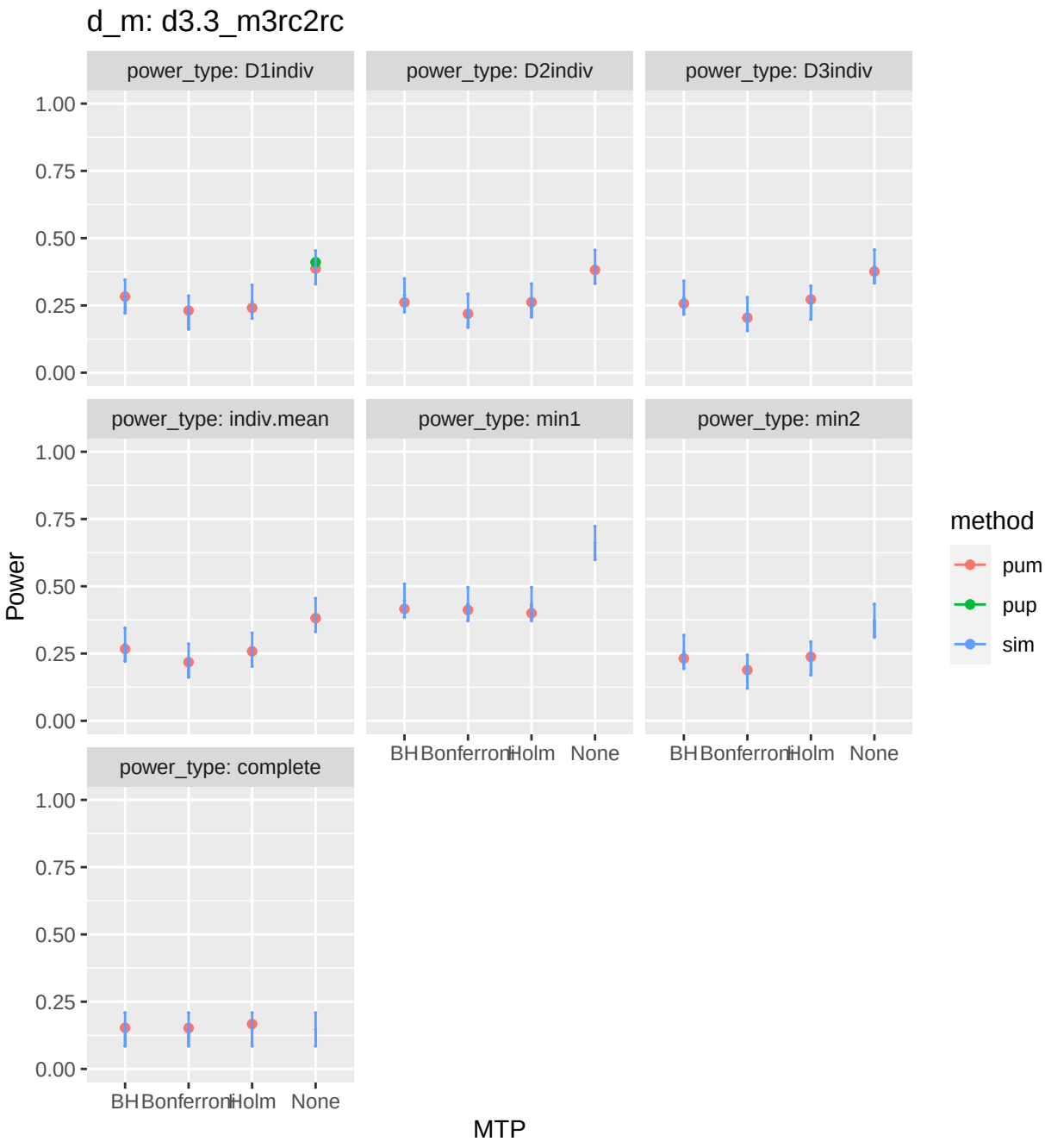
Models: random treatment effects.

Power Validation

Default parameters:

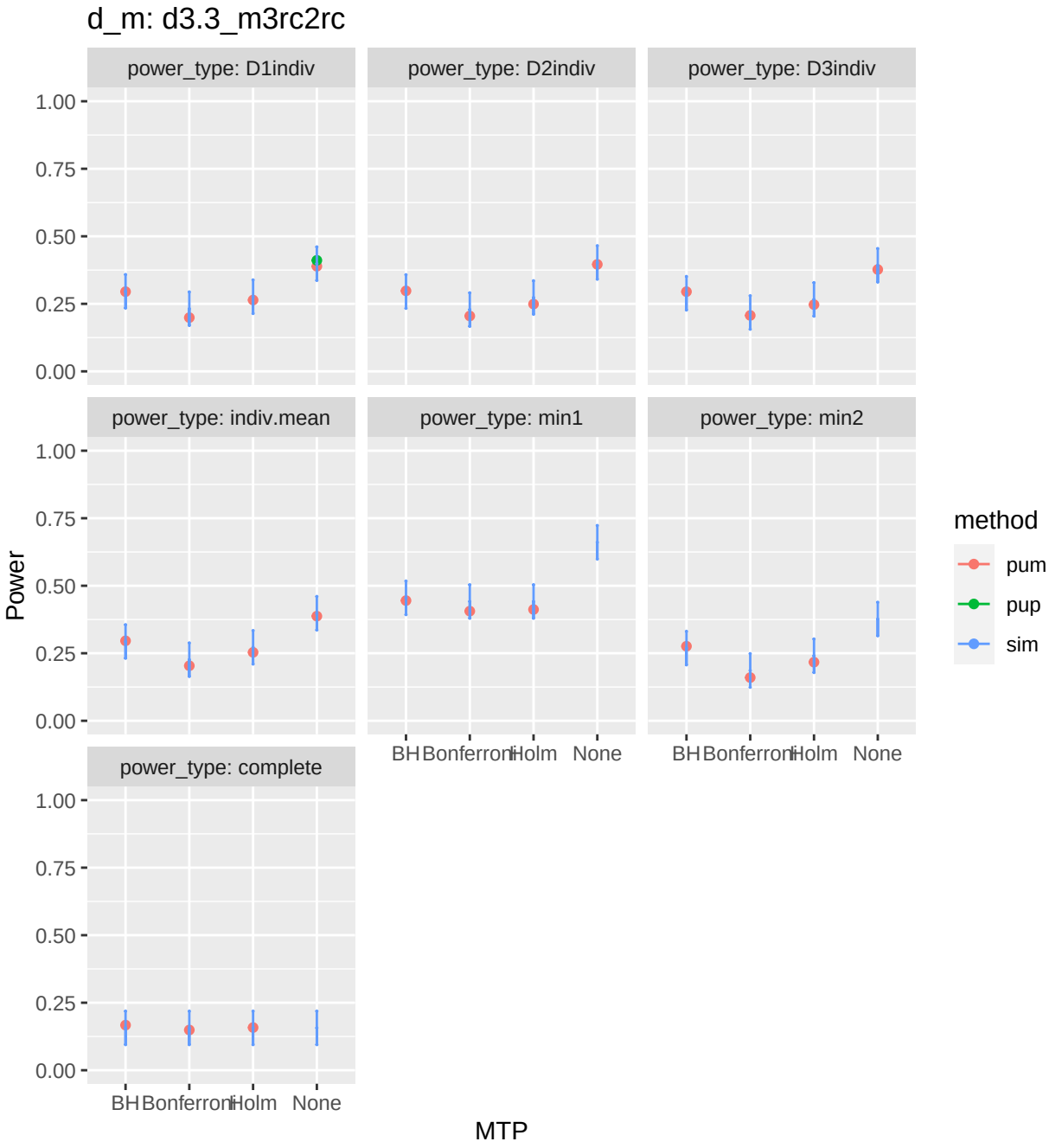
- M = 3
- J = 40
- K = 20
- rho: $\rho = 0.5$
- MDES = 0.25, 0.25, 0.25
- R2: $R_1^2 = 0.1, 0.1, 0.1$, $R_2^2 = 0.1, 0.1, 0.1$, $R_3^2 = 0.1, 0.1, 0.1$
- ICC: $\text{ICC}_2 = 0.1, 0.1, 0.1$, $\text{ICC}_3 = 0.1, 0.1, 0.1$
- Omega: $\omega_2 = 0$, $\omega_3 = 0$

Base case

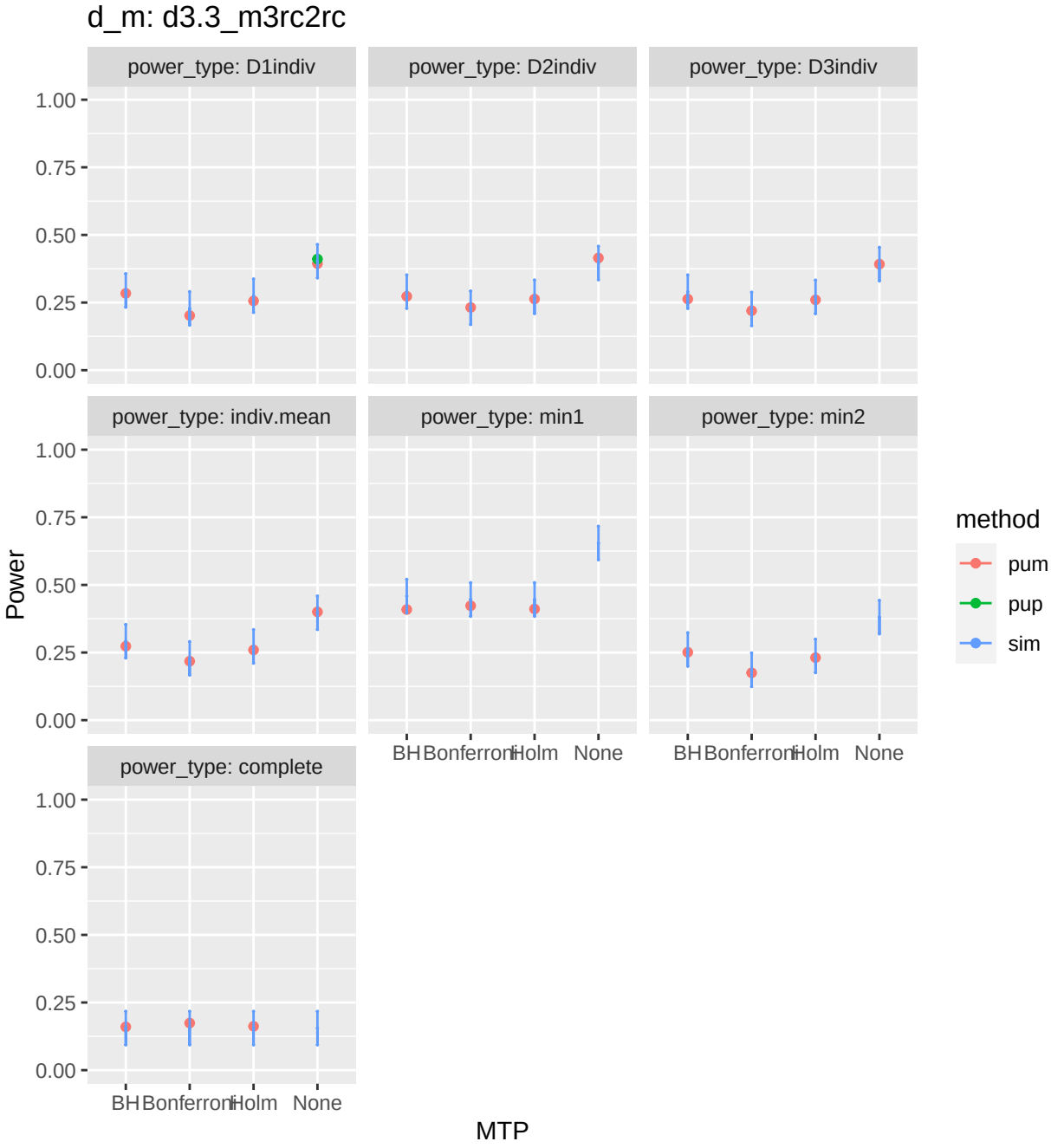

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BH
Bonferroni
Holm
None
MTP
method
pum
pup
sim

Varying school size

$\bar{n} = 100$

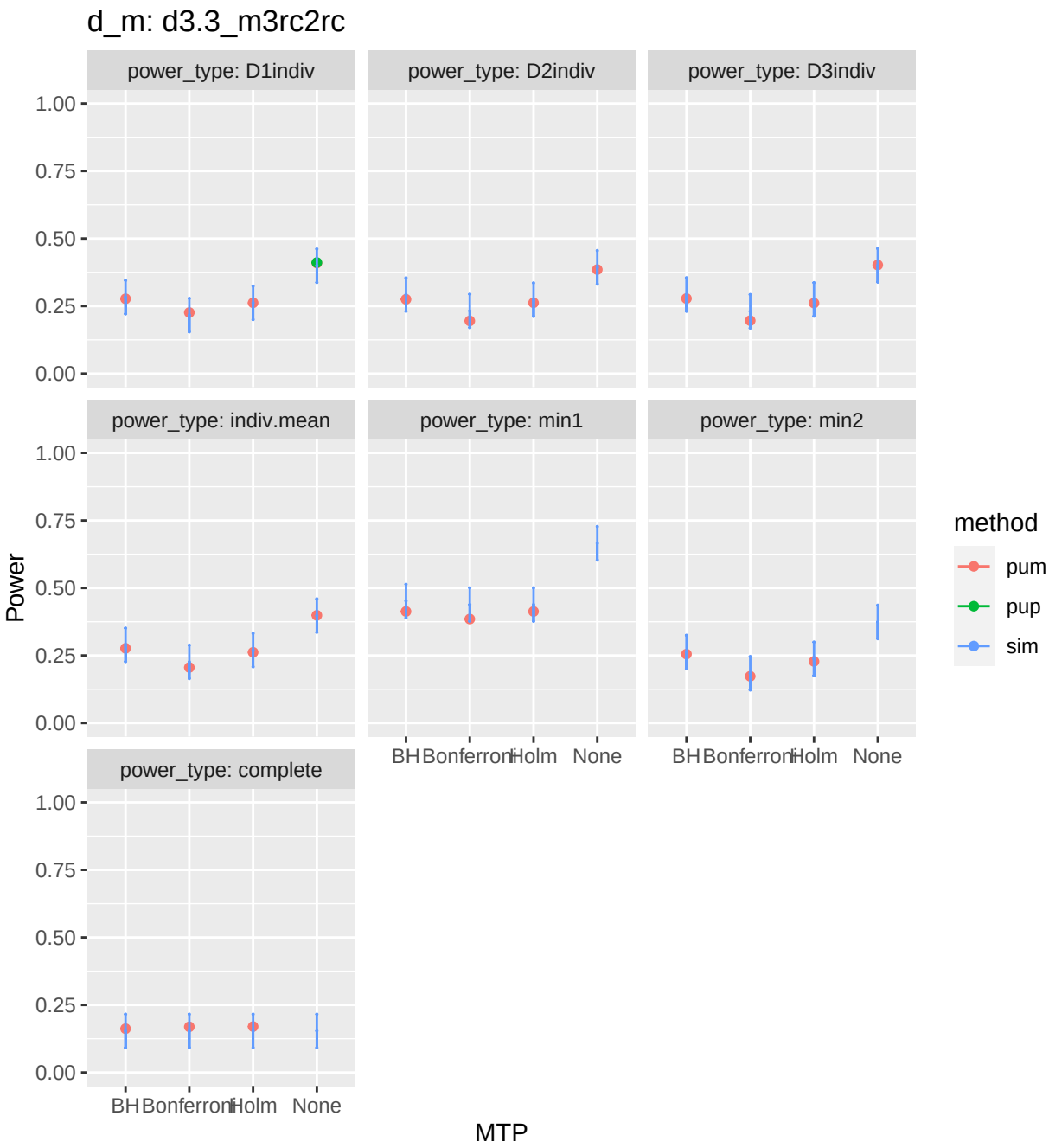


$\bar{n} = 75$

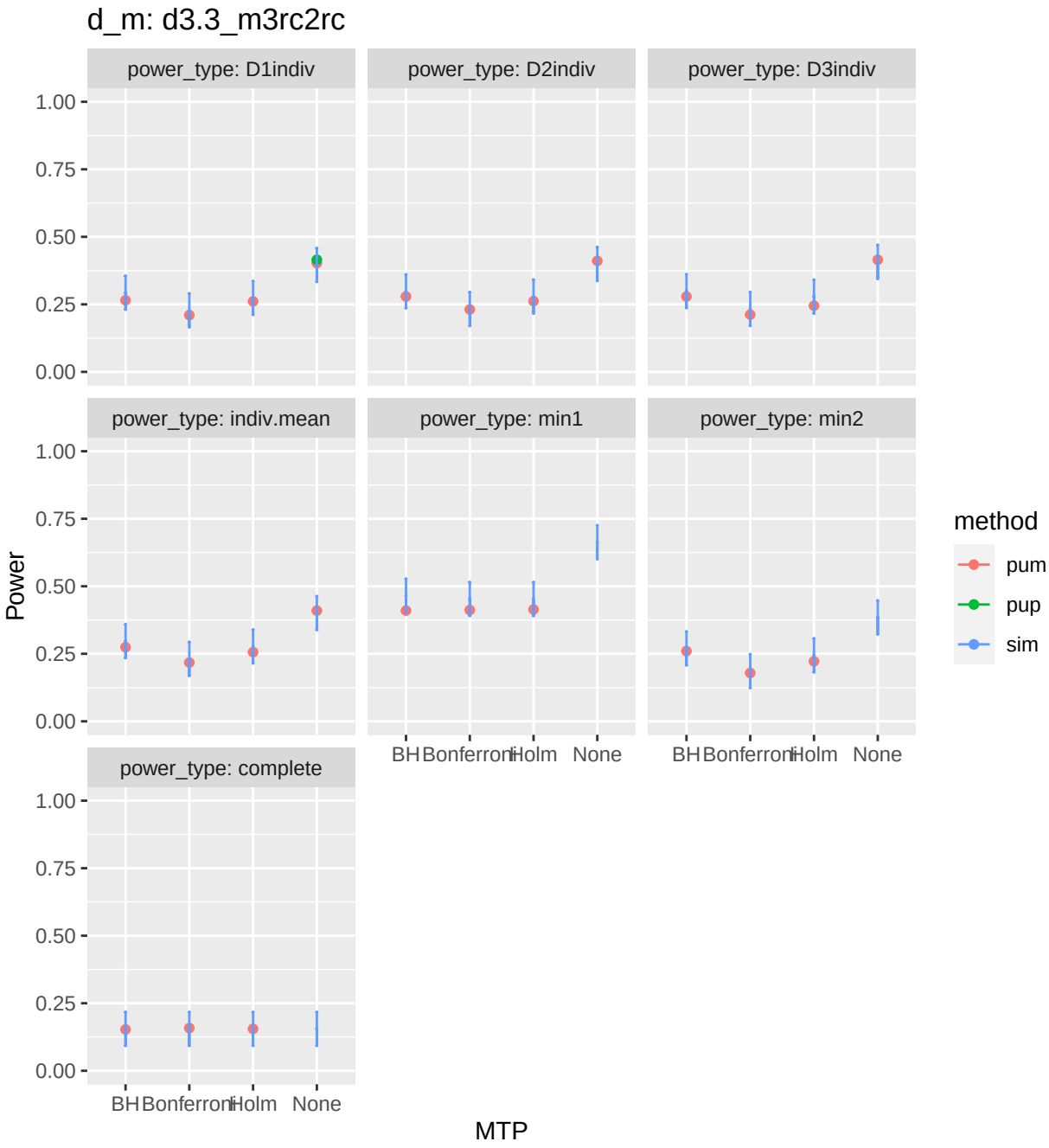

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BH
Bonferroni
Holm
None
MTP
method
pum
pup
sim

Varying R2

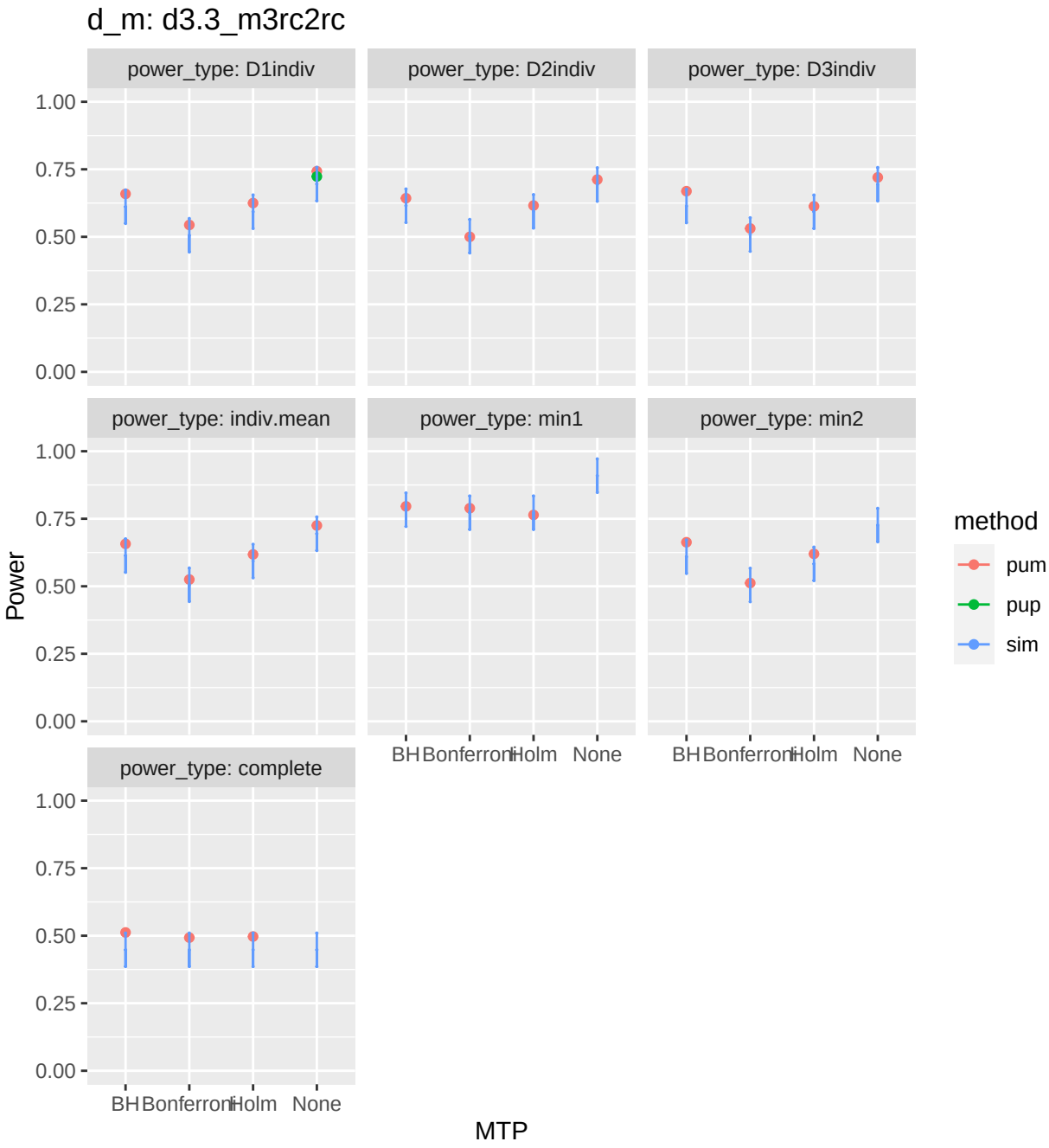
$R_1^2 = 0.6, 0.6, 0.6$



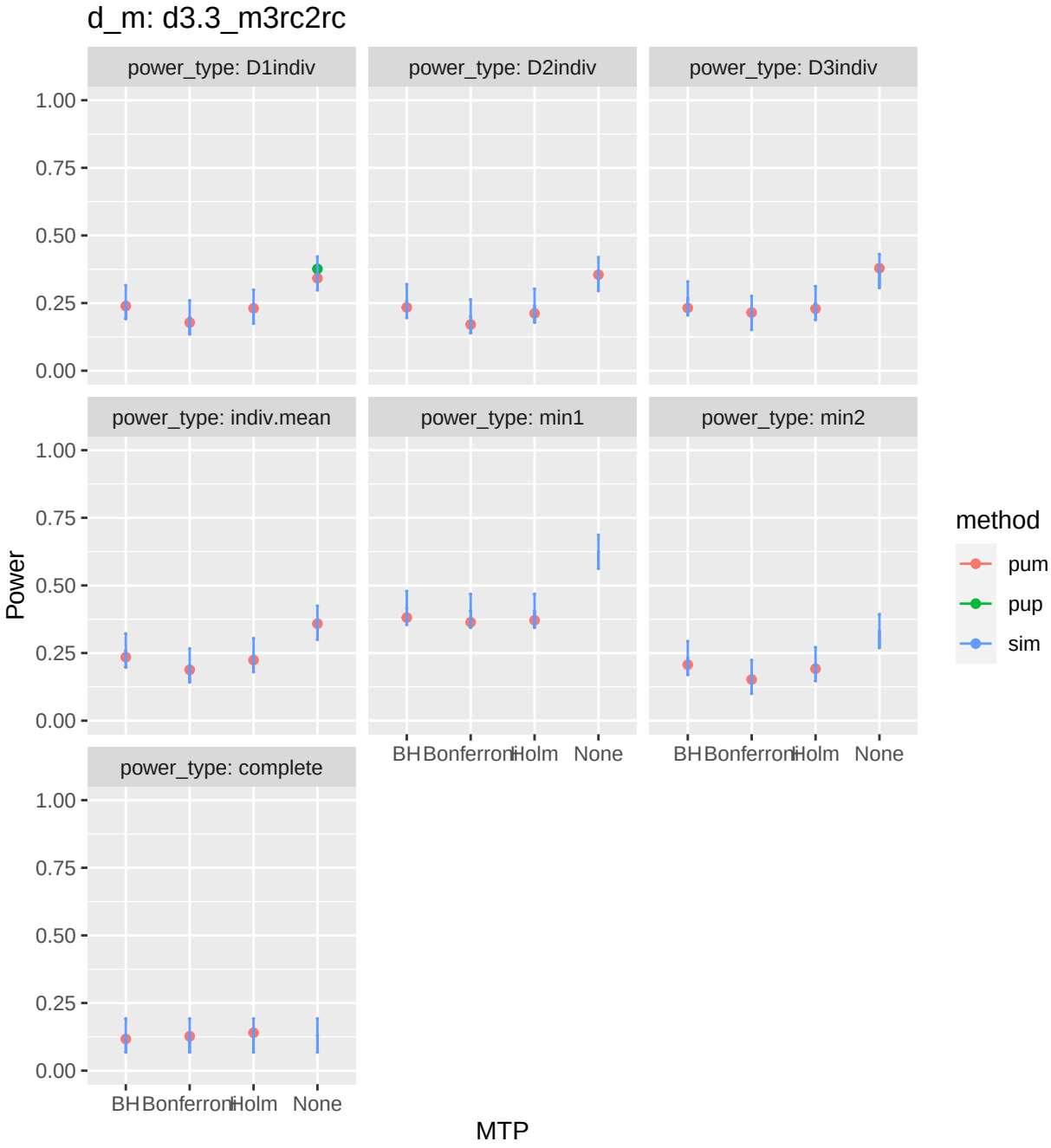
$R_2^2 = 0.6, 0.6, 0.6$


d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BH
Bonferroni
Holm
None
MTP
method
pum
pup
sim

$R_3^2 = 0.6, 0.6, 0.6$

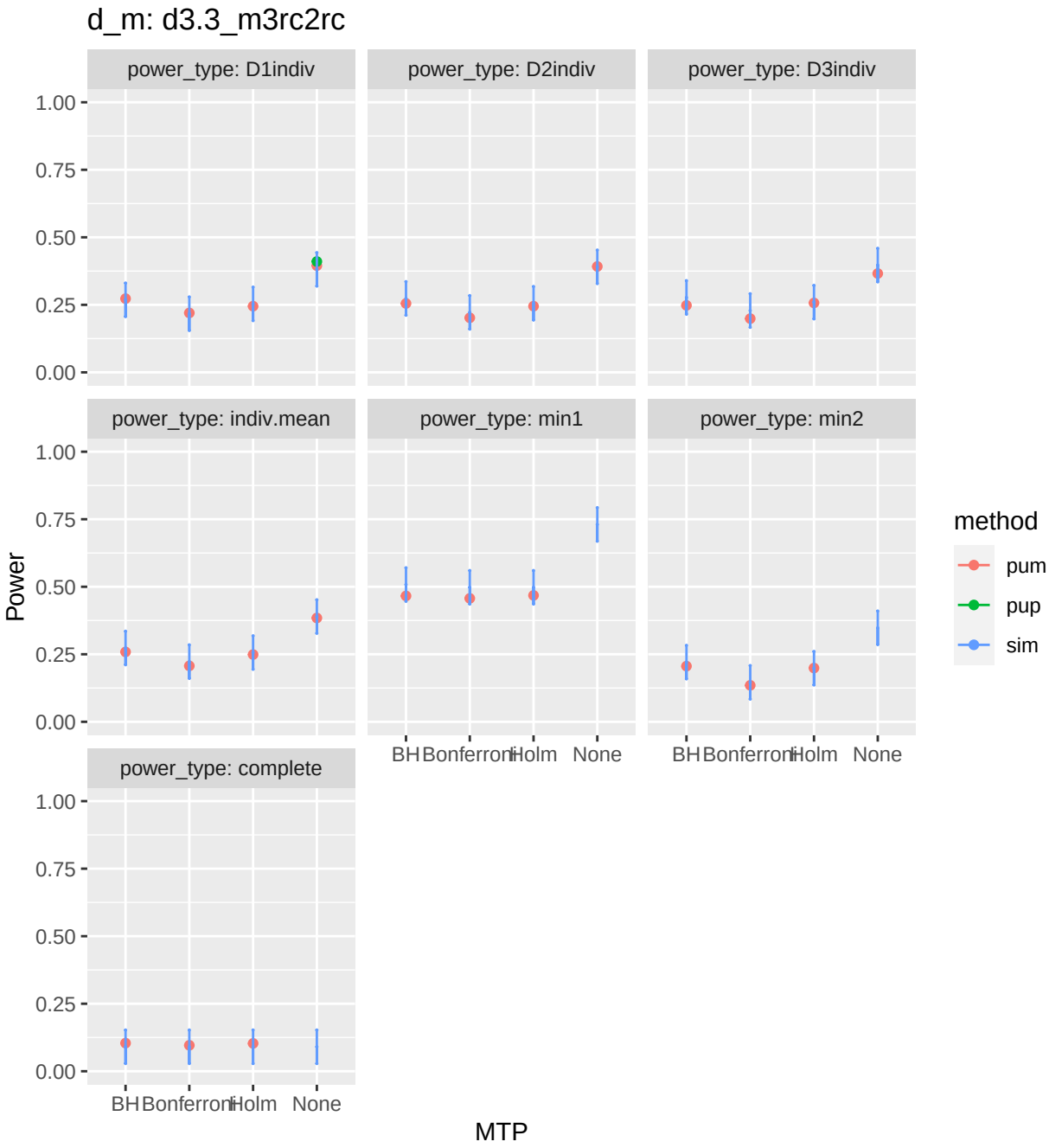

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
method
pum
pup
sim

$R_1^2 = 0, 0, 0$ $R_2^2 = 0, 0, 0$ $R_3^2 = 0, 0, 0$

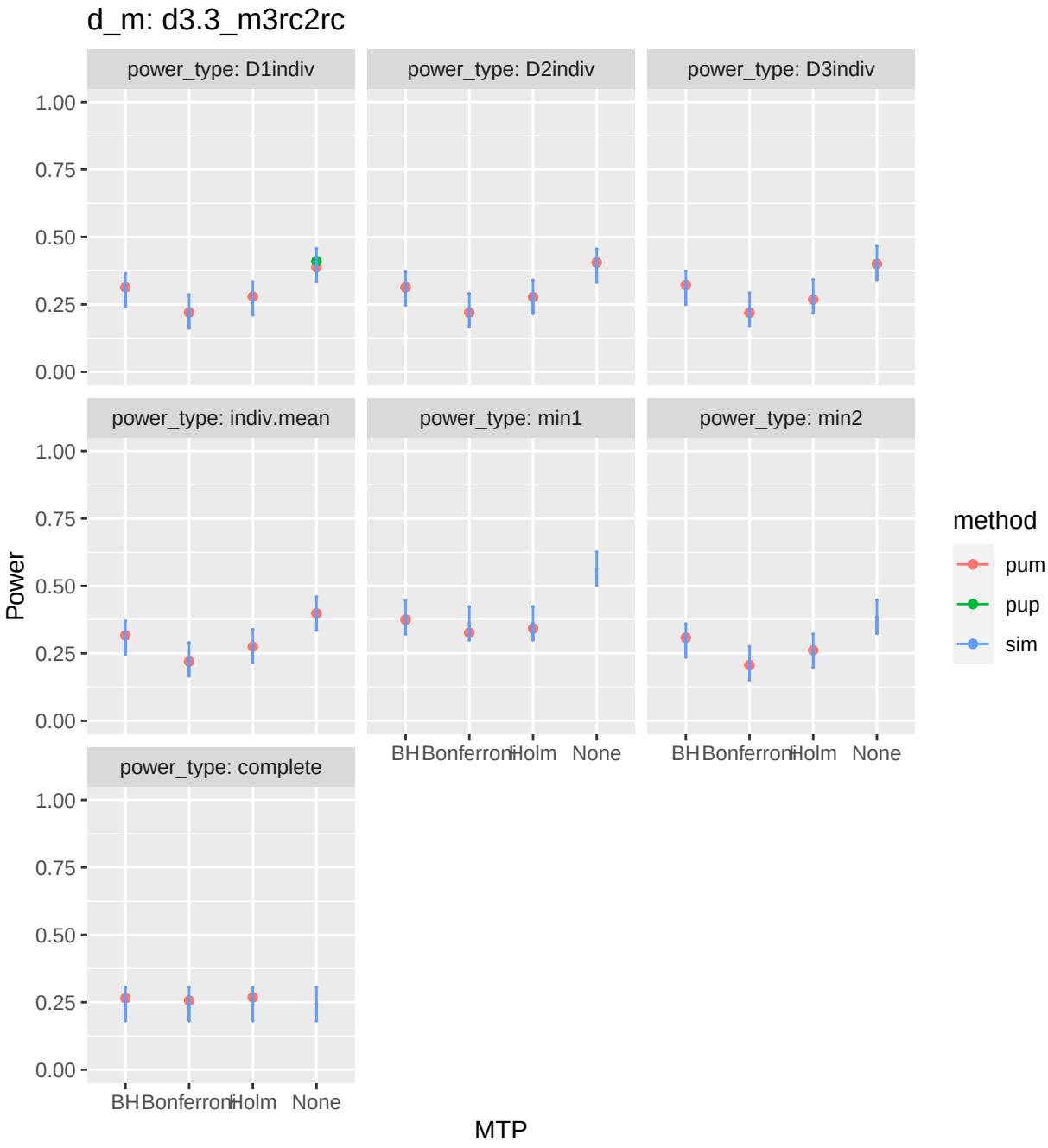


Varying rho

$\rho = 0.2$

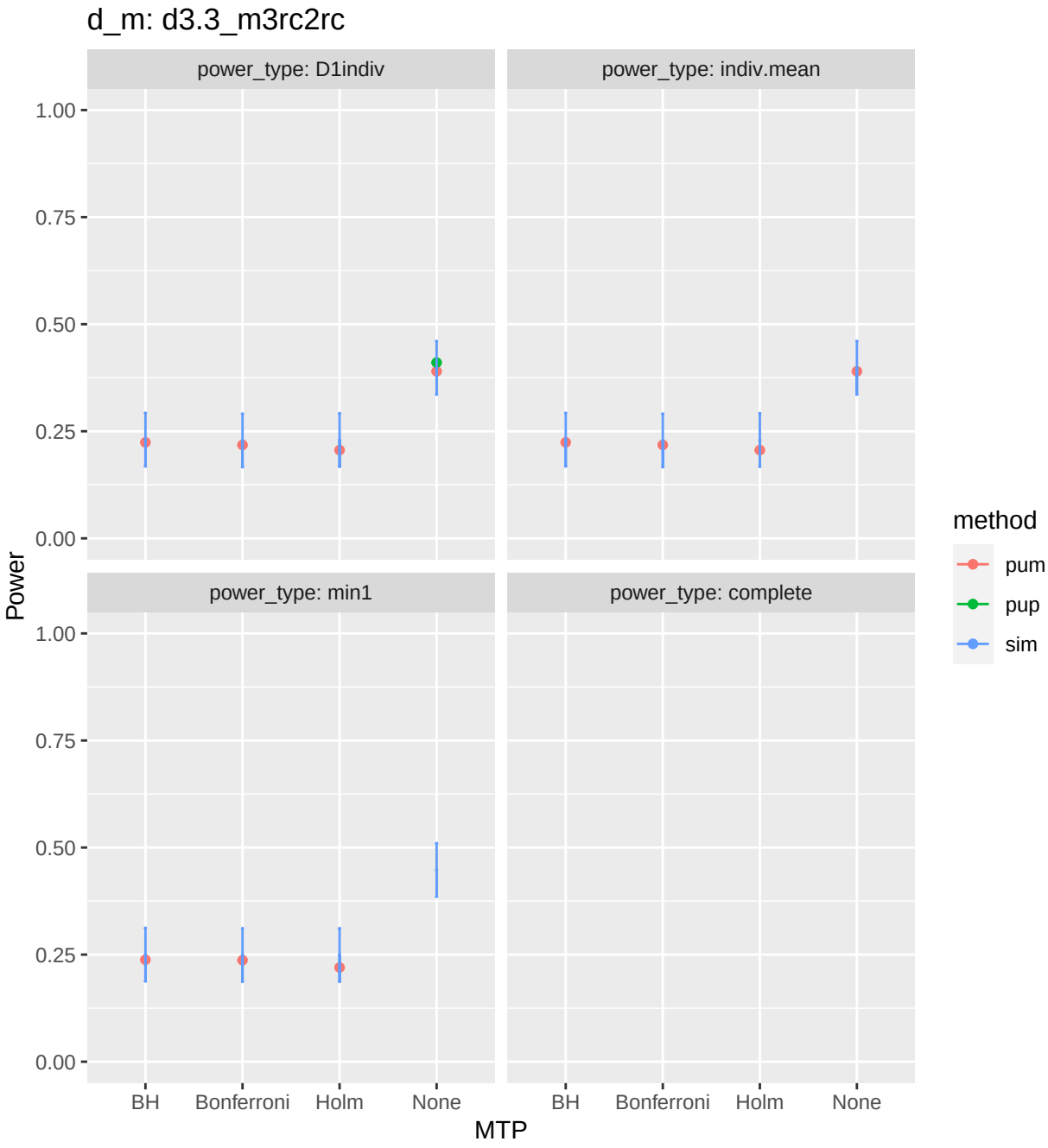


$\rho = 0.8$


d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
method
pum
pup
sim

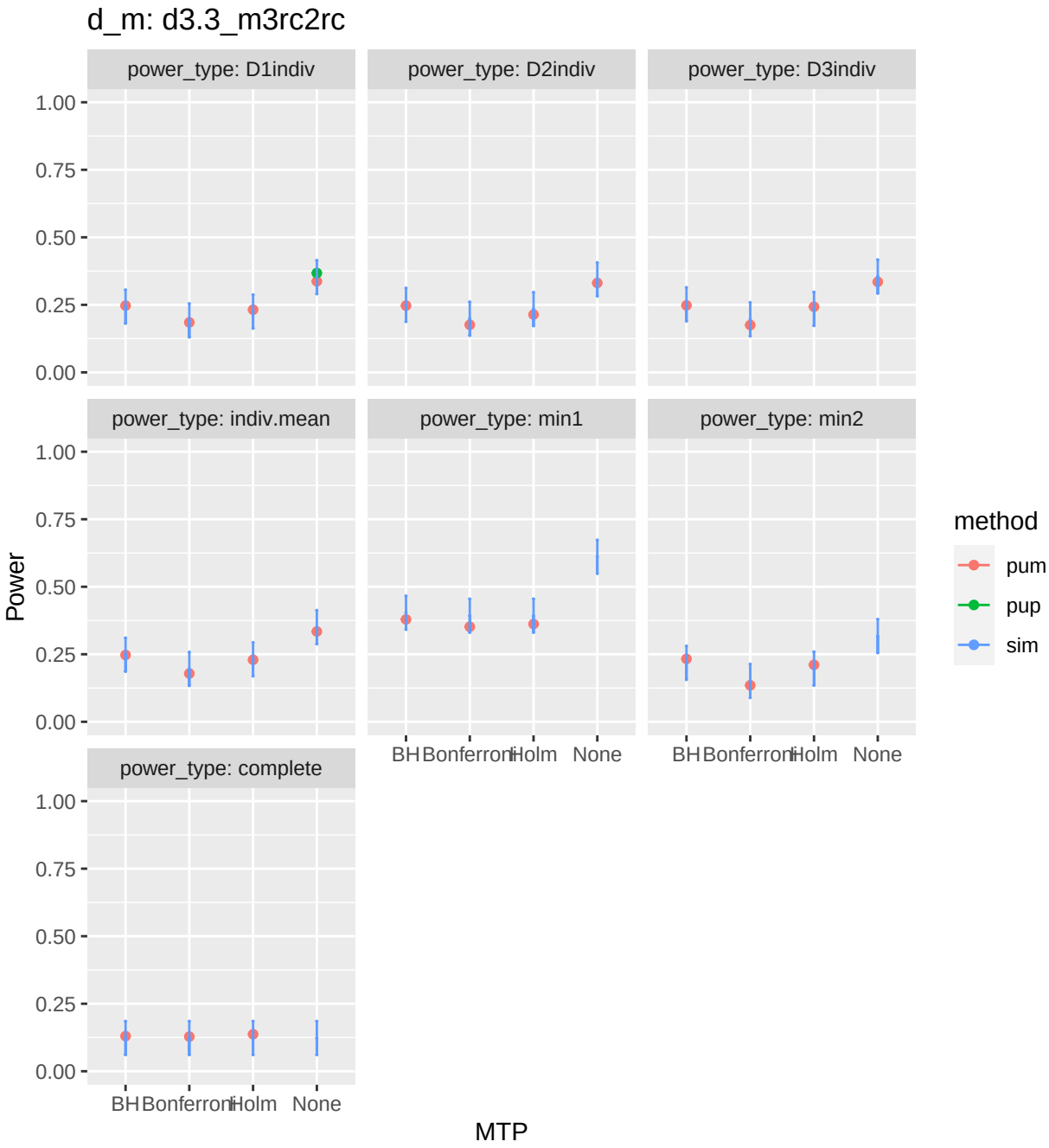
Varying true positives

MDES = 0.25, 0, 0

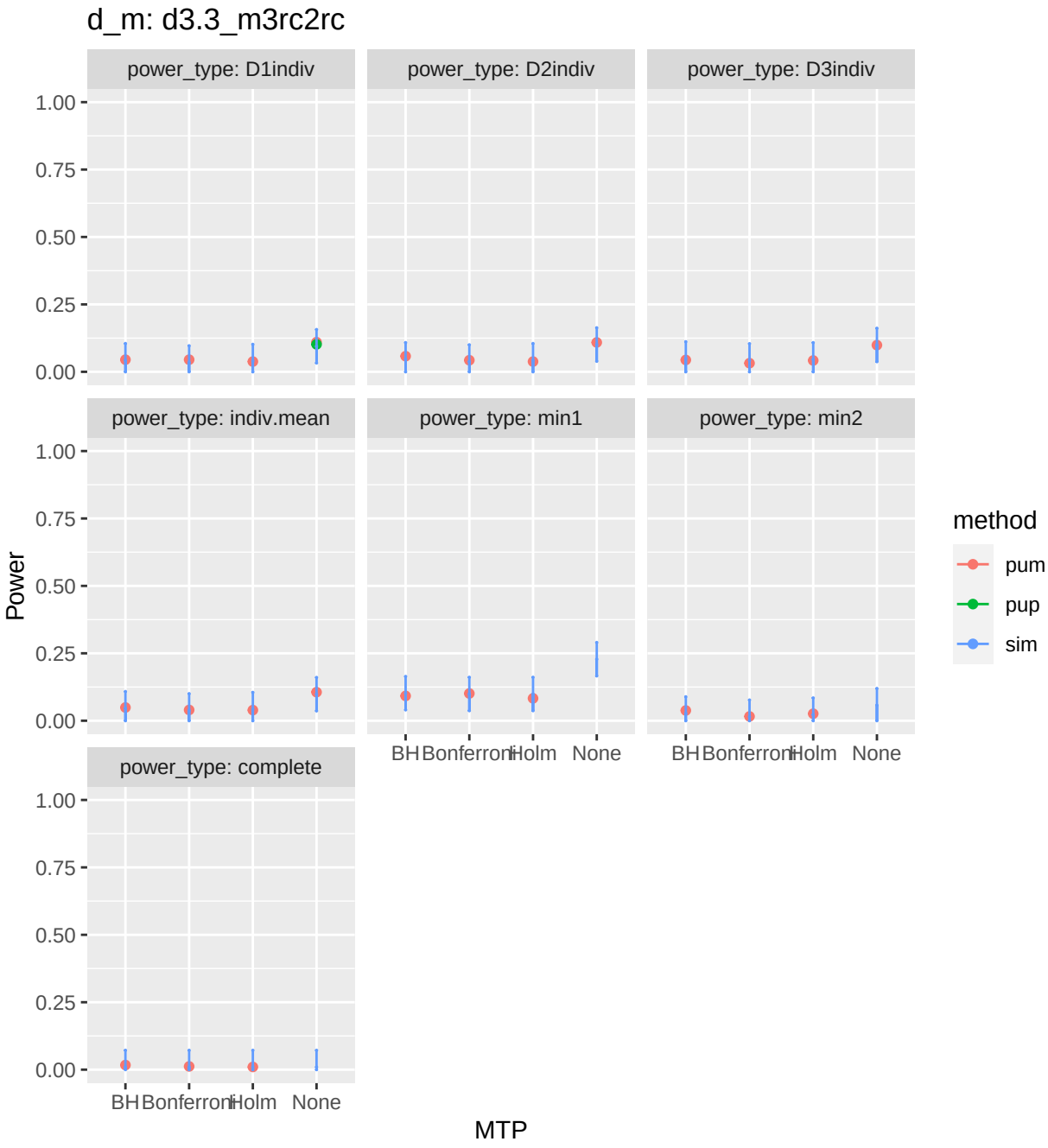


Varying ICC

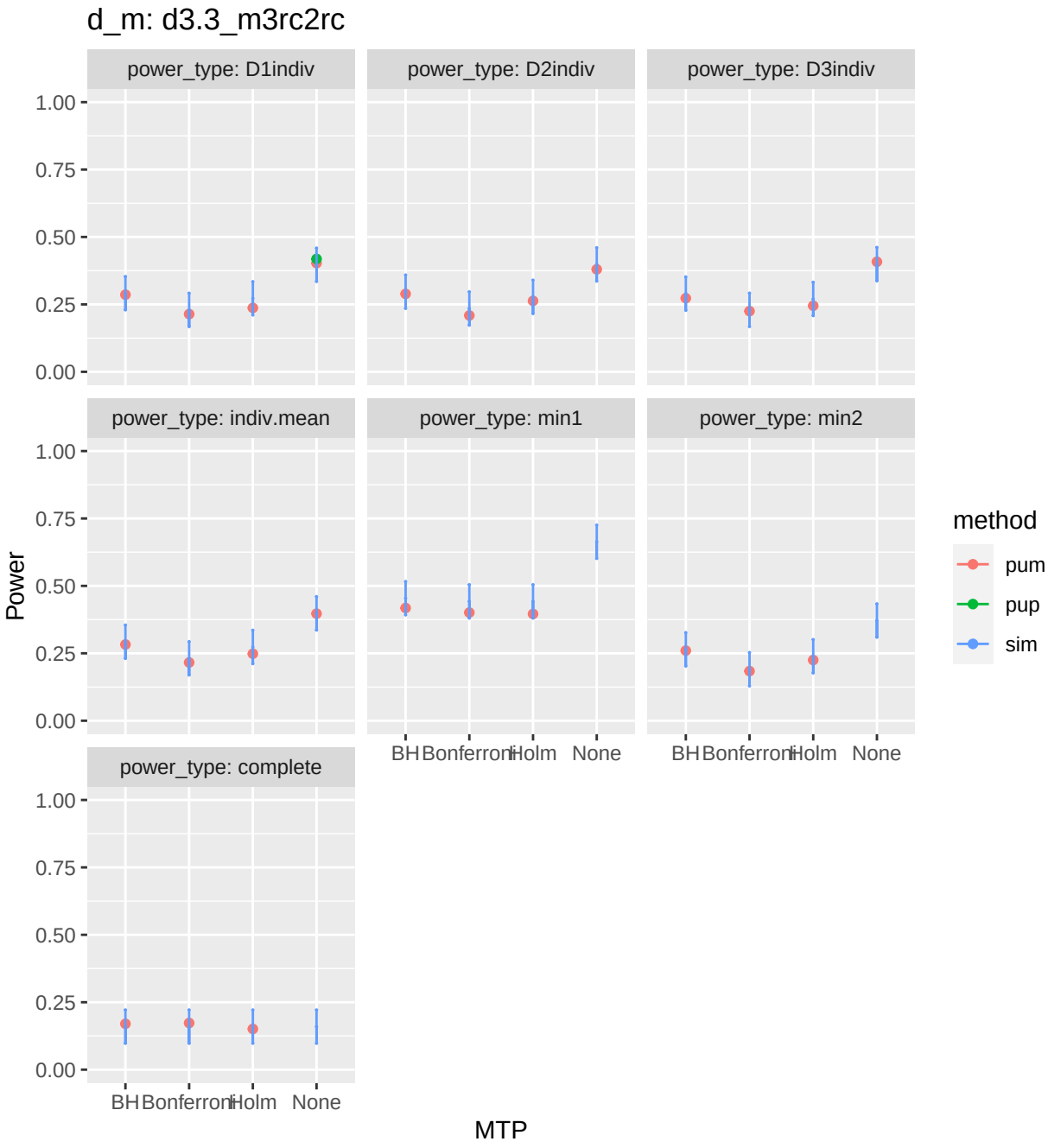
$\text{ICC}_2 = 0.7, 0.7, 0.7$



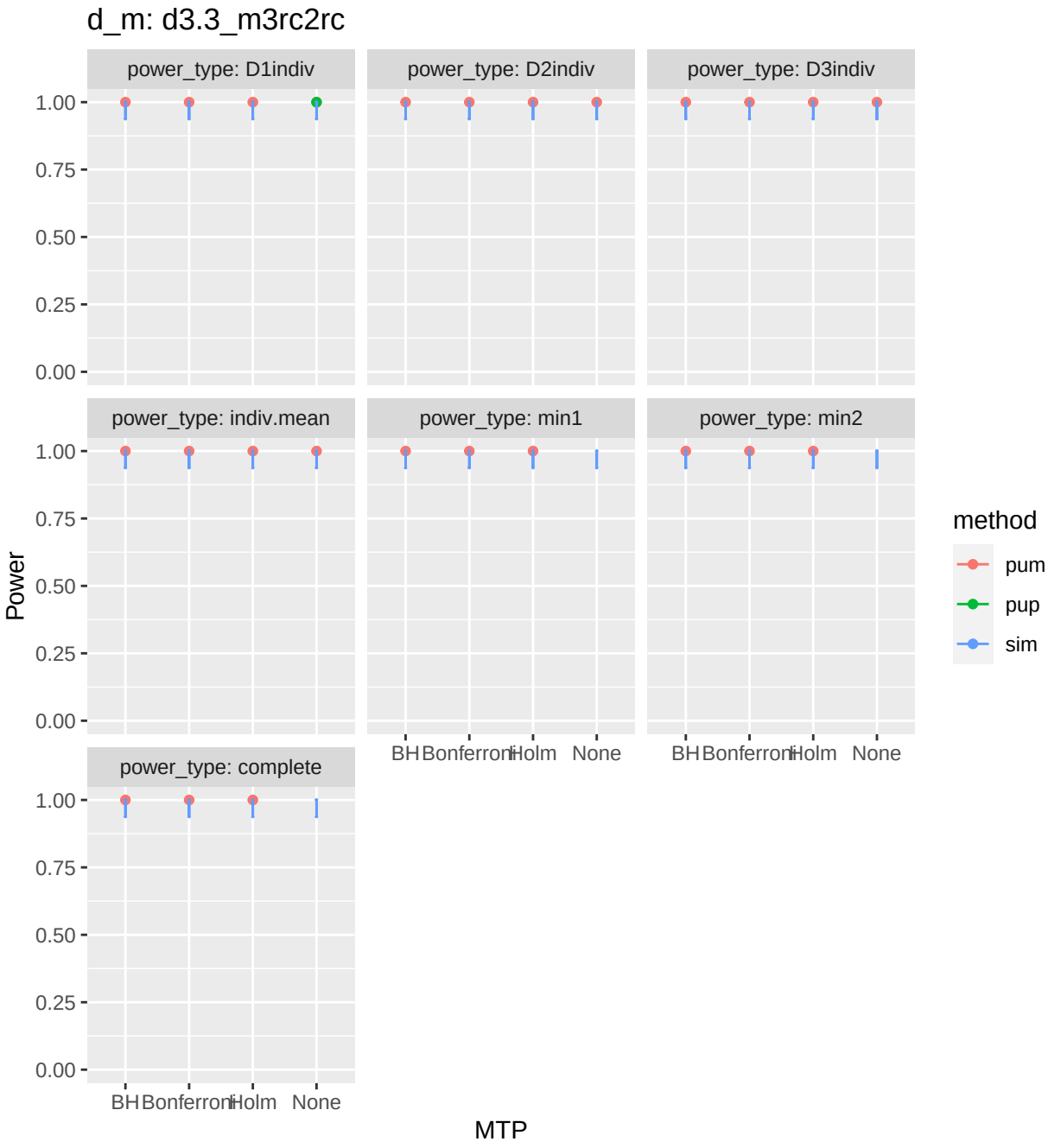
$\text{ICC}_3 = 0.7, 0.7, 0.7$



$\text{ICC}_2 = 0, 0, 0$



$\text{ICC}_3 = 0, 0, 0$



MDES validation

Target value: 0.25

```
##
##
## +------------+---------------+---------------+-------------+
## |    MTP     | Adjusted MDES | D1indiv Power | Target MDES |
## +============+===============+===============+=============+
## | Bonferroni |     0.259     |     0.231     |    0.25     |
## +------------+---------------+---------------+-------------+
## |     BH     |     0.247     |     0.274     |    0.25     |
## +------------+---------------+---------------+-------------+
## |    Holm    |     0.245     |     0.245     |    0.25     |
## +------------+---------------+---------------+-------------+
##
## Table: d3.3_m3rc2rc
```

Sample size validation

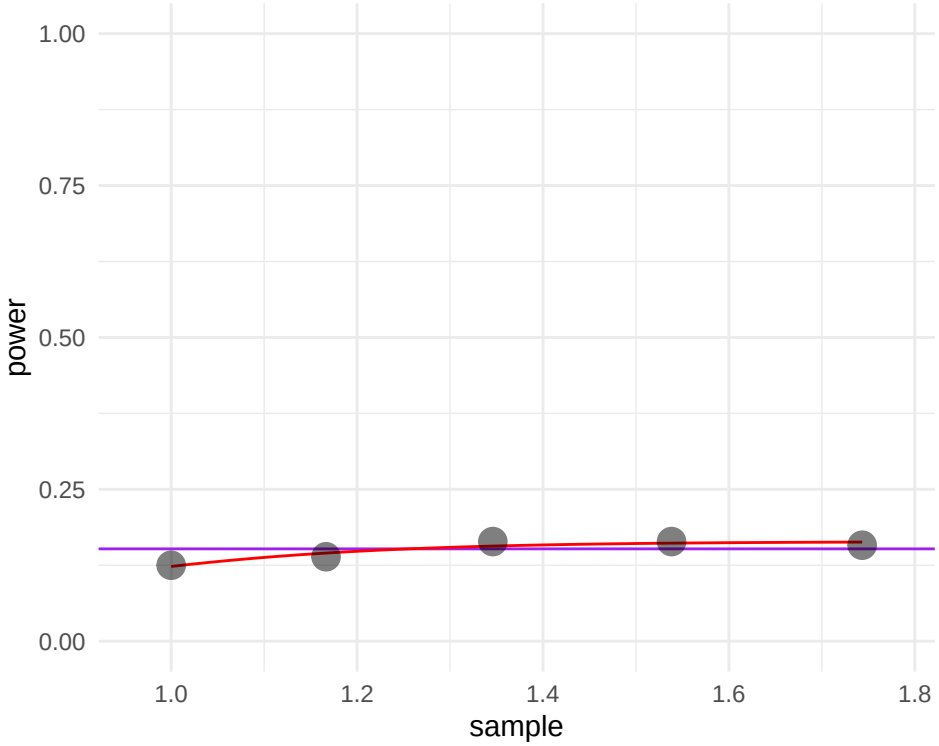
Target value: 20

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      K      |     21      |     0.231     |
## +------------+-------------+-------------+---------------+
## |     BH     |      K      |     21      |     0.288     |
## +------------+-------------+-------------+---------------+
## |    Holm    |      K      |     20      |     0.25      |
## +------------+-------------+-------------+---------------+
##
## Table: d3.3_m3rc2rc
```

Target value: 40

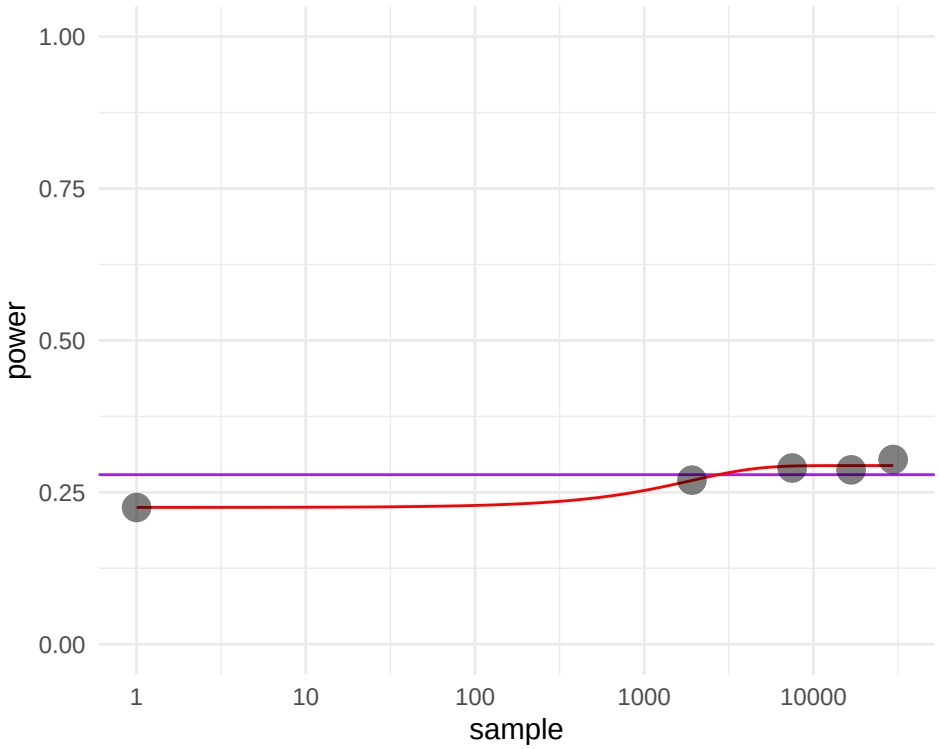
```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      J      |     NA      |     0.231     |
## +------------+-------------+-------------+---------------+
## |     BH     |      J      |      2      |     0.152     |
## +------------+-------------+-------------+---------------+
## |    Holm    |      J      |     11      |     0.236     |
## +------------+-------------+-------------+---------------+
##
## Table: d3.3_m3rc2rc
```

The target power cannot be achieved with the conservative Bonferroni correction. For other corrections, the power curve is very flat.



Target value: 50

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |    nbar     |     NA      |     0.231     |
## +------------+-------------+-------------+---------------+
## |     BH     |    nbar     |    13539    |     0.279     |
## +------------+-------------+-------------+---------------+
## |    Holm    |    nbar     |      1      |     0.226     |
## +------------+-------------+-------------+---------------+
##
## Table: d3.3_m3rc2rc
```


1.00
0.75
0.50
0.25
0.00
power
1
10
100
1000
10000
sample