Validate Power: d2.1

December 29, 2021

d_m: Blocked RCT, with 2 levels, and randomization done at level 1 (individual level).

Models: Constant treatment effects, fixed treatment effects, and random treatment effects.

Note: we expect a discrepancy when ICC is not zero between powerup and pump.

Default parameters:

- M = 3
- J = 20
- $\rho = 0.5$
- MDES = 0.125, 0.125, 0.125
- $R_1^2 = 0.1, 0.1, 0.1$
- $\text{ICC}_2 = 0.2, 0.2, 0.2$

Parameters by model type:

- Omega: $\omega_2 = 0$ for constant effects, $\omega_2 = 0.1, 0.1, 0.1$ for fixed and random

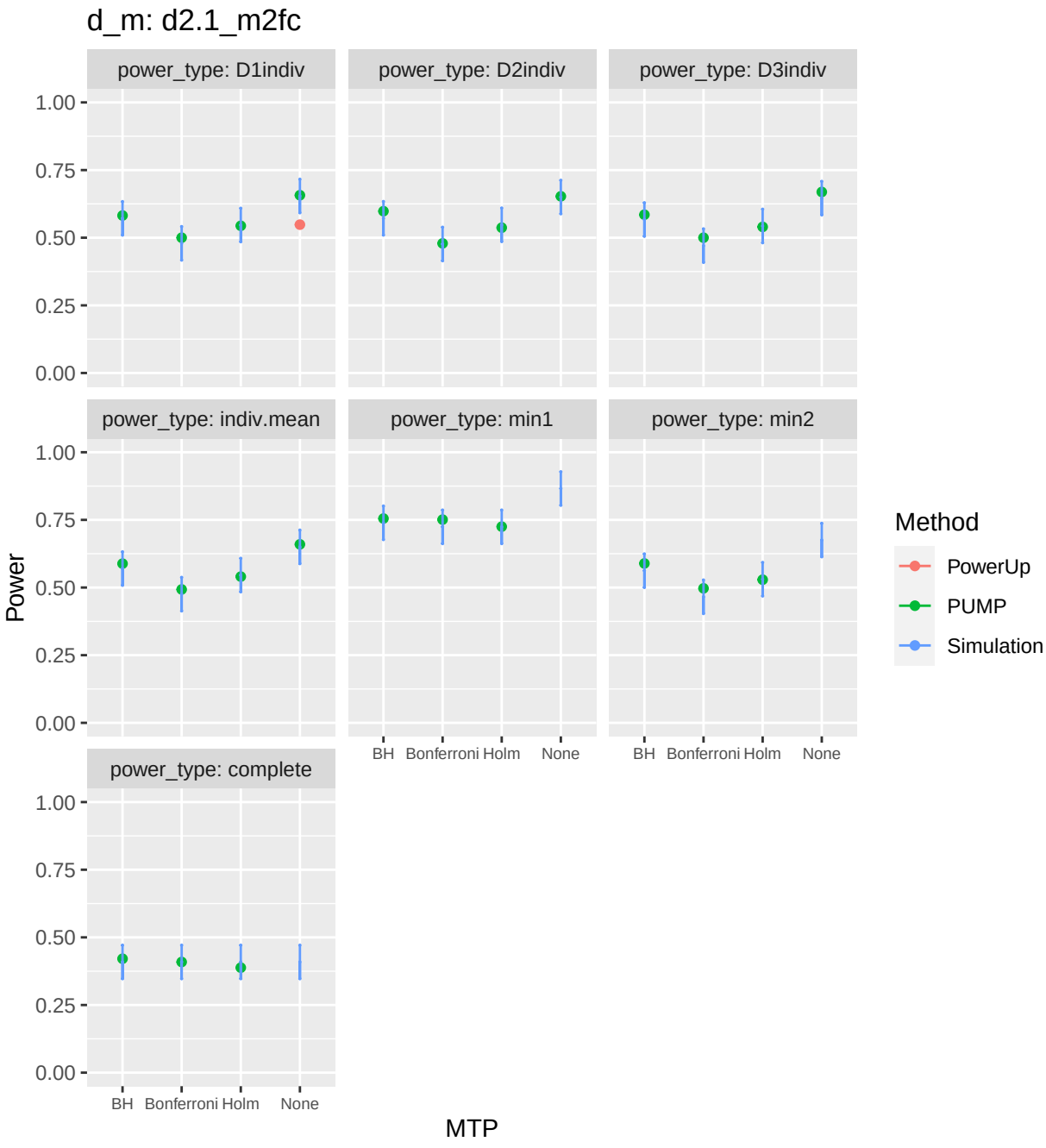
Assumptions:

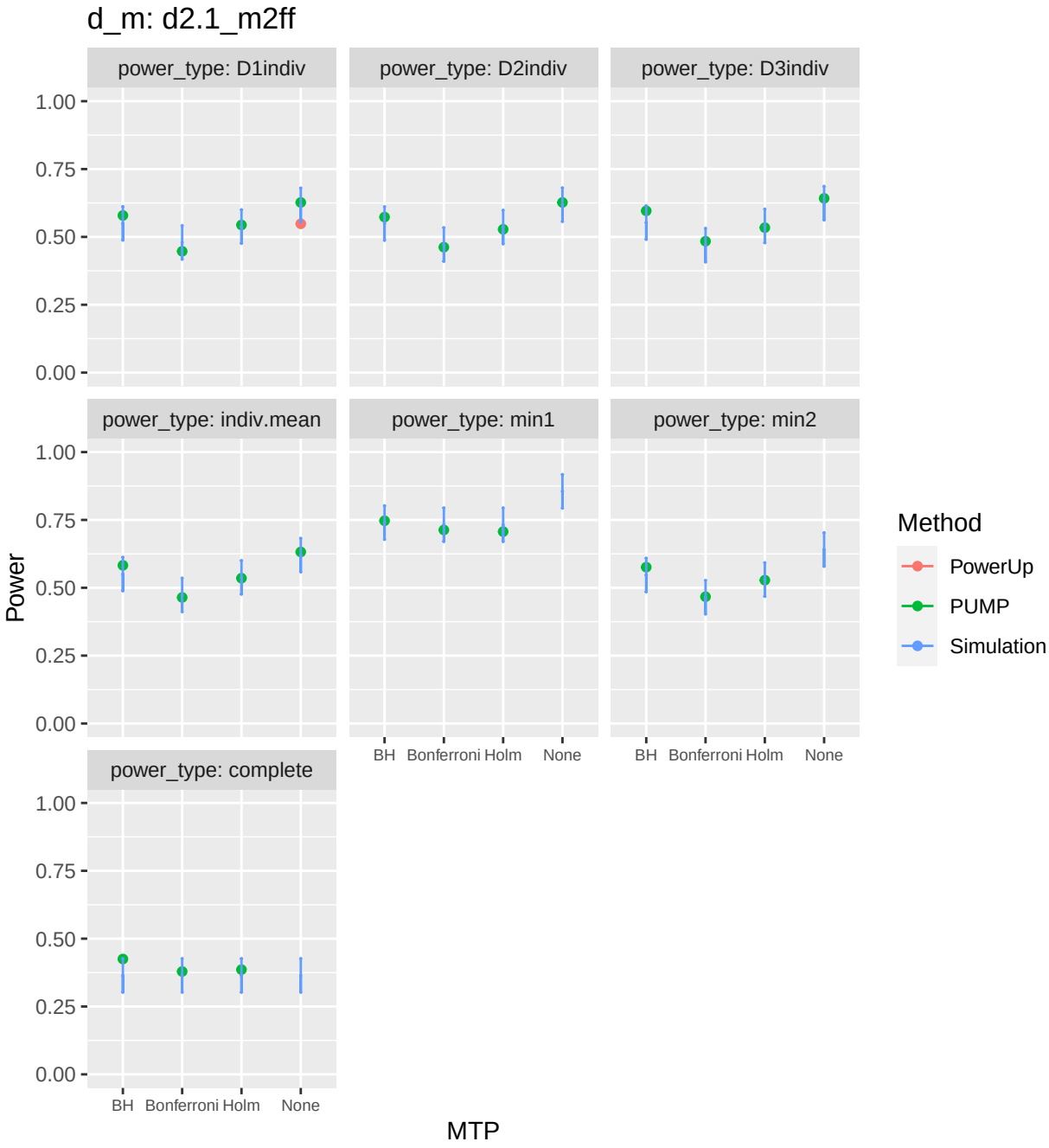
- Two-level design: $\text{ICC}_3 = 0$, $\omega_3 = 0$, $K = 1$

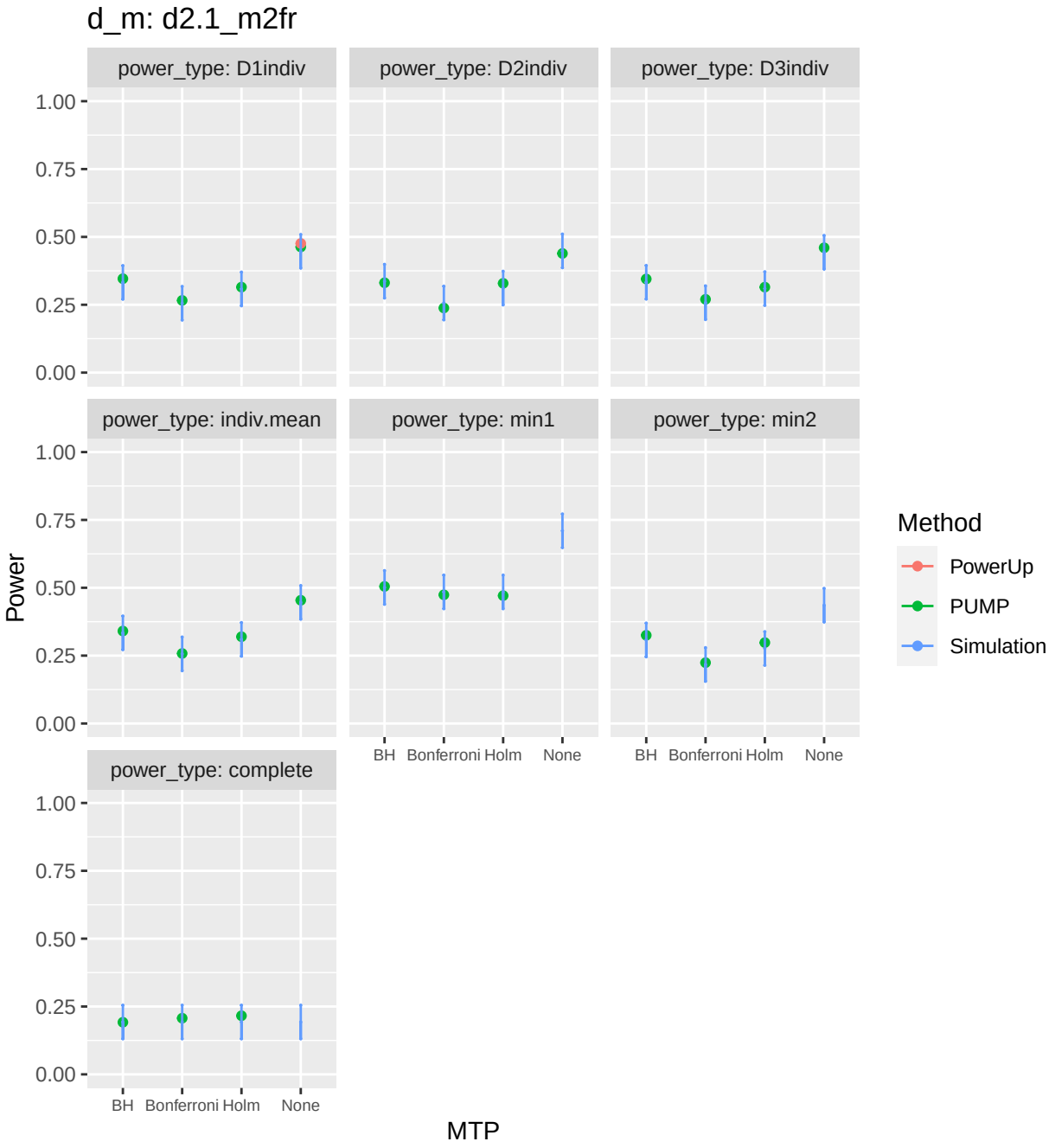
Remark. For all $d2.1$ designs and models, PowerUpR! assumes $ICC.2 = 0$, but we do not make that assumption here. Thus, we expect to see a discrepancy betweeen PUMP and Powerup except for the setting when we assume $ICC.2 = 0$.

Power Validation

Base case

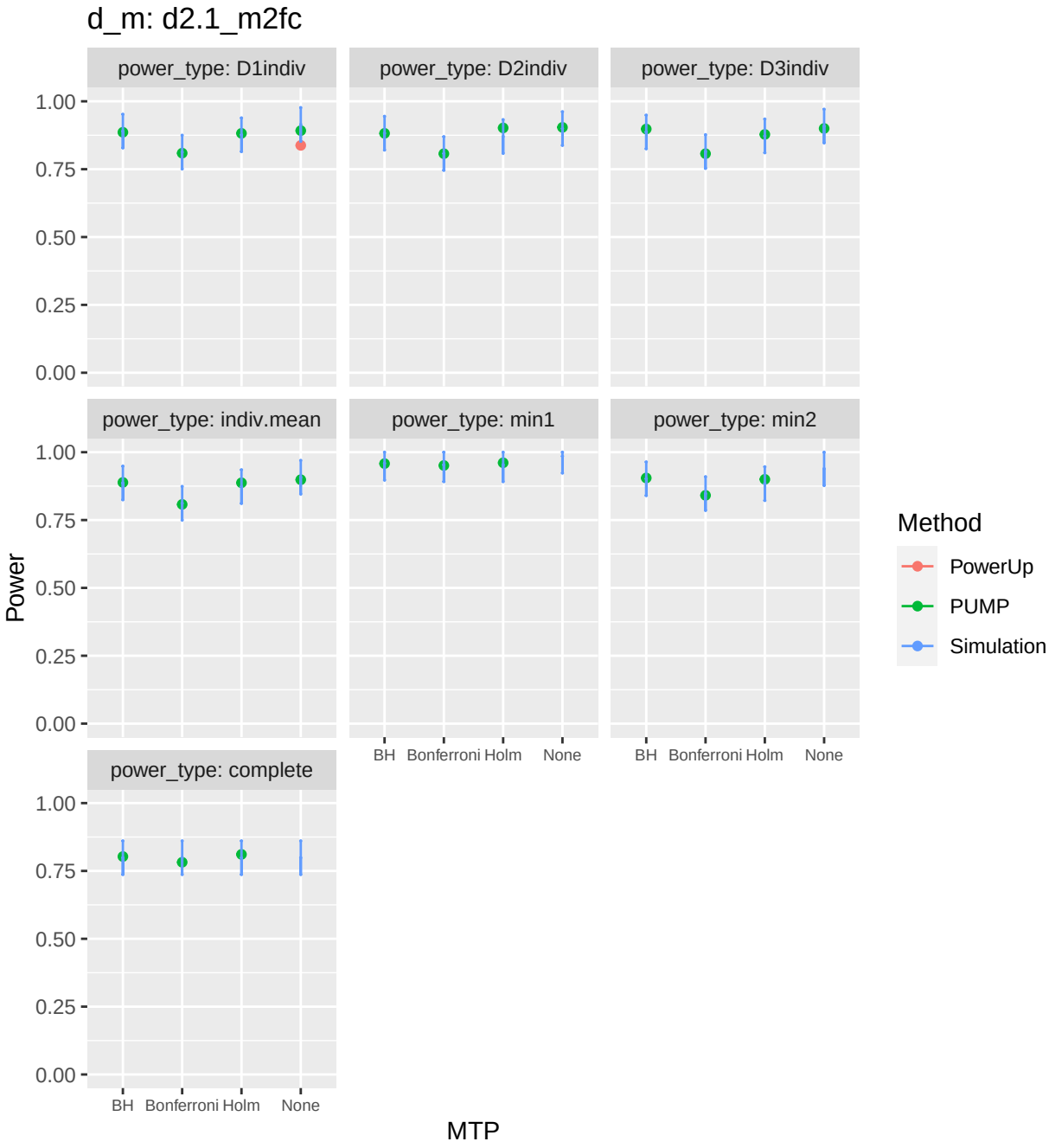


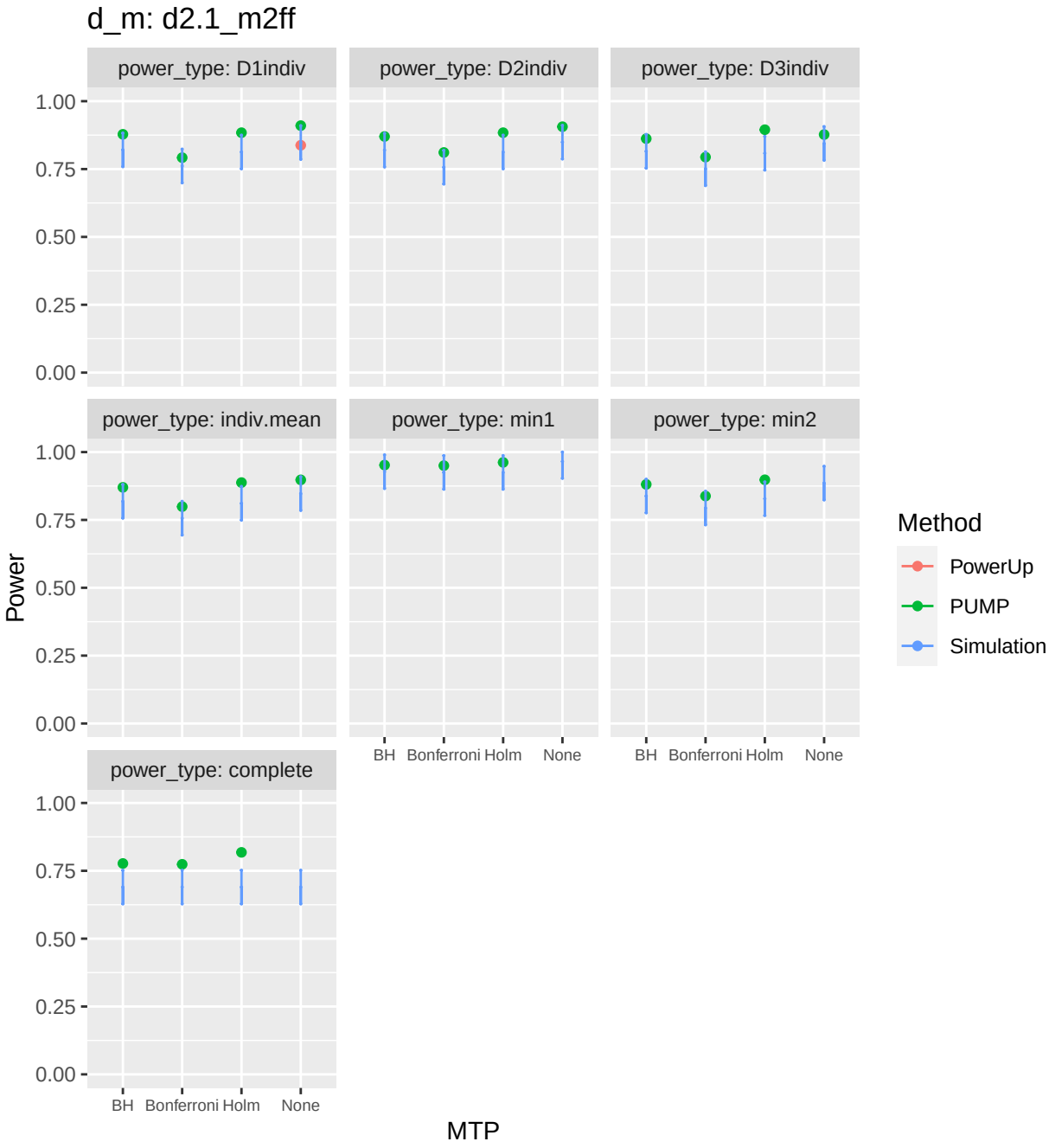

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

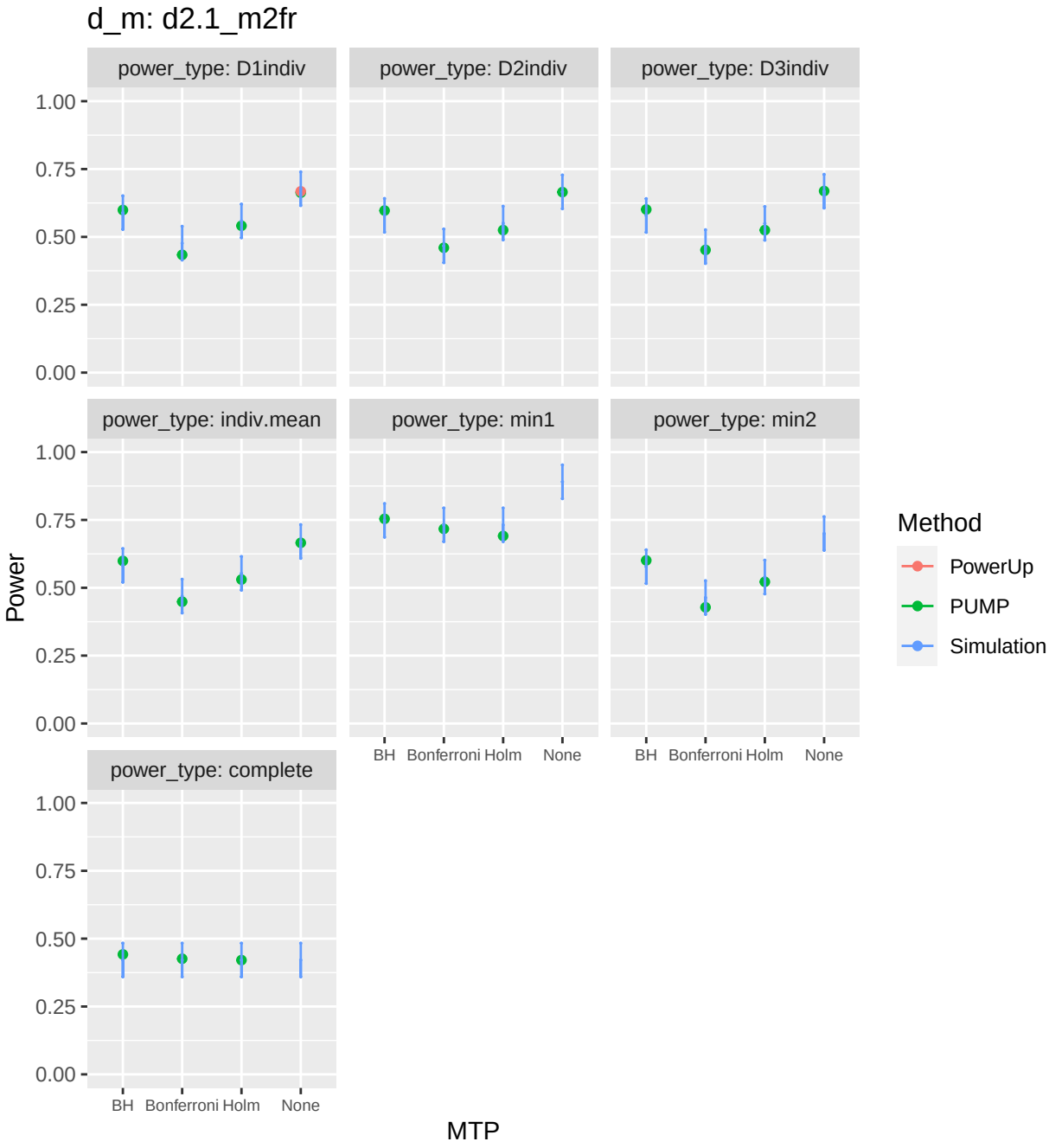

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

Varying school size

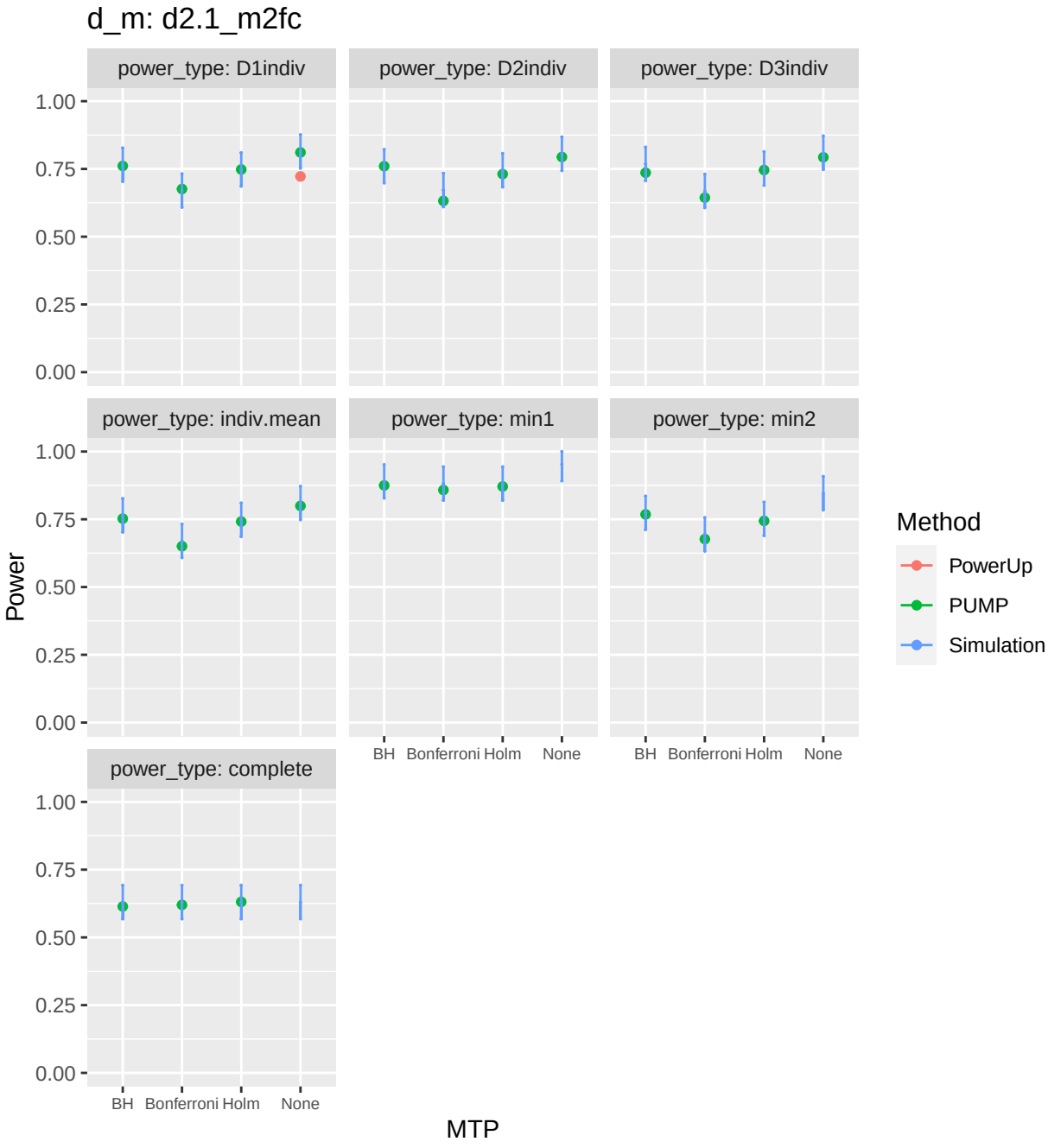
$\bar{n} = 100$

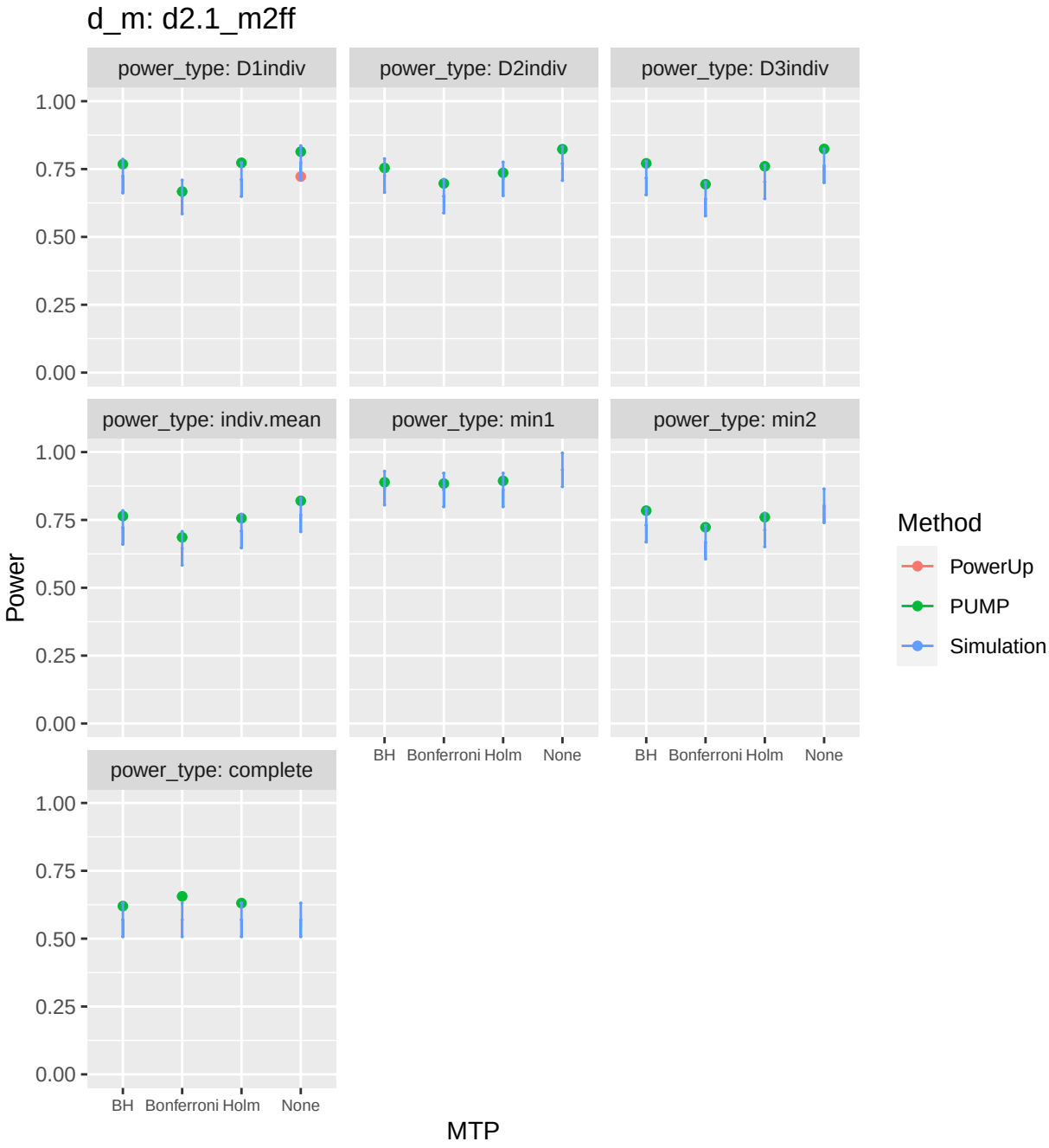


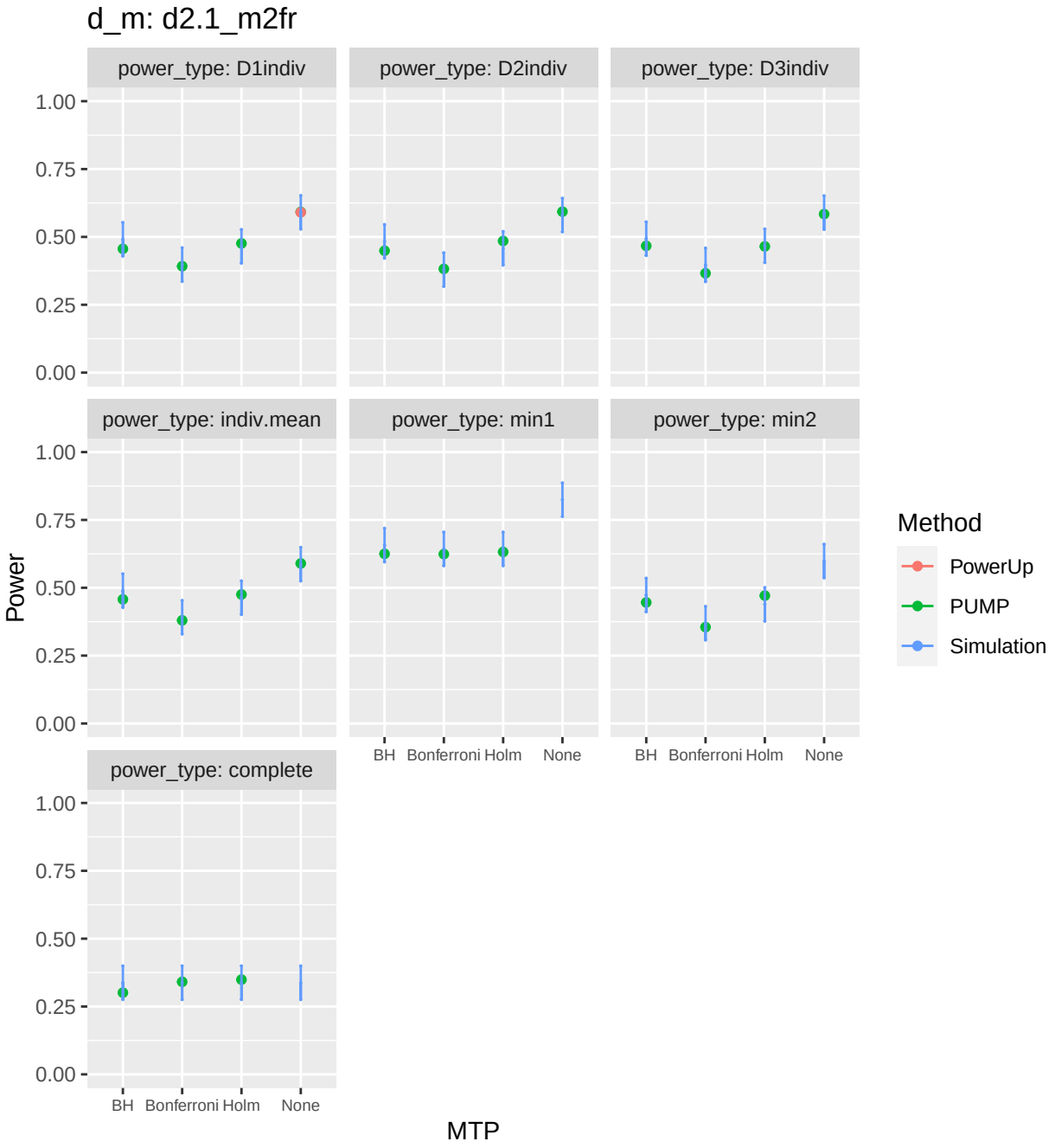

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2fr
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
PowerUp
PUMP
Simulation

$\bar{n} = 75$

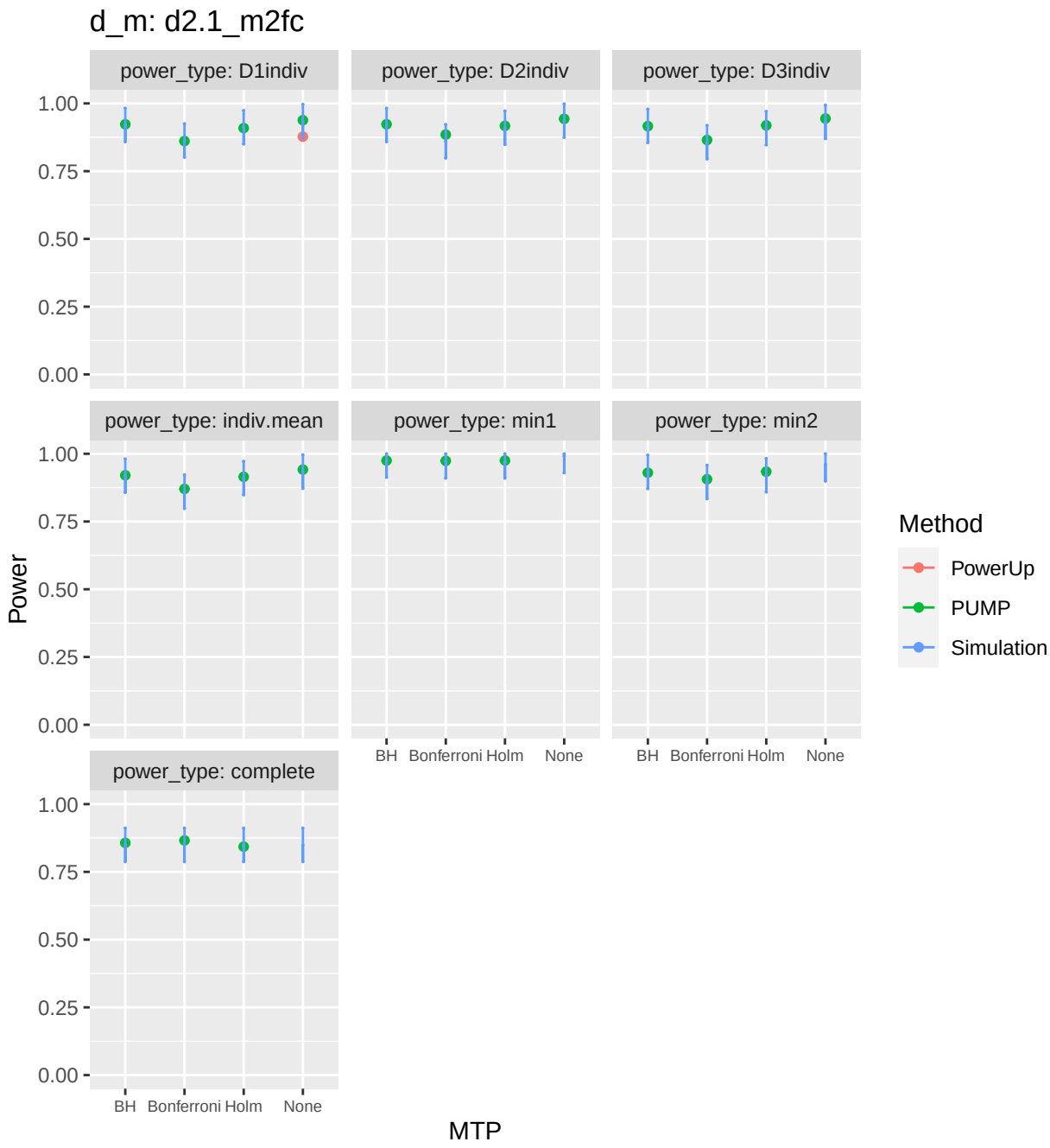

d_m: d2.1_m2fc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2ff
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
PowerUp
PUMP
Simulation

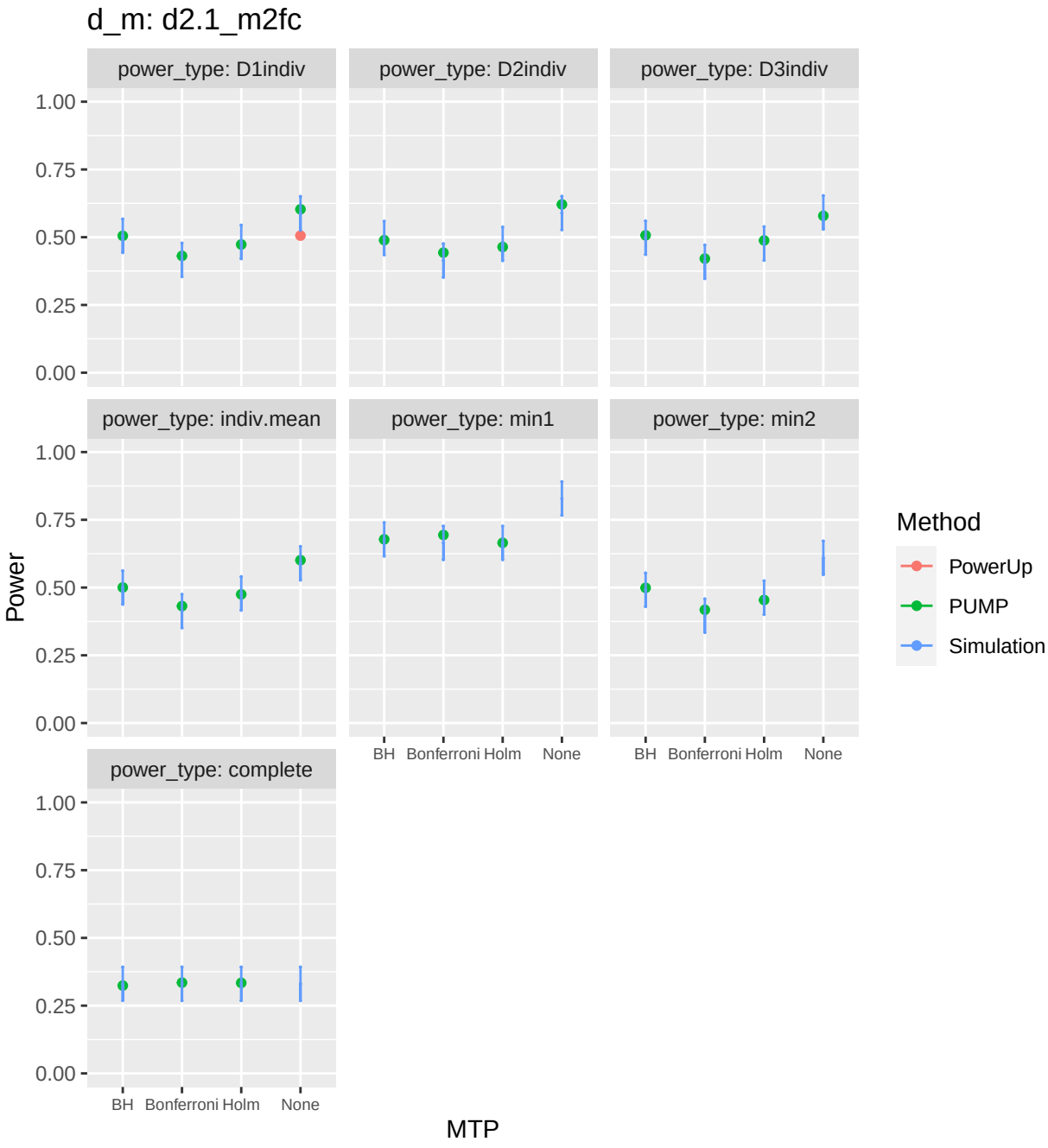

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

Varying R2

$R_1^2 = 0.6,\ 0.6,\ 0.6$

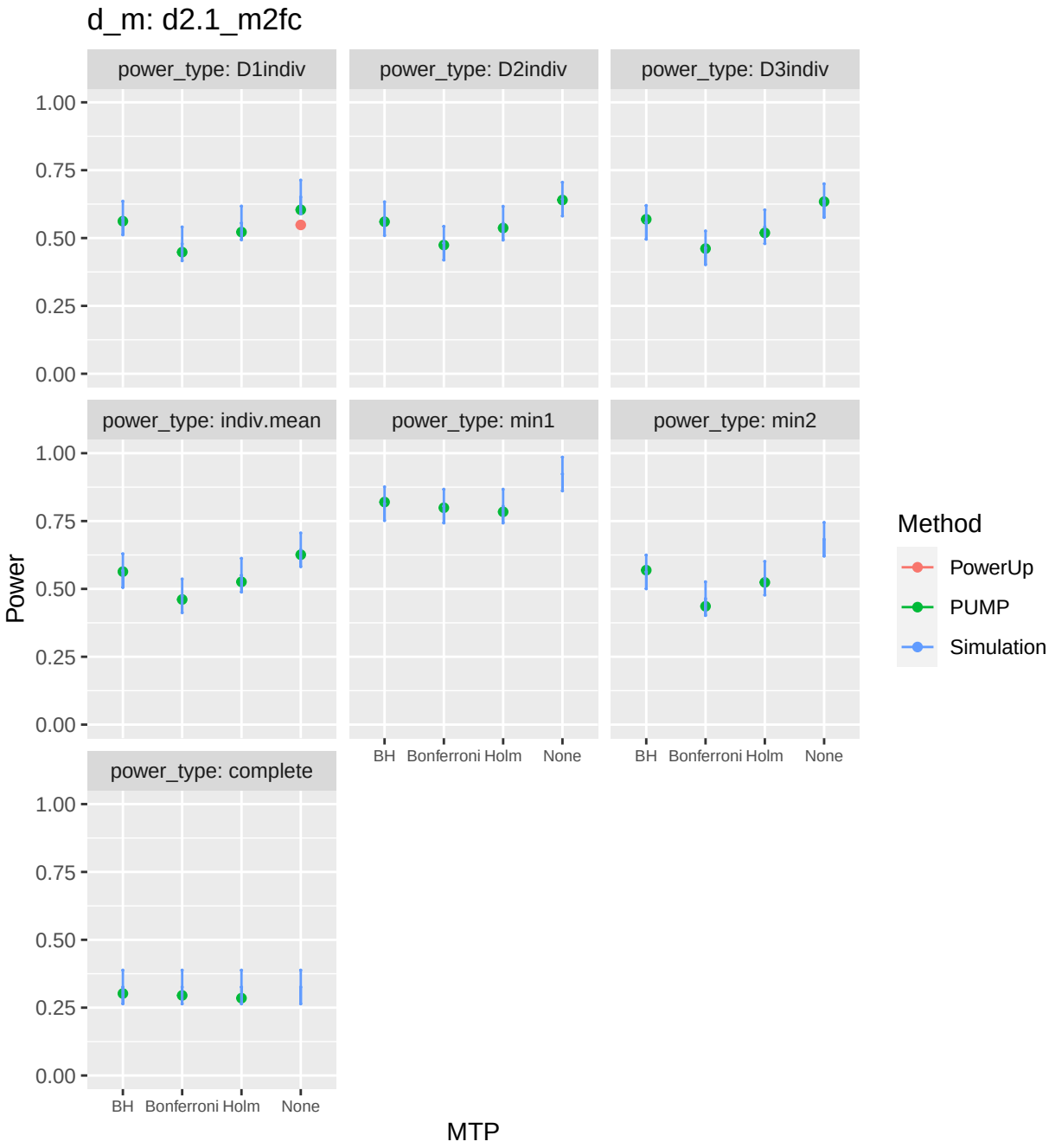


$R_1^2 = 0,\ 0,\ 0$

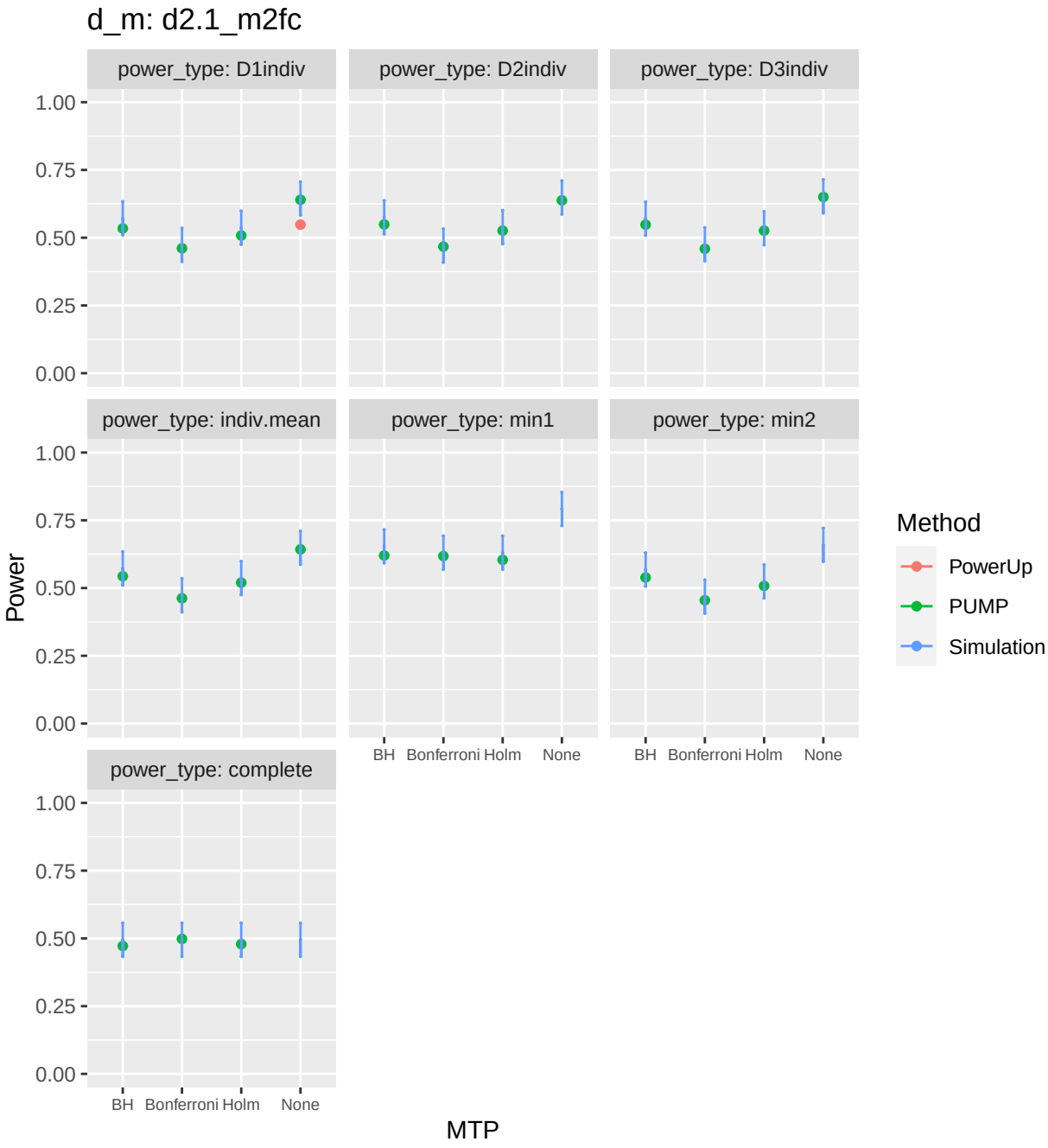

d_m: d2.1_m2fc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

Varying rho

$\rho = 0.2$

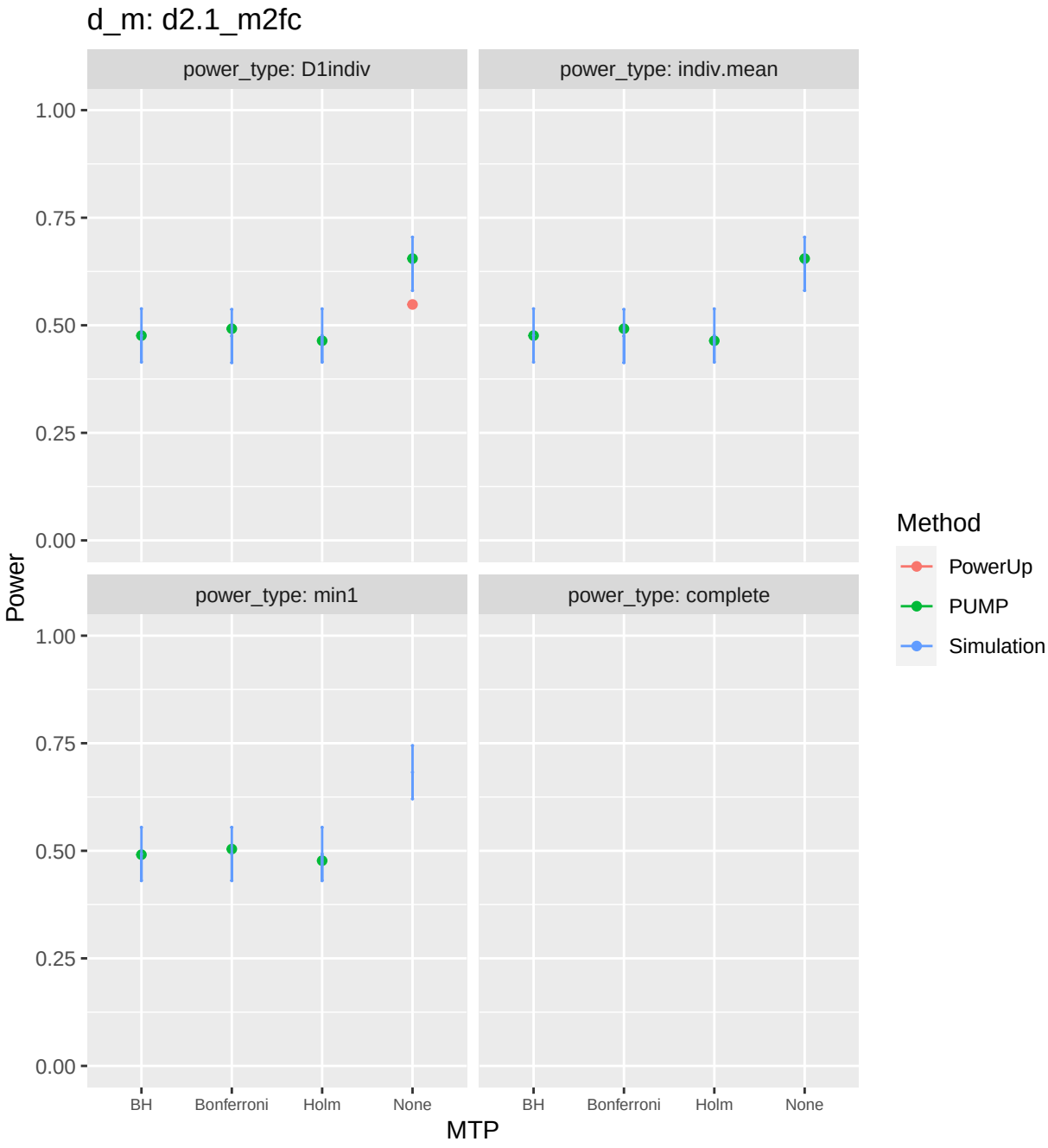


$\rho = 0.8$


d_m: d2.1_m2fc
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
PowerUp
PUMP
Simulation

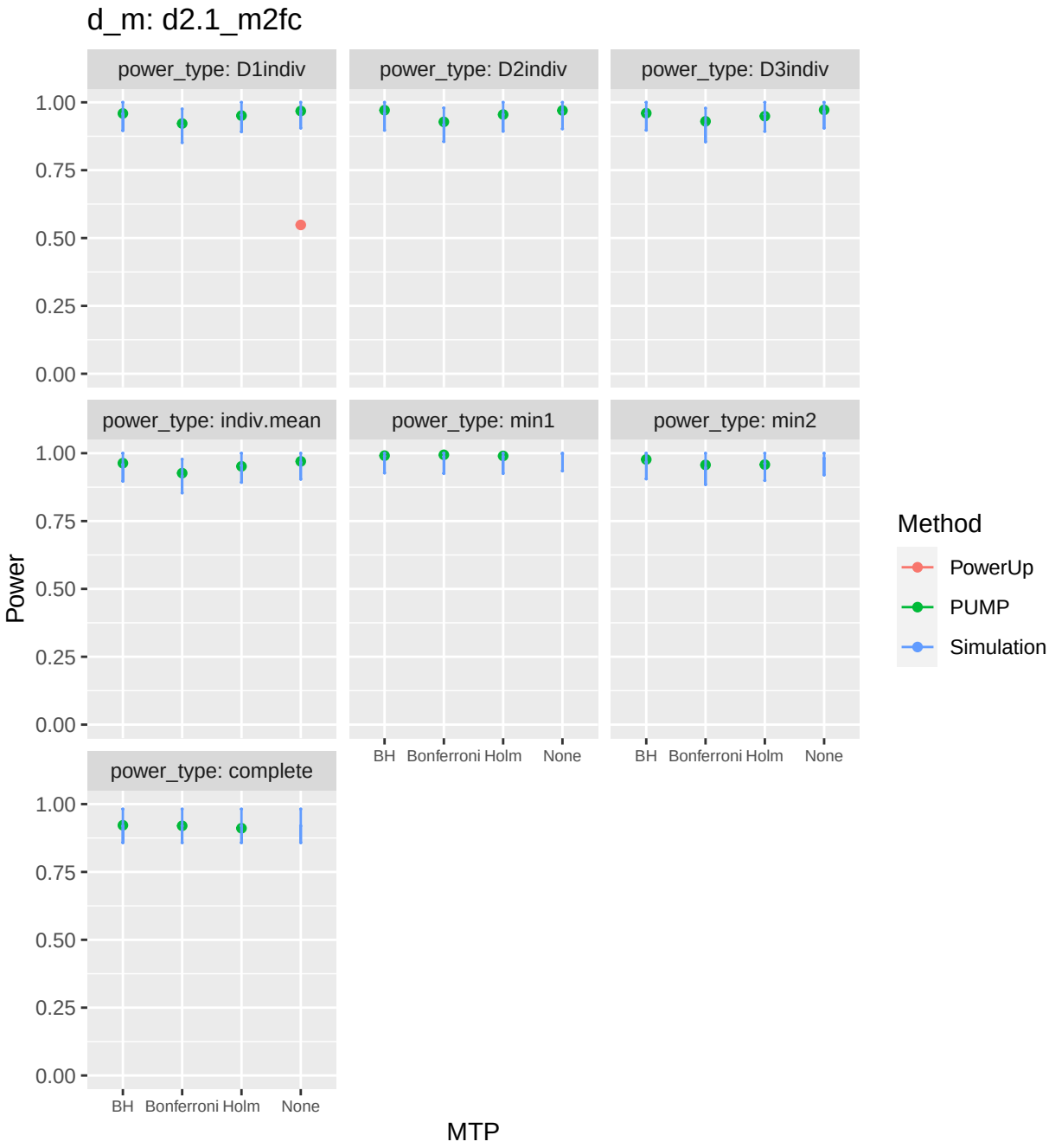
Varying true positives

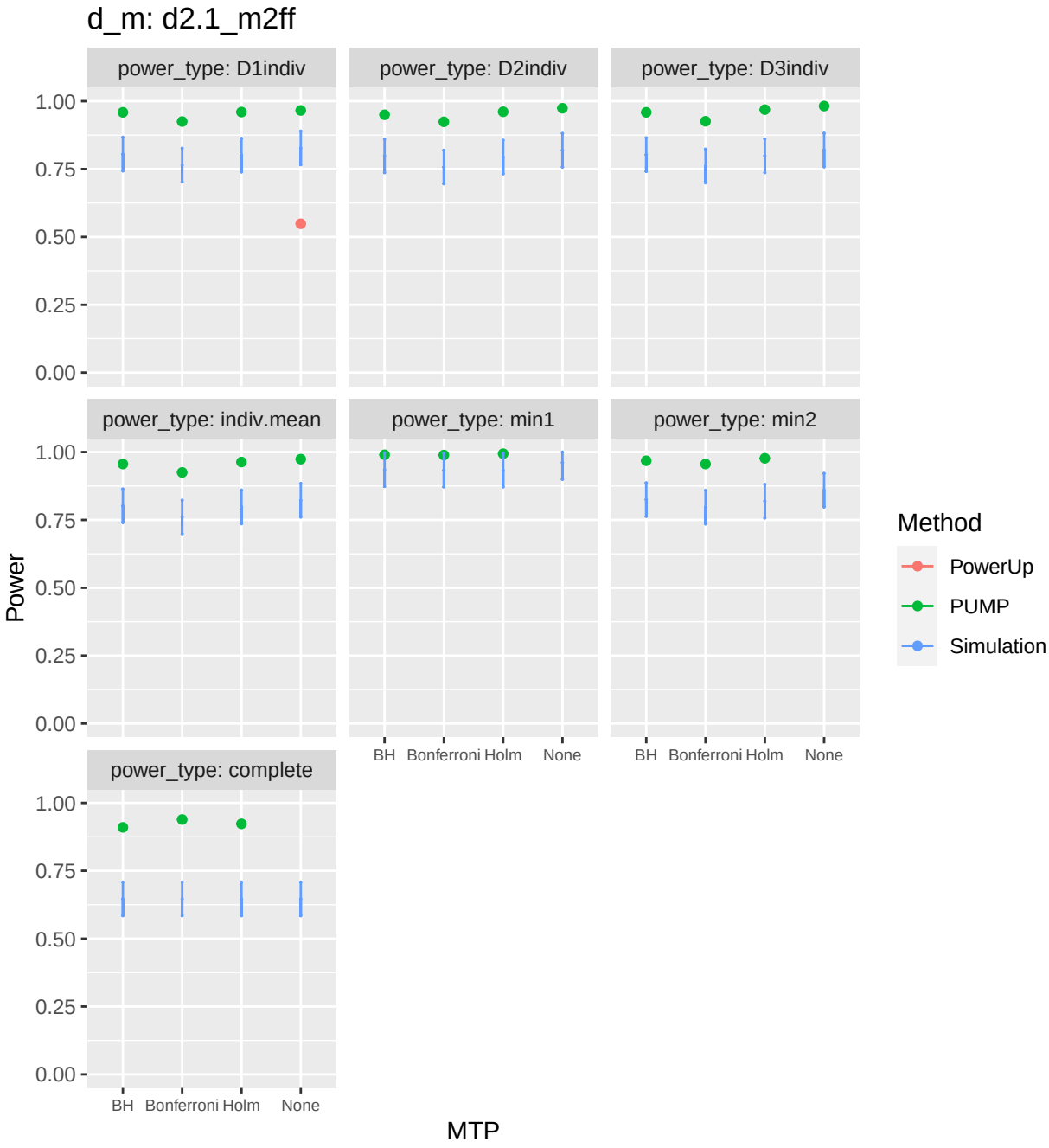
MDES = 0.125, 0, 0

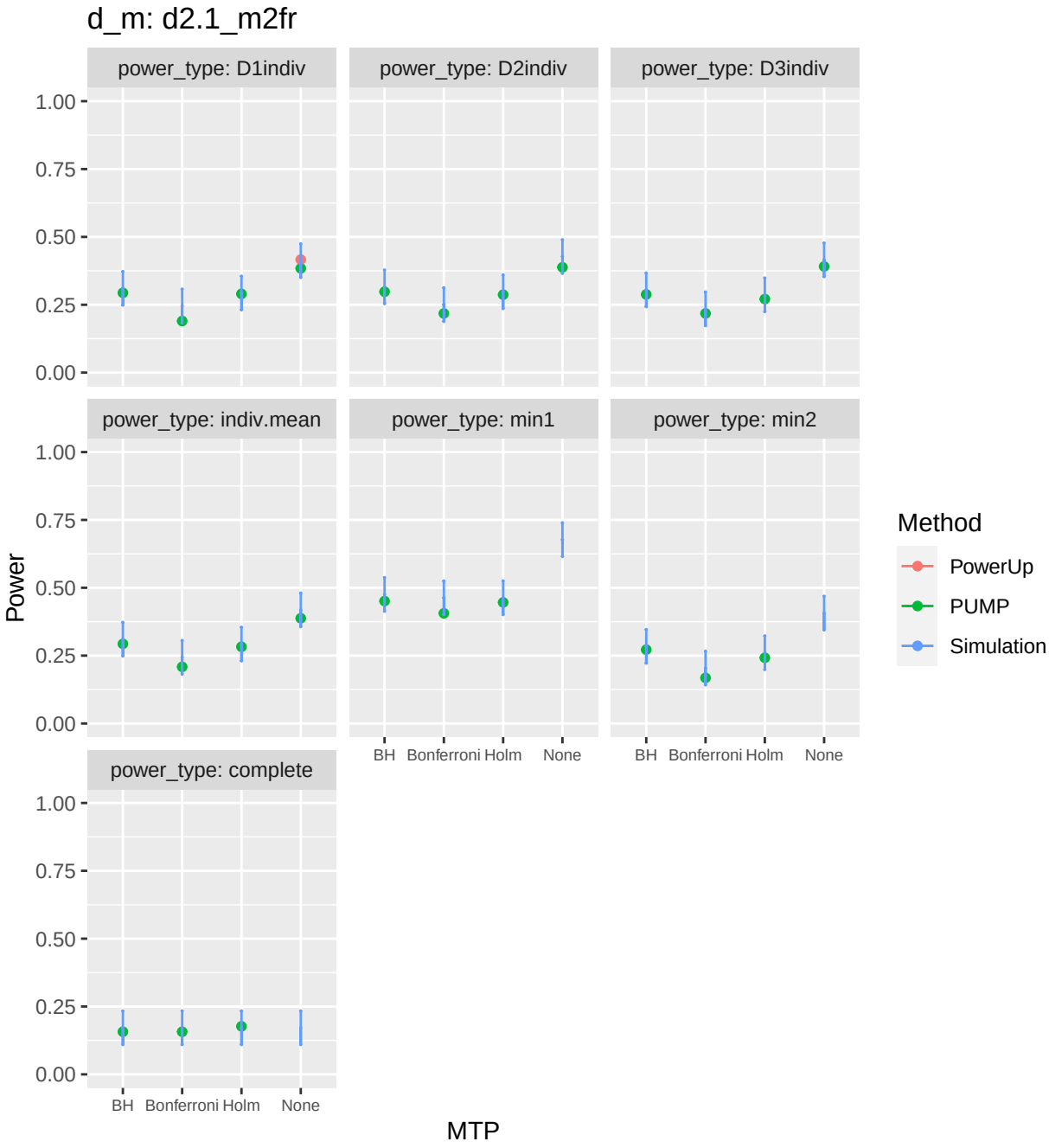


Varying ICC

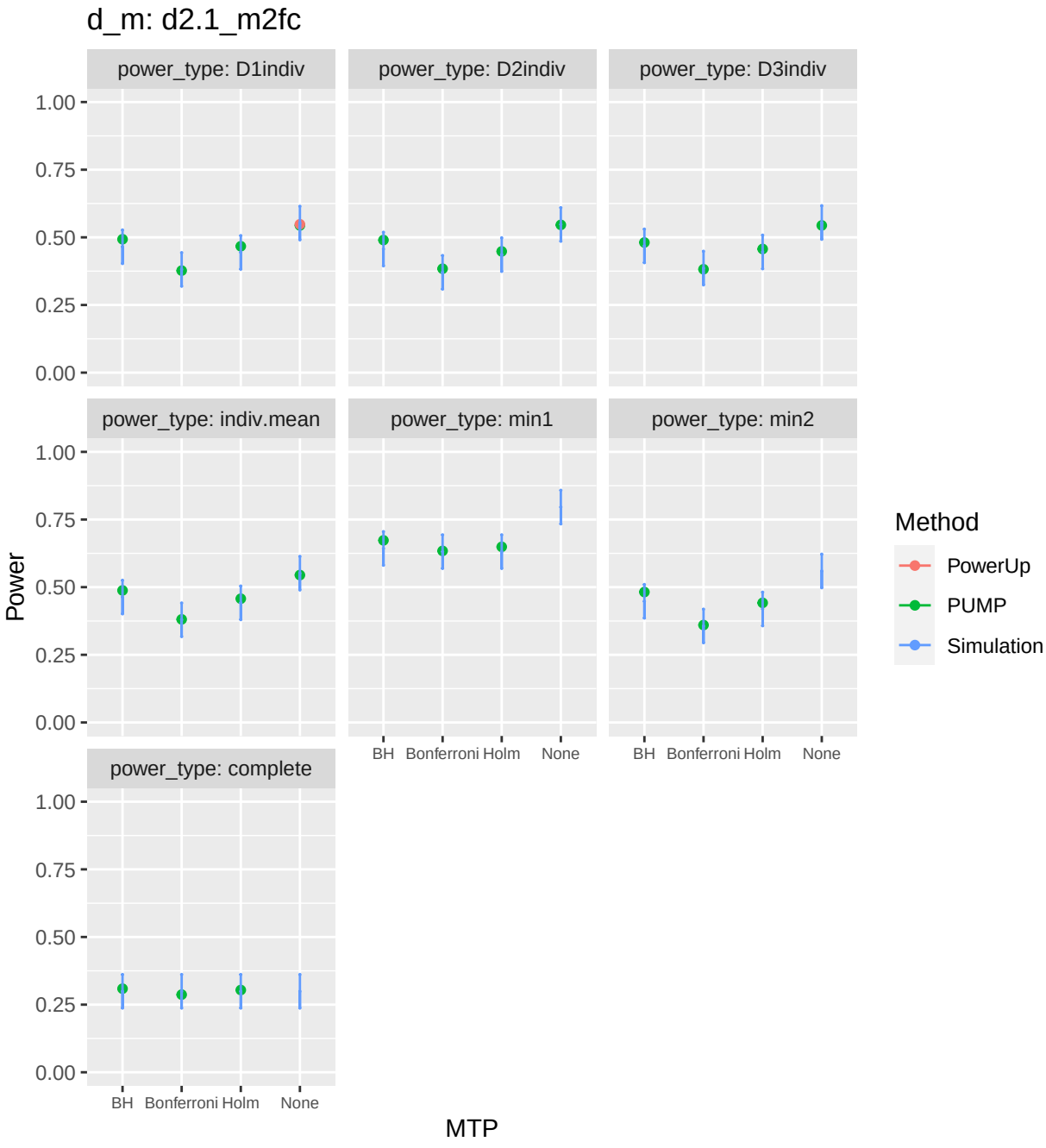
$\text{ICC}_2 = 0.7, 0.7, 0.7$



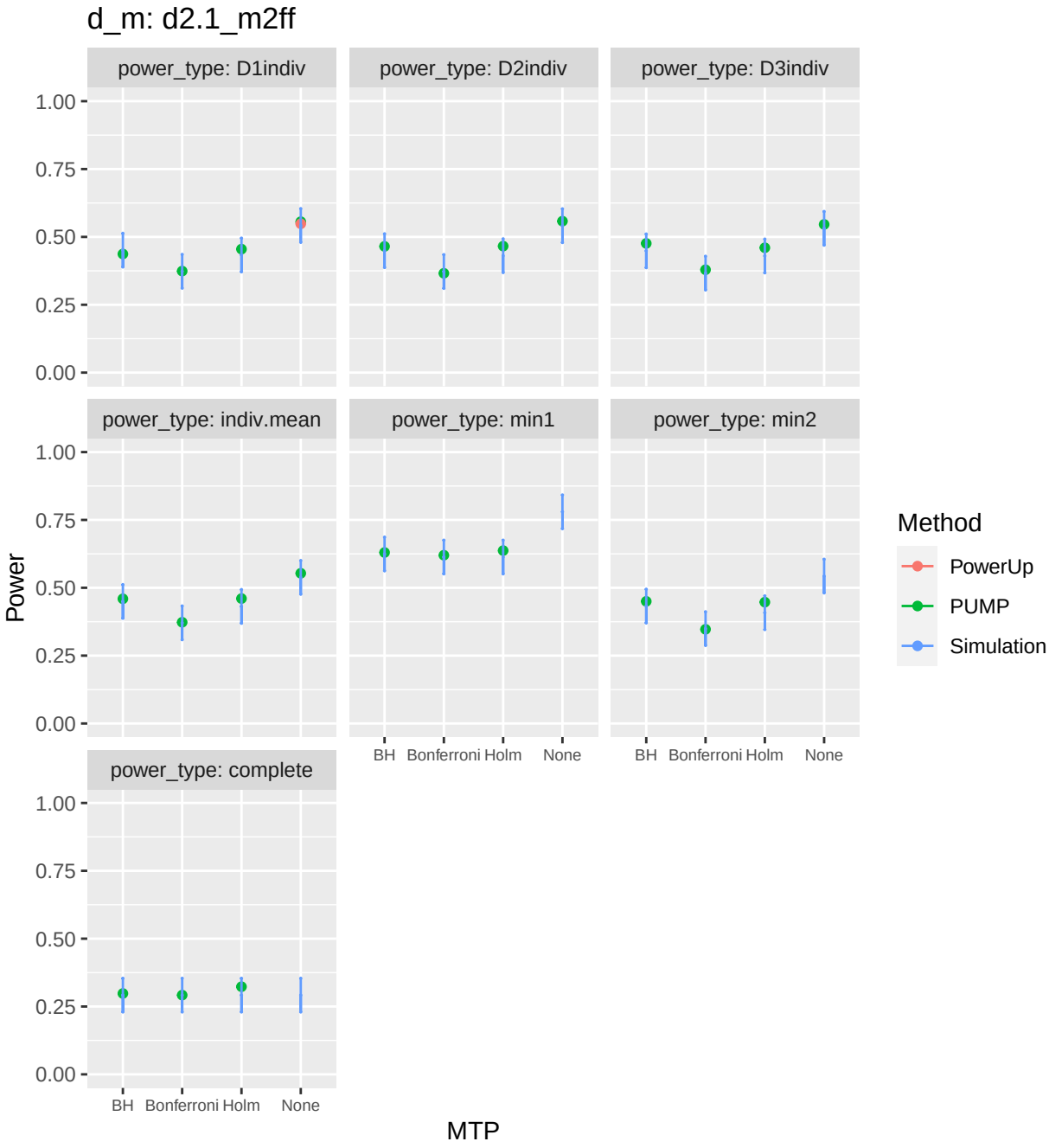

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

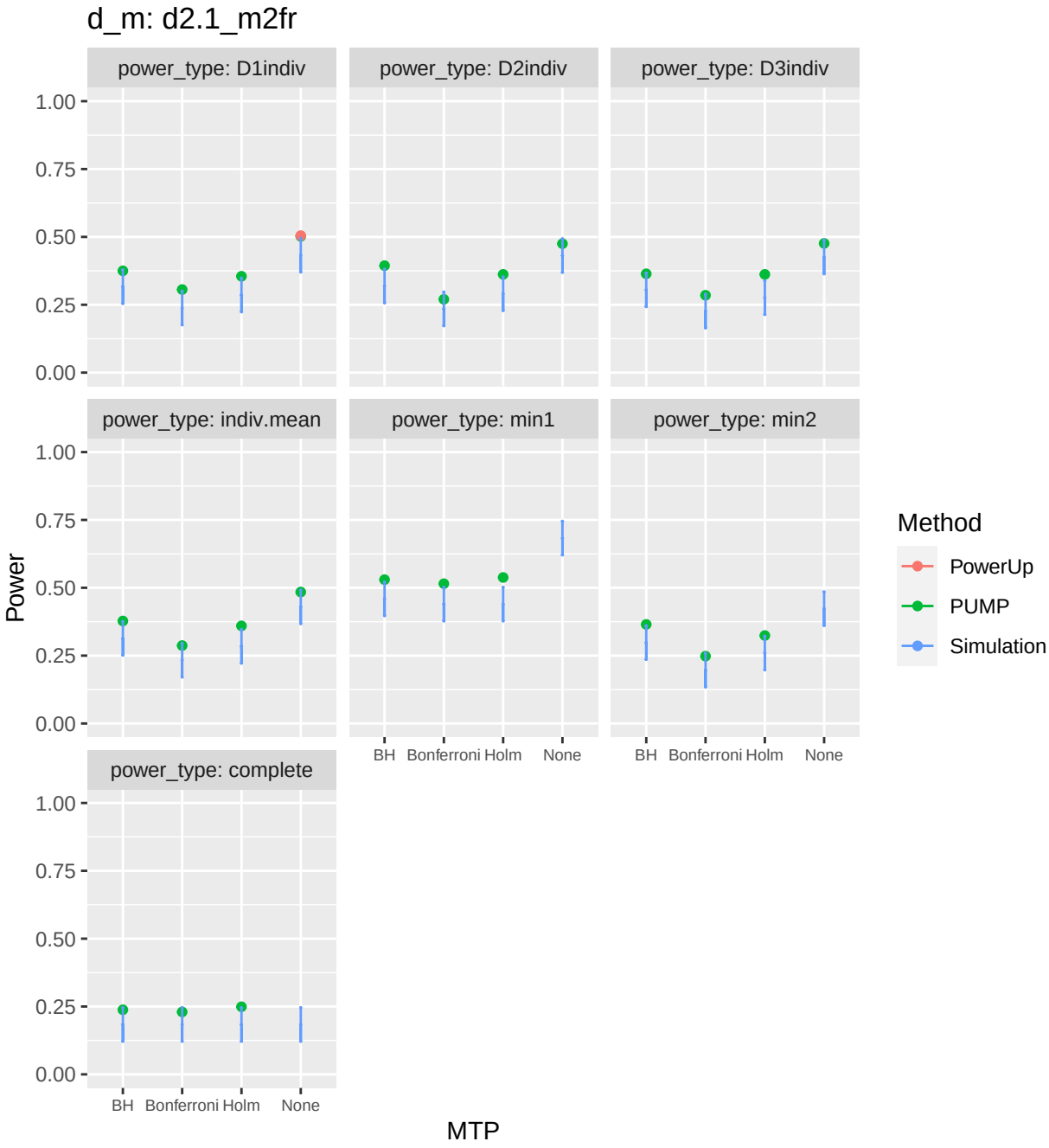

d_m: d2.1_m2fr
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation

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



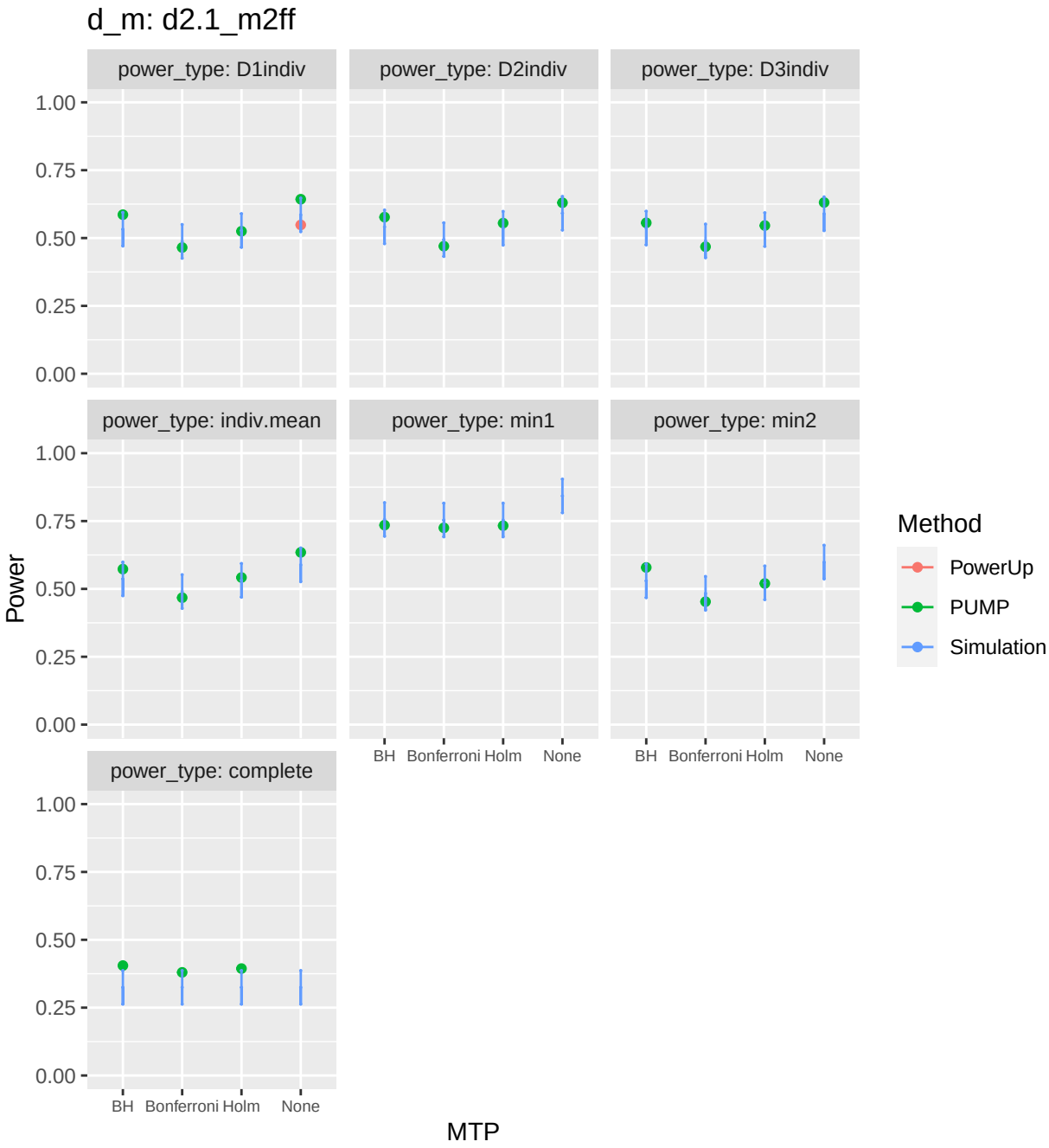

```
## pdf
##   2
```

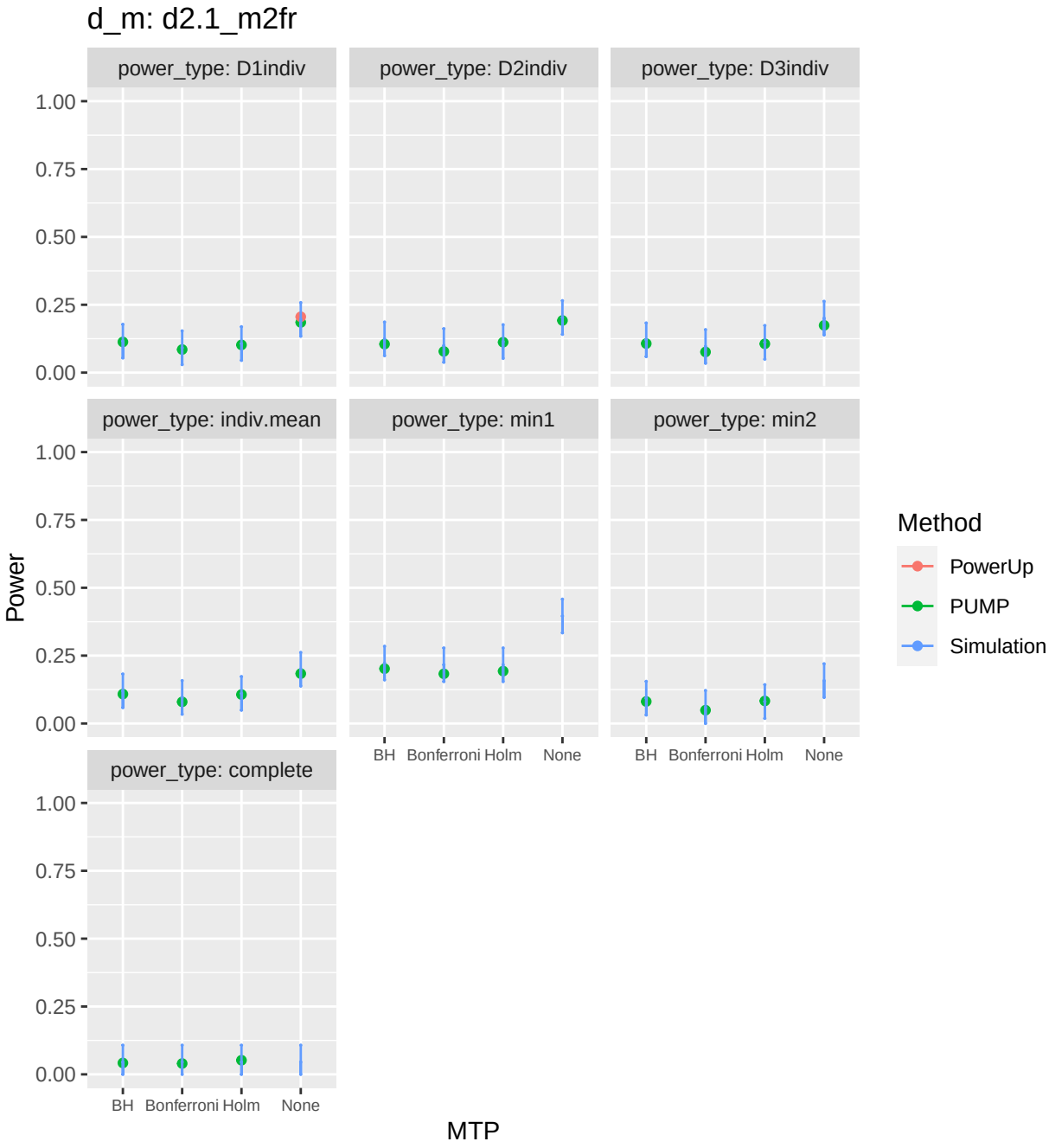

d_m: d2.1_m2ff
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BH
Bonferroni
Holm
None
MTP
Method
PowerUp
PUMP
Simulation


d_m: d2.1_m2fr
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
PowerUp
PUMP
Simulation

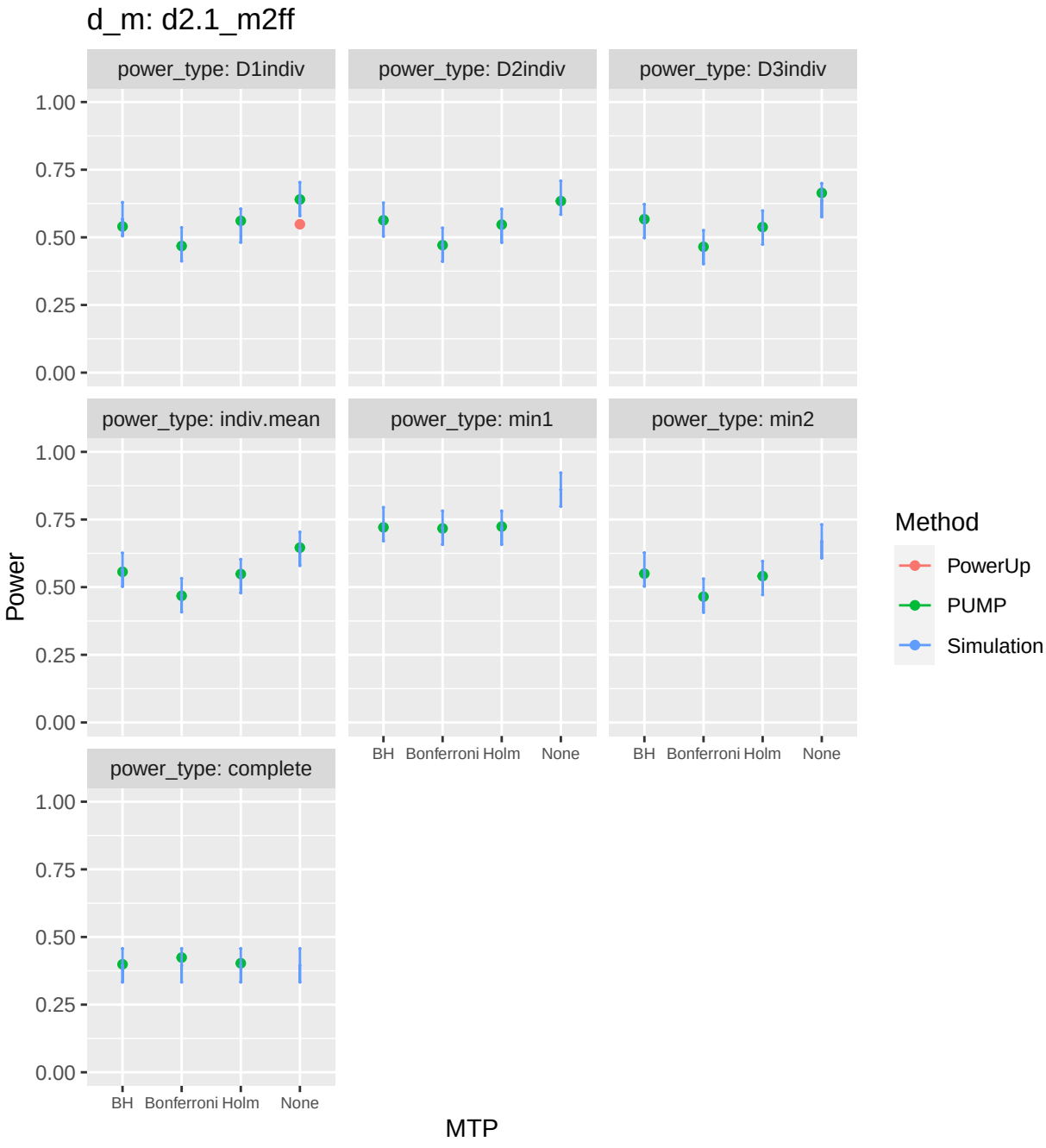
Varying Omega

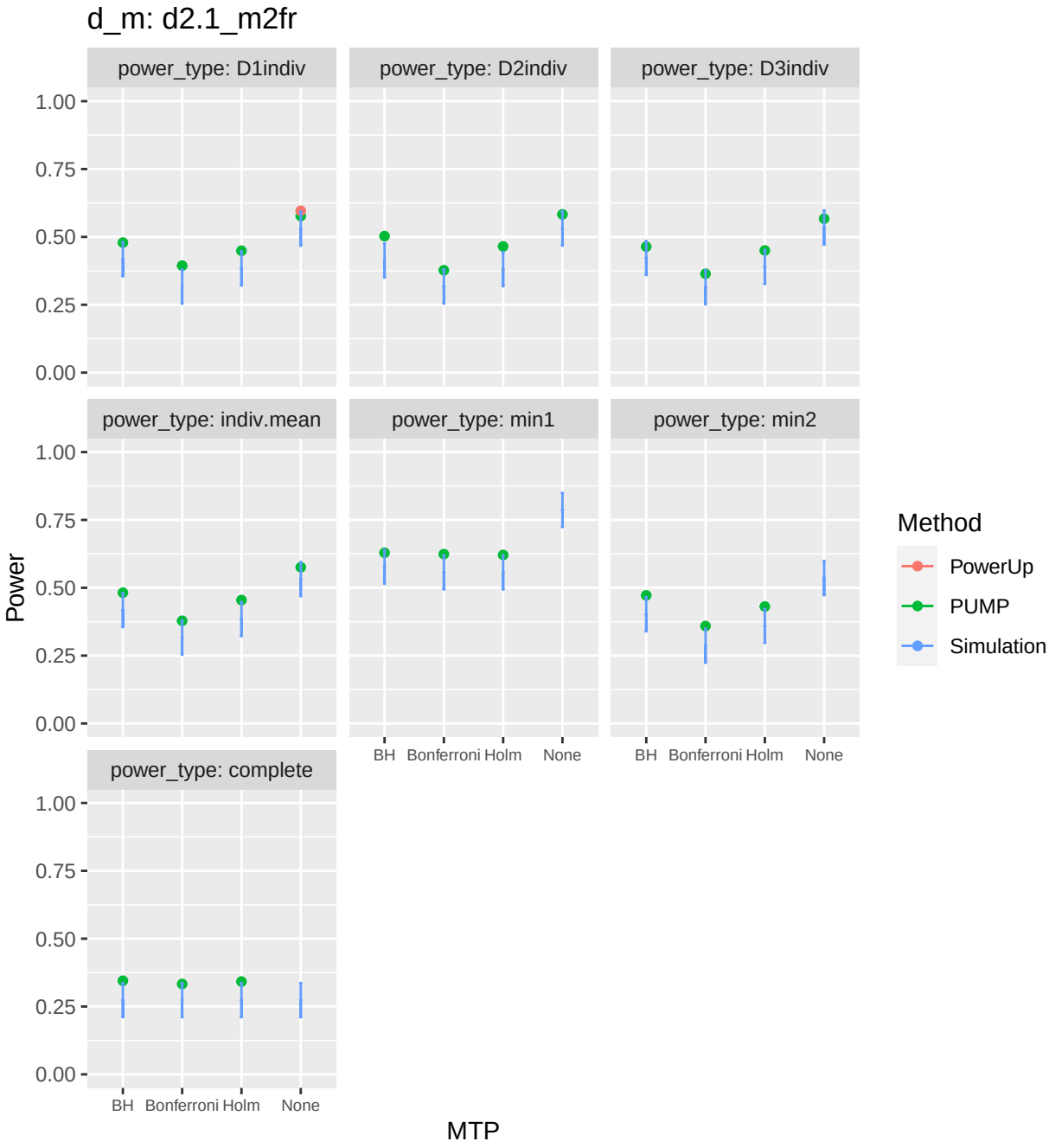
$\omega_2 = 0.8, 0.8, 0.8$




d_m: d2.1_m2fr
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
PowerUp
PUMP
Simulation

$\omega_2 = 0, 0, 0$


d_m: d2.1_m2ff
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
PowerUp
PUMP
Simulation


d_m: d2.1_m2fr
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
PowerUp
PUMP
Simulation

MDES validation

Target value: 0.125

```
##
##
## +------------+---------------+---------------+-------------+
## |    MTP     | Adjusted MDES | D1indiv Power | Target MDES |
## +============+===============+===============+=============+
## | Bonferroni |     0.129     |      0.5      |    0.125    |
## +------------+---------------+---------------+-------------+
## |     BH     |     0.128     |     0.583     |    0.125    |
## +------------+---------------+---------------+-------------+
## |    Holm    |     0.125     |     0.542     |    0.125    |
## +------------+---------------+---------------+-------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +------------+---------------+---------------+-------------+
## |    MTP     | Adjusted MDES | D1indiv Power | Target MDES |
## +============+===============+===============+=============+
## | Bonferroni |     0.122     |     0.447     |    0.125    |
## +------------+---------------+---------------+-------------+
## |     BH     |     0.127     |     0.578     |    0.125    |
## +------------+---------------+---------------+-------------+
## |    Holm    |     0.125     |     0.54      |    0.125    |
## +------------+---------------+---------------+-------------+
##
## Table: d2.1_m2ff
```

```
##
##
## +------------+---------------+---------------+-------------+
## |    MTP     | Adjusted MDES | D1indiv Power | Target MDES |
## +============+===============+===============+=============+
## | Bonferroni |     0.125     |     0.266     |    0.125    |
## +------------+---------------+---------------+-------------+
## |     BH     |     0.124     |     0.346     |    0.125    |
## +------------+---------------+---------------+-------------+
## |    Holm    |     0.125     |     0.32      |    0.125    |
## +------------+---------------+---------------+-------------+
##
## Table: d2.1_m2fr
```

Sample size validation

Target value: 20

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      J      |     21      |      0.5      |
## +------------+-------------+-------------+---------------+
## |     BH     |      J      |     21      |     0.58      |
## +------------+-------------+-------------+---------------+
## |    Holm    |      J      |     20      |     0.544     |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |    nbar     |    53.82    |      0.5      |
## +------------+-------------+-------------+---------------+
## |     BH     |    nbar     |     53      |     0.588     |
## +------------+-------------+-------------+---------------+
## |    Holm    |    nbar     |     50      |     0.539     |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2fc
```

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      J      |     19      |     0.447     |
## +------------+-------------+-------------+---------------+
## |     BH     |      J      |     21      |     0.578     |
## +------------+-------------+-------------+---------------+
## |    Holm    |      J      |     21      |     0.55      |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2ff
```

Target value: 50

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |    nbar     |    48.1     |     0.447     |
## +------------+-------------+-------------+---------------+
## |     BH     |    nbar     |     52      |     0.581     |
```

```
## +------------+-------------+-------------+---------------+
## |    Holm    |    nbar     |     50      |     0.544     |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2ff
```

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      J      |     20      |     0.266     |
## +------------+-------------+-------------+---------------+
## |     BH     |      J      |     21      |     0.356     |
## +------------+-------------+-------------+---------------+
## |    Holm    |      J      |     21      |     0.324     |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2fr
```

```
##
##
## +------------+-------------+-------------+---------------+
## |    MTP     | Sample.type | Sample.size | D1indiv.power |
## +============+=============+=============+===============+
## | Bonferroni |      J      |     20      |     0.266     |
## +------------+-------------+-------------+---------------+
## |     BH     |      J      |     21      |     0.356     |
## +------------+-------------+-------------+---------------+
## |    Holm    |      J      |     21      |     0.324     |
## +------------+-------------+-------------+---------------+
##
## Table: d2.1_m2fr
```