Validate Power: d3.3

February 25, 2022

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

Models: random treatment effects.

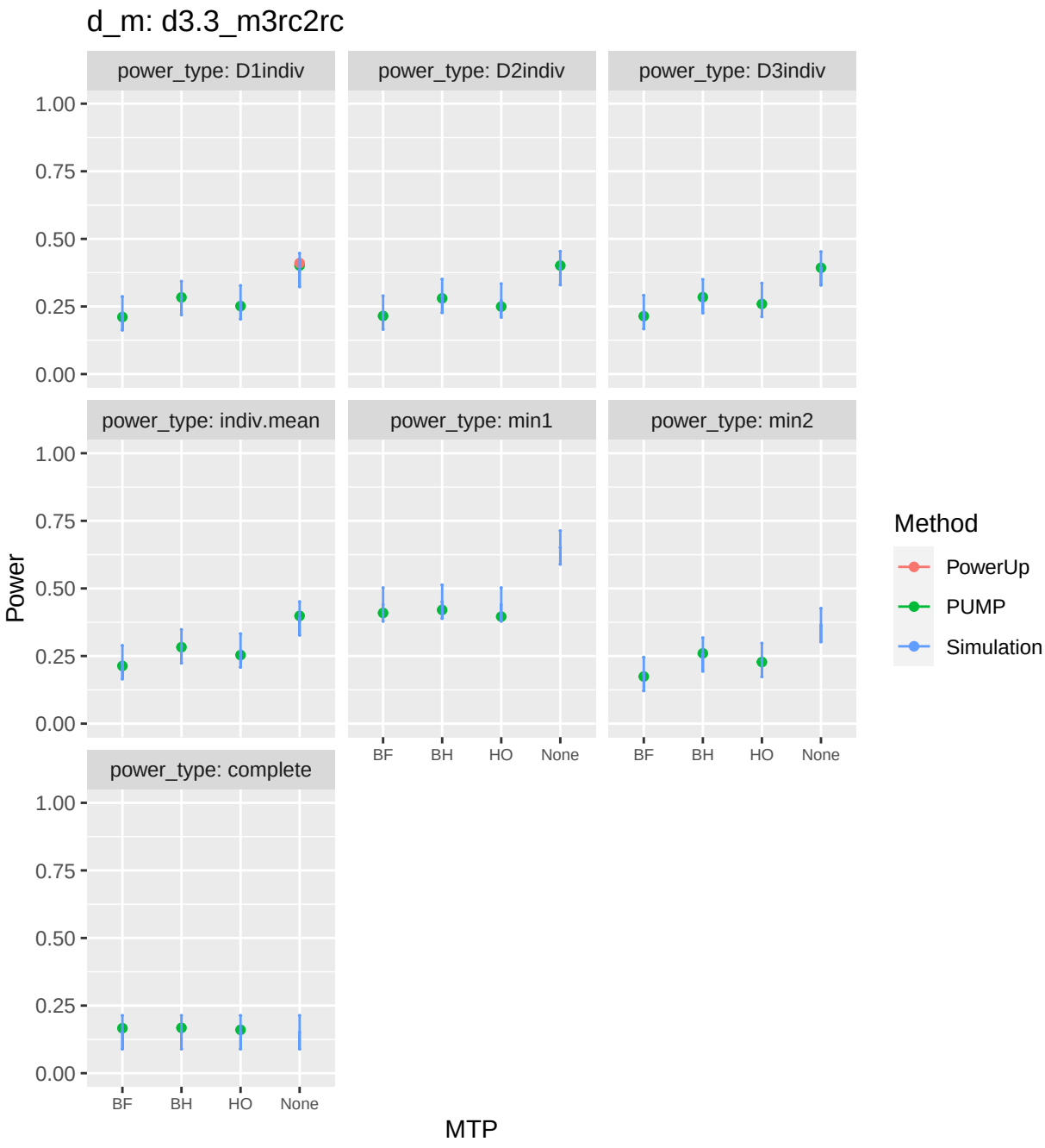
d_m codes: `d3.3_m3rc2rc`

Power Validation

Default parameters:

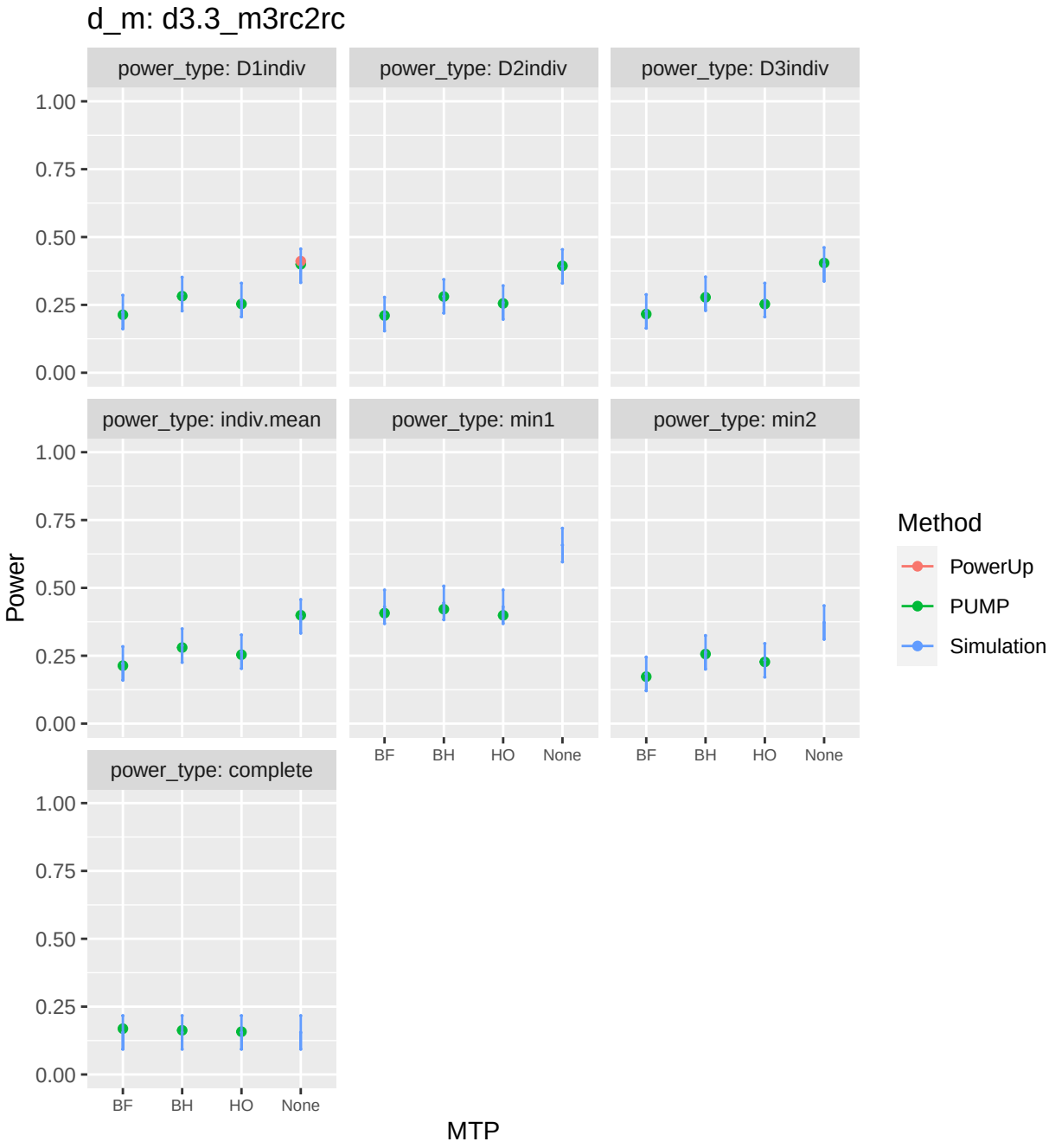
- M = 3
- J = 40
- K = 20
- rho: $\rho = 0.5$
- MDES = 0.25, 0.25, 0.25
- R2: $R_1^2 = 0.1, 0.1, 0.1$, $R_2^2 = 0.1, 0.1, 0.1$, $R_3^2 = 0.1, 0.1, 0.1$
- ICC: $\text{ICC}_2 = 0.1, 0.1, 0.1$, $\text{ICC}_3 = 0.1, 0.1, 0.1$
- Omega: $\omega_2 = 0$, $\omega_3 = 0$

Base case

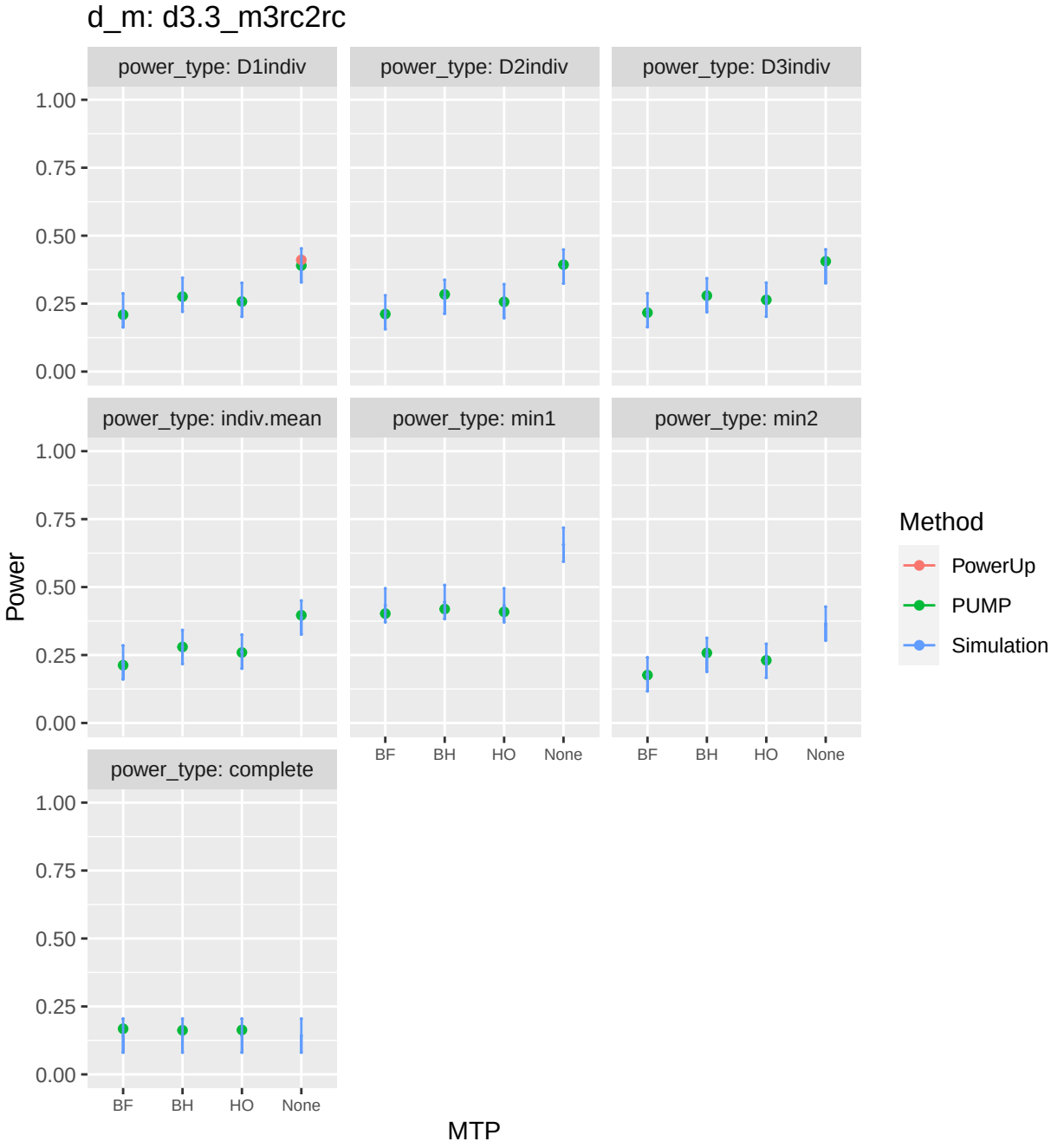

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying school size

$\bar{n} = 100$

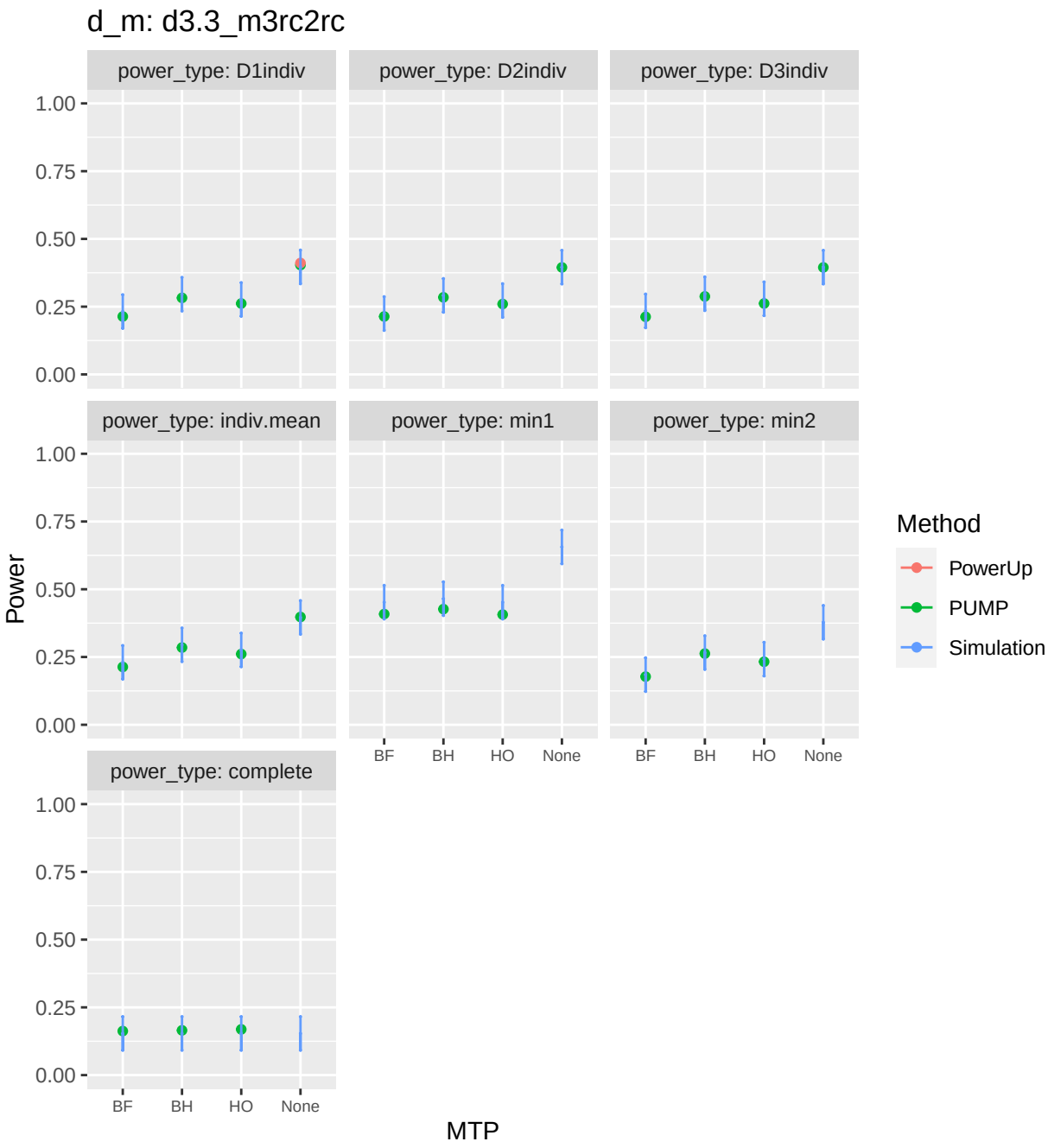


$\bar{n} = 75$

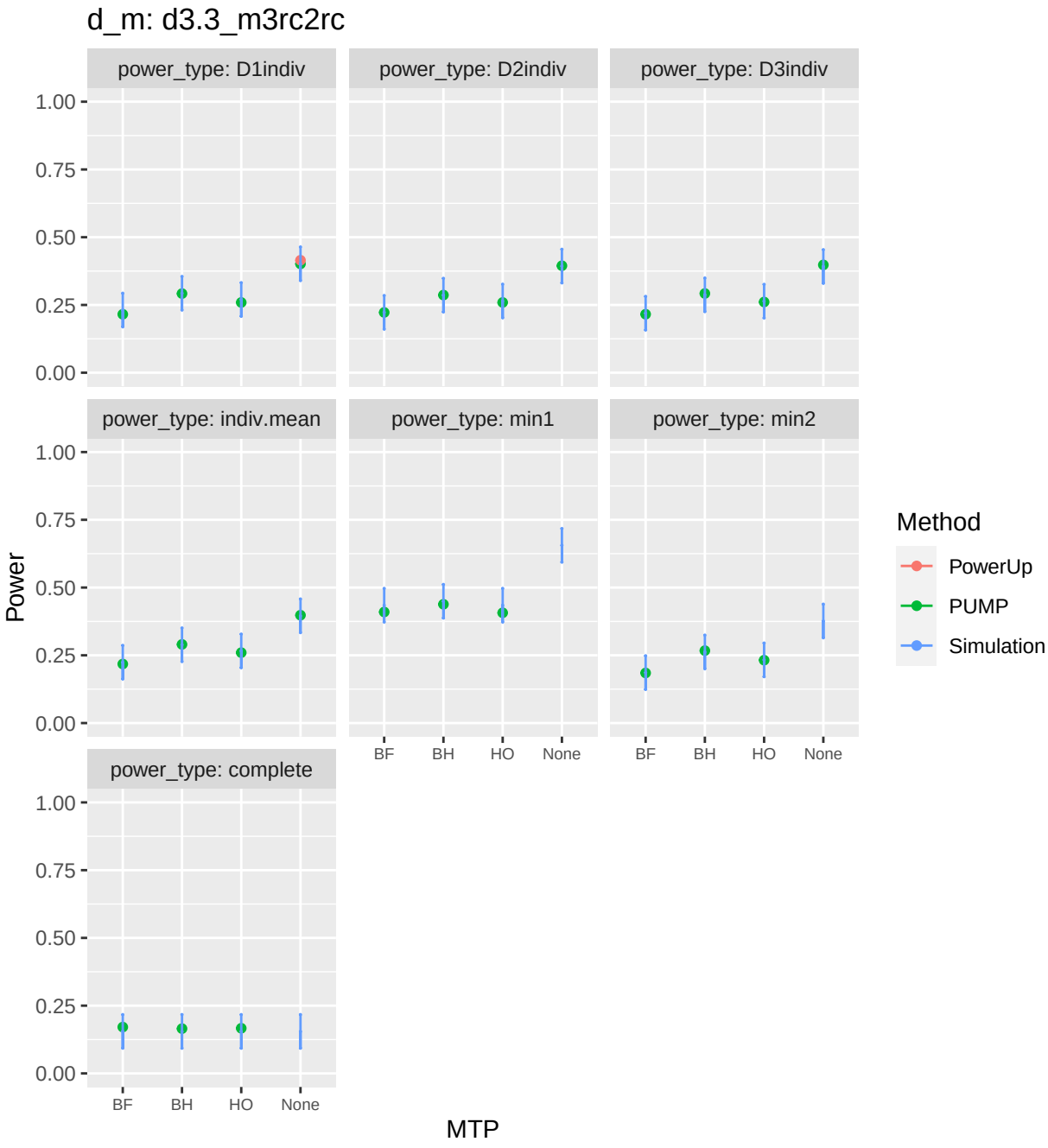

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying R2

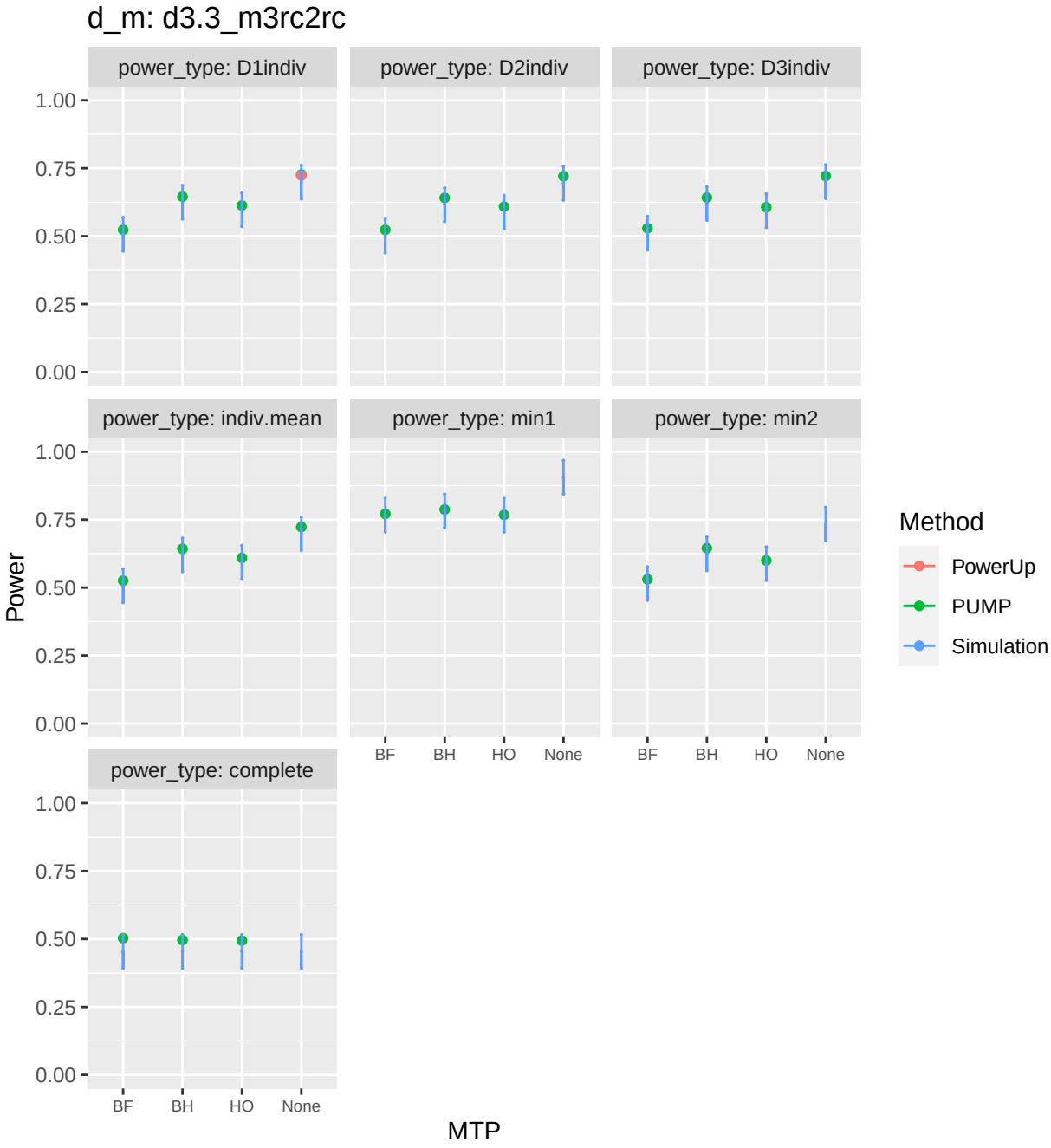
$R_1^2 = 0.6, 0.6, 0.6$



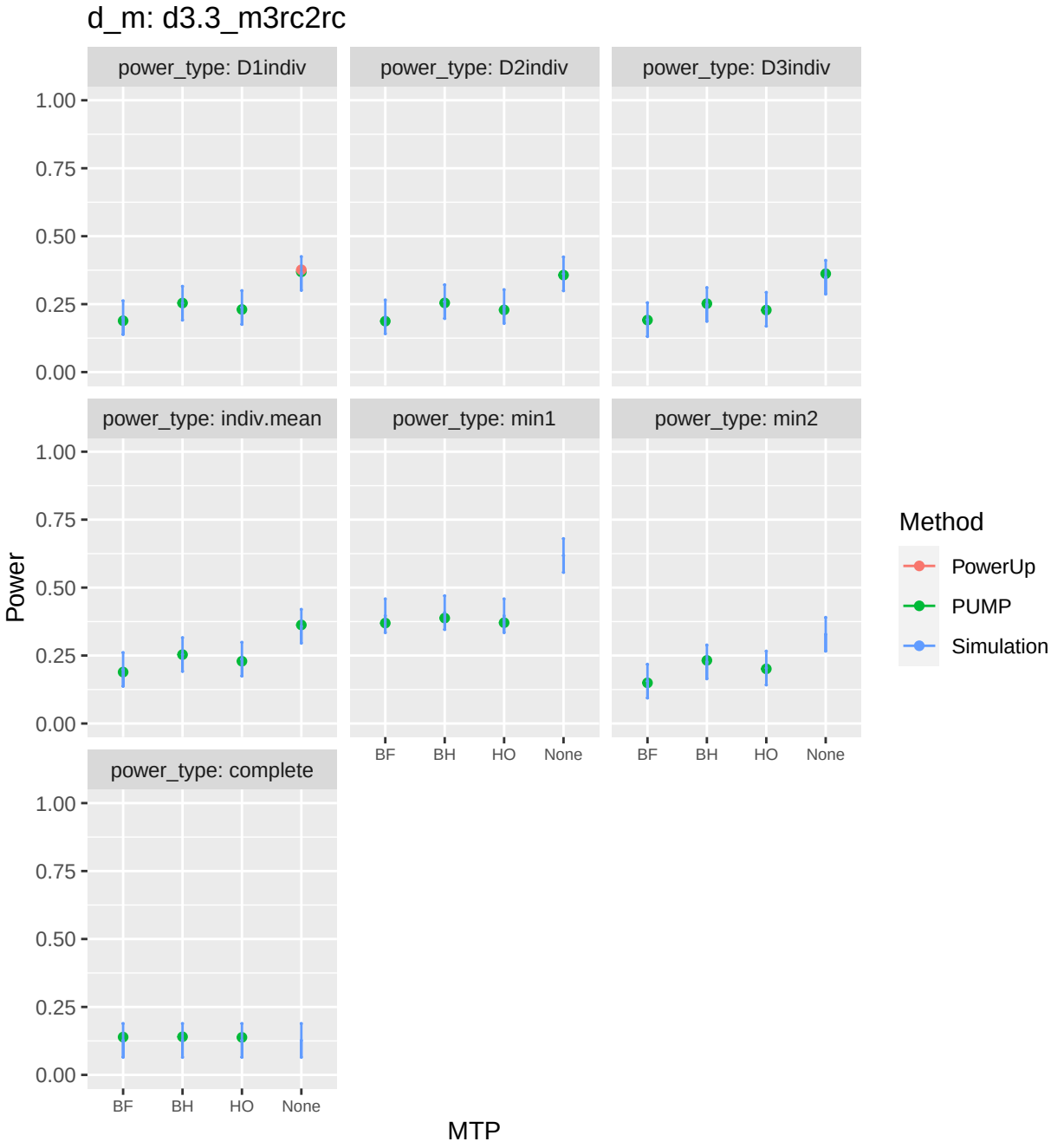
$R_2^2 = 0.6, 0.6, 0.6$


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
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

$R_3^2 = 0.6, 0.6, 0.6$

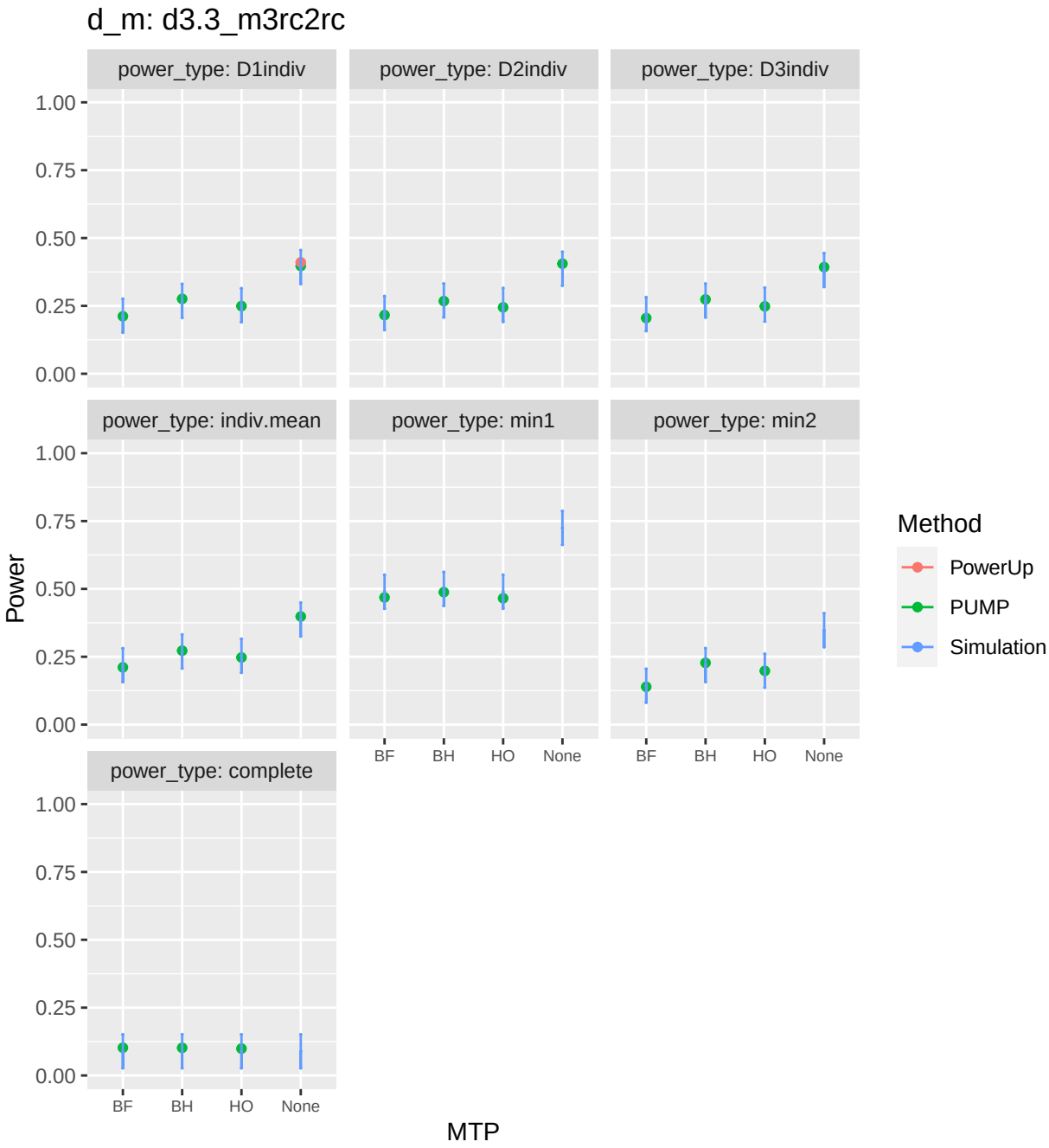

d_m: d3.3_m3rc2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

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

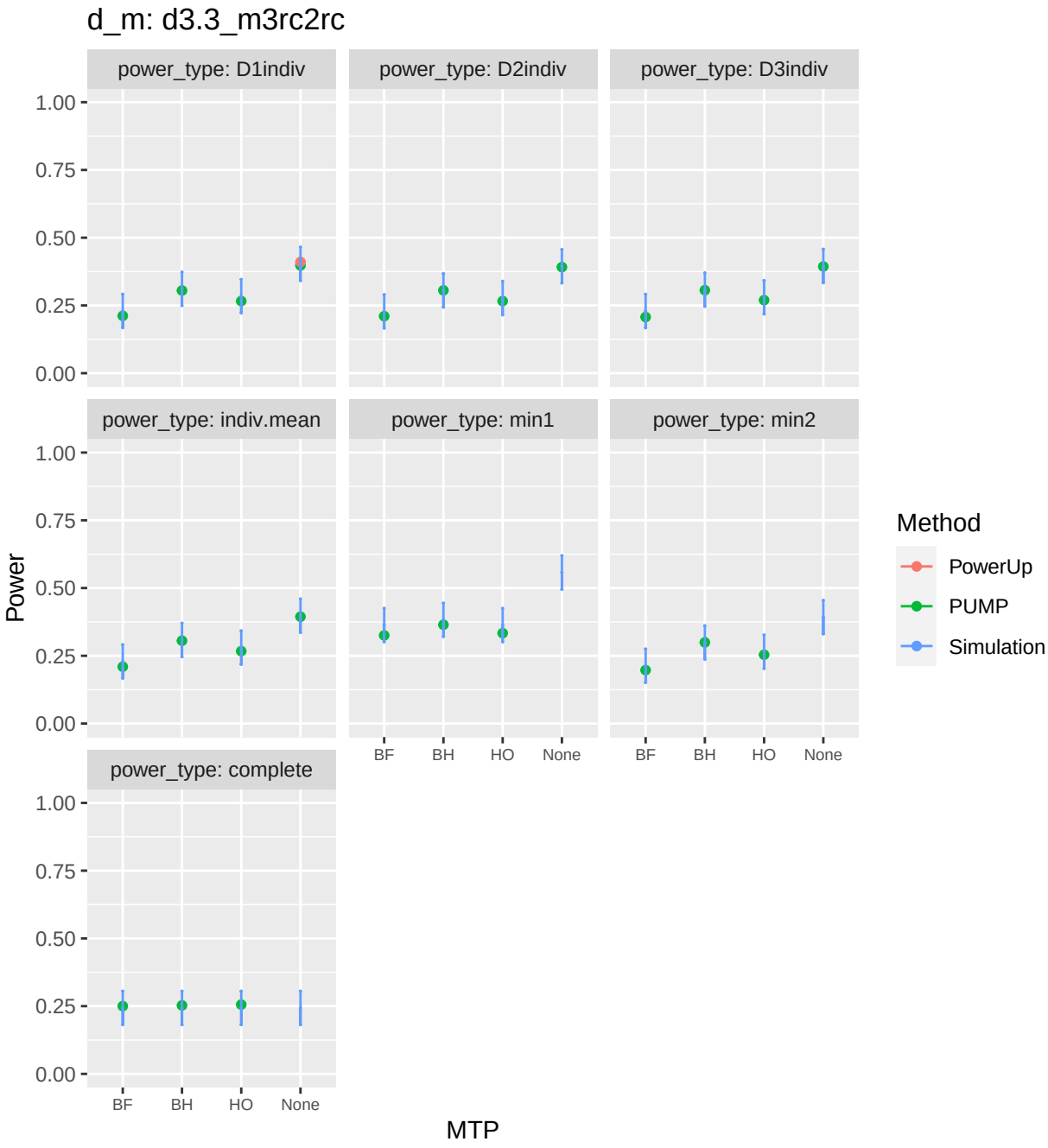


Varying rho

$\rho = 0.2$

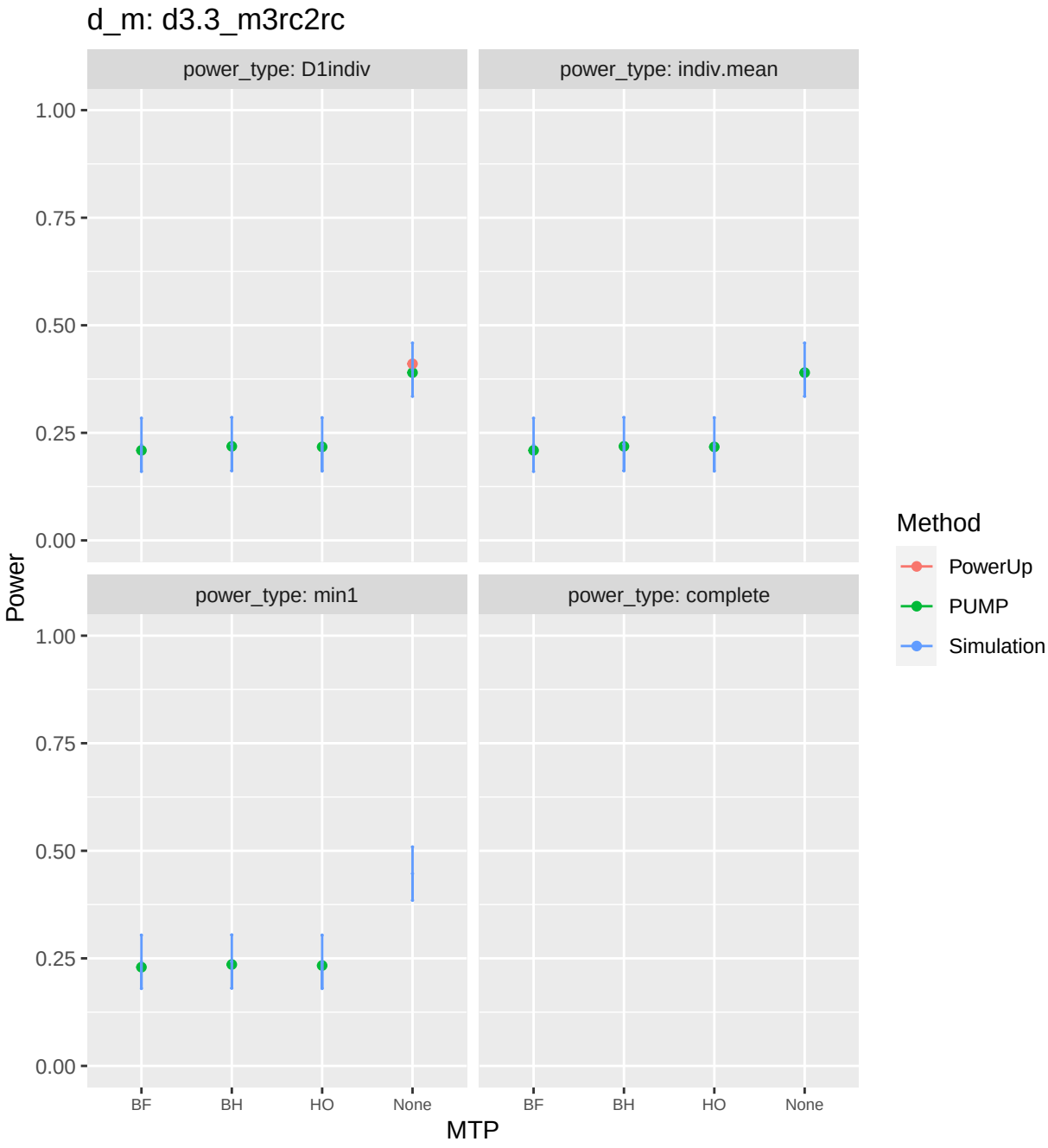


$\rho = 0.8$


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
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

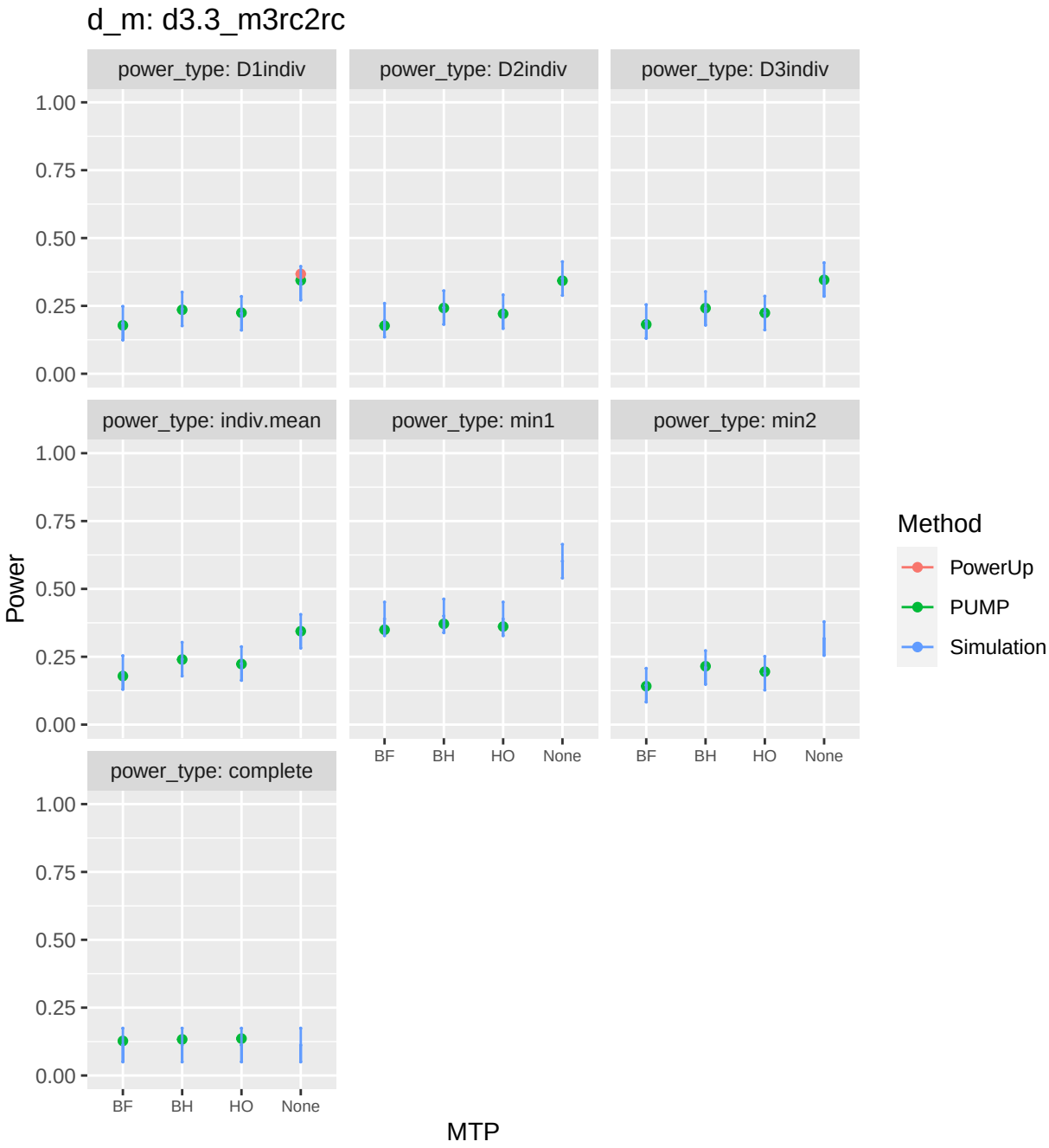
Varying true positives

MDES = 0.25, 0, 0

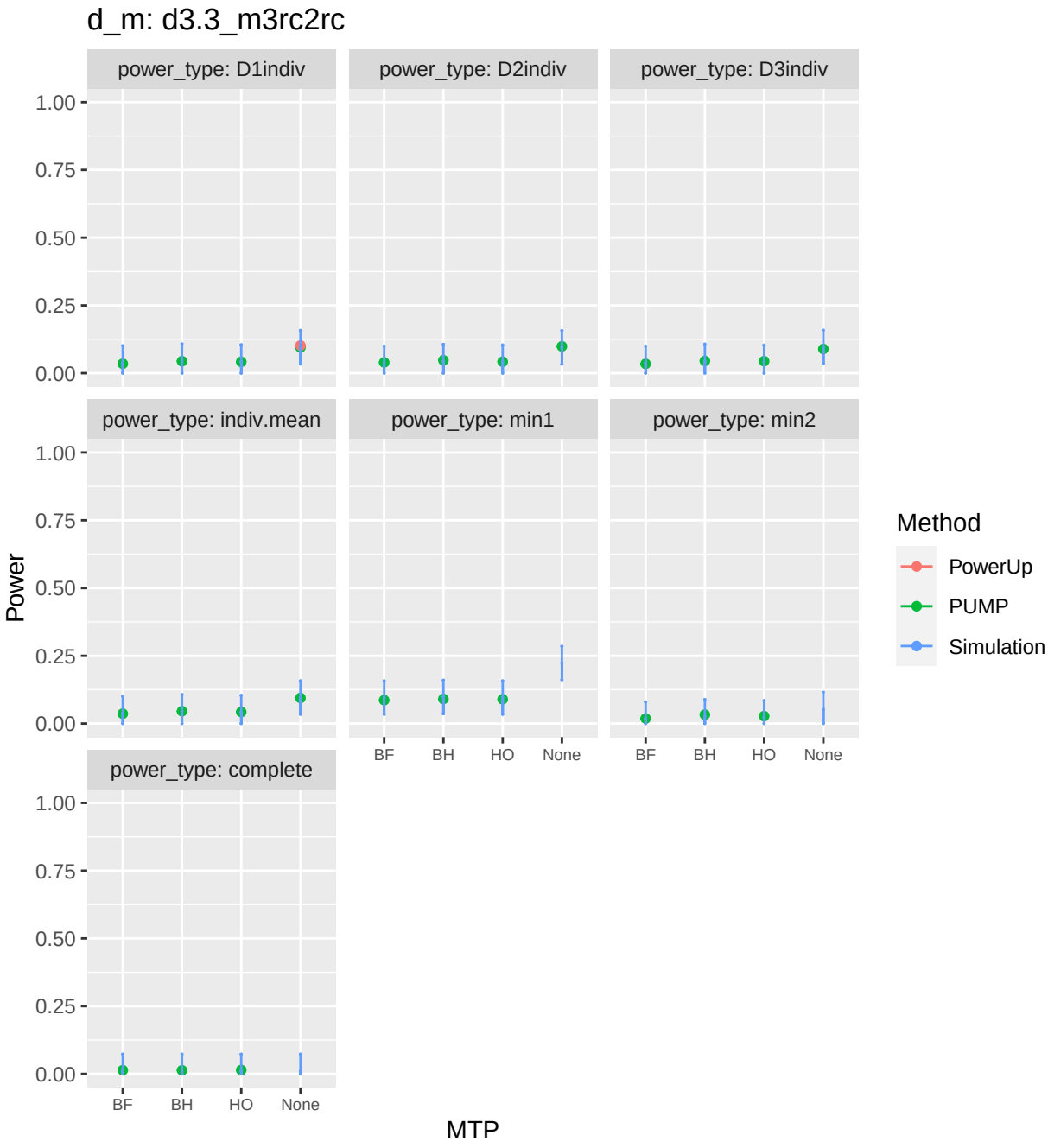


Varying ICC

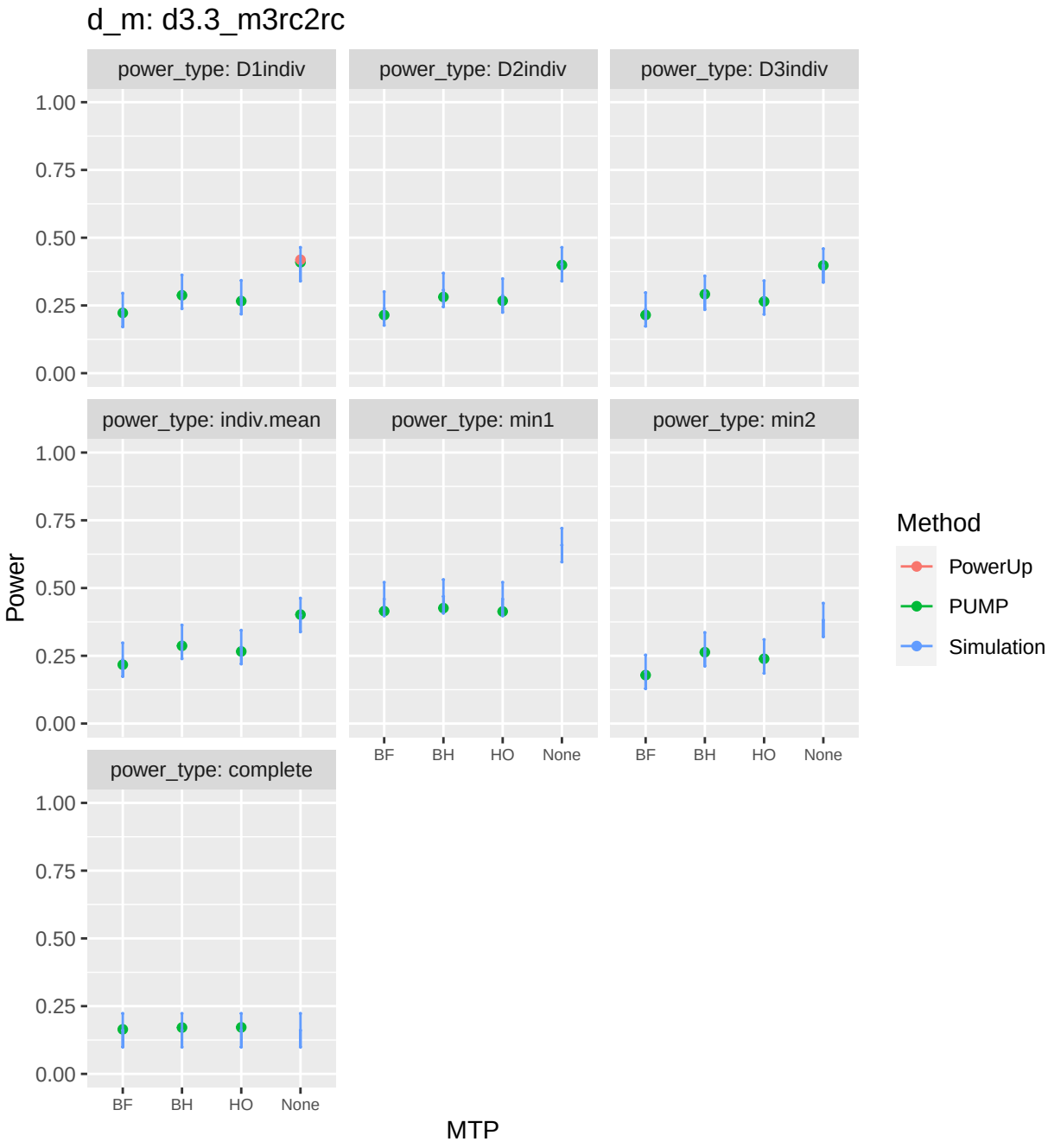
$\text{ICC}_2 = 0.7, 0.7, 0.7$



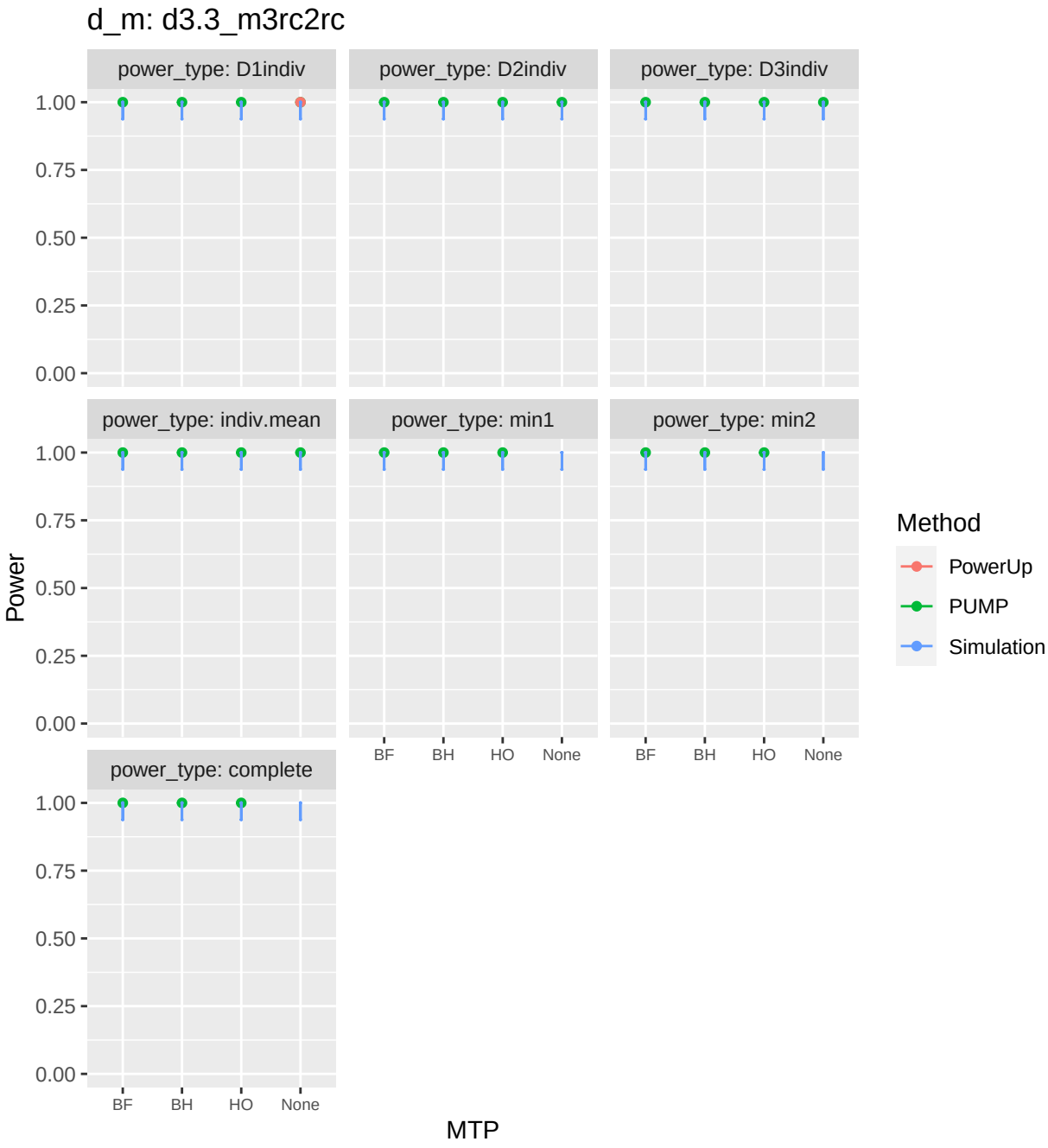
$\text{ICC}_3 = 0.7, 0.7, 0.7$



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



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



MDES validation

Target value: 0.25

```
##
##
## +-----+---------------+---------------+-------------+--------------+------+---+------+
## | MTP | Adjusted MDES | D1indiv Power | Target MDES |     d_m      |  S   | M | MDES |
## +=====+===============+===============+=============+==============+======+===+======+
## | BF  |     0.249     |     0.211     |    0.25     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+---------------+---------------+-------------+--------------+------+---+------+
## | BH  |     0.251     |     0.284     |    0.25     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+---------------+---------------+-------------+--------------+------+---+------+
## | HO  |     0.247     |     0.25      |    0.25     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+---------------+---------------+-------------+--------------+------+---+------+
##
## Table: d3.3_m3rc2rc (continued below)
##
##
##
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## | numZero | J  | K  | nbar | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +=========+====+====+======+=====+=========+=========+======+======+======+=======+=======+
## |    0    | 40 | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
```

Sample size validation

Target value: 20

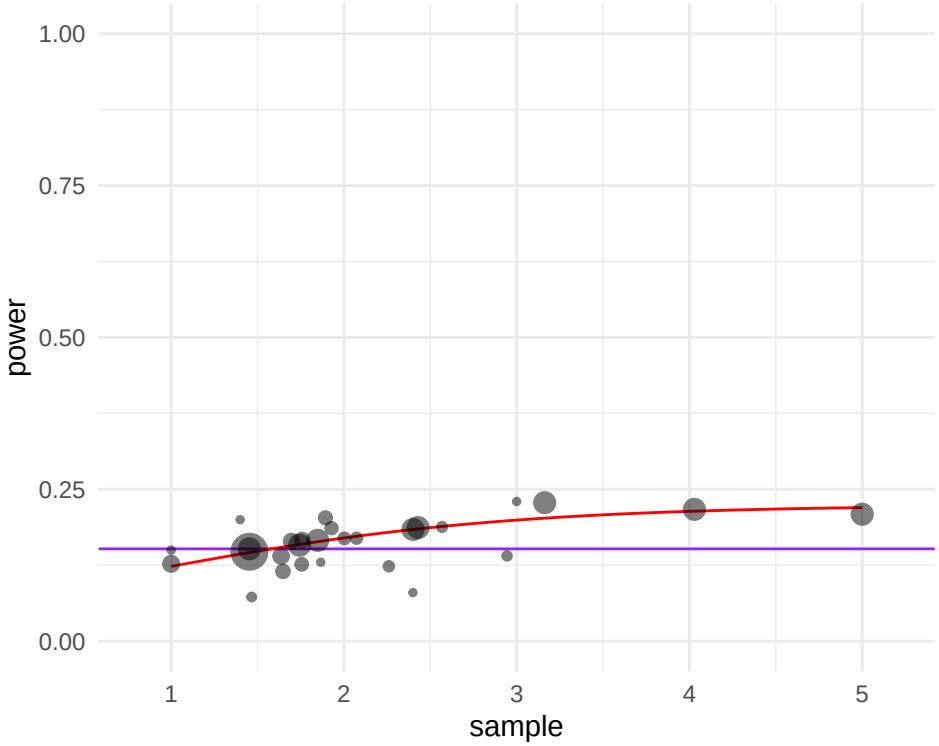
```
##
##
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | MTP | Sample.type | Sample.size | D1indiv.power |     d_m      |  S   | M | MDES |
## +=====+=============+=============+===============+==============+======+===+======+
## | BF  |      K      |     20      |     0.211     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | BH  |      K      |     20      |     0.278     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | HO  |      K      |     21      |     0.26      | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
##
## Table: d3.3_m3rc2rc (continued below)
##
##
##
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## | numZero | J  | K  | nbar | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +=========+====+====+======+=====+=========+=========+======+======+======+=======+=======+
```

```
## |    0    | 40 | NA |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | NA |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | NA |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
```

Target value: 40

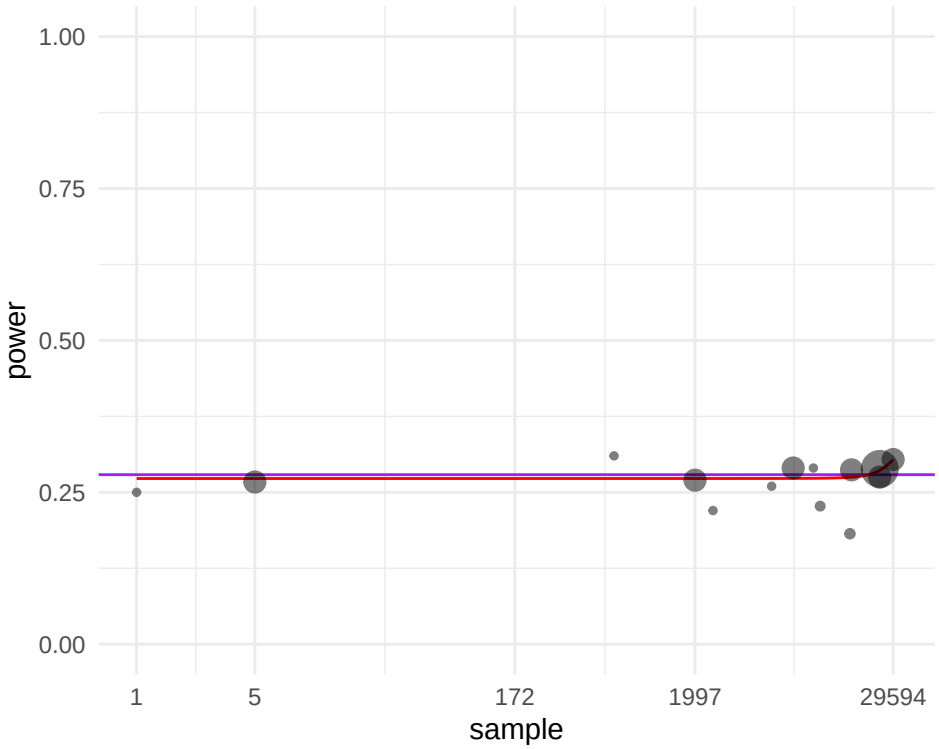
```
##
##
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | MTP | Sample.type | Sample.size | D1indiv.power |     d_m      |  S   | M | MDES |
## +=====+=============+=============+===============+==============+======+===+======+
## | BF  |      J      |     34      |     0.211     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | BH  |      J      |     998     |     0.29      | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | HO  |      J      |     36      |     0.255     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
##
## Table: d3.3_m3rc2rc (continued below)
##
##
##
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## | numZero | J  | K  | nbar | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +=========+====+====+======+=====+=========+=========+======+======+======+=======+=======+
## |    0    | NA | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | NA | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | NA | 20 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+------+-----+---------+---------+------+------+------+-------+-------+
```

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 |     d_m      |  S   | M | MDES |
## +=====+=============+=============+===============+==============+======+===+======+
## | BF  |    nbar     |    21.35    |     0.211     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | BH  |    nbar     |     408     |     0.282     | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
## | HO  |    nbar     |     NA      |      NA       | d3.3_m3rc2rc | 5000 | 3 | 0.25 |
## +-----+-------------+-------------+---------------+--------------+------+---+------+
##
## Table: d3.3_m3rc2rc (continued below)
##
##
##
## +---------+----+----+-----+---------+---------+------+------+------+-------+-------+
## | numZero | J  | K  | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +=========+====+====+=====+=========+=========+======+======+======+=======+=======+
## |    0    | 40 | 20 | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | 20 | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 40 | 20 | 0.5 |   NA    |   NA    | 0.1  | 0.1  | 0.1  |  0.1  |  0.1  |
## +---------+----+----+-----+---------+---------+------+------+------+-------+-------+
```


1.00
0.75
0.50
0.25
0.00
power
1
5
172
1997
29594
sample