Validate Power: d2.2

February 25, 2022

Design: Cluster RCT, with 2 levels, and randomization done at level 2 (school level).

Models: random treatment effects.

Default parameters:

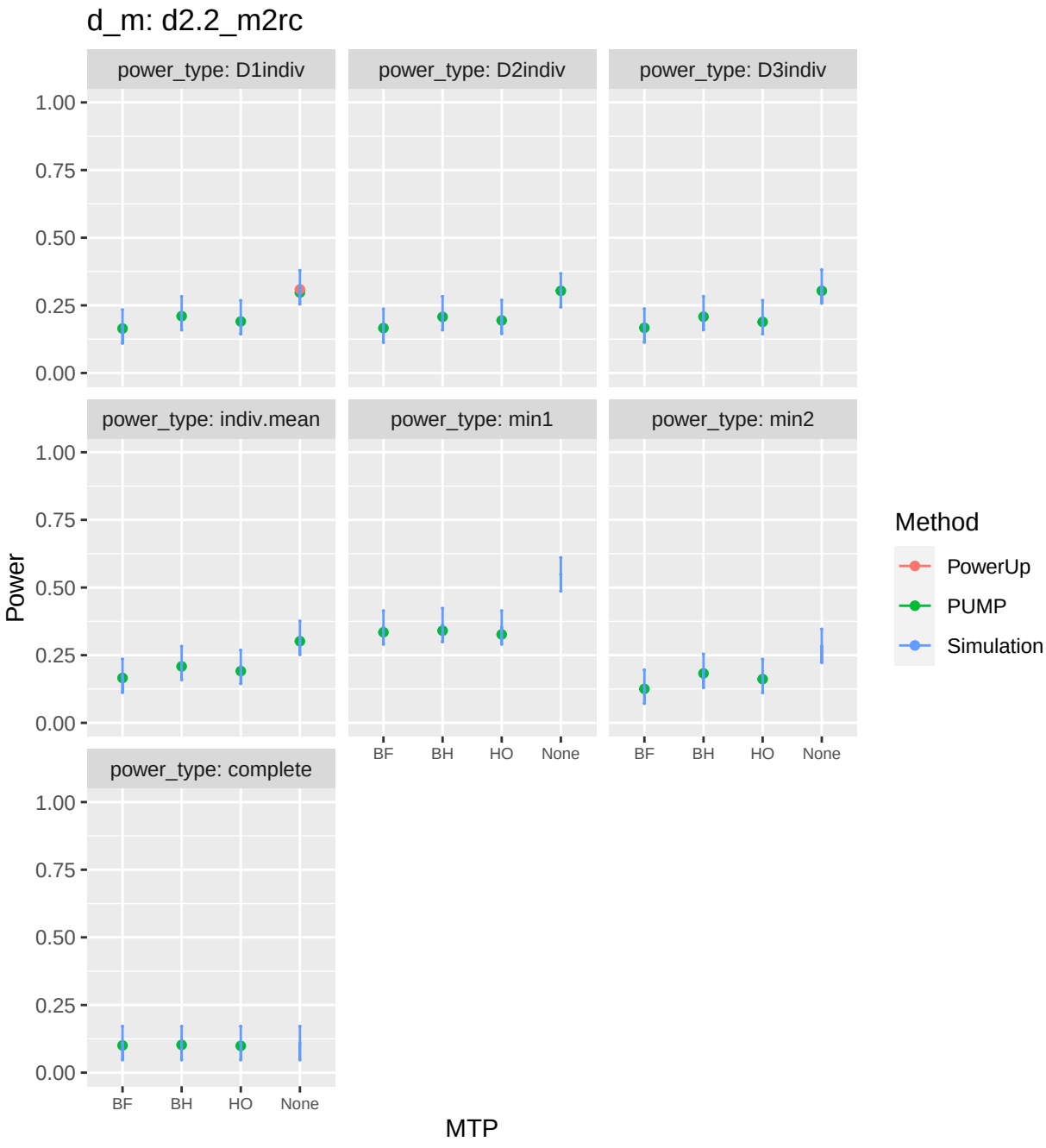
- M = 3
- J = 60
- rho: $\rho = 0.5$
- MDES = 0.125, 0.125, 0.125
- R2: $R_1^2 = 0.1, 0.1, 0.1$, $R_2^2 = 0.1, 0.1, 0.1$
- ICC: $\text{ICC}_2 = 0.1, 0.1, 0.1$

Assumptions

- Two-level design: $\text{ICC}_3 = 0$, $\omega_3 = 0$, $K = 1$
- Constant treatment effects: $\omega_2 = 0$

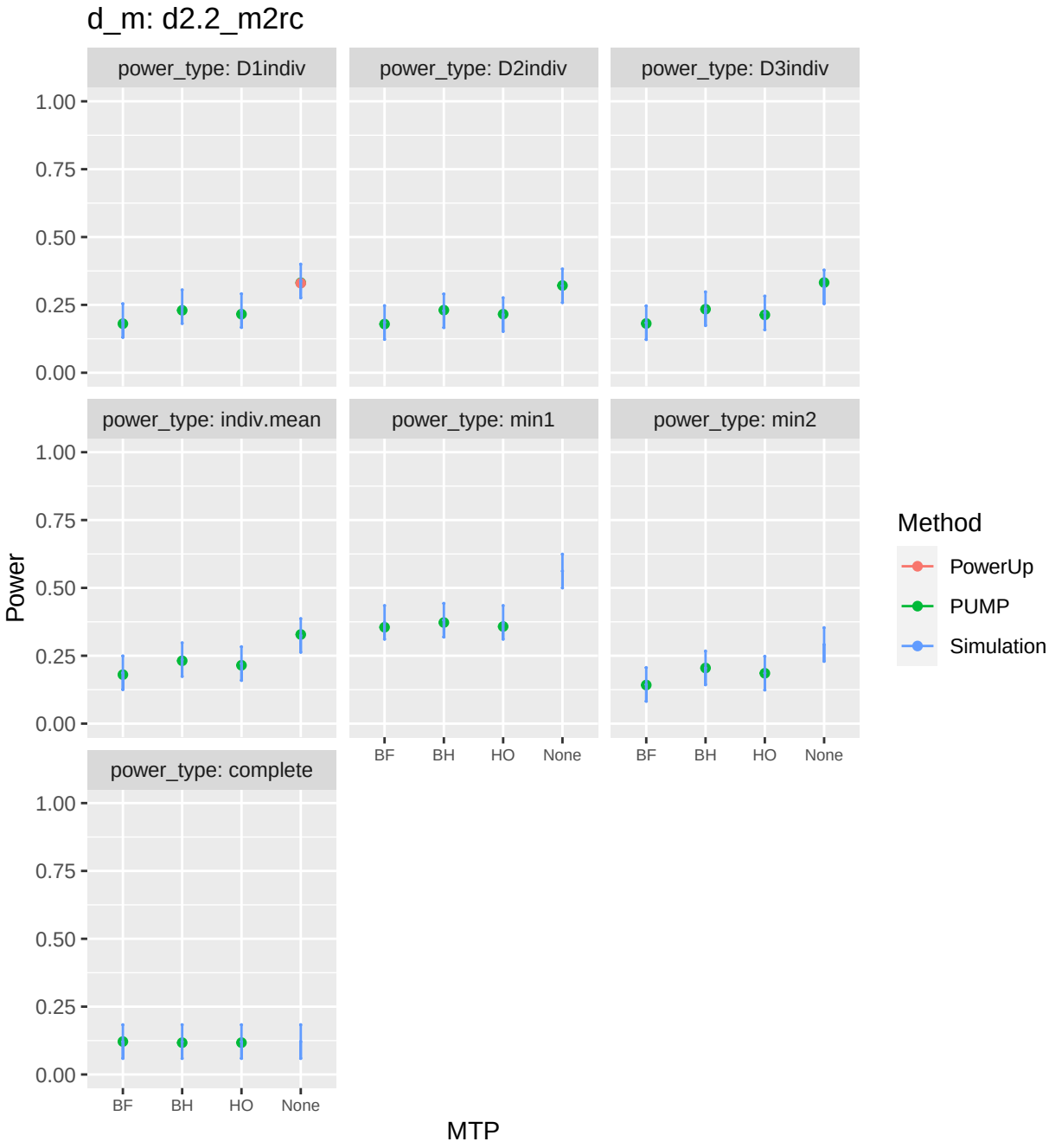
Power Validation

Base case

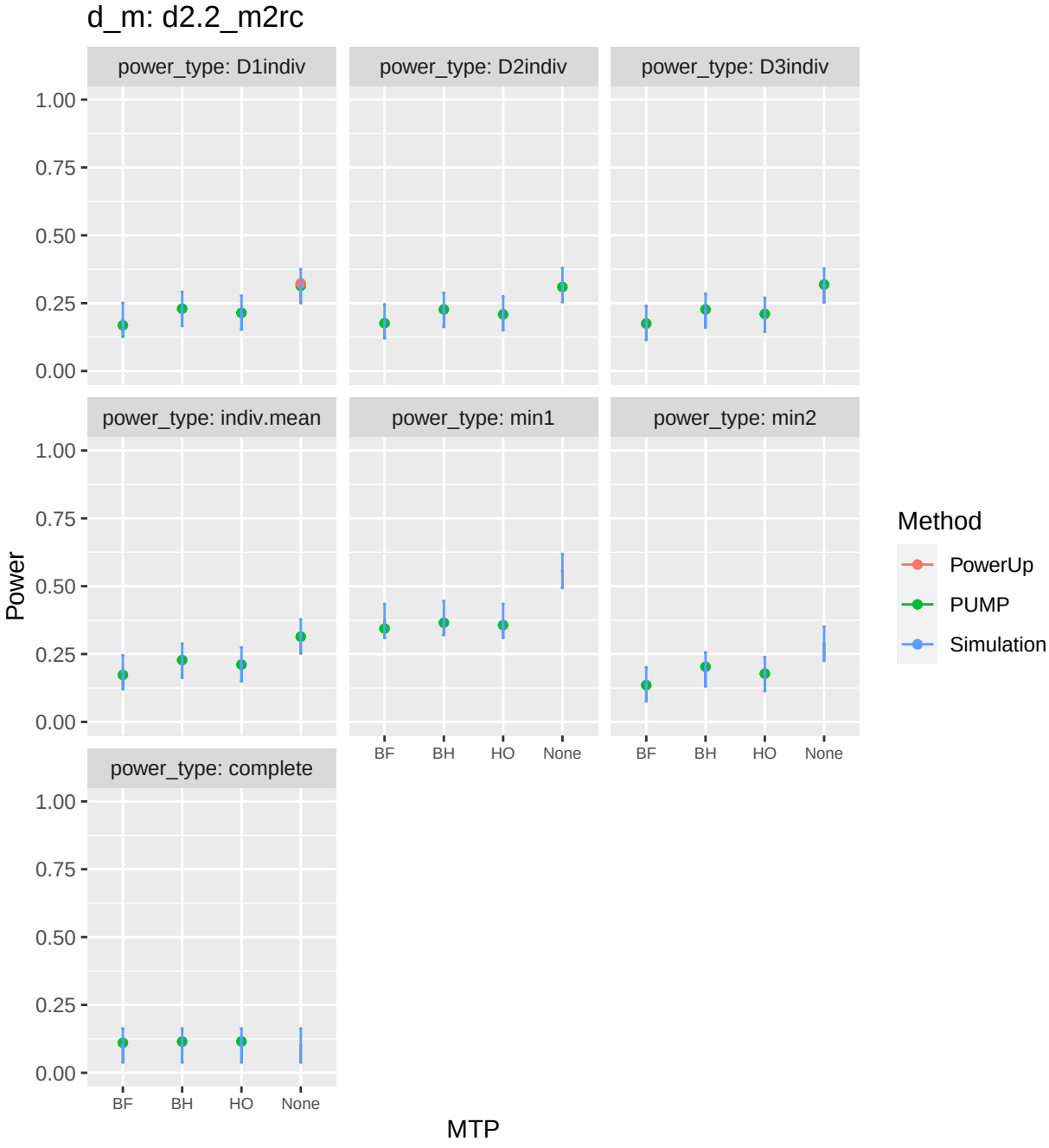


Varying school size

$\bar{n} = 100$

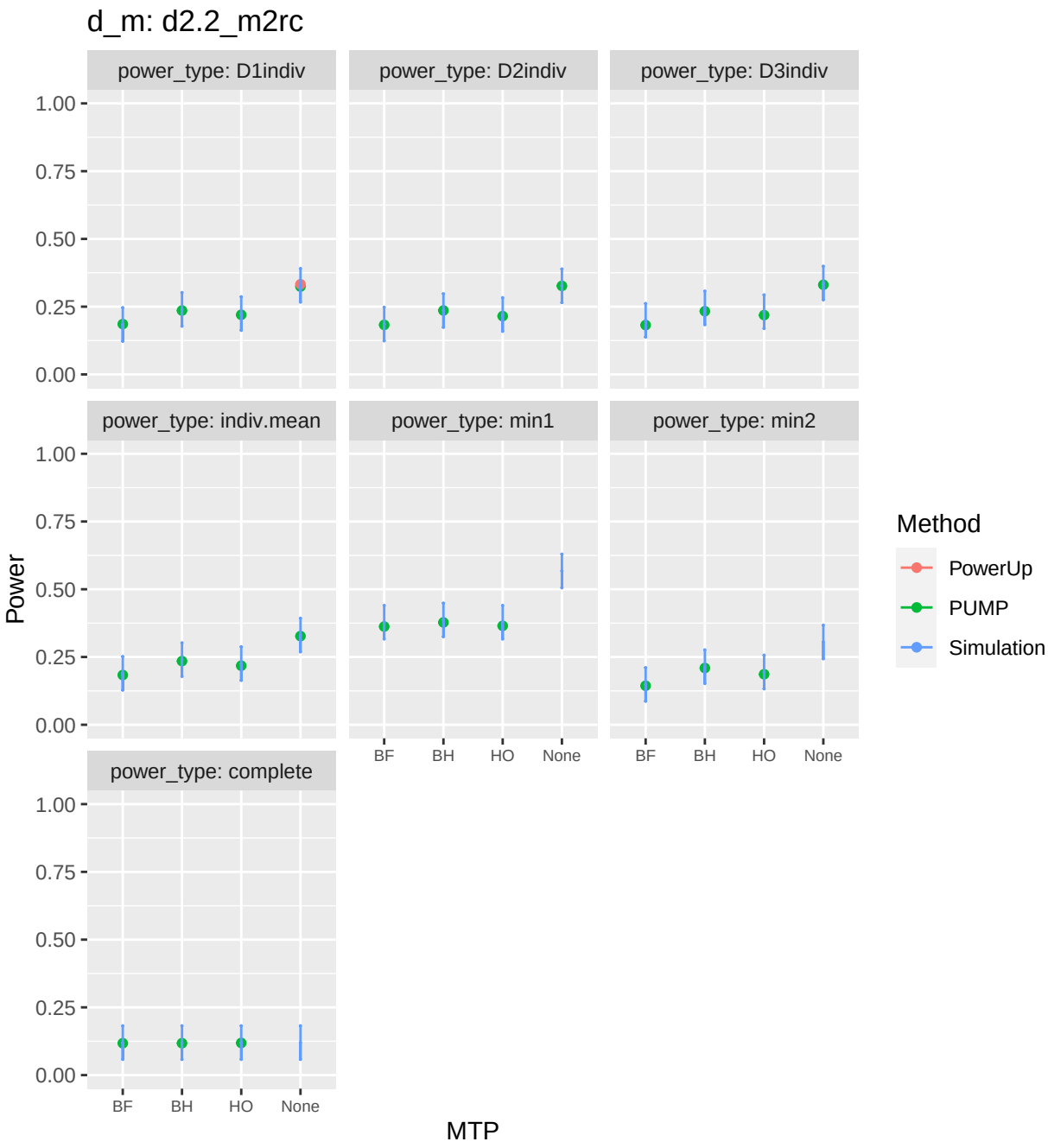


$\bar{n} = 75$

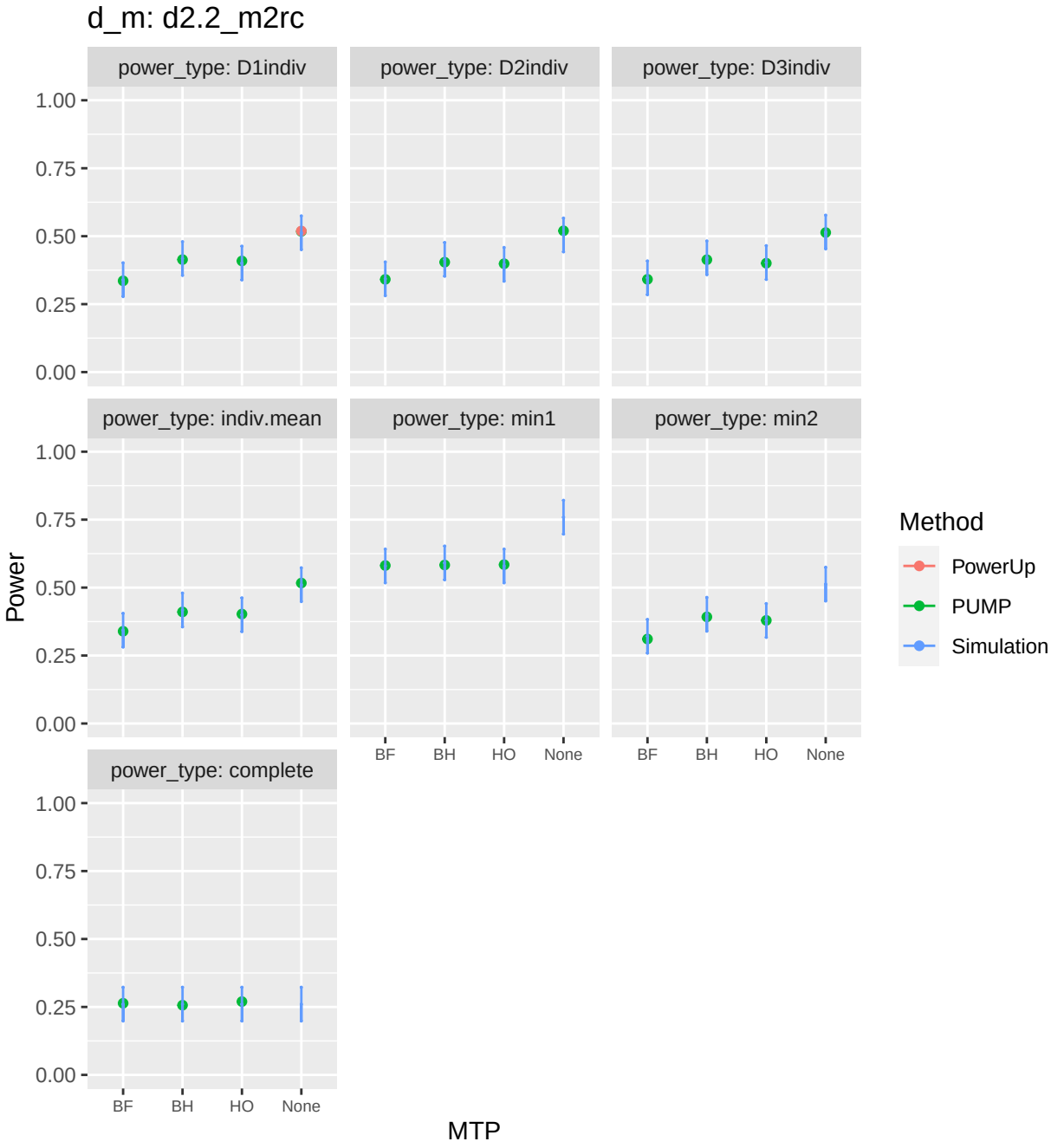

d_m: d2.2_m2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
Power
1.00
0.75
0.50
0.25
0.00
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

Varying R2

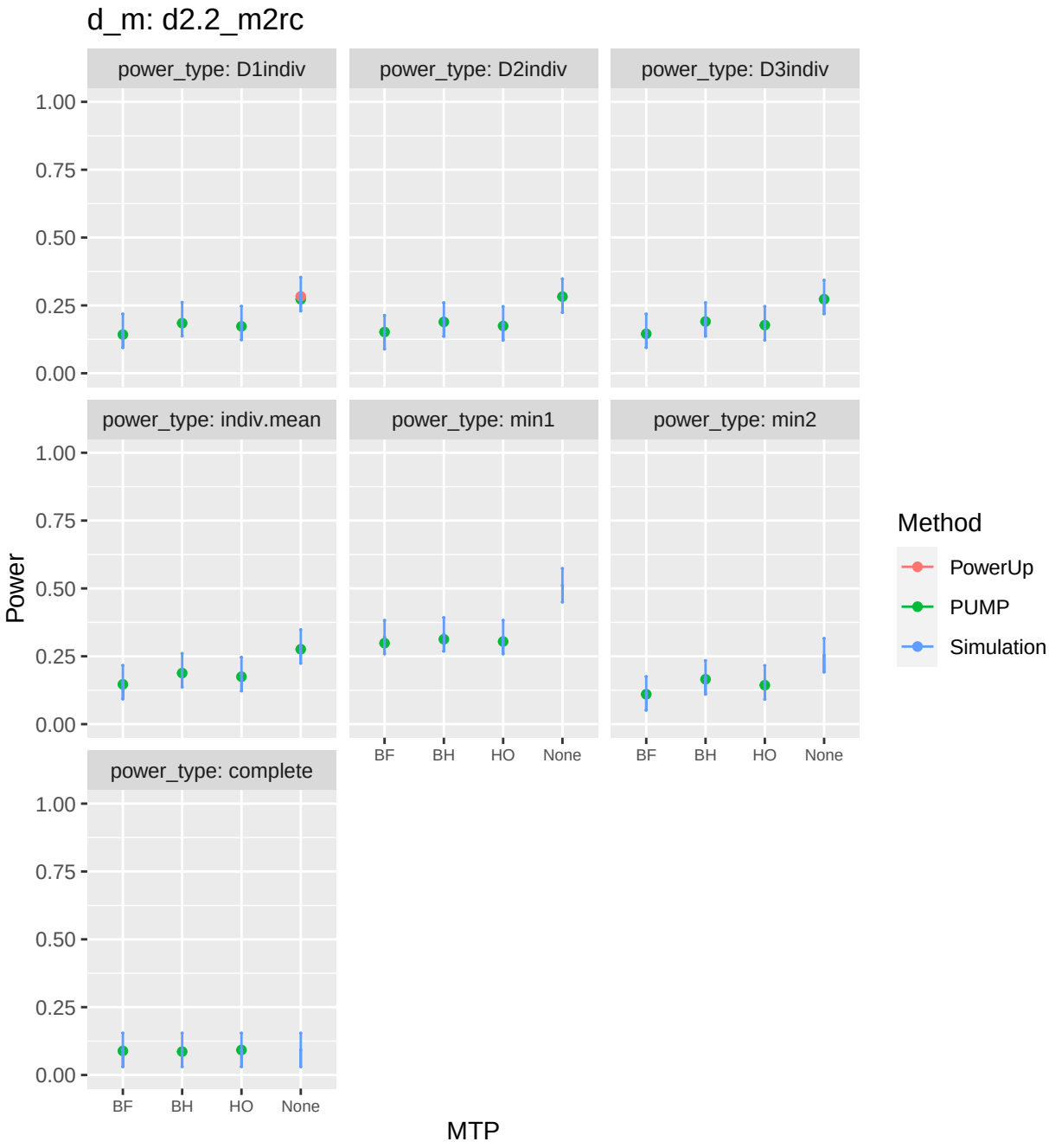
$R_1^2 = 0.6,\ 0.6,\ 0.6$



$R_2^2 = 0.6, 0.6, 0.6$

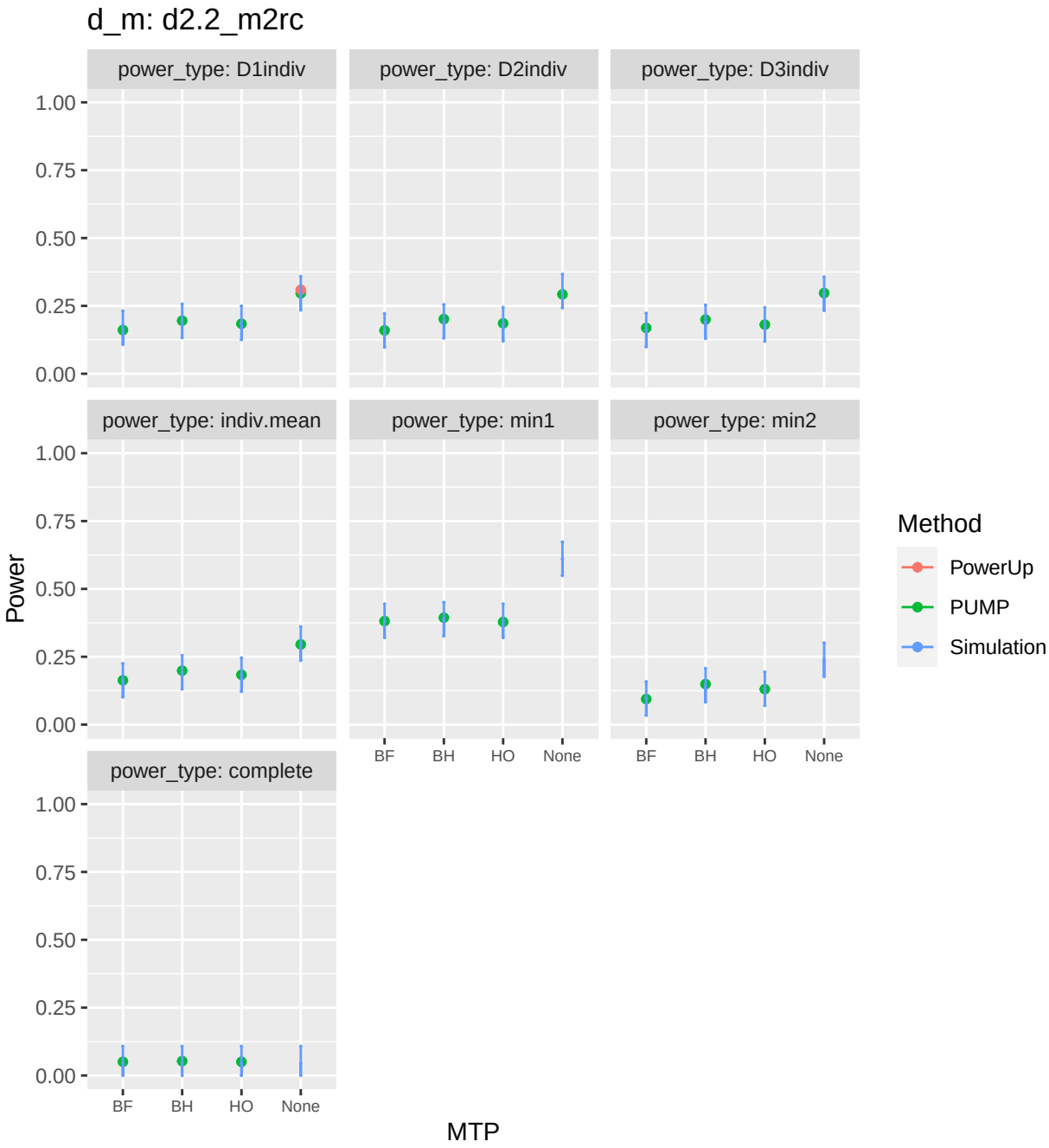

d_m: d2.2_m2rc
power_type: D1indiv
power_type: D2indiv
power_type: D3indiv
power_type: indiv.mean
power_type: min1
power_type: min2
power_type: complete
1.00
0.75
0.50
0.25
0.00
Power
BF
BH
HO
None
MTP
Method
PowerUp
PUMP
Simulation

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

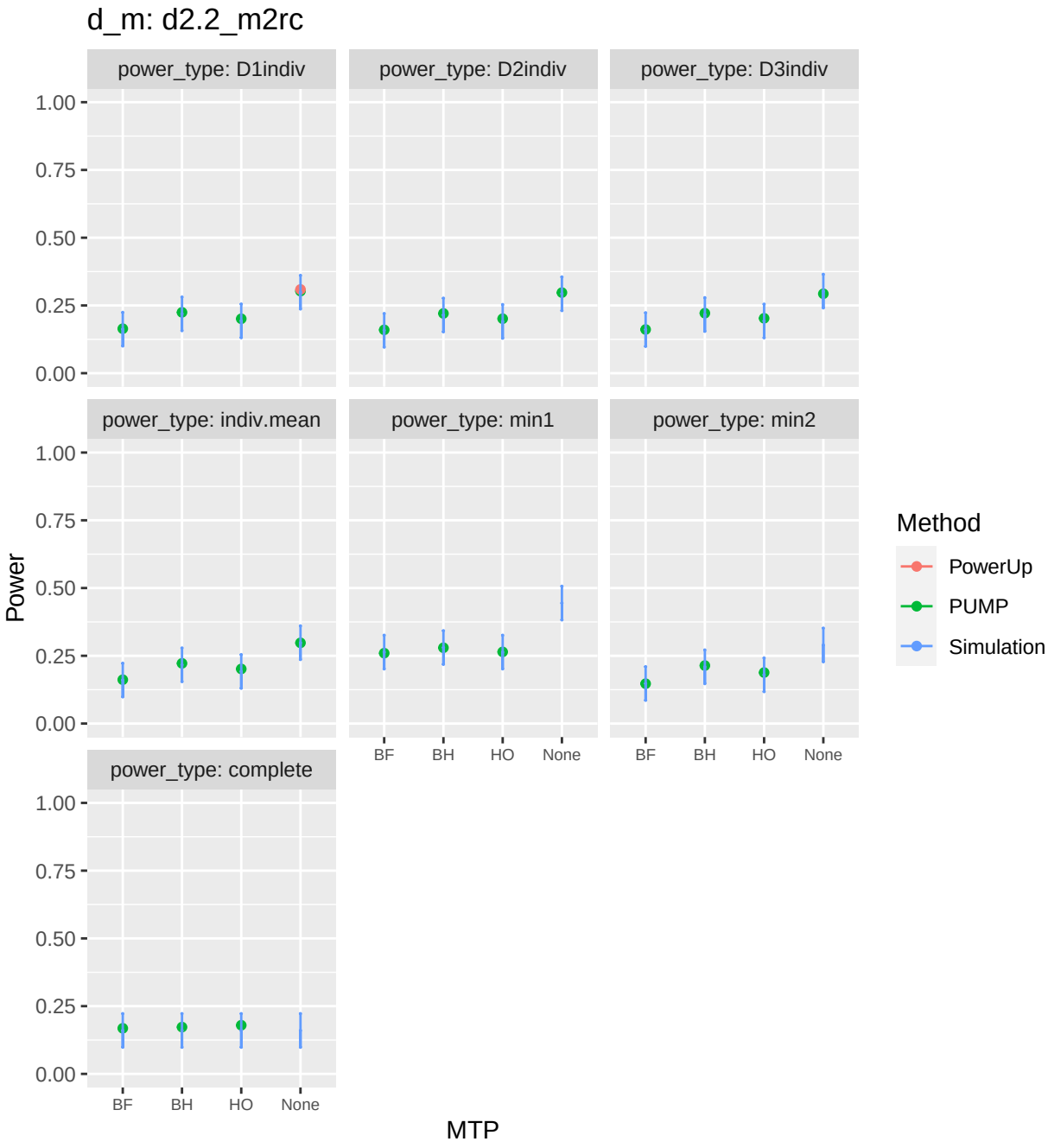


Varying rho

$\rho = 0.2$

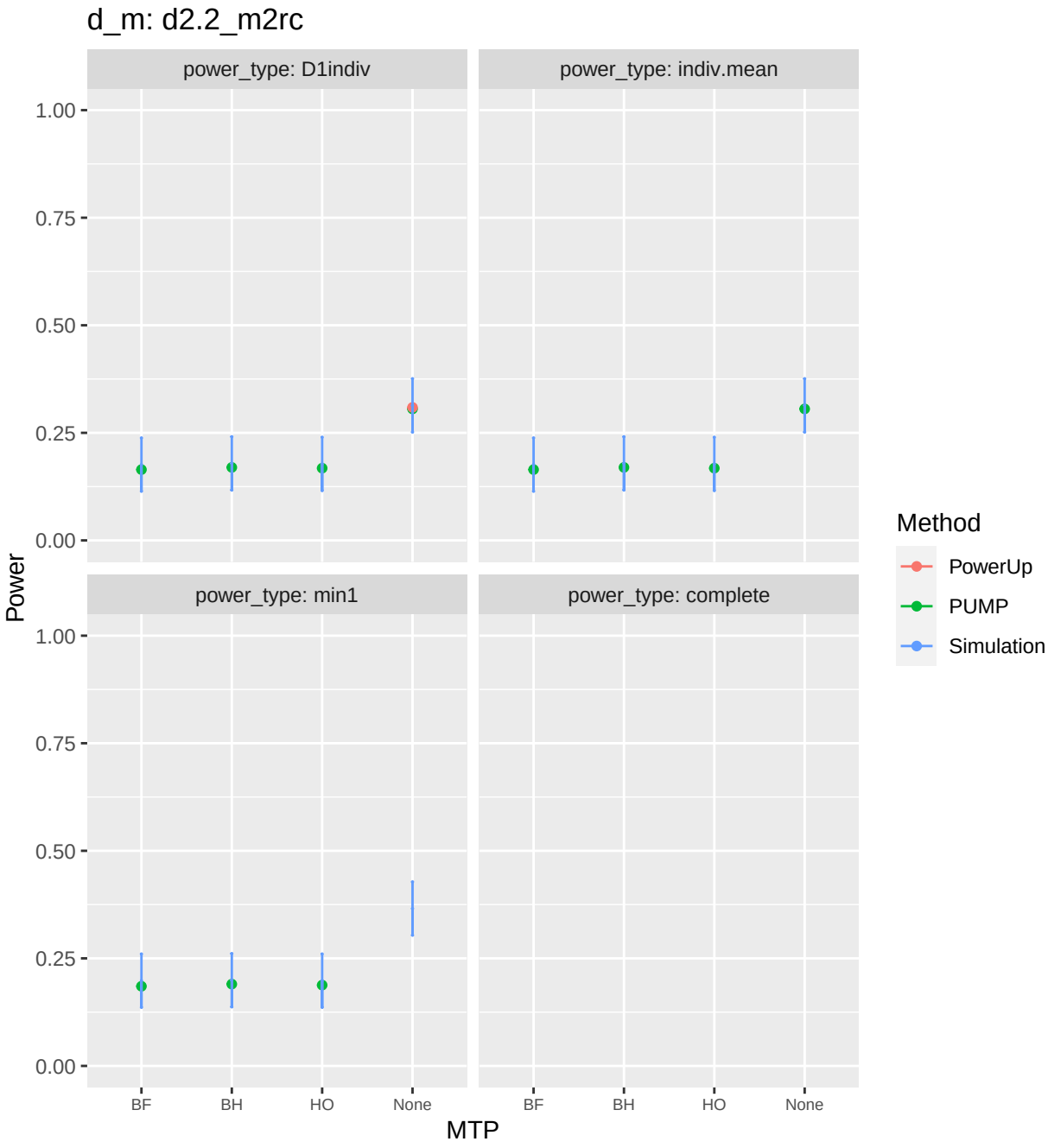


$\rho = 0.8$


d_m: d2.2_m2rc
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

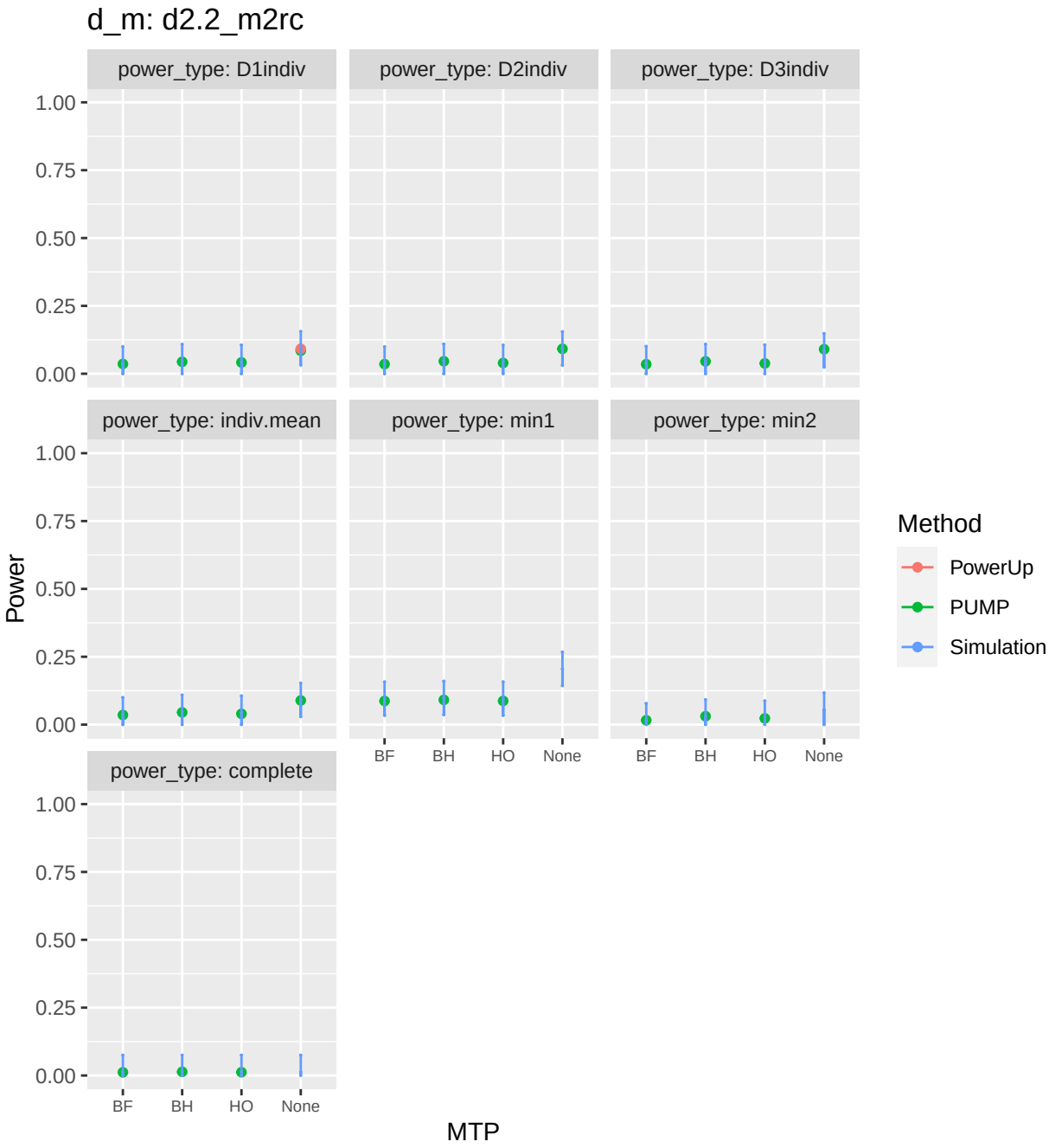
Varying true positives

MDES = 0.125, 0, 0

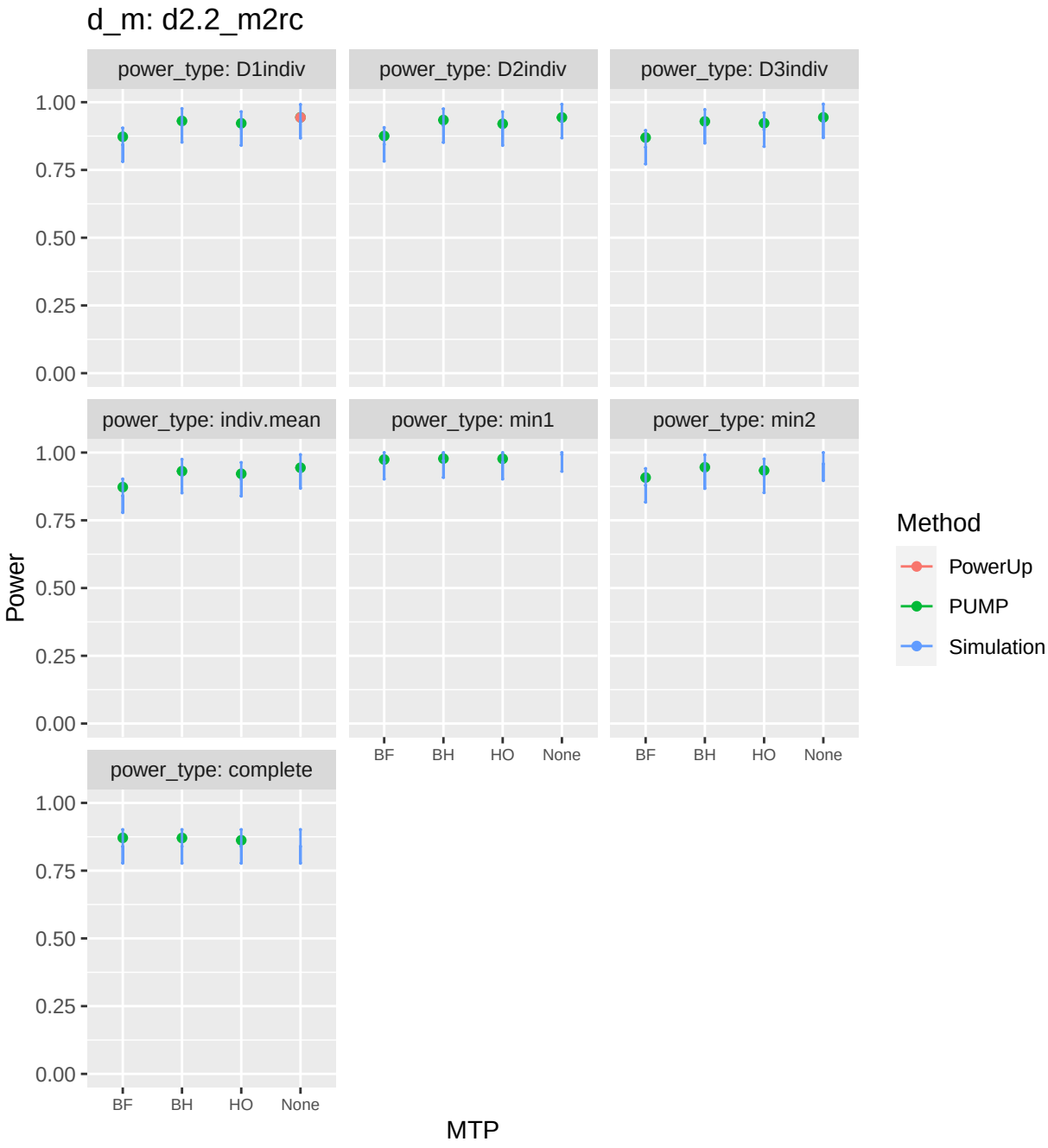


Varying ICC

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



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



MDES validation

Target value: 0.125

```
##
##
## +-----+---------------+---------------+-------------+-----------+------+---+-------+
## | MTP | Adjusted MDES | D1indiv Power | Target MDES |    d_m    |  S   | M | MDES  |
## +=====+===============+===============+=============+===========+======+===+=======+
## | BF  |     0.125     |     0.164     |    0.125    | d2.2_m2rc | 5000 | 3 | 0.125 |
## +-----+---------------+---------------+-------------+-----------+------+---+-------+
## | BH  |     0.125     |     0.209     |    0.125    | d2.2_m2rc | 5000 | 3 | 0.125 |
## +-----+---------------+---------------+-------------+-----------+------+---+-------+
## | HO  |     0.121     |     0.183     |    0.125    | d2.2_m2rc | 5000 | 3 | 0.125 |
## +-----+---------------+---------------+-------------+-----------+------+---+-------+
##
## Table: d2.2_m2rc (continued below)
##
##
##
## +---------+----+---+------+-----+---------+---------+------+------+------+-------+-------+
## | numZero | J  | K | nbar | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +=========+====+===+======+=====+=========+=========+======+======+======+=======+=======+
## |    0    | 60 | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +---------+----+---+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 60 | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +---------+----+---+------+-----+---------+---------+------+------+------+-------+-------+
## |    0    | 60 | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +---------+----+---+------+-----+---------+---------+------+------+------+-------+-------+
```

Sample size validation

Target value: 60

```
##
##
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | MTP | Sample.type | Sample.size | D1indiv.power |    d_m    |  S   | M | MDES  | numZero |
## +=====+=============+=============+===============+===========+======+===+=======+=========+
## | BF  |      J      |     60      |     0.164     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | BH  |      J      |     60      |     0.206     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | HO  |      J      |     62      |     0.199     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
##
## Table: d2.2_m2rc (continued below)
##
##
##
## +----+---+------+-----+---------+---------+------+------+------+-------+-------+
## | J  | K | nbar | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +====+===+======+=====+=========+=========+======+======+======+=======+=======+
## | NA | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+------+-----+---------+---------+------+------+------+-------+-------+
## | NA | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+------+-----+---------+---------+------+------+------+-------+-------+
## | NA | 1 |  50  | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+------+-----+---------+---------+------+------+------+-------+-------+
```

Target value: 50

```
##
##
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | MTP | Sample.type | Sample.size | D1indiv.power |    d_m    |  S   | M | MDES  | numZero |
## +=====+=============+=============+===============+===========+======+===+=======+=========+
## | BF  |    nbar     |    48.18    |     0.164     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | BH  |    nbar     |     60      |     0.215     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
## | HO  |    nbar     |     55      |     0.199     | d2.2_m2rc | 5000 | 3 | 0.125 |    0    |
## +-----+-------------+-------------+---------------+-----------+------+---+-------+---------+
##
## Table: d2.2_m2rc (continued below)
##
##
##
## +----+---+-----+---------+---------+------+------+------+-------+-------+
## | J  | K | rho | omega.2 | omega.3 | R2.1 | R2.2 | R2.3 | ICC.2 | ICC.3 |
## +====+===+=====+=========+=========+======+======+======+=======+=======+
## | 60 | 1 | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+-----+---------+---------+------+------+------+-------+-------+
## | 60 | 1 | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+-----+---------+---------+------+------+------+-------+-------+
```

```
## | 60 | 1 | 0.5 |   NA    |   NA    | 0.1  | 0.1  |  NA  |  0.1  |  NA   |
## +----+---+-----+---------+---------+------+------+------+-------+-------+
```

Note: particularly flat power curves results in discrepancy for `nbar`.