SIR for Belgium

Model has 581 spatial patches connected with a commuter mobility matrix and four age groups whose contacts are governed by a contact matrix. Simulations run for 120 days with N=24.08, beta=0.03, gamma = 0.2 as default parameters.

**pySODM**

Uses commuter mobility matrix and social contact matrix

Total number of compartments: 3 x 581 x 4 = 6972

Simulated using `scipy.solve\_ivp()`, method RK45, rel. tolerance 1e-4

Approx. computational complexity: 0.5 s

A diagram of a curve

Description automatically generated with medium confidence

**flepiMoP – no age groups**

Uses commuter mobility matrix

Total number of compartments: 3 x 581 = 1743

Simulated using built-in RK4, dt=1.0

Approx. computational complexity: 4.5s (overhead) + 1.0s (simulation)

Varied dt in [0.1, 1, 2], comp. complex. 14.5s, 1.0s, 0.5s 🡪 scales linearly, no changes in output

A graph of a function

Description automatically generated with medium confidence

**flepiMoP – with age groups (row sums)**

Uses commuter mobility matrix and social contacts are modeled in a destination average way

Total number of compartments: 3 x 581 x 4 = 6972

Simulated using built-in RK4, dt=1.0

Approx. computational complexity: 4.5s (overhead) + 7.6s (simulation)

A graph of a line

Description automatically generated with medium confidence

This simulation does not actually contain the full contact matrix. It contains the contact structured summed over the matrix rows. The transition from S 🡪 I is currently implemented as follows,

S\_age0to5 🡪 I\_age0to5 \isprop

beta\*\sum\_j N\_ij \* S\_age0to5 \* (I\_age0to5 + I\_age5to15 + I\_age15to65 + I\_age65to120)

A screenshot of a computer

Description automatically generated

Where 24.8, 39.9, etc. are the total number of contacts an individual aged 0-5, 5-15, etc. makes.

**flepiMoP – with age groups (integrating the full contact matrix)**

Uses commuter mobility matrix and social contact matrix

Total number of compartments: 3 x 581 x 4 = 6972

Simulated using built-in RK4, dt=1.0

Approx. computational complexity: 4.5s (overhead) + 25.0s (simulation)

A green and black line graph

Description automatically generated

Verified that changing the timestep to dt=0.5 and dt=2.0 don’t influence the simulation output.

The contacts have been implemented in the following way (for all age groups),

A screen shot of a computer

Description automatically generated

Curiously enough, doubling “beta” to 0.06 yields,

A graph of a line

Description automatically generated with medium confidence

So is something happening to this “beta” behind the screens?