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.

**pySODM**

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 group of graphs showing different types of blood

Description automatically generated with medium confidence

**flepiMoP – no age groups**

Total number of compartments: 3 x 581 = 1743

Simulated using built-in RK4, dt=1.0

Approx. computational complexity: 4.5s (overhead) + 1.2s (simulation)

A graph of a function

Description automatically generated with medium confidence

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

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

Simulated using built-in RK4, dt=1.0

Approx. computational complexity: 4.5s (overhead) + 6.5s (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,

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 (attempt at integrating the full 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) + 17.0s (simulation)

Here, I now tried to incorporate the full contact matrix by explicitly defining all 16 transitions in the 4x4 matrix (see below). Clearly, something is wrong as the epidemic is now strongly delayed.

A graph of a line

Description automatically generated with medium confidence

A screenshot of a computer

Description automatically generated

I thought this would work by defining the 4 transitions for S\_age0to5 🡪 I\_age0to5 separately, each proportional to N\_{ age0to5 , age0to5 } \* S\_age0to5 \* I\_age0to5, then N\_{ age0to5 , age5to15 } \* S\_age0to5 \* I\_age5to15, then N\_{ age0to5 , age15to65 } \* S\_age0to5 \* I\_age15to65. Why does this not work?