New SEIR with age compartments

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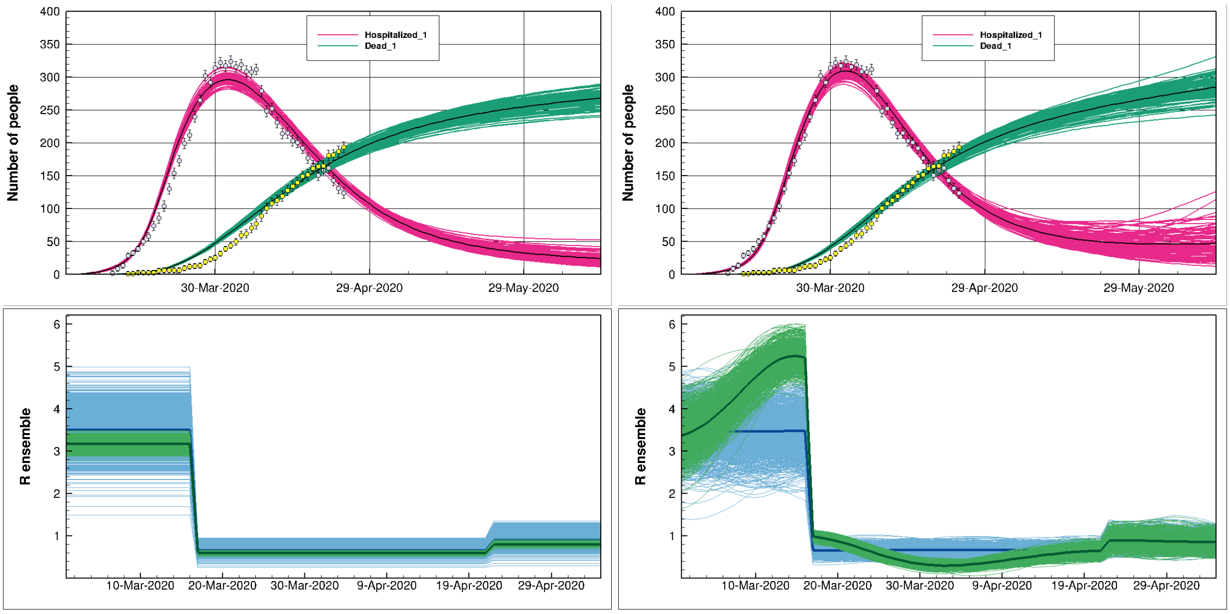

1 SEIR model with agecompartments

$$
\begin{cases}
\mathbf{S}_1 \to & \mathbf{E}_1 \to \mathbf{I}_1 \\
 & \vdots \\
\mathbf{S}_i \to & \mathbf{E}_i \to \mathbf{I}_i \\
 & \vdots \\
\mathbf{S}_n \to & \mathbf{E}_n \to \mathbf{I}_n
\end{cases}
\to
\begin{cases}
\mathbf{Q}_\mathrm{m} & & \to \mathbf{R}_\mathrm{m} \\
\mathbf{Q}_\mathrm{s} & \to \mathbf{H}_\mathrm{s} & \to \mathbf{R}_\mathrm{s} \\
\mathbf{Q}_\mathrm{f} & \to \mathbf{H}_\mathrm{f} & \to \mathbf{D} \\
\mathbf{Q}_\mathrm{f} & \to \mathbf{C}_\mathrm{f} & \to \mathbf{D}
\end{cases}
\tag{1}
$$

The model equations are as follows:

$$\frac{\partial \mathbf{S}_i}{\partial t} = -\frac{1}{\tau_\mathrm{inf}} \left(\sum_{j=1}^{n} R_{ij}(t)\, \mathbf{I}_j \right) \mathbf{S}_i - \frac{q_\mathrm{m} R(t)}{\tau_\mathrm{inf}} \mathbf{Q}_\mathrm{m} \mathbf{S}_i \tag{2}$$

$$\frac{\partial \mathbf{E}_i}{\partial t} = \frac{1}{\tau_\mathrm{inf}} \left(\sum_{j=1}^{n} R_{ij}(t)\, \mathbf{I}_j \right) \mathbf{S}_i - \frac{1}{\tau_\mathrm{inc}} \mathbf{E}_i + \frac{q_\mathrm{m} R(t)}{\tau_\mathrm{inf}} \mathbf{Q}_\mathrm{m} \mathbf{S}_i \tag{3}$$

$$\frac{\partial \mathbf{I}_i}{\partial t} = \frac{1}{\tau_\mathrm{inc}} \mathbf{E}_i - \frac{1}{\tau_\mathrm{inf}} \mathbf{I}_i \tag{4}$$

$$\frac{\partial \mathbf{Q}_\mathrm{m}}{\partial t} = \sum_{i=1}^{n} \frac{p_\mathrm{m}^i}{\tau_\mathrm{inf}} \mathbf{I}_i - (1/\tau_\mathrm{recm})\, \mathbf{Q}_\mathrm{m} \tag{5}$$

$$\frac{\partial \mathbf{Q}_\mathrm{s}}{\partial t} = \sum_{i=1}^{n} \frac{p_\mathrm{s}^i}{\tau_\mathrm{inf}} \mathbf{I}_i - (1/\tau_\mathrm{hosp})\, \mathbf{Q}_\mathrm{s} \tag{6}$$

$$\frac{\partial \mathbf{Q}_\mathrm{f}}{\partial t} = \sum_{i=1}^{n} \frac{p_\mathrm{f}^i}{\tau_\mathrm{inf}} \mathbf{I}_i - (1/\tau_\mathrm{hosp})\, \mathbf{Q}_\mathrm{f} \tag{7}$$

$$\frac{\partial \mathbf{H}_\mathrm{s}}{\partial t} = \frac{1}{\tau_\mathrm{hosp}} \mathbf{Q}_\mathrm{s} - \frac{1}{\tau_\mathrm{recs}} \mathbf{H}_\mathrm{s} \tag{8}$$

$$\frac{\partial \mathbf{H}_\mathrm{f}}{\partial t} = \frac{h}{\tau_\mathrm{hosp}} \mathbf{Q}_\mathrm{f} - \frac{1}{\tau_\mathrm{death}} \mathbf{H}_\mathrm{f} \tag{9}$$

$$\frac{\partial \mathbf{C}_\mathrm{f}}{\partial t} = \frac{(1-h)}{\tau_\mathrm{hosp}} \mathbf{Q}_\mathrm{f} - \frac{1}{\tau_\mathrm{death}} \mathbf{C}_\mathrm{f} \tag{10}$$

$$\frac{\partial \mathbf{R}_\mathrm{m}}{\partial t} = \frac{1}{\tau_\mathrm{recm}} \mathbf{Q}_\mathrm{m} \tag{11}$$

$$\frac{\partial \mathbf{R}_\mathrm{s}}{\partial t} = \frac{1}{\tau_\mathrm{recs}} \mathbf{H}_\mathrm{s} \tag{12}$$

$$\frac{\partial \mathbf{D}}{\partial t} = \frac{1}{\tau_\mathrm{death}} \mathbf{H}_\mathrm{f} + \frac{1}{\tau_\mathrm{death}} \mathbf{C}_\mathrm{f} \tag{13}$$