New SEIR with age compartments
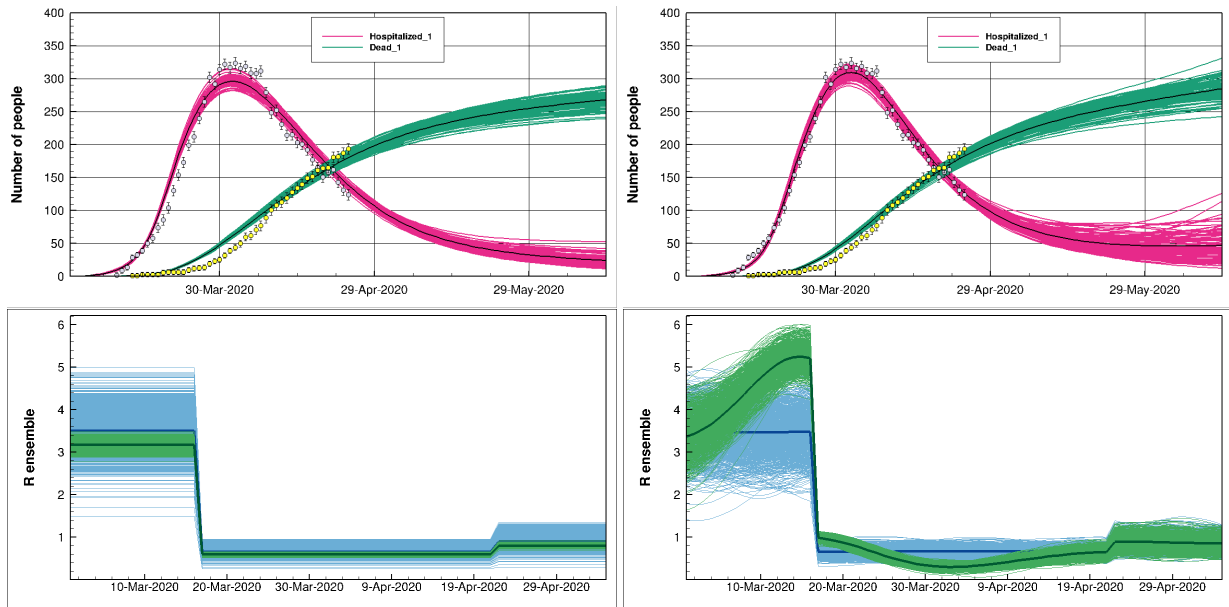
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1 SEIR model with agecompartments

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

The model equations are as follows:

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

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

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

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

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

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

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

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

$$\frac{\partial \mathbf{R}_{\mathrm{m}}}{\partial t} = (1/\tau_{\mathrm{recm}})\, \mathbf{Q}_{\mathrm{m}} \tag{10}$$

$$\frac{\partial \mathbf{R}_{\mathrm{s}}}{\partial t} = (1/\tau_{\mathrm{recs}})\, \mathbf{H}_{\mathrm{s}} \tag{11}$$

$$\frac{\partial \mathbf{D}}{\partial t} = (1/\tau_{\mathrm{death}})\, \mathbf{H}_{\mathrm{f}} \tag{12}$$