Infectious Disease Modelling and Analytics for Pandemic Preparedness: A focus on Latin America

IDMAPP-LATAM

14th-16th October 2025

Respiratory Project: Modelling the simulated SARS-X outbreak

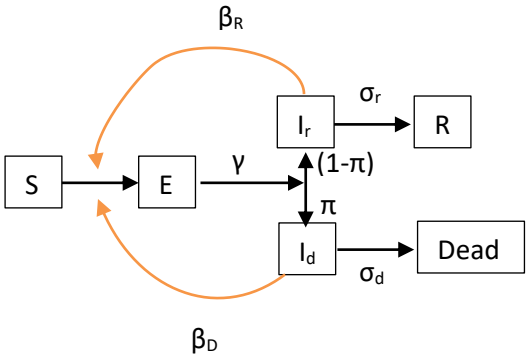
MODEL FLOWCHART SOLUTIONS

Examples of models

Below you will find some flow charts corresponding to 3 examples of models coded in the Odin interface (see shared solutions). Those models are illustrative of what could be done alongside the data analyses as part of the practical. In the saved versions of the models, some parameters have been fitted using the "Fit model" button in the 'Fit' tab.

Model 1:

This is a simple model with change in reproduction number associated with the time of intervention.



Variables

S: susceptible, E: exposed, I_r and I_d: infectious who will eventually recover or die respectively, R: recovered.

Parameters

$\beta_{D/R}$: transmission rates, in this model two values exist associated with infectious cases who will either die or recover. In the parameterisation (see Odin interface solutions), it is assumed that the overall infectiousness of dying or recovering cases are the same but distributed along a shorter period for the dying case as the delay from onset to final outcome is longer (therefore they are more infectious per unit time). Thus the individual basic reproduction number of cases who will eventually recover or die is the same.

π: Case Fatality Ratio (CFR), $1/\gamma$: incubation period, $1/\sigma_r$ and $1/\sigma_d$: delay to recover or dying respectively.

Impact of the intervention

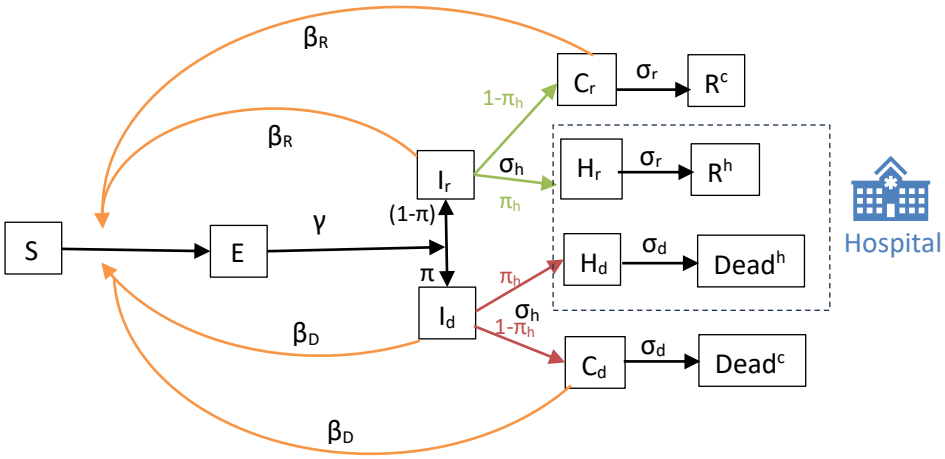
On day 170, the effective reproduction number is decreased, therefore the rate of transmission also decreases.

Model 2:

This model increases complexity by:

- Explicitly modelling hospitalisation (and therefore those who stay in the community).

In perhaps the most important feature of this model, it is assumed that cases in hospital are not transmitting the virus further, i.e. they are perfectly isolated.



The intervention is then modelled as a decrease in the delay to isolate cases.

New parameters

Note that the rates of infection are defined from a constant basic reproduction number here (i.e. no changes before/after the intervention), which is defined for the cases that remain in the community.

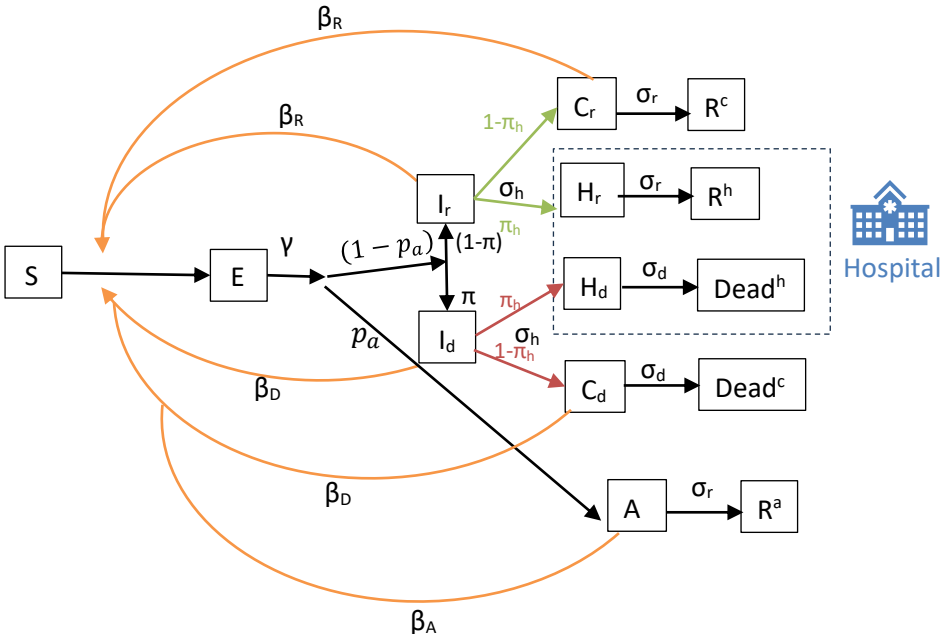
Impact of the intervention

On day 170, the delay between onset of symptoms and hospitalisation ($1/\sigma_h$) is decreased. This induces a reduction in the effective reproduction number as cases in hospital are assumed to be isolated and therefore do not contribute to onward transmission.

Model 3:

This model increases complexity by:

- Explicitly modelling asymptomatic cases (which can cause onwards infections)



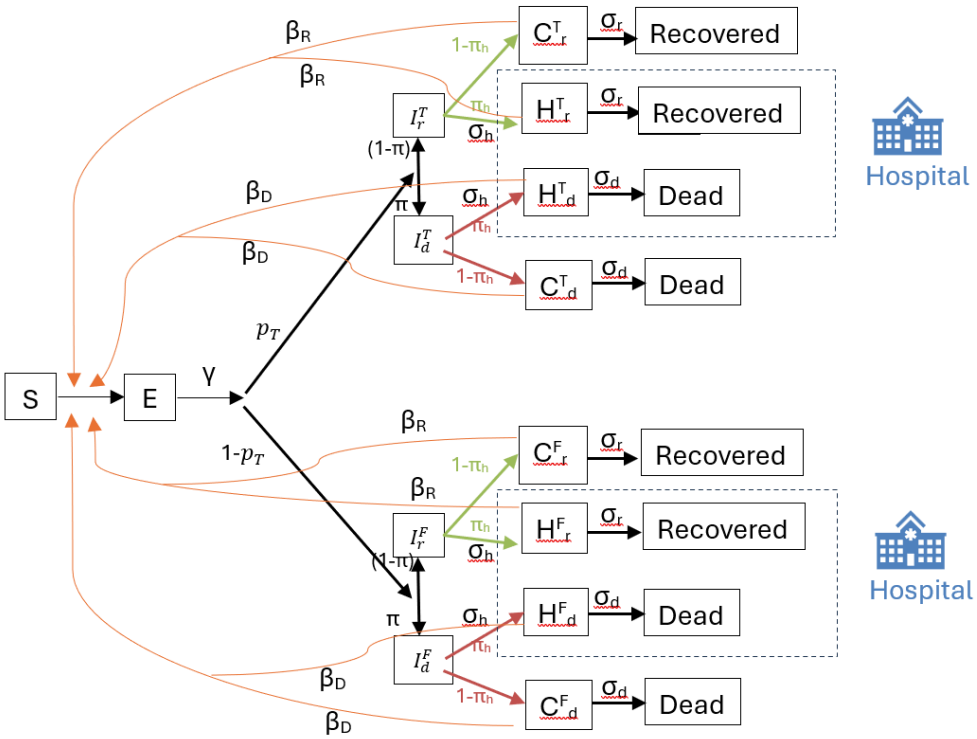
New parameters

Probability of asymptomatic cases - p_a

Model 4:

This model increases complexity by:

- Modelling the higher CFR for those with underlying health conditions.



New parameters

Probability of underlying health conditions (TRUE) - p_T