

Infectious time normalization

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This addresses T1.

We have prescribed values for the infectious periods for symptomatic (γ_I^{-1}), severe (η^{-1}) and critical (α^{-1}) cases, and at the same time we have what fraction of the cases, for each age band, are severe (q_i^H) and critical (q_i^D). The fraction of cases in each group (symptomatic, severe, critical). Since the proportion of cases in each age band is given by the infectious periods, we add a correction coefficient depending on the each band. More precisely, let $h_i, g_i > 0$, and consider that the age-corrected rates are $h_i\eta$ for severe cases, $g_i\alpha$ for critical cases, and $((1 - h_i - g_i)\gamma_I)$ for other symptomatic cases. The fractions of cases in each age band satisfy

$$q_i^H = \frac{h_i\eta}{(1 - h_i - g_i)\gamma_I + h_i\eta + g_i\alpha}, q_i^D = \frac{g_i\alpha}{(1 - h_i - g_i)\gamma_I + h_i\eta + g_i\alpha}.$$

We can explicitly find h_i, g_i :

$$h_i = \frac{\alpha q_i^H}{\eta q_i^D} g_i, g_i = \gamma_I \left(\frac{\alpha}{q_i^D} + \frac{\gamma_I \alpha q_i^H}{\eta q_i^D} + \gamma_I - \frac{\alpha q_i^H}{q_i^D} - \alpha \right)^{-1}.$$

The formulae are implemented in the script *infection_time_normalization.R*. The table below includes the results:

	Age 1	Age 2 no com.	Age 2 com.	Age 3 no com.	Age 3 com.
h_i	0.06382221	0.06643059	0.19129360	0.17818890	0.40633968
g_i	0.009259919	0.028328612	0.129085416	0.087633885	0.289590399

Implementation

To implement this in the model, we just need to replace the current q_i^H values by h_i , and the current q_i^D values by g_i .