# SARS-CoV-2 omicron variant modelling

**Interim Progress Report 08/12/21**
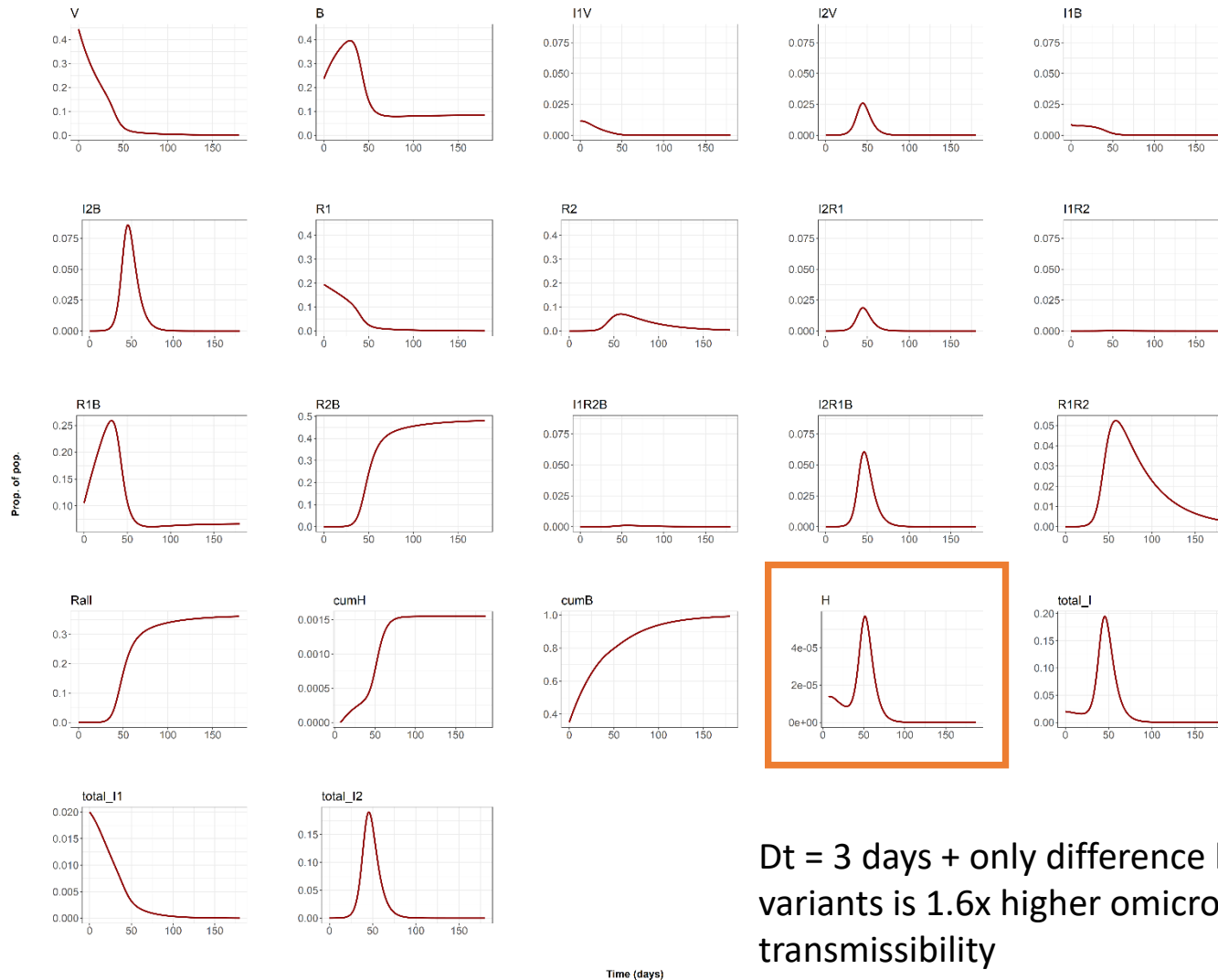University of Edinburgh

Bram van Bunnik

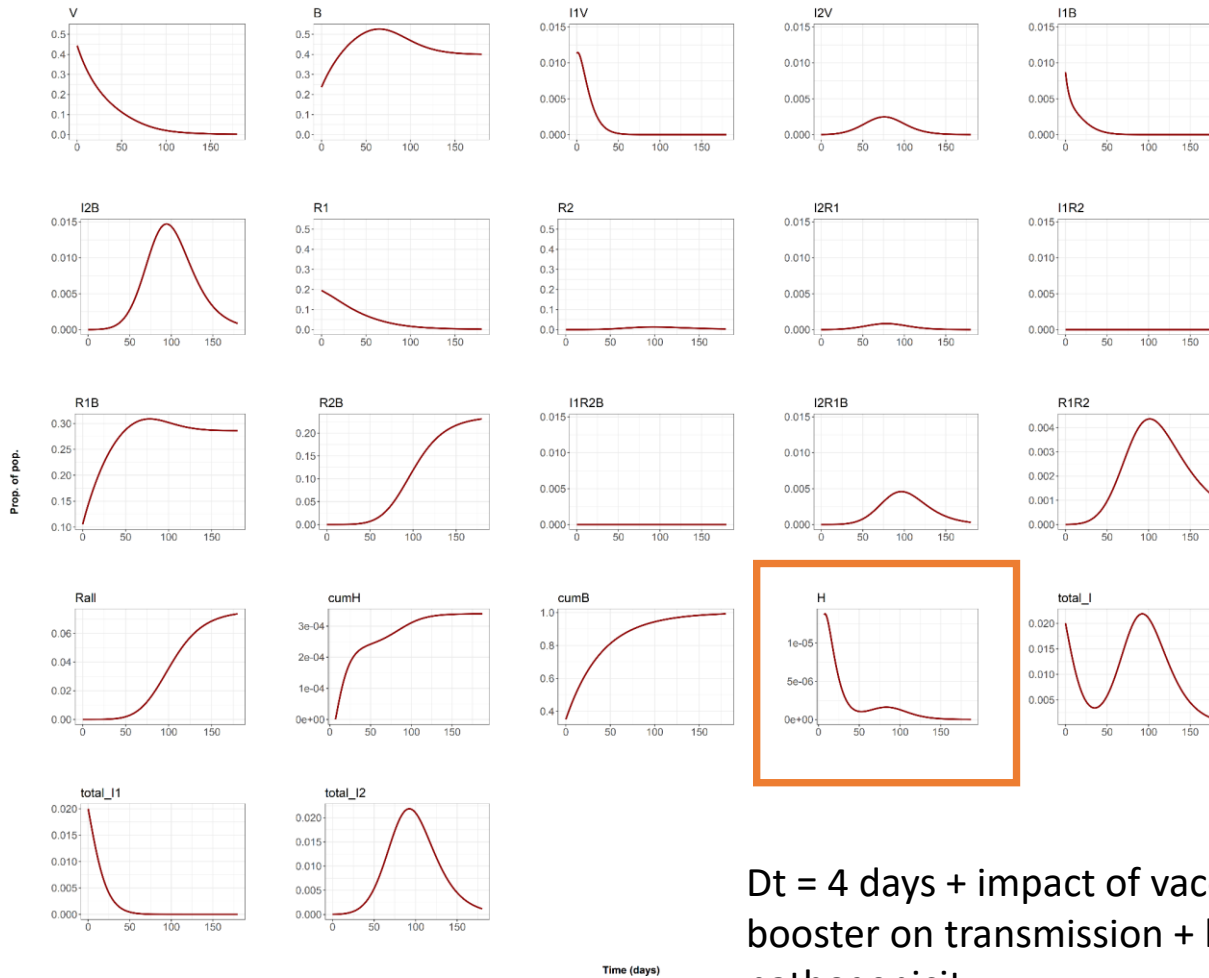Alex Morgan

Mark Woolhouse

*Follows draft briefing note for SPI-M 01/12/21*

# Baseline scenario



Dt = 3 days + only difference between variants is 1.6x higher omicron transmissibility

# Optimistic scenario



Dt = 4 days + impact of vaccination and booster on transmission + low omicron pathogenicity

# Discussion points

- There is still huge **uncertainty** regarding the expected scale and impact of an omicron wave in Scotland/UK
- Scenarios presented are <u>**not predictions**</u>. It is inconceivable that a major omicron wave would not precipitate significant behaviour change plus a government response – both of which would affect the course of the wave
- Broad agreement with range of scenarios generated by other models
- Note that there remain plausible combinations of parameters that **do not generate a major omicron wave** (optimistic scenario has high vaccine protection against omicron – though less than delta – and significant impact of booster vaccination of transmission of both variants)
- Baseline scenario generates huge wave of **infections** which would be enormously **disruptive** in its own right, given current self-isolation requirements
- Caveat: size of infection wave depends critically on **heterogeneities in susceptibility**, i.e. innate as well as acquired resistance
- Large region of parameter space where interventions to suppress transmission are effective
- Paradoxical situation where per capita risk to the great majority of individuals remains extremely low, yet may be subject to severe restrictions
- Urgent need to characterise heterogeneities in susceptibility and hospitalisation risk (given potential for very high penetrance)

# Model structure
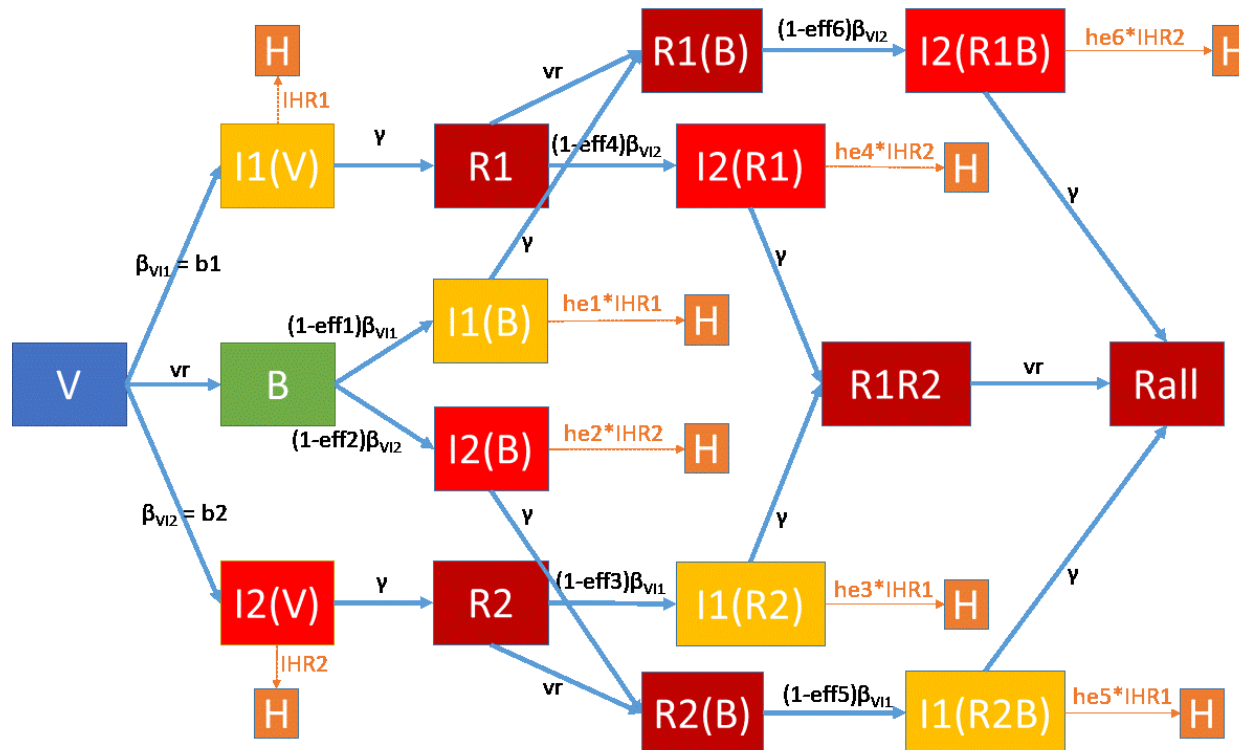
# Model inputs

Initial values:

| Comp | Initial Value |
|---|---|
| V | (0.455 - 0.01130435 - 1.028696e-05) |
| B | (0.245-0.008695652 - 7.913043e-06) |
| I1V | 0.01130435 |
| I2V | 1.028696e-05 |
| I1B | 0.008695652 |
| I2B | 7.913043e-06 |
| R1 | 0.3-0.105 |
| R2 | 0 |
| I2R1 | 0 |
| I1R2 | 0 |
| R1(B) | 0.105 |
| R2(B) | 0 |
| I1R2B | 0 |
| I2R1B | 0 |
| R1R2 | 0 |
| Rall | 0 |

Optimistic parameter values:

| Parameter | Value |
|---|---|
| $\gamma$ | 0.2 |
| vr | 0.025 |
| $\beta_{VI1}$ | 0.28 |
| $\beta_{VI2}$ | 0.56 |
| eff1 | 0.5 |
| eff2 | 0.5 |
| eff3 | 0.5 |
| eff4 | 0.5 |
| eff5 | 0.75 |
| eff6 | 0.75 |
| IHR1 | 0.0012 |
| IHR2 | 0.0006 |
| he1 | 0.01 |
| he2 | 0.01 |
| he3 | 0.1 |
| he4 | 0.1 |
| he5 | 0.001 |
| he6 | 0.001 |