Transmission matrix specifies what happens to each state for each event. Events and state are split by group number. So e.g. an infection in group 2 (“Inf2”) only changes the states in group 2 (“S2”, “I2”, “R2”).

Recovery (γ); Immune waning (σ); Latent period (𝛿)

**SIR transmission matrix structure:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | States | | | | | | | | | |
| Events |  | S1 | S2 | Sn | I1 | I2 | In | R1 | R2 | Rn |
| Inf1 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Inf2 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Infn | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rec1 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 |
| Rec2 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 |
| Recn | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 |

**SIRS transmission matrix structure:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | States | | | | | | | | | |
| Events |  | S1 | S2 | Sn | I1 | I2 | In | R1 | R2 | Rn |
| Inf1 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Inf2 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Infn | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rec1 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 |
| Rec2 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 |
| Recn | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 |
| Waning1 | 1 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 |
| Waning2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | -1 | 0 |
| Waningn | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | -1 |

**SEIR transmission matrix structure:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | States | | | | | | | | | | | | |
| Events |  | S1 | S2 | Sn | E1 | E2 | En | I1 | I2 | In | R1 | R2 | Rn |
| Exp1 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exp2 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Expn | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inf1 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Inf2 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Infn | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rec1 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 |
| Rec2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 |
| Recn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 |

**SEIRS transmission matrix structure:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | States | | | | | | | | | | | | |
| Events |  | S1 | S2 | Sn | E1 | E2 | En | I1 | I2 | In | R1 | R2 | Rn |
| Exp1 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exp2 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Expn | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inf1 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Inf2 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Infn | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rec1 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 | 0 |
| Rec2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 | 0 |
| Recn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 1 |
| Waning1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 |
| Waning2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 |
| Waningn | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 |