SIRVD-model

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1 Mathematical model

$$\frac{dS}{dt} = -\beta\frac{SI}{N} + \sigma R - \alpha S \tag{1}$$

$$\frac{dI}{dt} = \beta\frac{SI}{N} - \gamma I - \delta I \tag{2}$$

$$\frac{dR}{dt} = \gamma I - \sigma R \tag{3}$$

$$\frac{dV}{dt} = \alpha S \tag{4}$$

$$\frac{dD}{dt} = \delta I \tag{5}$$

where:

- $S(t)$ — susceptible to the disease;
- $I(t)$ — infected;
- $R(t)$ — recovered;
- $V(t)$ — vaccinated;
- $D(t)$ — the dead;
- N — total population;
- β — transmission rate of infection;
- γ — recovery rate;
- δ — death rate;
- α — vaccination rate;
- σ — loss of immunity.