Simple model for R_0

$$\begin{aligned} j(t) &= \int_0^\infty A(\tau) j(t-\tau) d\tau \\ R_0 &= \int_0^\infty A(\tau) d\tau \end{aligned}$$

Where

- $j(t)$ is the number of new infections at time t
- $A(\tau)$ is the rate an infected person infects a healthy person at time τ after infection
- R_0 is the total number of new infections resulting from an infected person

If we assume the infection rate is constant for a number of consecutive days (w) following infection then

$$\begin{aligned} j(t) &= A(t) \int_0^w j(t-\tau) d\tau \\ R_0(t) &= w\, A(t) \end{aligned}$$

So

$$R_0(t) = w \frac{j(t)}{\int_0^w j(t-\tau) d\tau}$$

Approximated as

$$\begin{aligned} R_0(t) &= w \frac{j(t)}{s(t)} \\ s(t) &= \sum_{\tau=0}^{\tau=w} j(t-\tau) \end{aligned}$$