

The force of infections are

$$\lambda_G = (1 - \phi_G)\beta_I S_G \frac{I_G + I_Q}{N_G} \quad (1)$$

$$\lambda_F = \omega\beta_I S_F \frac{F_T}{F_T + N_F} \quad (2)$$

$$\lambda_W = (1 - \phi_W)\beta_W S_W \frac{I_{WE} + I_{GE} + I_{QE}}{N_W + I_{GE}} \quad (3)$$

where

$$N_G = S_G + S_F + E_G + E_Q + I_G + I_Q + R_G + R_Q,$$

$$N_W = S_W + E_W + I_{WE} + R_{WE},$$

$$N_D = S_G + S_F + S_W + E_G + E_W + E_Q + R_G + R_{WE} + R_Q + R_{QE}$$

$$N_F = \frac{N_D}{\gamma_F E}$$

$$F_T = F_G + F_{GE} + F_{WE} + F_Q + F_{QE}$$

The rates of death and recovery are

$$\gamma_{FG} = (1 - \theta)(1 - p_G)\delta_G\gamma_D \quad (4)$$

$$\gamma_{FE} = (1 - p_H)\delta_H\gamma_{DH} \quad (5)$$

$$\gamma_{FW} = (1 - p_H)\delta_G\gamma_D \quad (6)$$

$$\gamma_{FQ} = (1 - \theta)(1 - p_Q)\delta_G\gamma_D \quad (7)$$

$$\gamma_{DG} = (1 - \theta)p_G\delta_G\gamma_D \quad (8)$$

$$\gamma_{DE} = p_H\delta_H\gamma_{DH} \quad (9)$$

$$\gamma_{DW} = p_H\delta_G\gamma_D \quad (10)$$

$$\gamma_{DQ} = (1 - \theta)p_Q\delta_G\gamma_D \quad (11)$$

$$\gamma_{RG} = (1 - \theta)(1 - \delta_G)\gamma_R \quad (12)$$

$$\gamma_{RE} = (1 - \delta_H)\gamma_{RH} \quad (13)$$

$$\gamma_{RW} = (1 - \delta_G)\gamma_R \quad (14)$$

$$(15)$$

The rate at which general community attends funerals is

$$\begin{aligned} f_{GF} = M_F \left[\frac{N_D}{E} + (1 - \theta)(1 - p_G)\delta_G\gamma_D I_G + (1 - p_H)\delta_H\gamma_{DH} I_{GE} \right. \\ \left. + (1 - p_H)\delta_G\gamma_D (I_{WE} + I_{QE}) + (1 - \theta)(1 - p_Q)\delta_G\gamma_D I_Q \right] \frac{S_G}{N_G - S_F} \end{aligned} \quad (16)$$

and the proportion of exposed contacts that are successfully followed is given by

$$C_r = \phi_C C (\gamma_H \theta (I_G + I_Q) + \alpha (E_W + E_Q)) \left(1 - \left(1 - \frac{\beta_I}{C} \right)^{\frac{1}{\gamma_H}} \right) \quad (17)$$