

$$\dot{S}_0 = \rho(N_0 + N_1) + \sigma_0^F F_0 + \sigma^L L_0 + \varphi_0(I_0 + J_0) - \lambda_0 S_0 - \mu_0 S_0$$

$$\dot{F}_0 = p\lambda_0 S_0 + xp\lambda_0 L_0 - (\mu_0 + \nu^F + \sigma_0^F)F_0$$

$$\dot{L}_0 = (1 - p)\lambda_0 S_0 - xp\lambda_0 L_0 - (\mu_0 + \nu_0^L + \sigma^L)L_0$$

$$\dot{I}_0 = q(\nu^F F_0 + \nu_0^L L_0) - (\mu_0 + \mu^d + \varphi_0)I_0$$

$$\dot{J}_0 = (1 - q)(\nu^F F_0 + \nu_0^L L_0) - (\mu_0 + \mu^d + \varphi_0)J_0$$

$$\dot{S}_1 = (1 - f)\alpha(N_0 + N_1) + \sigma_1^F F_1 + \sigma^L L_1 + \varphi_1(I_1 + J_1) - \lambda_1 S_1 - \mu_1 S_1$$

$$\dot{F}_1 = gpf\alpha(N_0 + N_1) + p\lambda_1 S_1 + xp\lambda_1 L_1 - (\mu_1 + \nu^F + \sigma_1^F)F_1$$

$$\dot{L}_1 = (1 - gp)f\alpha(N_0 + N_1) + (1 - p)\lambda_1 S_1 - xp\lambda_1 L_1 - (\mu_1 + \nu_1^L + \sigma^L)L_1$$

$$\dot{I}_1 = q(\nu^F F_1 + \nu_1^L L_1) - (\mu_1 + \mu^d + \varphi_1)I_1$$

$$\dot{J}_1 = (1 - q)(\nu^F F_1 + \nu_1^L L_1) - (\mu_1 + \mu^d + \varphi_1)J_1$$