

**Males**

$$dS_m = -\lambda_m N_{sm} + (1 - \omega_m) N_m + \delta N_{im} - \mu N_{sm}$$

$$dI_m = \lambda_m N_{vm}(1 - \psi) + (\lambda_m N_{sm}) N_m - \delta N_{im} - \mu N_{im}$$

$$dV_m = -\lambda_m N_{vm}(1 - \psi) + (\omega_m \mu N_m) - \mu N_{vm}$$

**Females**

$$dS_f = -\lambda_f N_{sf} + (1 - \omega_f) N_f + \delta N_{if} - \mu N_{sf}$$

$$dI_f = \lambda_m N_{vf}(1 - \psi) + (\lambda_m N_{sf}) N_f - \delta N_{if} - \mu N_{if}$$

$$dV_f = -\lambda_f N_{vf}(1 - \psi) + (\omega_f \mu N_f) - \mu N_{vf}$$