Instantaneous

$$\lambda \propto \left[1-(1-\beta)^F\right]IC$$

$S \rightarrow I$

Proposed

$$\lambda \propto \beta F[Y(C-1)+IC] \qquad \delta^{-1}$$

$S \rightarrow Y \rightleftarrows I$ with λ'

S: susceptible
I: infectious, new partner
Y: infectious, same partner
λ: incidence
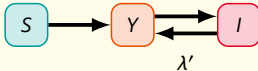
β: transm prob per contact
F: contact frequency
δ: partnership duration
C: simultaneous partnerships