

ODEs for Model

November 30, 2012

$$\left\{ n/2 \right.$$

$$\dot{N}_0 = -(1 - p_r)p_c N_0 - p_r N_0 + \kappa N_1^c + \kappa N_2^c \quad (1)$$

$$\dot{N}_1 = (1 - p_r)p_c N_0 - r N_1 \quad (2)$$

$$\dot{N}_1^c = r N_1 - \kappa N_1^c \quad (3)$$

$$\dot{P} = p_r N_0 \quad (4)$$

$$p_c = \frac{1}{2}(p_i + a_i s_i) = \frac{1}{2} \left(\frac{p0 + ku}{ku + p + p0} + (1 - h \exp -(t - t_k)/\tau) \frac{\sum_{k \neq 0} N_k}{N_{\text{tot}}} \right) \quad (5)$$

$$p_{\text{reform}} = \begin{cases} \frac{P}{\sum_k N_k + P} h \exp(-(t_k - t_c)/\tau) & \text{if no crime committed} \\ \frac{1}{2} \left(h \frac{P}{\sum_k N_k + P} + \frac{k_p}{k_p + k_u} r (\theta - \delta) \right), & \text{if crime committed, punished, and resources given} \\ \frac{1}{2} \left(\frac{k_p}{k_p + k_u} r (\theta - \delta) \right), & \text{if crime committed, punished, no resources given} \\ 0, & \text{if crime committed, not punished} \end{cases}$$