Zombie model with human behavior equations

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$$\frac{dS}{dt} = bS(t) - mS(t) - \alpha S(t)Z(t) + r(Q(t) + E(t))$$

$$C(t) = \begin{cases} 0 & Q(t) < q_{\max} \vee X_S(t) < 1/2 \\ C_0 & Q(t) \geq q_{\max} \wedge X_S(t) \geq 1/2 \end{cases}$$

$$\frac{dE}{dt} = \begin{cases} \alpha S(t)Z(t) - zE(t) - rE(t) - (C_0 + X_I(t))E(t) - C(t)E(t) & Q(t) < q_{\max} \\ \alpha S(t)Z(t) - zE(t) - rE(t) - C(t)E(t) & Q(t) \geq q_{\max} \end{cases}$$

$$\frac{dQ}{dt} = \begin{cases} (C_0 + X_I)E - rQ(t) - zQ(t) & Q(t) < q_{\max} \\ rQ(t) - zQ(t) & Q(t) \geq q_{\max} \end{cases}$$

$$\frac{dZ}{dt} = zE(t) - kS(t)Z(t)$$

$$\frac{dD}{dt} = kS(t)Z(t) + mS(t) + zQ(t) + C(t)E$$

$$\frac{dX_S}{dt} = k_S X_S(t)(1 - X_S(t))[Z(t) + Q(t) - \epsilon_S L_S(t)]$$

$$\frac{dX_I}{dt} = \begin{cases} k_I X_I(t)(1 - X_I(t))\{(z - r)[E(t) + Q(t)] - \epsilon_I\} & Q(t) < q_{\max} \\ 0 & Q(t) \geq q_{\max} \end{cases}$$

$$\frac{dL_S}{dt} = \alpha_S C(t) - \mu L_s(t)$$