Mode 1 (on-treatment)

$\mathrm{flow}_1:$

$$\frac{dx}{dt}=\left(\alpha_x\left(k_1+\frac{(1-k_1)z}{z+k_2}\right)-\beta_x\left(k_3+\frac{(1-k_3)z}{z+k_4}\right)-m_1\left(1-\frac{z}{z_0}\right)\right)x$$

$$\frac{dy}{dt}=m_1\left(1-\frac{z}{z_0}\right)x+\left(\alpha_y\left(1-d\,\frac{z}{z_0}\right)-\beta_y\right)y$$

$$\frac{dz}{dt}=\frac{-z}{\tau}$$

$$\frac{dv}{dt}=\left(\alpha_x\left(k_1+\frac{(1-k_1)z}{z+k_2}\right)-\beta_x\left(k_3+\frac{(1-k_3)z}{z+k_4}\right)-m_1\left(1-\frac{z}{z_0}\right)\right)x$$
$$+m_1\left(1-\frac{z}{z_0}\right)x+\left(\alpha_y\left(1-d\,\frac{z}{z_0}\right)-\beta_y\right)y$$

$\mathrm{jump}_{1\to2}:$

$$x+y\le r_0\wedge\frac{dx}{dt}+\frac{dy}{dt}<0$$

$\mathrm{jump}_{2\to1}:$

$$x+y\ge r_1\wedge\frac{dx}{dt}+\frac{dy}{dt}>0$$

Mode 2 (off-treatment)

$\mathrm{flow}_2:$

$$\frac{dx}{dt}=\left(\alpha_x\left(k_1+\frac{(1-k_1)z}{z+k_2}\right)-\beta_x\left(k_3+\frac{(1-k_3)z}{z+k_4}\right)-m_1\left(1-\frac{z}{z_0}\right)\right)x$$

$$\frac{dy}{dt}=m_1\left(1-\frac{z}{z_0}\right)x+\left(\alpha_y\left(1-d\,\frac{z}{z_0}\right)-\beta_y\right)y$$

$$\frac{dz}{dt}=\frac{z_0-z}{\tau}$$

$$\frac{dv}{dt}=\left(\alpha_x\left(k_1+\frac{(1-k_1)z}{z+k_2}\right)-\beta_x\left(k_3+\frac{(1-k_3)z}{z+k_4}\right)-m_1\left(1-\frac{z}{z_0}\right)\right)x$$
$$+m_1\left(1-\frac{z}{z_0}\right)x+\left(\alpha_y\left(1-d\,\frac{z}{z_0}\right)-\beta_y\right)y$$