Immuno-epidemiological Model of HIV and Opioid Epidemics

We introduce a multiscale immuno-epidemiological model of the HIV infection and the opioid epidemics. The between-host model incorporates susceptible individuals, infected with HIV only individuals, opioid affected only individuals and co-affected with HIV and opioids. The co-affected individuals are structured by the time since-co-affection and their within-host dynamics is explicitly included. We fit the multi-scale model to multi-scale data. Elasticity analysis of the invasion reproduction numbers suggests that the best control strategy is to decrease HIV infection of opioid-addicted individuals and to target the opoioid epidemics.