

# Applying Immuno-Epidemiology Principles to Violence

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Societies have always struggled with violence, but recently there has been a push to understand violence as a disease and public health issue. This idea has unified professionals in medicine, epidemiological, and psychology with a goal to end violence and help heal those exposed to it. Recently, analogies have been made between community-level infectious disease epidemiology and how violence spreads within a community. Experts in public health and medicine suggest an epidemiological framework could be used to study violence.

Infectious disease studies are often approached from two scales: outbreak/community and immune system/individual. At both scales, mathematical modeling of infectious disease dynamics plays an important role. Usually, each scale is modeled in isolation from the other; however, there is a natural connection between these dynamics. Thus, there is a push to consider the multi-scale integrated approach of Immuno-Epidemiological (IE) modeling. We apply IE modeling to violence by employing the epidemiological part to explore violence spread in the community and the immune system model to look at the impact that violence exposure has on an individual with respect to increasing their propensity to commit violence.

In this talk I will expand on the analogy of violence as an infectious disease and show how mathematical epidemiology and immunology is a useful framework for understanding the dynamics of violence. Next, we will look at a susceptible-exposed-infected mathematical model for violence spread in a community and compare it with traditional disease modeling. Then we will explore some basic equilibrium/stability analysis and numerical simulations.