# HIV influence on the transmission dynamics of Mpox disease

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Mpox is a viral disease caused by Mpox virus, a species of the genus Orthopoxvirus. Initially present in animals, particularly in African rodents, Mpox has led to major and alarming human outbreaks over recent years. In a short period of time (23, July 2022, 13 & 14, August 2024), the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) declared Mpox a Public Health Emergency of International Concern (PHEIC) due to its rapid global spread in countries where the virus had not previously been detected. In this talk, we present a mathematical model for Mpox involving people with HIV (PWH) and without HIV who are susceptible. We investigate scenarios with different transmission routes. In the absence of the rodent-to-human transmission route, the model undergoes a backward bifurcation, suggesting that reducing the basic reproduction number below one would not eliminate the disease unless further control strategies are used. Whenever the transmission channel is rodent-to-human, and Mpox is endemic in the rodent population, it is shown that there exists a unique interior equilibrium, which is globally asymptotically stable. In this case, we implement targeted interventions such as quarantine or vaccination on PWH for the disease control. Model validation using USA case data (May 2022 - July 2024) shows that both human-to-human and rodent-to-human transmissions prevail in the population, but the disease is not endemic. Projections indicate that the outbreak will be overcome by May 2027. We design a nonstandard finite difference (NSFD) scheme which is dynamically consistent with respect to the qualitative properties of the continuous model. Numerical simulations demonstrate that reducing the recruitment rate of PWH is essential, and that the transmission route "rodent-to-human" is highly influential in increasing the number of Mpox cases.

This presentation is based on the following joint work with A.J. Ouemba Tassé and Y. A. Terefe:

(1) A.J. Ouemba Tassé, Y.A. Terefe and J.M-S. Lubuma, J.M-S., Assessing the influence of HIV on the spread of Mpox disease, *Mathematical Biosciences,* **387**, 2025, 109499, (https://doi.org/10.1016/j.mbs.2025.109499).

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