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Canine Distemper Virus (CDV): Methods for modeling spillover infections for African Wild Dogs (*Lycaon pictus*) in a multi-host community

Canine Distemper Virus (CDV) is a potentially lethal morbillivirus spread via aerosol. It is common in domestic dogs and also affects many wild carnivores, including lions, hyenas, jackals and African wild dogs (AWDs). The AWD is a critically endangered canid that is known to experience high mortality from epizootics of CDV. AWDs are only known to survive in protected areas in Africa, which they share with lions, hyenas and jackals. Inter-species interactions at shared kill sites provide an opportunity for CDV to spill over from one infected species to another susceptible species. We aim to examine how CDV is transmitted between four different host species (lions, jackals, hyenas and AWDs) within a reserve.

We constructed a heterogeneous deterministic SEIR model to establish a disease-free equilibrium for each species. We then introduced stochasticity to our model to understand how CDV spreads through multispecies metapopulations. Stochasticity was introduced in the infection process and in the inter-species contact process. Due to variation in collection techniques for demographic data in the literature, our model was compromised since data for some species may already reflect the endemic state of the disease while other species are potentially disease-free. Nevertheless, our model demonstrates a valid method for determining the sources and sinks of disease in a multi-host metapopulation. We also plan to build a contact network model to avoid the issue of mixing endemic host populations with disease-free host populations. These models could be applied to other metapopulation systems to study or prevent disease spillovers between neighboring populations.