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Modeling seasonal behavior change and disease transmission in wildlife

Behavior and habitat of wildlife change seasonally according to environmental conditions. Since transmission of infectious diseases among wildlife depends strongly on social behavior, mechanisms of disease transmission could also change seasonally. A specific consideration in this regard is whether disease transmission is frequency-dependent or density-dependent. We argue that seasonal behavior changes could lead to a seasonal shift between density and frequency dependence. We explore the effects of such a change in disease transmission via a two-season model for Chronic Wasting Disease in wild ungulates. We derive a system of impulsive differential equations and determine the basic reproduction number for our model. We parameterize the model from published CWD data and perform a sensitivity analysis by Latin Hypercube sampling. We discuss how effective culling could be to slow the spread of the disease.