XUEYING WANG, Washington State University

Target reproduction numbers for reaction-diffusion population models

A very important population threshold quantity is the target reproduction number, which is a measure of control effort required for a target prevention, intervention or control. This concept, as a generalization of type reproduction number, was first introduced in Shuai et al. (J Math Biol 67:1067–1082, 2013) for nonnegative matrices with immediate applications to compartmental population models of ordinary differential equations. The current paper is devoted to the study of all target reproduction numbers for reaction-diffusion population models with compartmental structure. It turns out that the target reproduction number can be regarded as the basic reproduction number of a modified system, where the state of newborn individuals is limited to the target control set and the offspring from the non-target set is regarded as a part of the transition. In other words, the target reproduction number can be interpreted as the expected number of offspring in a specific target set that a primary newborn individual of the same set would produce during its lifetime. We also characterize the target reproduction number so that it can be easily computed numerically for reaction-diffusion models. At the end, we demonstrate our theoretical observations using two examples.