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A recursive point process model for infectious diseases

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Abstract

We introduce a new type of point process model to describe the incidence of contagious diseases. The model incorporates the premise that when a disease occurs at low frequency in the population, such as in the primary stages of an outbreak, then anyone with the disease is likely to have a high rate of transmission to others, whereas when the disease is prevalent, the transmission rate is lower due to prevention measures and a relatively high percentage of previous exposure in the population. The model is said to be recursive, in the sense that the conditional intensity at any time depends on the productivity associated with previous points, and this productivity in turn depends on the conditional intensity at those points. Basic properties of the model are derived, estimation and simulation are discussed, and the recursive model is shown to fit well to California Rocky Mountain Spotted Fever data.

Keywords Conditional intensity · Contagious diseases · Hawkes process · Productivity

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