Semiparametric Stochastic Modeling for Epidemic Data

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Abstract

An epidemic model is developed to study the underlying mechanisms of the spread of an infectious disease, in which one of the aims is to find out whether or not hospital staff may become carriers in the transmission of infectious diseases. We propose a new approach for data arising from such a situation when there is a large number of independent small groups of correlated event times, and previous event occurrence may become part of risk factors for subsequent event occurrence. The latter makes the usual marginal models and frailty models not applicable. Under this set-up, the estimation of covariate effects and standard errors are carried out using a martingale approach. Related hypothesis testing on the contact effect is also developed, extensive simulation studies are conducted to access the performance of the proposed methods. Particular attention is paid to potential bias, which may be caused by discretized of failure times. The proposed method is applied to a real data from Columbia University Children's Hospital.