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Burton Singer* (bhsinger@epi.ufl.edu) and **Celeste Vallejo** (vallejo.26@osu.edu).

Interval Censored Data and reachable sets of solutions of Kolmogorov Differential Equations.

We consider infection dynamics processes observed at only two time points. Estimation of transition rates between pairs of states requires: (i) delineation of a class of discrete-state continuous time stochastic processes whose transition probabilities can match those derived from observed data; and (ii) algorithms for calculating transition rates within such a class of models. The rates may only be partially identifiable given the sparse data. Hence, we also require characterizations of sets of transition rates that, via a model, can generate a given set of observed transition probabilities.

Here we use the class of time-inhomogeneous Markov chains, whose transition probabilities are governed by the Kolmogorov forward and backward differential equations, and mixtures of them as candidates to represent observed transition probabilities. This leads to the problem of determining the reachable set of solutions of these differential equations and their mixtures for restricted classes of them. We take three illustrative infection status data sets and describe: (a) reachable sets associated with classes of models that represent the data; and (b) zones of partial identification when auxiliary constraints on model parameters do not allow for unique determination of transition rates. (Received August 25, 2019)