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Modeling Dynamic Networks in Changing Populations based on Static Egocentrically-Sampled Data

Abstract: Dynamic network models — models for evolution of networks over time — have manifold applications. In epidemiology, in particular, of interest is not just the presence of relationships of interest but their timing, as well as the impact of changing size and composition of the network. Yet, the data available are often limited to egocentric views of the network processes at a single time point. We develop and apply a discrete-time generative model for social network evolution that seeks to inherit the richness and flexibility of exponential-family random graph models, while adjusting for changing network size and composition and facilitating modeling of tie duration distributions; and we develop a generalized method of moments estimation technique to fit the model to available cross-sectional, egocentric network and/or tie duration data.

We illustrate our development with an application to sexual partnership data in the context of modeling the structure of HIV spread.