

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, Feb 8, 2005
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

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Likelihood-Based Model Selection for Sexual Partnership Distributions

Abstract:

Social structure plays a fundamental role in the dynamics of infectious disease models. While this statement applies to any type of infectious disease, the effects of social structure are particularly strong in models for sexually transmitted infections (STIs). For example, heterogeneity in contact rates in a population can raise the effective reproduction number of the pathogen, thereby lowering the epidemic threshold and making control and eradication more difficult. One extreme case of this occurs when partnership heterogeneity is described by a power law with infinite variance. This model can arise when partnerships are formed by preferential attachment. In this case, there is no epidemic threshold and traditional control measures will inevitably fail to eradicate an STI from the population. We specify a series of competing stochastic models for partnership formation and using data on the sexual partnership distributions of three populations (Uganda, USA, Sweden), fit the data and choose the best model using likelihood-based model selection procedures (e.g., AIC). Our results do not, in general support the infinite-variance power law model and suggest that mechanisms other than preferential attachment should be considered for the formation of sexual networks. We suggest a heterogeneous stopping rule as one possibility. The most promising future directions for work in STI epidemic models moves beyond marginal distributions for partnerships and specifically models the network structure at the level of the actor and the partnership.