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A Reexamination of Connectivity Trends via Exponential Random Graph Modeling in Two IDU Risk Networks

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Abstract

Patterns of risk in injecting drug user (IDU) networks have been a key focus of network approaches to HIV transmission histories. New network modeling techniques allow for a reexamination of these patterns with greater statistical accuracy and the comparative weighting of model elements. This paper describes the results of a reexamination of network data from the SFHR and P90 data sets using Exponential Random Graph Modeling. The results show that “transitive closure” is an important feature of IDU network topologies, and provides relative importance measures for race/ethnicity, age, gender, and number of risk partners in predicting risk relationships.

Keywords

injector networks; ERGM; HIV transmission; network modeling; social network analysis; IDU; SFHR network

INTRODUCTION

Patterns of social and risk bearing connectivity in injecting drug user (IDU) risk networks have been a consistent concern as researchers attempt to understand disease transmission among people who inject drugs (PWID) and between their networks and surrounding communities. Until recently, however, statistical modeling of network connectivity has posed considerable difficulty. The reasons for this are straightforward: ordinary statistical modeling techniques involve linear regression and other forms of tests-against-randomness to determine the relative importance of model factors as they influence the likelihood of

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

TABLE 3b

Multivariate models for P90

Model	Variables	Edges	θ	Error	p
1	Transitive closure	-5.517	2.501	0.036	***
	Age homophily	-	-0.101	0.095	0.290
2	Transitive closure	-4.845	1.740	0.037	***
	Gender homophily	-	-0.145	0.083	0.081
3	Transitive closure	-5.170	1.710	0.037	***
	Race/ethnicity homophily	-	0.659	0.319	***
4	Transitive closure	-5.438	1.375	0.000	***
	Age homophily	-	0.458	0.001	***
	Gender homophily	-	-0.360	0.000	***
	Race/ethnicity homophily	-	0.614	0.001	***
	Injection partner homophily	-	0.574	0.000	***

($p < .001$);**
($p < .01$);*
($p < .05$).