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The Interaction of Risk Network Structures and Virus Natural History in the *non-Spreading* of HIV among People Who Inject Drugs in the Early Stages of the Epidemic

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Abstract

This article explores how social network dynamics may have reduced the spread of HIV-1 infection among people who inject drugs during the early years of the epidemic. Stochastic, discrete event, agent-based simulations are used to test whether a “firewall effect” can arise out of self-organizing processes at the actor level, and whether such an effect can account for stable HIV prevalence rates below population saturation. Repeated simulation experiments show that, in the presence of recurring, acute, and highly infectious outbreaks, micro-network structures combine with the HIV virus’s natural history to reduce the spread of the disease. These results indicate that network factors likely played a significant role in the prevention of HIV infection within injection risk networks during periods of peak prevalence. They also suggest that social forces that disturb network connections may diminish the natural firewall effect and result in higher rates of HIV.

Resumen

Este artículo explora cómo las dinámicas de redes sociales pueden haber reducido la propagación de la infección por VIH-1 entre las personas que se inyectan drogas durante los primeros años de la epidemia. Estocásticas, eventos discretos, las simulaciones basadas en agentes se utilizan para probar la de si un "efecto cortafuegos" puede surgir de los procesos de auto-organización, al nivel

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Compliance with Ethical Standards

The authors declare that they have no conflicts of interest. All original data collection with human subjects was carried out under Institutional Review Board supervisions, and informed consent was obtained from all individual participants included in the study. The current study involves secondary data analysis using only de-identified data. This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

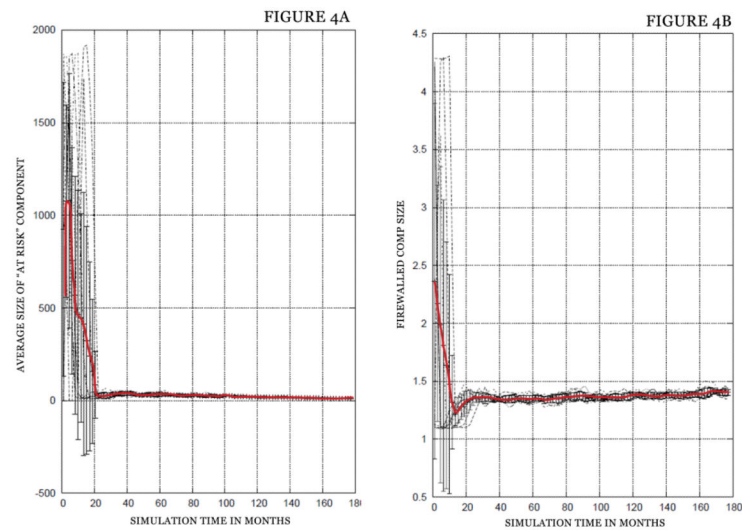


Figure 4.

Showing the average size of (a) “at risk” components (i.e. those that include an acutely infected node) versus (b) “firewalled” component over time in repeated simulations of 5000 PWID across 180 months. The red line indicates the mean across 10 independent simulations.