PLOS ONE

RESEARCH ARTICLE

Competing forces of withdrawal and disease avoidance in the risk networks of people who inject drugs

Elspeth Ready[1,2]*, **Patrick Habecker**[3], **Roberto Abadie**[3], **Bilal Khan**[3], **Kirk Dombrowski**[4]

1 Department of Human Behavior, Ecology and Culture, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany, **2** Department of Anthropology, University of Florida, Gainesville, Florida, United States of America, **3** Department of Sociology, University of Nebraska-Lincoln, Lincoln, Nebraska, United States of America, **4** VP Research Admin Office, University of Vermont, Burlington, Vermont, United States of America

* elspeth_ready@eva.mpg.de

Citation: Ready E, Habecker P, Abadie R, Khan B, Dombrowski K (2020) Competing forces of withdrawal and disease avoidance in the risk networks of people who inject drugs. PLoS ONE 15 (6): e0235124. https://doi.org/10.1371/journal.pone.0235124

Editor: Limin Mao, University of New South Wales, AUSTRALIA

Received: March 13, 2020

Accepted: June 9, 2020

Published: June 22, 2020

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Funding: This project was supported in part by a grant from the National Science Foundation (www.nsf.gov) program for Enhancing Access to Radio Spectrum, grant numbers 1443985 and 1638618 (KD and BK), and in part by a grant from the National Institutes of Health (www.nih.gov) grant number R01DA037117 (KD and BK). The funders had no role in study design, data collection and

Abstract

We analyze a network of needle-sharing ties among 117 people who inject drugs (PWID) in rural Puerto Rico, using exponential random graph modeling to examine whether network members engage in partner restriction to lower their risk of contracting HIV or hepatitis C (HCV), or in informed altruism to prevent others from contracting these infections. Although sharing of used syringes is a significant risk factor for transmission of these diseases among PWID, we find limited evidence for partner restriction or informed altruism in the network of reported needle-sharing ties. We find however that sharing of needles is strongly reciprocal, and individuals with higher injection frequency are more likely to have injected with a used needle. Drawing on our ethnographic work, we discuss how the network structures we observe may relate to a decision-making rationale focused on avoiding withdrawal sickness, which leads to risk-taking behaviors in this poor, rural context where economic considerations often lead PWID to cooperate in the acquisition and use of drugs.

Introduction

Sharing injection equipment with another person when using drugs can be risky but can potentially also have some benefits. Common risks include the possibility of infection with HIV or the hepatitis C virus (HCV). These risks compete with the potential benefits (or avoidance of negative consequences) that may come from *not* purchasing clean works, such as saving money and time, or avoiding potentially incriminating possession of paraphernalia. When people use drugs with others, maintaining good relationships with co-injectors, who are often an important source of assistance, may also factor into the decision to share injection equipment [1–3]. These benefits and risks are reckoned by individuals in view of their past, their present, their envisioned future, and the surrounding social environment. Here, we examine the role of the HIV and HCV infection status in structuring needle-sharing networks among people who inject drugs (PWID) in rural Puerto Rico.

37. Friedman SR, Neaigus A, Jose B, Curtis R, Goldstein M, Ildefonso G, et al. Sociometric risk networks and risk for HIV infection. American Journal of Public Health. 1997; 87(8):1289–1296. https://doi.org/10.2105/ajph.87.8.1289 PMID: 9279263

38. Davey-Rothwell MA, Latkin CA. Gender differences in social network influence among injection drug users: perceived norms and needle sharing. Journal of Urban Health. 2007; 84(5):691–703. https://doi.org/10.1007/s11524-007-9215-1

39. Friedman SR, Sandoval M, Mateu-Gelabert P, Meylakhs P, Des Jarlais DC. Symbiotic goals and the prevention of blood-borne viruses among injection drug users. Substance Use & Misuse. 2011; 46(2-3):307–315. https://doi.org/10.3109/10826084.2011.523316

40. Abadie R, Gelpi-Acosta C, Davila C, Rivera A, Welch-Lazoritz M, Dombrowski K. "It Ruined My Life": The effects of the War on Drugs on people who inject drugs (PWID) in rural Puerto Rico. International Journal of Drug Policy. 2018; 51:121–127. https://doi.org/10.1016/j.drugpo.2017.06.011

41. Strathdee SA, Beyrer C. Threading the needle—how to stop the HIV outbreak in rural Indiana. New England Journal of Medicine. 2015; 373(5):397–399. https://doi.org/10.1056/NEJMp1507252

42. Zibbell JE, Iqbal K, Patel RC, Suryaprasad A, Sanders KJ, Moore-Moravian L, et al. Increases in hepatitis C virus infection related to injection drug use among persons aged ≤30 years—Kentucky, Tennessee, Virginia, and West Virginia, 2006-2012. Morbidity and Mortality Weekly Report. 2015; 64(17):453–458. PMID: 25950251

43. Cicero TJ, Ellis MS, Surratt HL, Kurtz SP. The changing face of heroin use in the United States: a retrospective analysis of the past 50 years. JAMA Psychiatry. 2014; 71(7):821–826. https://doi.org/10.1001/jamapsychiatry.2014.366

44. CDC. HIV Surveillance Report 2010. Center for Disease Control and Prevention; 2010. Available from: https://www.cdc.gov/hiv/surveillance/resources/reports/2010report/.

45. Norman LR, Dévieux JG, Rosenberg R, Malow RM. HIV-testing practices and a history of substance use among women living in public housing in Puerto Rico. Journal of the International Association of Physicians in AIDS Care. 2011; 10(4):260–265. https://doi.org/10.1177/1545109710393310

46. Pérez CM, Marrero E, Meléndez M, Adrovet S, Colón H, Ortiz AP, et al. Seroepidemiology of viral hepatitis, HIV and herpes simplex type 2 in the household population aged 21–64 years in Puerto Rico. BMC Infectious Diseases. 2010; 10(1):76. https://doi.org/10.1186/1471-2334-10-76 PMID: 20331884

47. Colón-López V, Ortiz AP, Banerjee G, Gertz AM, García H. HIV and syphilis infection among men attending a sexually transmitted infection clinic in Puerto Rico. Puerto Rico Health Sciences Journal. 2013; 32(1):8–13.

48. Klovdahl AS, Potterat JJ, Woodhouse DE, Muth JB, Muth SQ, Darrow WW. Social networks and infectious disease: the Colorado Springs study. Social Science & Medicine. 1994; 38(1):79–88. https://doi.org/10.1016/0277-9536(94)90302-6

49. Snijders TA, Pattison PE, Robins GL, Handcock MS. New specifications for exponential random graph models. Sociological Methodology. 2006; 36(1):99–153. https://doi.org/10.1111/j.1467-9531.2006.00176.x

50. Hunter DR, Handcock MS, Butts CT, Goodreau SM, Morris M. ergm: a package to fit, simulate and diagnose exponential-family models for networks. Journal of Statistical Software. 2008; 24(3):nihpa54860.

51. Hunter DR. Curved exponential family models for social networks. Social Networks. 2007; 29(2):216–230. https://doi.org/10.1016/j.socnet.2006.08.005

52. R Core Team. R: A Language and Environment for Statistical mputing. Vienna, Austria: R Foundation for Statistical Computing; 2018. Available from: https://www.R-project.org/.

53. Handcock MS, Hunter DR, Butts CT, Goodreau SM, Krivitsky PN, Morris M. ergm: Fit, Simulate and Diagnose Exponential-Family Models for Networks. The Statnet Project; 2018. Available from: https://CRAN.R-project.org/package=ergm.

54. Handcock MS. Statistical Models for Social Networks: Inference and Degeneracy. In: Breiger R, Carley K, Pattison P, editors. Dynamic Social Network Modeling and Analysis. Washington, DC.: Committee on Human Factors, Board on Behavioral, Cognitive, and Sensory Sciences, National Academy Press; 2003. p. 229–252.

55. Abadie R, Welch-Lazoritz M, Gelpi-Acosta C, Reyes JC, Dombrowski K. Understanding differences in HIV/HCV prevalence according to differentiated risk behaviors in a sample of PWID in rural Puerto Rico. Harm Reduction Journal. 2016; 13(1):10. https://doi.org/10.1186/s12954-016-0099-9

56. Krumpal I. Determinants of social desirability bias in sensitive surveys: a literature review. Quality & Quantity. 2013; 47(4):2025–2047. https://doi.org/10.1007/s11135-011-9640-9