Social Place as a Location of Potential Core Transmitters:
Implications for the targeted control of STI transmission in urban areas

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Environment is a driver of STI transmission (1)

- Risk environment - the social and physical space in which factors exogenous to the individual interact to increase infection risk for an individual
- Social venues (e.g. bars, clubs and street corner) – may represent an STI risk environment in 3 ways:
  - Attracting individuals who practice risk behaviors (e.g. inconsistent condom use)
  - Encourage or enable individual risk behaviors (e.g. multiple sex partners)
  - Create the opportunity for high risk individuals to coalesce into risk-related sexual networks (e.g. concurrency)

(1) Potterat STD 1985; Wohl AIDS Behav 2001; Jennings SSM 2012; Jennings Health Place 2013; Jennings JUH 2015

Evidence for the importance of social venues and their characteristics

- Gonorrhea occurs in small, socially definable segments of the population and the individuals in the segments showed significant social association (1)
- Comparing two distinct networks of individuals at risk for STIs and HIV, transmission was associated with structural characteristics of networks (2)
- Neighborhood drug market venues were associated with an increased likelihood of selecting a high-risk sexual partner and a 10-fold increase in the odds of a current infection with a bacterial STI (3)

(1) Potterat 1985; (2) Rothenberg 1999; (3) Jennings 2010

Current Study

- Sought to extend this work to look directly at individuals congregating at venues to determine whether drug and/or sex market venues (vs. other venues) are more likely to be frequented by individuals most likely to transmit STIs, i.e., core transmitters
- A direct link between these venues and transmission risk, would suggest that these venues may be effective targets for structural and individual level STI control activities.

Objectives

- To determine whether sex partner meeting places characterized as drug markets, sex markets and separately, drug and/or sex markets were more likely to have potential core transmitters as compared to other sex partner meeting places in one urban setting.
- We tested the independent association each type of market in an attempt to tease out the importance of each as well as the potential interaction of the two types of venues.

(1) Rothenberg STD 1988; Weir AIDS 2003; Michaud STD 2003; Denning 2010; Polk JUH 2013
(2) Frost STI 2007; Grov AIDS Educ Prev 2010
(3) Klovdahl SSM 2001; Oster STD 2013

Setting – Baltimore City, Maryland, USA

- 6th poorest metropolitan area in the U.S. with a poverty rate of 24% (1)
- High rates of injection drug use – roughly 10% of the population is estimated to be illicit drug addicts (2)
- Endemic rates of STIs and racial/ethnic disparities – in 2011, Baltimore had the 6th highest chlamydia and HIV and 10th highest gonorrhea incidence among U.S. counties (3)

(1) US Census 2010; (2) US NDIC 2003; (3) US CDC STD Surveillance 2011

Study Design

- Venue-base, cross-sectional study of adults 18-35 years of age, Baltimore, MD, Oct 2008 – Dec 2009
- Sex partner meeting venues identified through a 3 phase, venue-based methodology (1)
  - Phase 1: multiple sources of information used to identify specific sex partner meeting venues and high STI-risk areas
  - Phase 2: brief windshield tours conducted to identify venues where people congregate
  - Phase 3: observational data were collected and venue informant interviews were conducted to identify high volume, heterosexual sex partner meeting venues

(1) Weir AIDS 2003; Polk JUH 2013, Polk AIDS Behav 2014; Jennings Annals of Epi 2015

Participant Recruitment & Interview

- Via a mobile van, a team recruited and enrolled participants at selected venues until 20 participants were enrolled
- Eligibility
  - 18-35 years of age
  - English-speaking
  - Sexually active within last 3 months
- Informed consent
- Brief, staff-administered questionnaire
- Biologic samples – urine from males, self-administered vaginal swabs from females for NAAT(ProbeTec) testing for gonorrhea and chlamydia

Core Transmitter - definition

- Self-report of sexual concurrency (1)
  - In the last six months, have you had more than one sex partner within the same week?
  - In the last three months, have you had at least one other partner during the time you were seeing your main partner?
- Positive for gonorrhea and/or chlamydia
- 3% (39) of participants were classified as potential core transmitters

(1) Potterat Am J Epi 1999

Results

- Screened 2,247 potential participants
  - 24% (545) screened ineligible or refused
- Enrolled 1,702 participants from 87 venues
- 22% (368) excluded - no sexual orientation, missing STI testing results, no venue-level information
- Final sample: 1,334 participants from 85 venues

Sociodemographics by core transmitter status among heterosexuals (18-35 years) in a venue-based study, Baltimore, MD 2008-2009 (n=1,334)

Individual-level	Overall	Core transmitter n=39	Non-core transmitter n=1295
Sociodemographics	*mean (SD)*	*mean (SD)*	*mean (SD)*
Age, years	**27.5 (6.1)**	**25.4 (6.3)**	**27.5 (6.1)**
	%	%	%
Male	48	49	48
Black	85	85	85
< High school education	41	54	41

Sexual risk behaviors by core transmitter status among heterosexuals (18-35 years) in a venue-based study, Baltimore, MD 2008-2009 (n=1,334)

Individual-level	Overall	Core transmitter n=39	Non-core transmitter n=1295
Sexual risk behaviors	%	%	%
Sex w/o a condom, 6 mos	71	77	70
> 2 sex partners, 6 mos	**25**	**64**	**24**
Sex w/ anonymous partner, 12 mos	**11**	**33**	**11**
IDU sex partner, 12 mos	5	3	5
Sex/drug exchange, 12 mos	**15**	**36**	**14**

Drug-related behaviors by core transmitter status among heterosexuals (18-35 years) in a venue-based study, Baltimore, MD 2008-2009 (n=1,334)

Individual-level	Overall	Core transmitter n=39	Non-core transmitter n=1295
Drug-related behaviors	%	%	%
Crack cocaine use,12 mos	**9**	**21**	**8**
Injection drug use, 6 mos	8	8	8
Needle sharing, 6 mos	3	3	3
Bought or sold drugs (ever)	**48**	**67**	**48**

Adjusted odds ratios (AORS) of identifying a core transmitter based on venue-level factors among heterosexuals (18-35) in a venue-based study, Baltimore, 2008-2009

Venue-level	AORs	AORs	AORs
Drug Market	**1.37 (1.23,1.53)**		
Sex Market		**1.27 (1.14,1.41)**	
Drug and/or Sex Market			**1.49 (1.32,1.68)**
Individual-level			
Age	0.94 (0.93,0.95)	0.94 (0.93,0.95)	0.94 (0.93,0.95)
Gender, male	1.07 (0.96,1.20)	1.06 (0.96,1.19)	1.06 (0.95,1.18)

Discussion

- This study identified key characteristics of venues, such as drug and sex market activity, which may be important in identifying places for the targeted control of STI transmission.
- 62% of venues were classified as drug markets, sex markets and drug and/or sex markets and potential core transmitters were significantly more likely to be identified at these venues.
- Similar to work by Tobin, et al. (2012) which found evidence of spatial clustering of sex exchange and in particular in one housing complex in East Baltimore among a sample of predominantly injection drug users.

Implications

1. Testing and treatment at drug and sex market venues should be a priority for STI prevention and control programs
2. It is essential to disrupt drug and sex market risk environments that underpin high transmission network structures in order to reduce ongoing transmission of STIs that maintain endemic bacterial STI rates in communities with these venues.

Future Research

- Determine the stability of venues and identifying other important features of venues which distinguish places with ongoing transmission
- Test methods to disrupt the networks and the transmission within the networks
- Investigate the relative cost benefit of place-based testing and treatment
- Explore community receptivity to place-based testing and treatment

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