

# Measuring the Network Overlap in Transmission Networks of Syphilis and/or HIV Infected MSM

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# Syphilis is on the RISE

- Syphilis is increasing in the U.S. and the highest rates are among Black gay, bisexual, and other men who have sex with men (MSM).
- Baltimore, Maryland has one of the most severe syphilis epidemics with a co-occurring HIV epidemic.
  - In 2015, 65% (268) of all reported P&S and early latent cases were among MSM, 88% of whom were Black MSM.
  - P&S cases among MSM increased 39% and early latent syphilis increased by 250% from 2009-2015.
  - Among MSM, 76% of syphilis cases were co-infected with HIV.

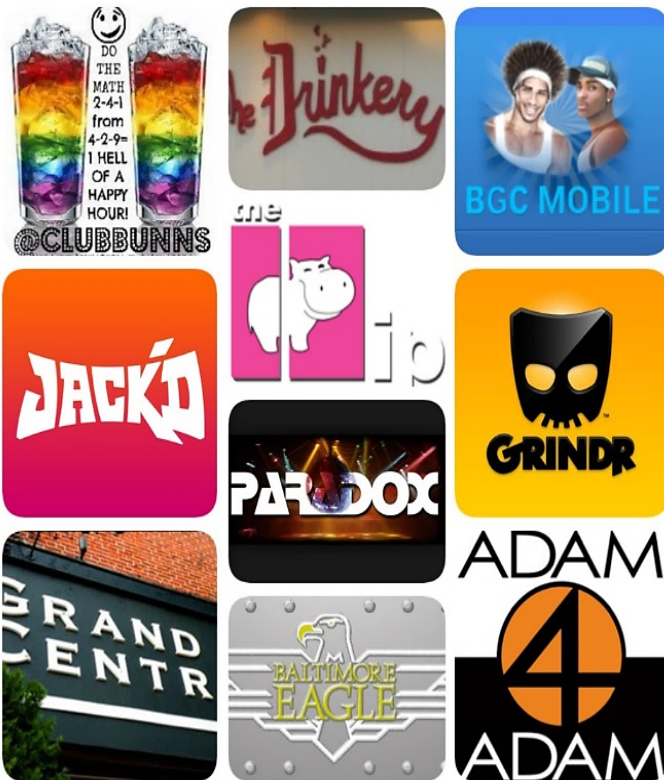
# Urgent need

- The racial disparities and number of new syphilis infections demonstrate that our current prevention strategies are not effective.
- Underscores the urgent need to prioritize syphilis and HIV control strategies, particularly among MSM at high risk for transmitting and acquiring syphilis and/or HIV.

# Public Health Control Strategies

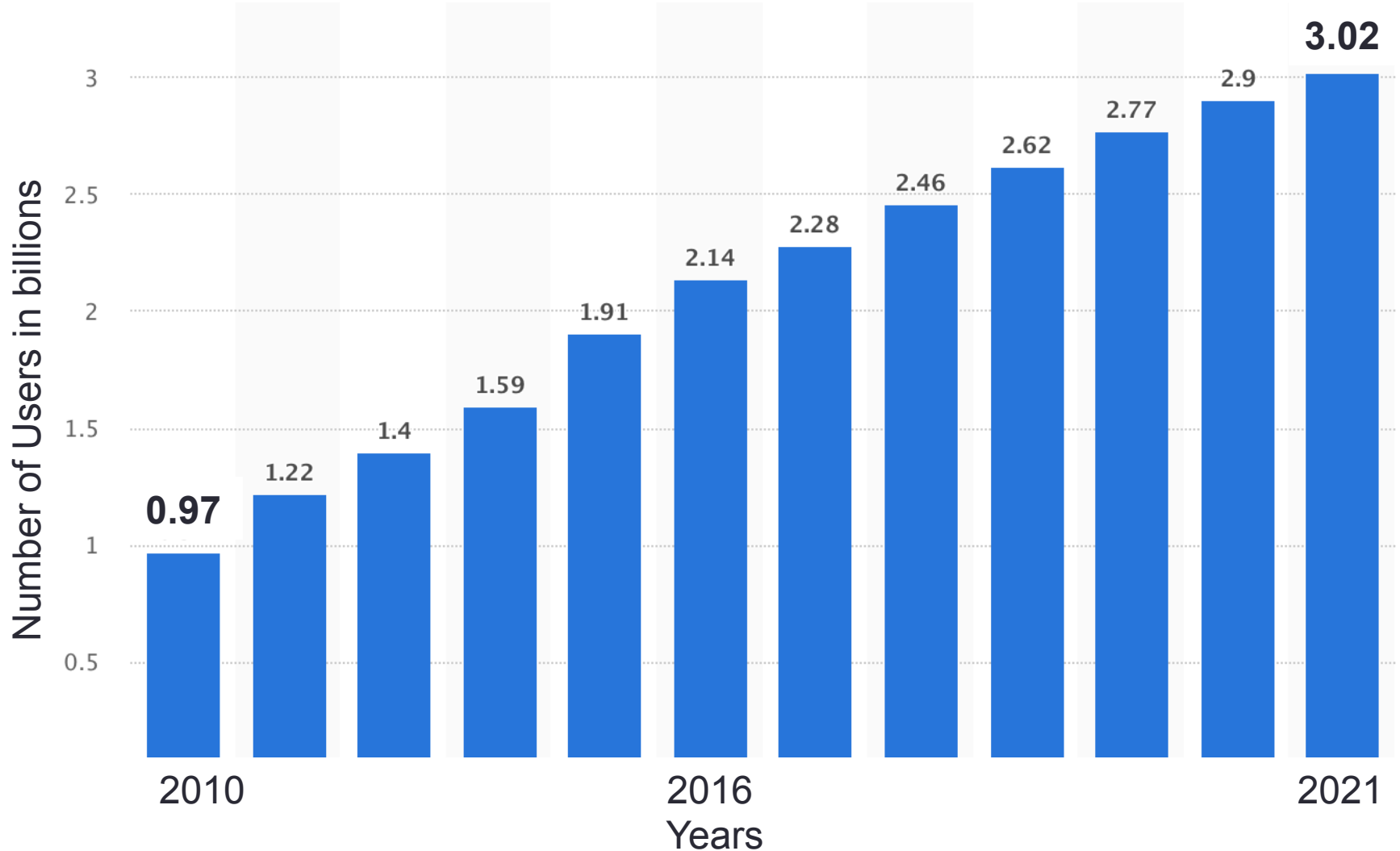
- Strategies are most effective if implemented at right time, in the right place/space and with the most important populations.
- Sex partner meeting venues may be important locales to access MSM and implement control strategies.

# Sex Partner Meeting Venues



- Social venues where individuals congregate including bars/clubs, internet apps, social websites, chat lines, etc.
- May attract individuals with transmissible infection
- May create opportunities for interconnectedness that perpetuate incident infection
- May be important places for control activities

# Numbers of Social Media Users Worldwide 2010-2021 in billions.

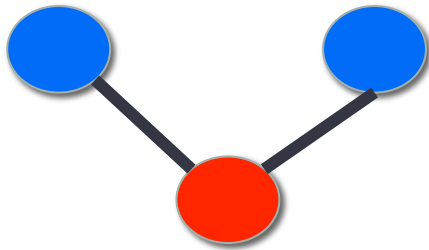


Source: Statistica

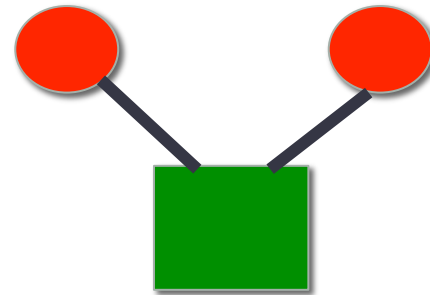
# Social Media Use among Irish Children and Adolescents, Ages 9-16 years

- Social networking use is a near universal and increasingly a part of young children's lives.
  - ~3 out of 5 children and adolescents have a profile on a social networking site
  - ~9 out of 10 adolescents, 15-16 years of age have a profile on a social networking site

# Sexual networks – Venue networks



Who did you have  
sex with in the  
past 3 months?



Where did meet  
sex partners in the  
past 3 months?

# Sexual Affiliation Network Analyses

- Connects individuals nominating sex partner meeting venues into a sexual network of venues.
- Indirect source of data on sexual networks which does not require tracing each direct contact of an individual.
- May reveal places where important clusters of sexual connections are occurring and access points for intervention.
- Strengths: Less resource intensive to obtain, fewer biases.

# Objectives

Using venue affiliation networks of syphilis and/or newly HIV diagnosed MSM during a local MSM syphilis epidemic, to

1. Describe and quantify the network structure and connectivity of venues
2. Examine overlap in syphilis and HIV transmission networks
3. Sub-analysis: Explore temporal changes in the venue network structure from 2012 to 2016  
(Abstract 297)

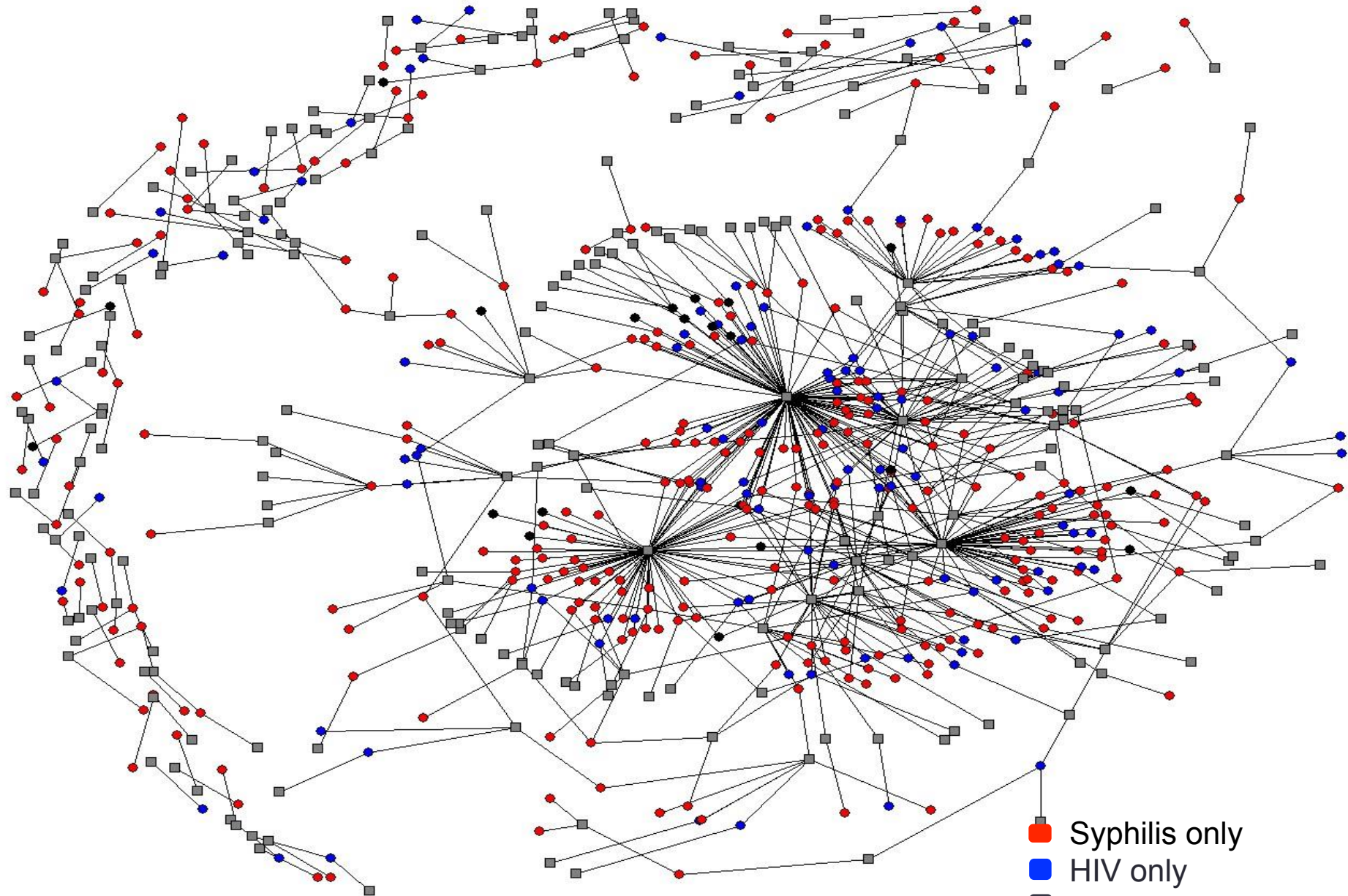
# Methods

- Public health surveillance data from 544 MSM diagnosed with syphilis and/or HIV from 2012-2017.
- Venue affiliation network graphs and whole network structure measures were generated using UCINET.

# MSM Study Population Characteristics, Baltimore City, 2012-2017 (n=544)

Characteristic		n	%
Age, years (n=512)	< 25	172	37
Race	Black	337	62
# of sex partners, past 12 mos	> 1	375	69
Injection drug use		16	3
Commercial sex work		26	5
Syphilis only		360	66
HIV only		146	27
Syphilis and HIV		38	7

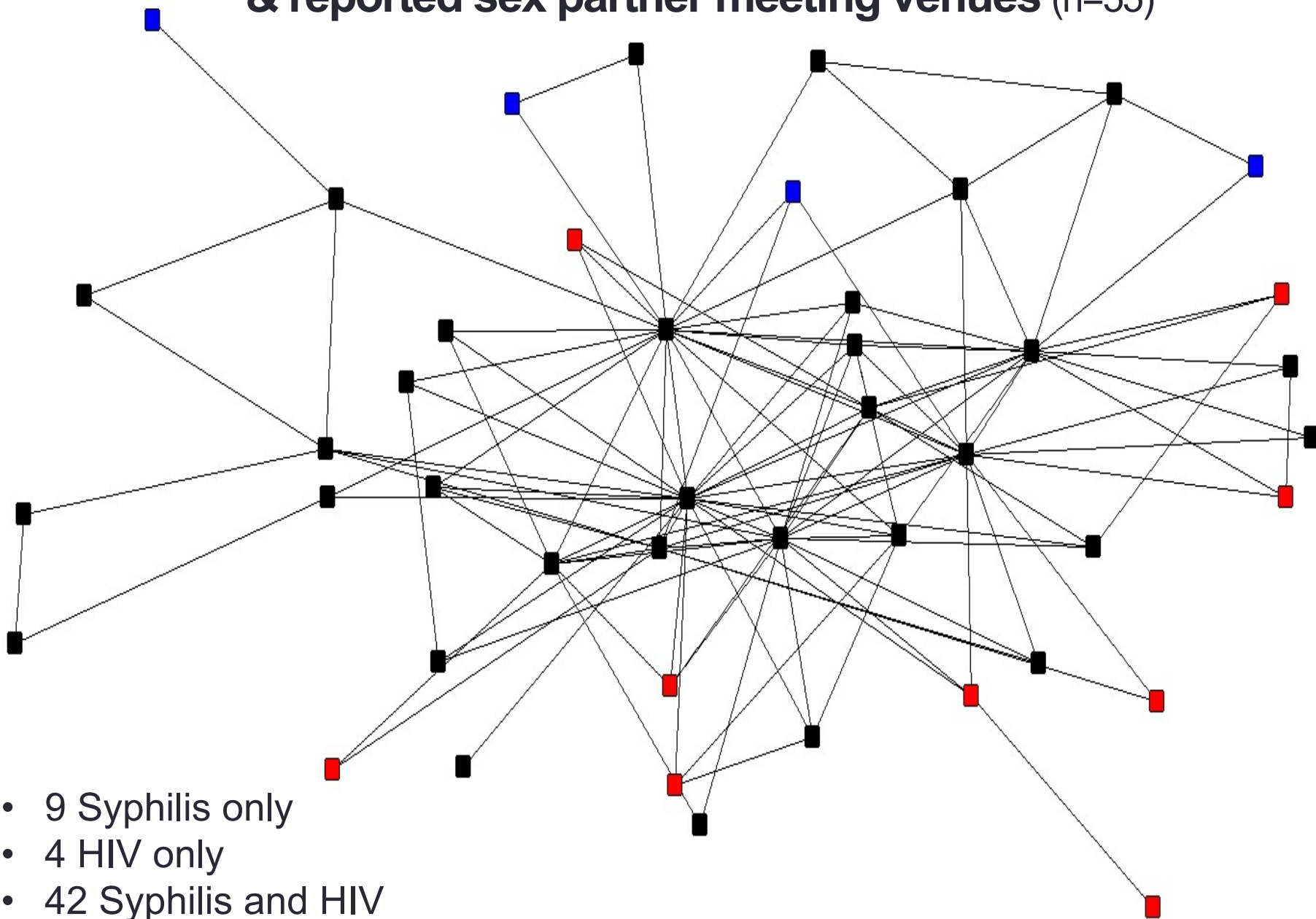
# Affiliation network of newly syphilis and/or HIV diagnosed MSM (n=544) & reported sex partner meeting places (n=146)



# Unique Sex partner Meeting Venues (n=146) Baltimore City, 2012-2017

Type	N	%
Streets/parks/neighborhoods (S/P/N)	48	33
Internet-based sites	40	27
Bars/clubs	26	18
Market or malls	15	10
Other venues	10	7
School	5	3
Private residences	2	1
Total	146	100

# Affiliation network of newly syphilis and/or HIV diagnosed MSM & reported sex partner meeting venues (n=55)

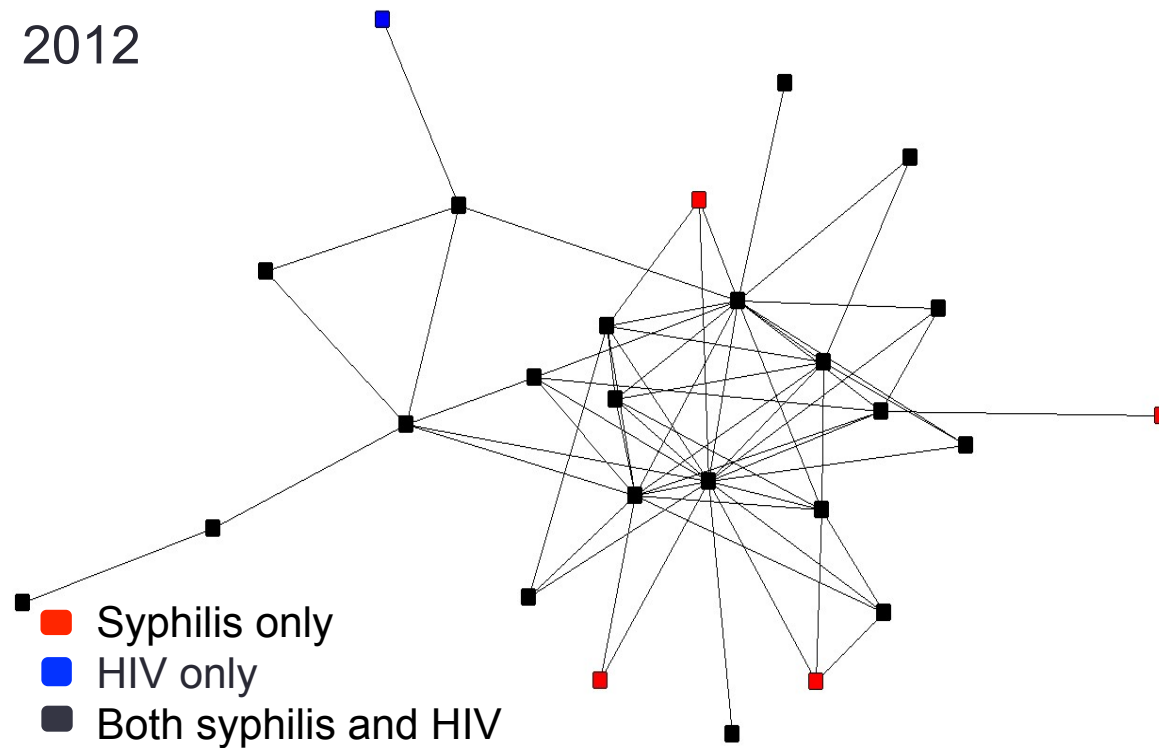


# A tightly connected cluster of 5 online meeting venues emerged

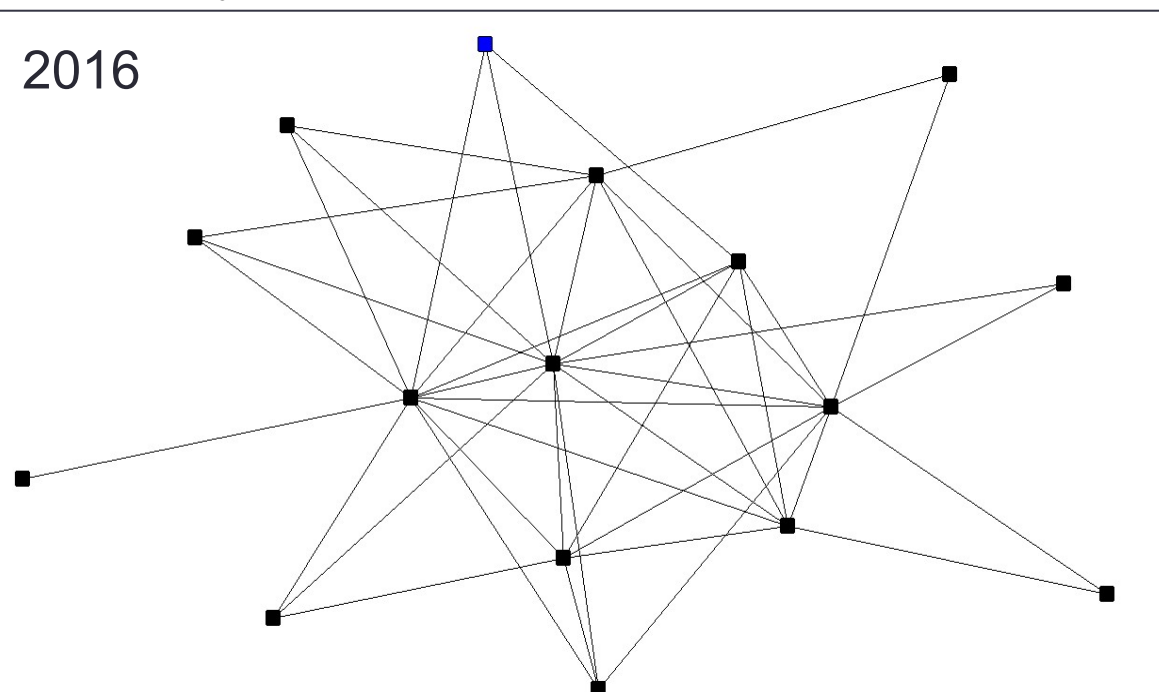
- 59% of reports
- connected the most venues (degree centrality)
- shortest path between venues not directly connected (betweenness centrality)

Online space	Degree	Betweenness
Facebook	0.43	0.18
Adam4adam	0.39	0.19
Jack'd	0.33	0.09
Grindr	0.28	0.10
Instagram	0.19	0.02

2012



2016



# Results

- Comparing 2012 to 2016
  - density of the network increased 23.8% (0.09 to 0.11)
  - compactness (shortest distance path) of the network increased 16.3% (0.22 to 0.26)
- Proportion of venues nominated by MSM with HIV and/or syphilis (vs. only one diagnosis) in the main network component increased 17.1% (80.0% to 93.7%)

# Conclusions

- Venue affiliation graphs of syphilis and/or HIV infected MSM suggest high overlap in transmission networks.
- Five highly central venues emerged, representing the venues that
  - connected the most venues (degree centrality)
  - were on the shortest path between venues not directly connected (betweenness centrality).
- These venues may represent the optimal set for tailored interventions.

## Co-Authors

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## Funding & Partners

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