

Network Analysis

Why Measuring Connections Matter

Interdisciplinary Methods Core
Center for Interdisciplinary Research on AIDS



The Importance of Networks in HIV

Who are you
really **sleeping** with?

CAT **H** Y T **I** M **V** INCENT

Get off the sexual network,
get tested for HIV and start a new life.

USAID
UxMG

The poster features a central network diagram with orange circular nodes connected by lines. A man and a woman are standing on the central node, while other people are on surrounding nodes. The text 'Who are you really sleeping with?' is at the top, and 'Get off the sexual network, get tested for HIV and start a new life.' is at the bottom. Logos for USAID and UxMG are at the bottom corners.

The Importance of Networks in HIV

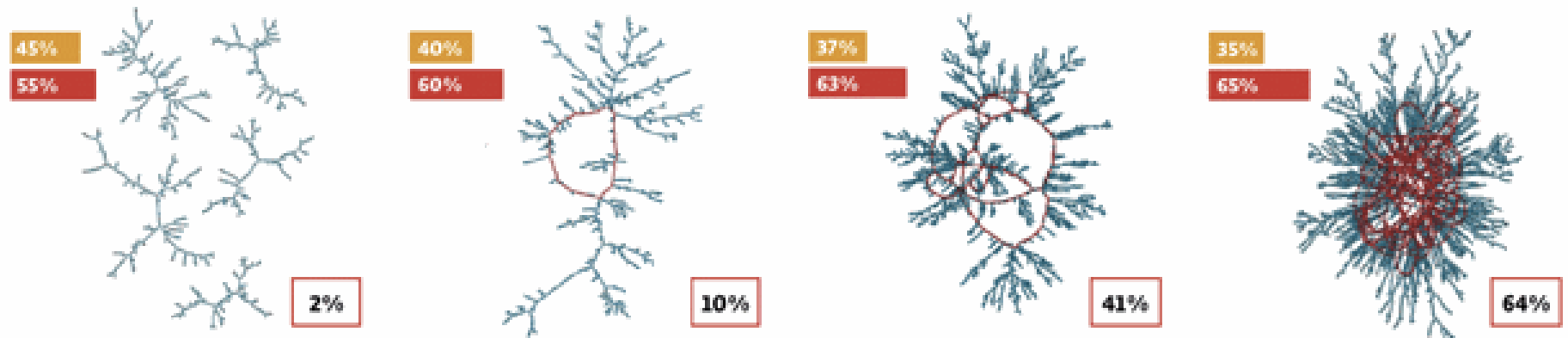
Small Change, Big Effects

KEY

1 partner

2 or 3 partners

Percent of people that are connected in the network through their sexual partnerships

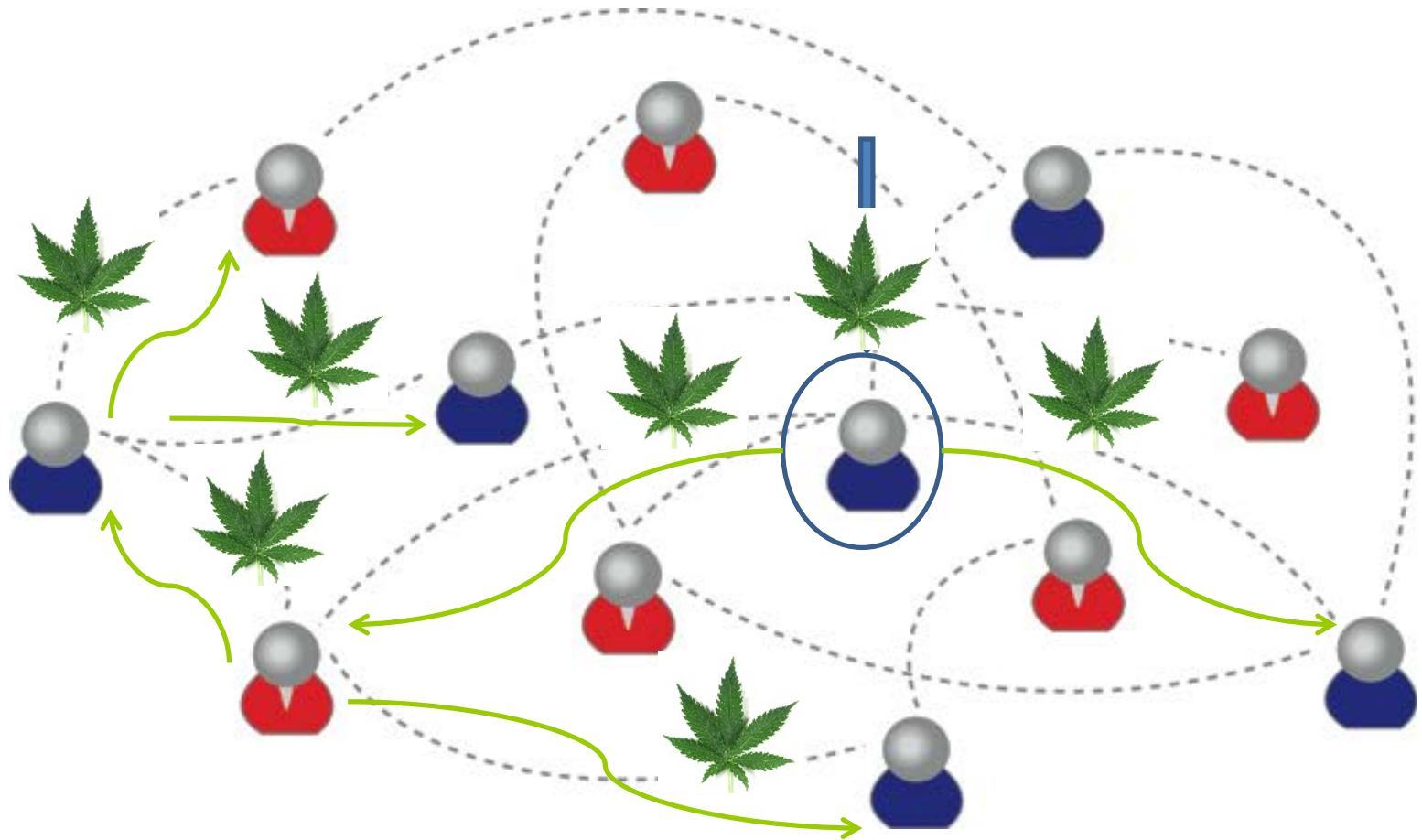


Modest variations in the concurrency rate—the proportion of people in overlapping sexual partnerships—can have a dramatic effect on a population's vulnerability to HIV.

When the concurrency rate is 55%, only 2% of this population is connected to the broader sexual network required for HIV transmission (top). But when concurrency reaches 65%, an astonishing 64% of the population is vulnerable, even though the number of sexual partners remains constant.

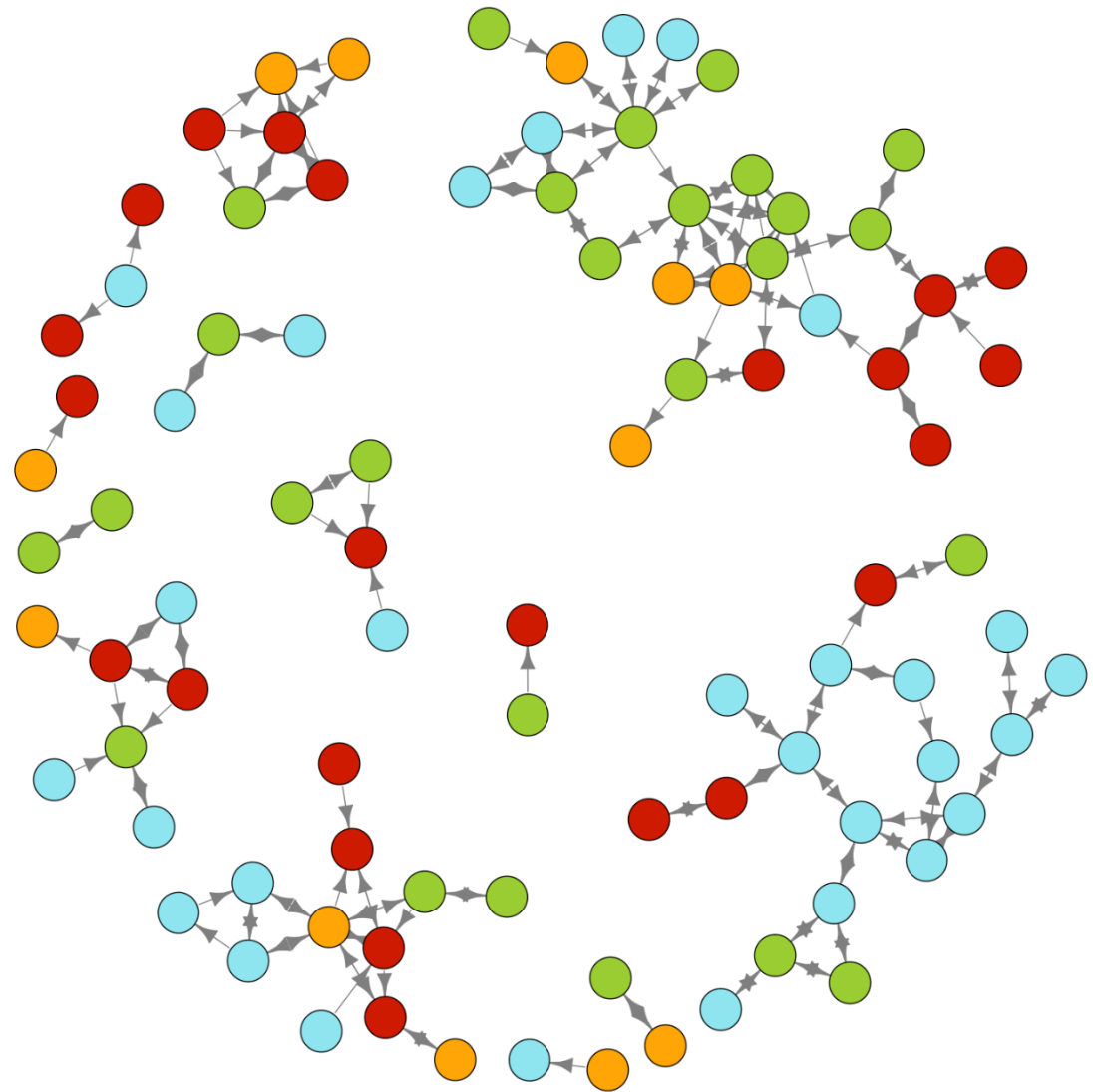
Source: Morris, et al. The Relationship Between Concurrent Partnerships and HIV Transmission, 2008. See www.aidstar-one.com/.

Social Networks and Behavior Change



Texting Connections by Problem Substance Use Group

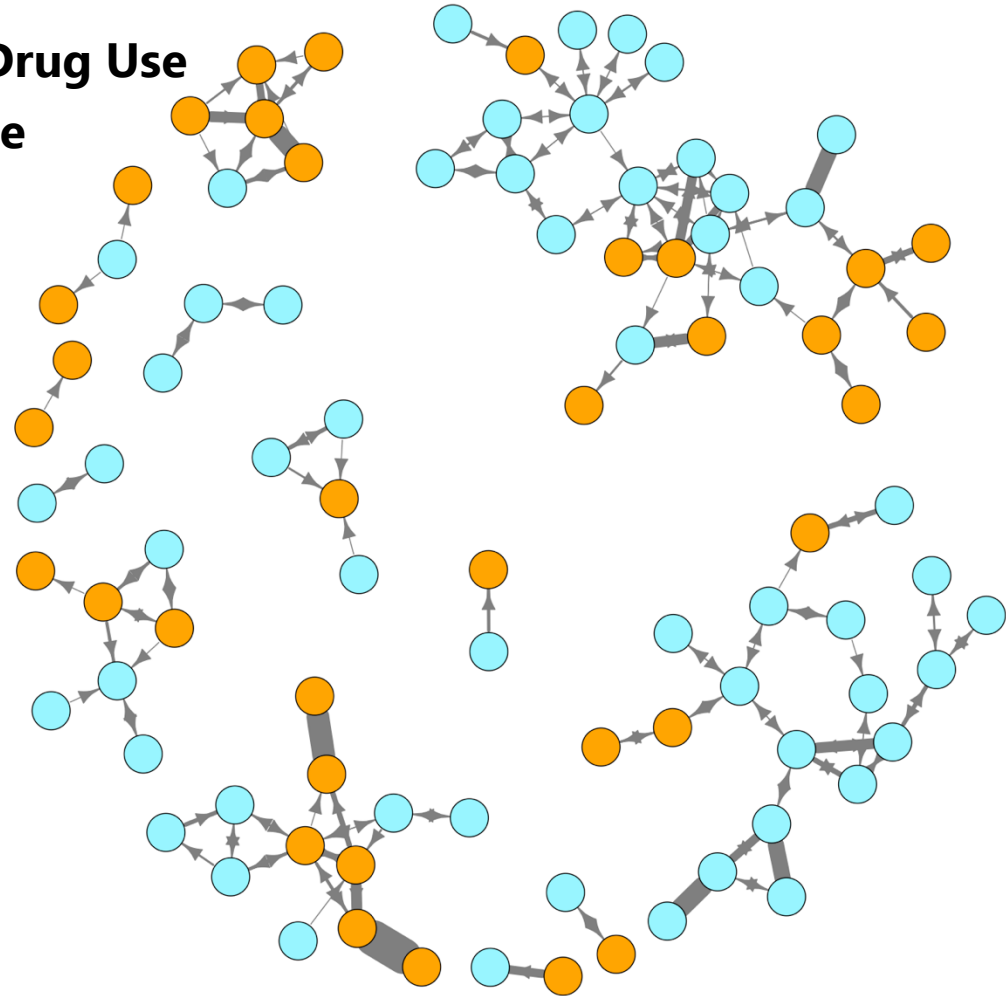
- No Problematic Substance Use
- Problem Alcohol Use
- Problem Drug Use
- Problem Alcohol & Drug Use



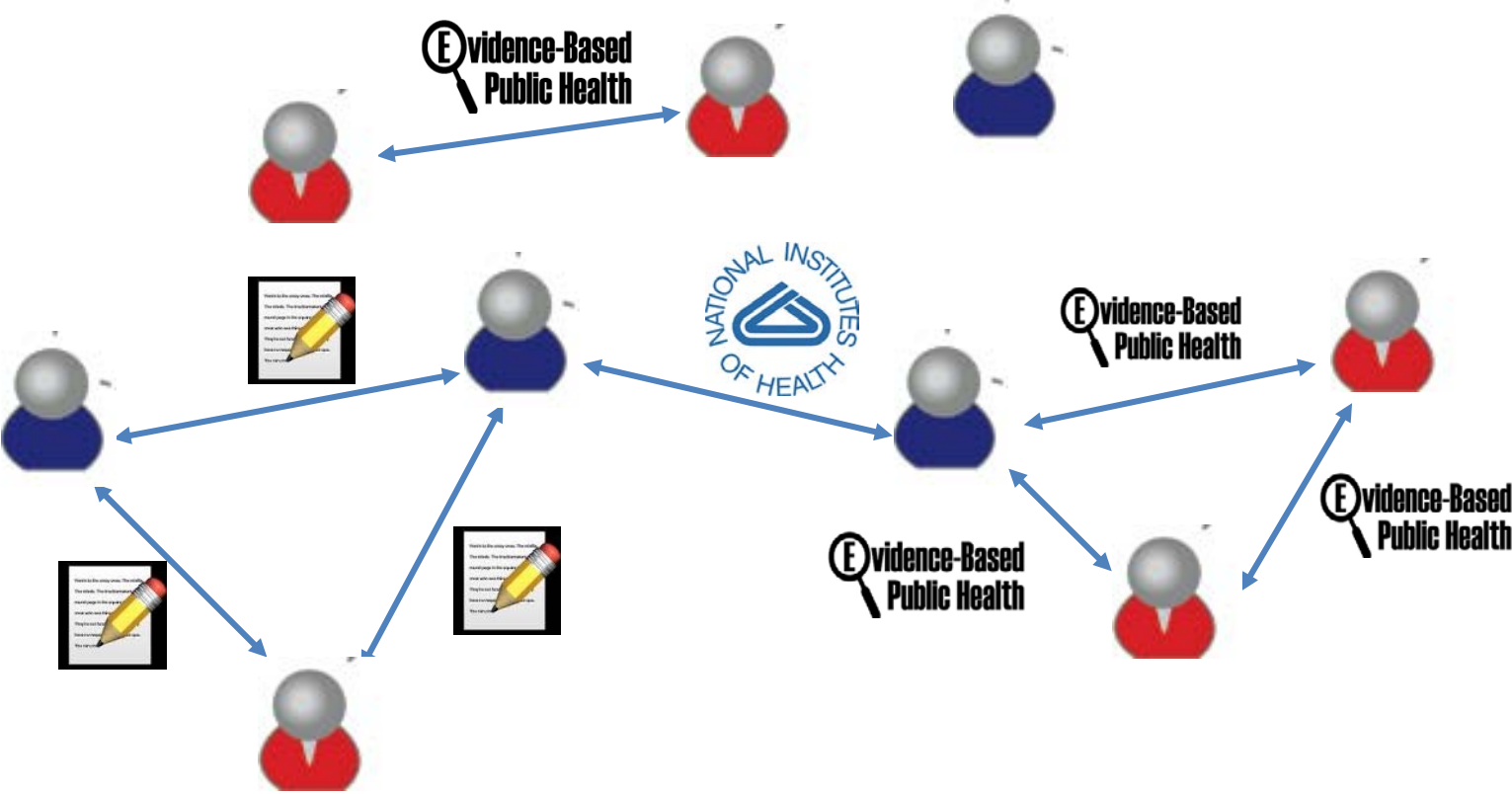
Texting about Drug Use and Marijuana Use



- **No Problematic Drug Use**
- **Problem Drug Use**

- Individuals who sent more texts with marijuana related content were more likely to have:
 - positive attitudes toward marijuana use
 - more frequent marijuana use
 - problem marijuana use
- Those with problem marijuana use had significantly:
 - Lower betweenness centrality (15.5 vs. 42.2)

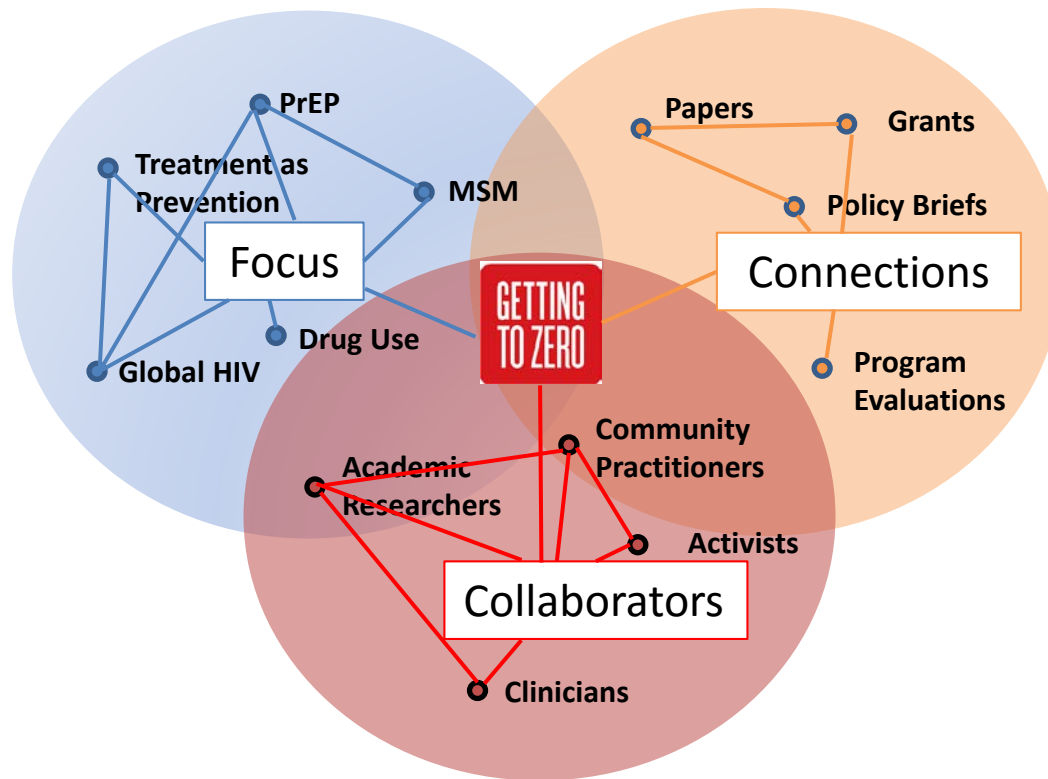


Extending the Understanding of Network Analysis to Research Networks



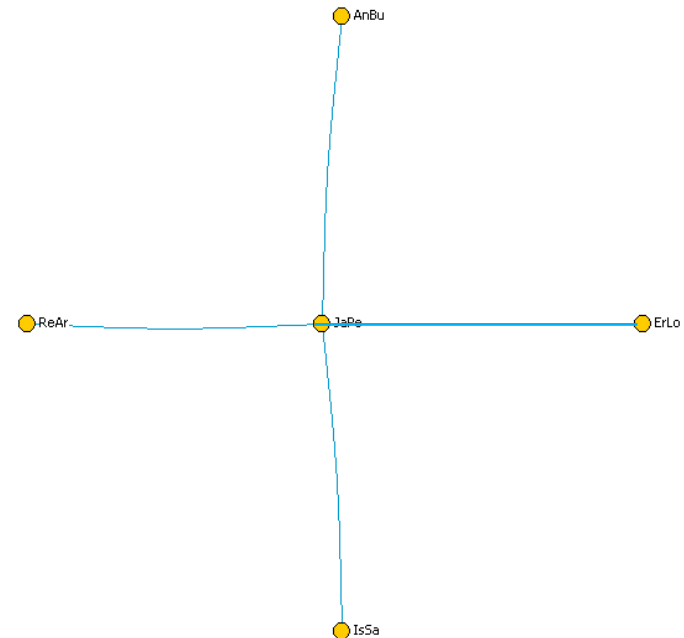
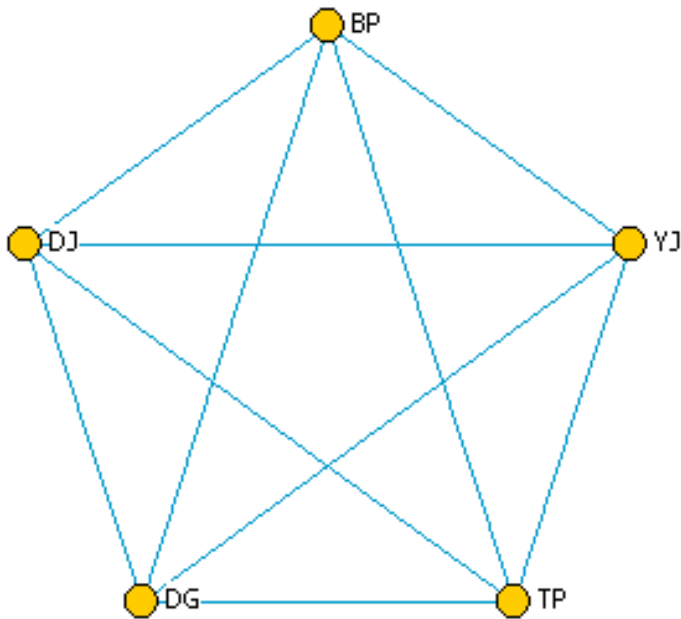
-  Community Practitioner
-  Academic Researcher

Connected HIV Care and Prevention: Research, Policy, and Action



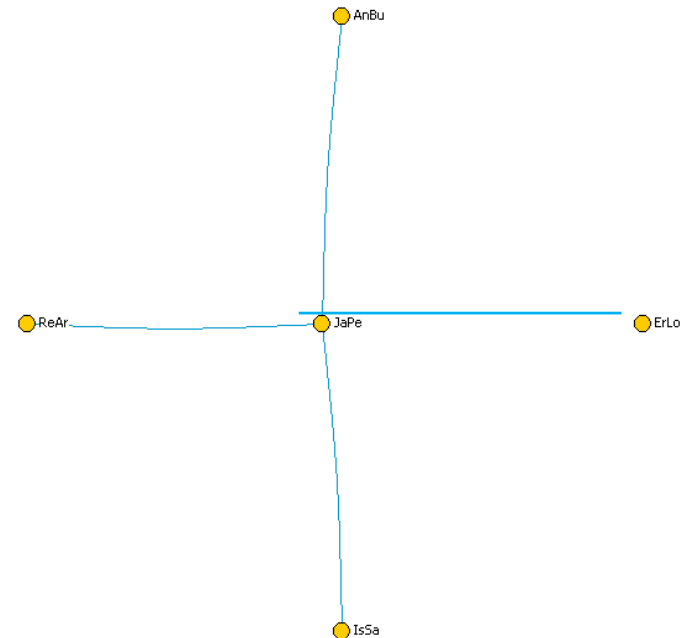
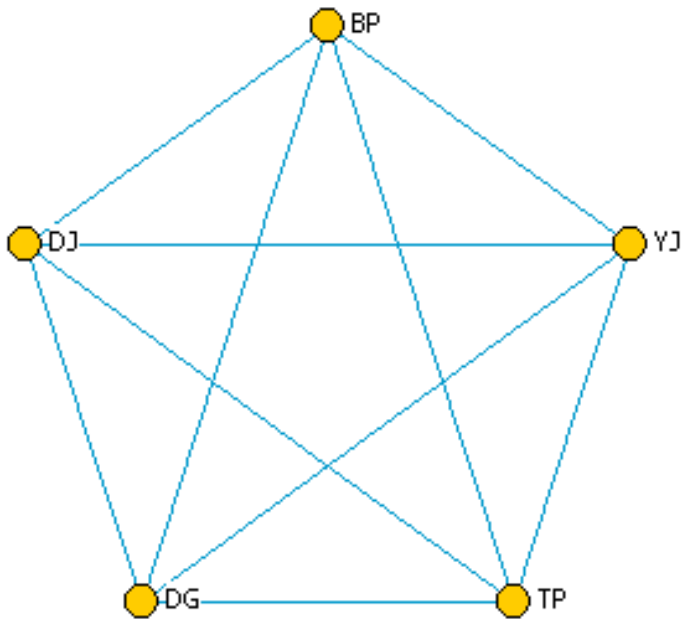
Network Measures

- Size
- Centrality
 - Network: Whether network is formed around a few central members
 - Individual: # of total connections (indegree, outdegree)



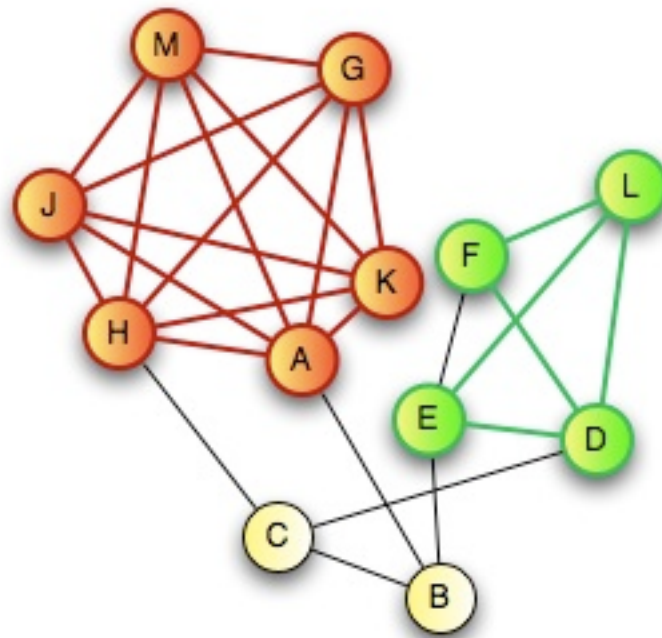
Network Measures

- Cohesion
 - Network: Average closeness or Liking ratings
- Density
 - Proportion of all possible ties in a network



Network Measures

- Cliques
 - Subgroups in a network

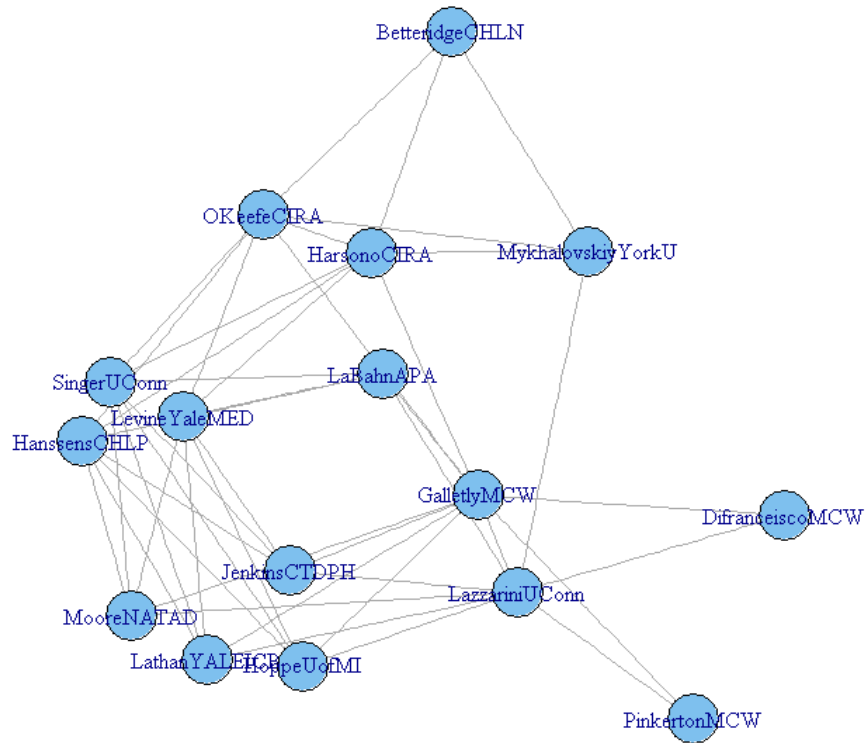


An Example: The Criminalization Working Group

- To quantify relationships within and among members of the Criminalization Working Group, the IRM core created a network graph using the *digraph* package in R statistical software*
- In this graph each CWG member is a node and the ties represent both peer reviewed publications and collaboration on grant development

*Csardi G, Nepusz T: The igraph software package for complex network research, InterJournal, Complex Systems 1695. 2006. <http://igraph.sf.net>

Network Representation of CWG Collaboration 2014

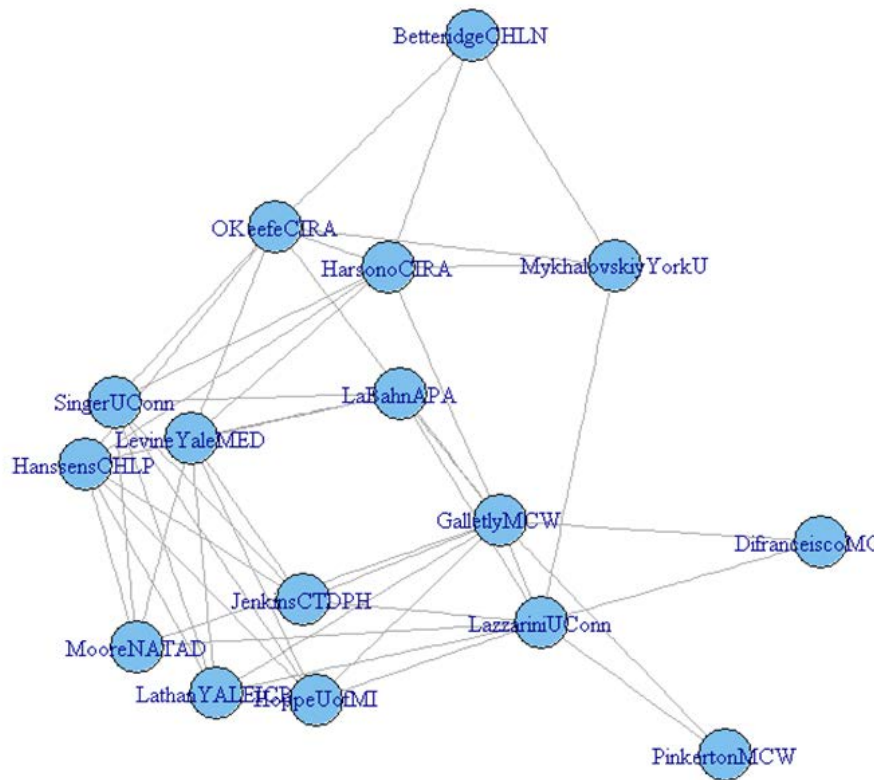


Benefits of Network Analysis

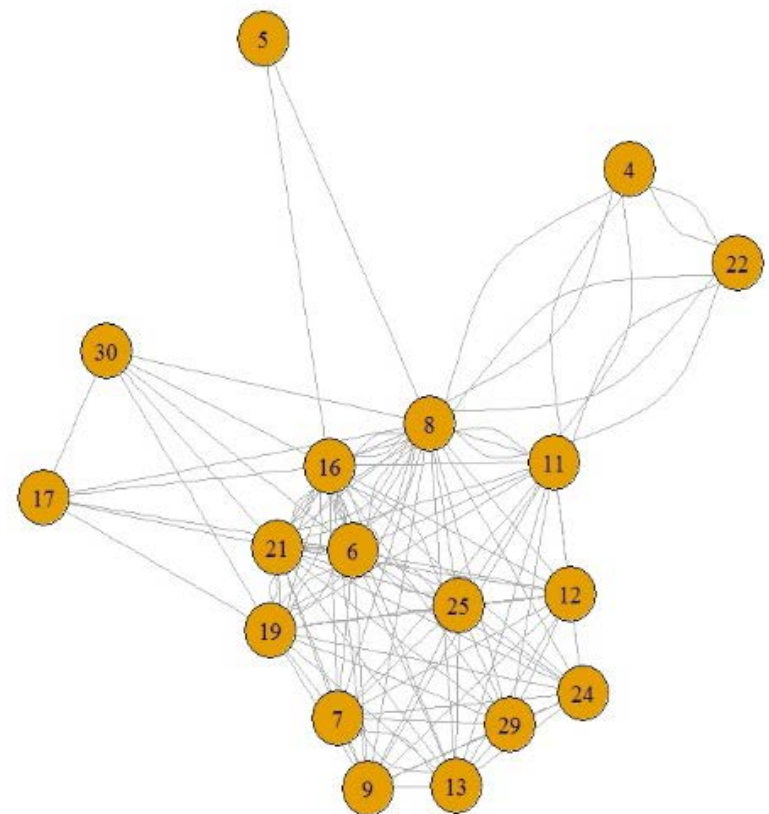
- Visualization makes working structure accessible
- Can identify individuals with high importance in terms of contributions to the collaboration
- Can identify what attributes of individuals and the network are needed for successful collaborations
- Ideal for monitoring of research and implementation, easily identifies where collaboration should be strengthened
- Can be continually updated within the *igraph* software to produce longitudinal networks as new collaborations are formed

Network Over Time

2014



2016



Assessment of Connections in This Room

- *Developed Research Area*
- *Grant Submitted*
- *Grant Funded*
- *Manuscript Submitted*
- *Manuscript Published*
- *Other Collaboration*

