Integrating Venue-Based Social Network Analysis and Geographic Information System Analysis to Guide Targeted HIV Prevention

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Overview

- Types of Networks
- Creating Venue-Based Networks
- Gathering Geographic Information Systems (GIS) Data
- Integrating Venue Network and Geographic Information System (GIS) Data
- A Case Example: The Healthy Young Men’s Study
- Future Directions
Types of Networks
What is a network?

- An interconnected set of actors
  - Individuals
  - Groups
  - Organizations
  - Venues
Egocentric Networks

- The individual (ego) is connected to her network members (alters) by interpersonal connections (ties).
Egocentric Networks
Egocentric Name Generator

“Please tell me the names of the 20 people with whom you have spoken in person, by phone or by email in the past month”
Sociometric Networks

- A web of individuals who are connected to one another by interpersonal relationships in a bounded space.
Sociometric Networks
Sociometric Name Generator

“Please list the names of the UCLA faculty members with whom you have communicated in person, by phone or by email in the past month”
Affiliation Networks

- Individuals who are connected to one another through their shared membership in an organization or a group.
Affiliation Network Name Generator

- Please tell me the names of the UCLA committees on which you serve"

- OR -

- Please tell me the names of your favorite bars in which to socialize in Los Angeles County”
Creating Venue-Based Networks
Theory of Duality of Persons and Groups

- Goffman: “the individual is linked to society through two principal social bonds: to collectivities through membership and to other individuals through social relationships”

- By determining which social contexts are shared, two networks can be created
  - People connected by shared social space
  - Social spaces connected by people who cross those social spaces

Source: Brieger, 1974; Goffman, 1971
Creating Venue-Based Networks
UCINet and NetDraw

- Network software that can be used for matrix manipulation and network visualization
- Intuitive and easy-to-use
- Downloadable from:
  http://www.analytictech.com/ucinet

Source: Borgatti, Everett, & Freeman (2002)
Spring Embedder Algorithm

- Based on the idea that two nodes in a network push and pull each other simultaneously based on the strength of their connection.
- Two points located close together represent actors that have a stronger pull (and weaker push) on each other.
- Distant actors have a stronger push (and a weaker pull) on each other.
- Seeks to achieve a global optimum where there is the least amount of stress on the “springs” connecting nodes to each other.
Person and Venue Networks
Network Metrics

- **Density**: The total number of ties divided by the total possible number of ties.
- **Degree Centrality**: Central venues are those that have the most ties to other venues in the network.
- **Betweenness**: Central venues are those that most frequently lie on the shortest paths between all other venues in the network.
Other Network Information

- Because venue-based networks are created from individual nominations, other individual-level data can be aggregated to the venue level.
Gathering Geographic Information System (GIS) Data
Venues typically have a geographic location, which can be easily accessed through internet searches.

An exact address is the best type of data to gather for GIS analysis (vs. cross streets or zip codes)

ArcGIS allows you to input each data type

County level HIV and STI data can also be imported into ArcGIS
Geographic Information System Data

Source: HYM Study (Kipke et al., 2007)
Geographic Information System Data

Rates of Males Living with an HIV or AIDS Diagnosis, by ZIP Code, Los Angeles County, 2009

Source: AIDSVu (www.aidsvu.org), Emory University, Rollins School of Public Health.
Geographic Information System Data

- Can calculate average distance traveled by participants to their favorite venues
- Can use spatial analysis and map algebra to determine centroids of all venues.
Case Example:
The Healthy Young Men’s Study
Study Objective

- To examine the venues in which YMSM congregate and meet potential sexual partners in order to identify the venues that may be most conducive to HIV prevention interventions.
The Healthy Young Men Study

- PI: Michele Kipke, CHLA
- Venue-based recruitment during 2005-2006
- Eligibility Criteria
  - 18-24 years old
  - Caucasian, African American, or Latino or Mexican descent
  - Resident of LA County
Demographic Characteristics

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<th>Category</th>
<th>Value</th>
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<tbody>
<tr>
<td>N</td>
<td>526</td>
</tr>
<tr>
<td>Mean age</td>
<td>20 (1.6)</td>
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<tr>
<td>Race/ethnicity</td>
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<tr>
<td>White</td>
<td>27%</td>
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<tr>
<td>African American</td>
<td>24%</td>
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<tr>
<td>Latino</td>
<td>39%</td>
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<tr>
<td>In school or working</td>
<td>87%</td>
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</table>
“Please tell me the names of the three favorite gay places that you go to”
Central venues are those that have the most ties to other venues in the network.
Percent of Sample Reached by Nominations

Top Six Venues

Risk

Non-Risk
UCLA Luskin School of Public Affairs

Lifetime UAI

38%  

36%  

43%
HYM Study Participants by Zip Code and “Favorite Gay Places to Go To”

Source: HYM Study (Kipke et al., 2007)
Results

- Almost all participants were connected by at least one venue (99%)
- Nearly all YMSM (87%) were connected by the 6 most central venues
- Top 6 venues were located within 4.37 miles of one another
- This geographic area also contained an HIV incidence rate of 5,155 per 100,000 residents, one of the highest in LAC.
Future Directions
Future Directions

- More detailed venue-level data is needed
  - Multiple events may take place at a single venue
  - Venue nomination should be tied to specific behaviors (e.g., where you met your last sex partner)
- Venues open and close rapidly; analysis should be conducted as close to data collection as possible
Future Directions

- Forming relationships with LA County to access GIS data and gather venue-network data
- Must consider confidentiality issues in HIV/STI reporting
Questions?