Discovery of a Large Sexual Network Using Routine Partner Services Data, San Francisco, 2013

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Background

• Defining the network of partners to cases defines the only population really at risk for STD
• People in same “social” network as cases are also at risk because of other partners that their own partners may have in common.
• STD epidemics are sustained by sexual activity concentrated in a relatively small "core" of persons in the community
• Effective STD control efforts must identify and treat "core" transmitters
  – Geography of cases
  – Partner services data?
Syphilis in San Francisco, 1955 through 2013

Reported cases

EARLY LATENT
PRIMARY & SECONDARY

Syphilis cases in San Francisco from 1955 to 2013, showing a peak in the mid-1980s with a recent increase.
Partner notification in San Francisco

- Syphilis cases
- New HIV infections
- Standard CDC protocols
  - Critical period
  - Elicit names of partners
- Internet partner services
Data management

• All STD data in single database (“ISCHTR”)
  – Patient-based registry
  – Surveillance, screening, partner notification, STD clinic medical record data
  – Partners and cases handled the same way
  – Patients may be identified just by email or profile name

• Chains and networks of individuals
Network algorithm

- Find all the named partnerships in the time period
- Make an unduplicated list of individuals
- Put the first individuals into network #1
- Find all his partners, put them into same network
- Find all of their partners; if any are not already in the network, add them to the network as well
- Repeat until no partners are found who are not already in the network
- Find an individual who was not in that first network, put him in network #2, and find his partners
- Repeat until all individuals are in some network
Partner notification data, 2013

- Partnerships identified in 2013
- Both syphilis and HIV cases
- 1332 individuals
- 1066 sexual partnerships
## Results

<table>
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<tr>
<th>Size of network</th>
<th>Number of networks</th>
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<tr>
<td>2</td>
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<tr>
<td>435</td>
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“Mega-network”
“Mega-network” by condition
“Mega-network” by HIV status
“Mega-network” by follow-up
Network comparisons

• Mega-network more likely to be HIV-positive than those in other networks (72 percent versus 48 percent; p <0.001)

• Mega-network had more previous syphilis diagnoses reported to us (0.83 per case) than those in other networks (0.62 per case; p <0.001)

• How meaningful are these comparisons?
  – Proportions of cases versus contacts
  – Length of time to define network
Mega-network: first quarter
Mega-network: second quarter
Mega-network: third quarter
Mega-network:
fourth quarter
Bigger networks

• Using partners elicited in 2012 and 2013, we find a network of 998 individuals

• Using all the data we have ever recorded, going back to 1997:
  – 11,551 persons interviewed or named
  – 6,408 of them can be connected

• Is this a network? Are these core transmitters?
Concluding thoughts

• Our system has produced a rich set of data
• Our algorithm can quickly identify networks
• Need to determine the length of time for a meaningful network
  – Potential for transmission
  – Likelihood of future contact
• More sophisticated network measures may help us prioritize cases and identify likely unnamed partners in real time
## Acknowledgements

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<thead>
<tr>
<th>Brandon Ivory</th>
<th>Luis Hernandez</th>
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<tr>
<td>Charles Fann</td>
<td>Matthew Sachs</td>
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<tr>
<td>Desmond Miller</td>
<td>Monica Lee</td>
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<td>Erin Antunez</td>
<td>Rebecca Shaw</td>
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<td>Hannah Sabet</td>
<td>Tony Tran</td>
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<td>James McMaster</td>
<td>Wendy Wolf</td>
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<td>Joseph Imbriani</td>
<td>Andrew Reynolds</td>
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<td>Frank Strona</td>
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Thank you!