SPATIAL MAPPING OF SOCIAL NETWORKS

King County Prosecutor’s Office
Police-Prosecution Partnership (3PI)
August 2-4, 2017

Presented by Julie Wartell
MAPPING PEOPLE & PLACES TOGETHER
WHY PUT SNA & GIS TOGETHER

Crime Pattern Theory
(Brantingham & Brantingham)

Routine Activity Theory
(Felson & Cohen)

Rational Choice Theory
(Cornish & Clarke)

PROLIFIC OFFENDERS HAVE GEOGRAPHIC PREFERENCES

http://www.popcenter.org/learning/60steps/
What types of patterns can be revealed about the networks?

- Where they live in relation to where they commit crimes
  - Clustered
    - Crimes clustered near 1 or more homes
    - Crimes clustered but not near any homes
  - Dispersed
    - Crimes spread out but homes are clustered/nearby
    - Crimes spread out and nowhere near homes
- Live in one jurisdiction but commit crimes in another
  - Crimes and/or Homes Clustered v. Dispersed
- Arrest location
  - Near or far from home and/or crime locations
Offenders Live….

Where they shit

their shit is

Clustered

Near 1 or more homes

Not near any homes

Dispersed

Near 1 or more homes

Nowhere near homes

Away from where they shit

their shit is

Clustered

Near 1 or more homes

Nowhere near homes

Dispersed

Near 1 or more homes

Not near any homes

Credit to John Eck.
OK… what do we do with this info?

• Do more analysis of course!
  • Examine clusters within the maps
  • Assess relationships of the people to the places
  • Collect more info…
    • More locations for individuals
    • More relationship data on connected individuals (relative, friend, etc.)

• Focus efforts based on social and spatial connections
Jackson, MS PD

- Data from Dec 1, 2014 – Nov 30, 2016
  - Crime Reports
  - Arrests
- Analytic Strategies
  - Geographic
    - overall violent* crime and gun-related hot spots
    - cluster locations
  - Network analysis – clustering of individuals associated through arrests

*We defined “violent” crime to include the following categories: murder; rape and sexual battery; robbery; assault (aggravated and simple); shootings; and firearm and weapon violations. It should also be noted that only aggravated assaults, shootings and some weapon violations specifically state a gun was involved; with the data provided, we were unable to determine which murders, rapes and robberies were gun-related.
Jackson: Social Network Analysis

Two-mode co-arrest network, violent cluster 1 without labels

Note:
Black = non-violent incident
Red = violent incident
Green = person
Jackson:
SNA on a Map
Linn County, IA
(Cedar Rapids, Marion, Linn County)

• Multi-jurisdictional
  • Cedar Rapids PD
  • Marion PD
  • Linn County SO
• Data from May 1st, 2015 through April 30th, 2017
  • All Incidents and Field Interviews
  • Home Addresses
• Analysis
  • Two mode network connecting people through incidents
  • Mapping of incidents and home locations
Linn County: Social Network Analysis
Linn County:
SNA on a Map
Another Example...LA Gangs

“Spatializing Social Networks: Making Space for Theory in Spatial Analysis”
Dissertation by Steven Radil
KING COUNTY EXAMPLE

23 People
72 Incidents

Sheron Williams
GIS MAP OF SW NETWORK – SEATTLE
EXAMINING CLUSTERS
EXAMINING CLUSTERS

Table

<table>
<thead>
<tr>
<th>IncNum</th>
<th>Label</th>
<th>Mode</th>
<th>Degree</th>
<th>Between</th>
<th>Crimetype</th>
<th>Involvement</th>
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<td>JUV-SUBJECT</td>
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</table>
Once the Network is Mapped

Things to consider…

• How many incidents in each jurisdiction?
• How many people in each jurisdiction?
• How many different addresses in each?
• What does the clustering look like?
• Do the people with the strongest connections have close or further away locations?
LET’S DO THIS!

Step by Step Guide to Combining SNA with GIS
DATA

- Network nodes (people and incidents)
  - Unique identifier
  - Network number
  - Betweenness score
  - Centrality score
- Incidents/Crimes, Arrests, Field Interviews
  - MINIMUM
    - Unique identifier
    - Addresses
      - Location of Incident, Arrest, FI
      - Home(s)
  - OTHER THAT YOU MAY WANT TO CONSIDER
    - Crime Type/Charge/Group (eg. Violent, gun-related, etc.)
    - Incarceration Status
    - Parole/Probation Status
    - Outstanding Warrants
PREPPING YOUR DATA

Make sure...

✓ Dupes are deleted
✓ Addresses are geocoded (if you have x,y already, bonus!)
✓ Unique identifiers match (*beware of dupes from differing agencies – create new if needed!)
✓ There is a field that designates (may need to create!) whether address is home, crime, or arrest
✓ Crime charges/groups are consistent
✓ Any additional data/fields are consistent
Combining/Linking Data

- Combine multiple jurisdictions (*already done for this class)
  - Just the fields you will use, for keeping it simple
- Add incident address field(s) to network output table for incident (using VLookUp works well)
- For addresses associated with people, you will need to link tables to determine all addresses the person may be associated with (Access works well for this “one to many”)
  - Import your address data table
  - Import your network data table with the person label
  - Link on Network label to address table
  - Export linked table(s) back out to Excel
LET’S MAP!

• Add table(s) to ArcMap
• Convert to shapefile
• Add appropriate base layers (after downloading shp files - http://www5.kingcounty.gov/gisdataportal/)
  • Streets (“Street Address”)
  • Jurisdictional boundaries (“Cities and Unincorporated King County”)
  • Schools, Parks, Water features to give context
• Other relevant data for your jurisdiction
  • Transit stations/stops
  • Gang territories
  • Patrol district/beat boundaries
MAKING THE MAP USEFUL

• Symbolizing your data
  • Creating graduated symbols
  • Choosing a color and size scheme

• Cartographic Elements
  • Title
  • Legend
  • Scale Bar
  • North Arrow
  • Date/Source