What is Spatial Analysis and Why Use It?

What is Spatial Analysis?

"Spatial analysis is the process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques in order to address a questions or gain useful knowledge. Spatial analysis extracts or creates new information from spatial data." - ESRI

- Using place-based data to help us answer questions
  - How is crime spread out or concentrated about a jurisdiction/beat/patrol zone?
  - What are the patterns and trends to the data? Are these patterns significant?
  - How have patterns changed over time?
  - How are features/attributes related to one another?
  - How do we allocate resources effectively given the patterns and trends?
  - Where might events happen in the future?
  - And beyond law enforcement…

The Study of Place

- Pareto Rule
  - 80% of outcomes are due to 20% of the causes
  - If we can identify this small proportion of people/places, we can address a large portion of the crime problem

- Instead of focusing on why people commit crimes, we focus on the setting where crime occurs…where are these 20% and what is it about them?
- Crime occurs when there is an opportunity for it to do so
- Problem analysis triangle[1]

[1] Clark and Eck (2005)

The Study of Place

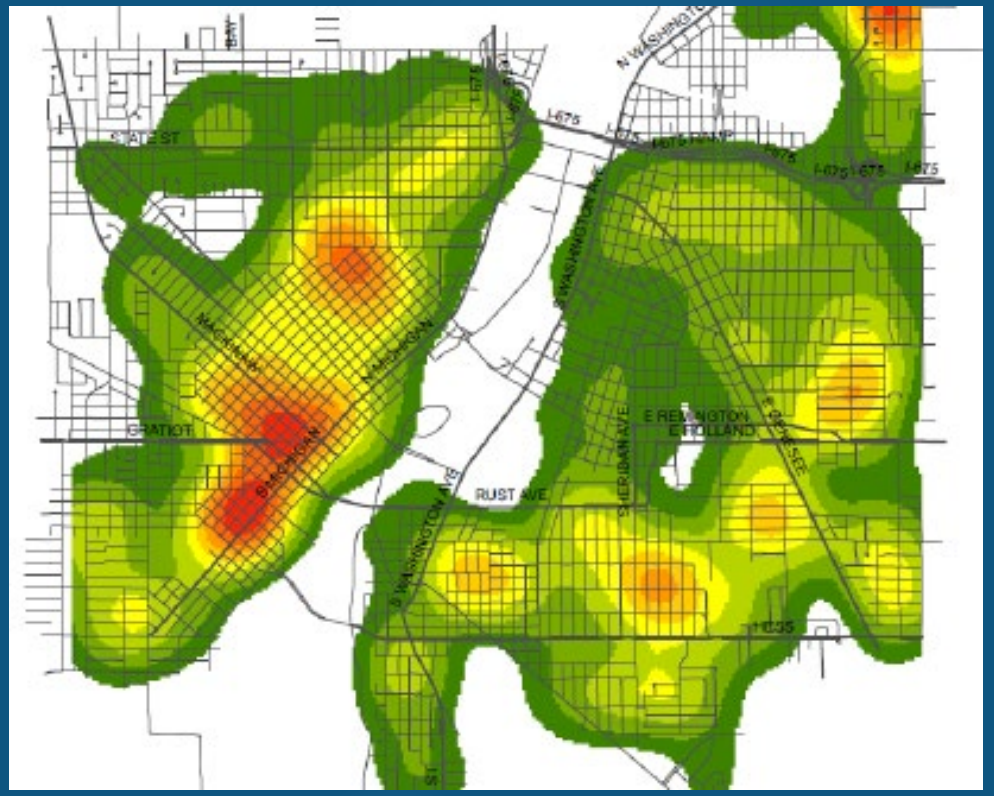
- We know crime is concentrated in some areas more than others…but what is it about these areas?
  - Crime generator or attractor?[2]
- Acute or chronic?
- If chronic…
  - Hot dots
  - Hot lines
  - Hot areas
- Knowing as much detail about our hot spots helps identify and formulate effective strategies to reduce

- Displacement and diffusion of benefits

[2] Brantingham and Brantingham (1995)

Applying Spatial Analysis – Hot Spots

- Project Safe Neighborhoods and Strategies in Policing Innovation funding
- Data
  - Part I and Part II offenses
  - 2017-2019
  - Offenses with a firearm
- Goal
  - Identify locations for CCTV cameras
    - Repeat victimization
    - Spatial concentrations of crime
  - Long-term violence prevention and reduction



Applying Spatial Analysis – Repeat and Near-Repeat

True Repeat – same location victimized again
Near Repeat – nonvictimized places near places that have been burlgarized[4]

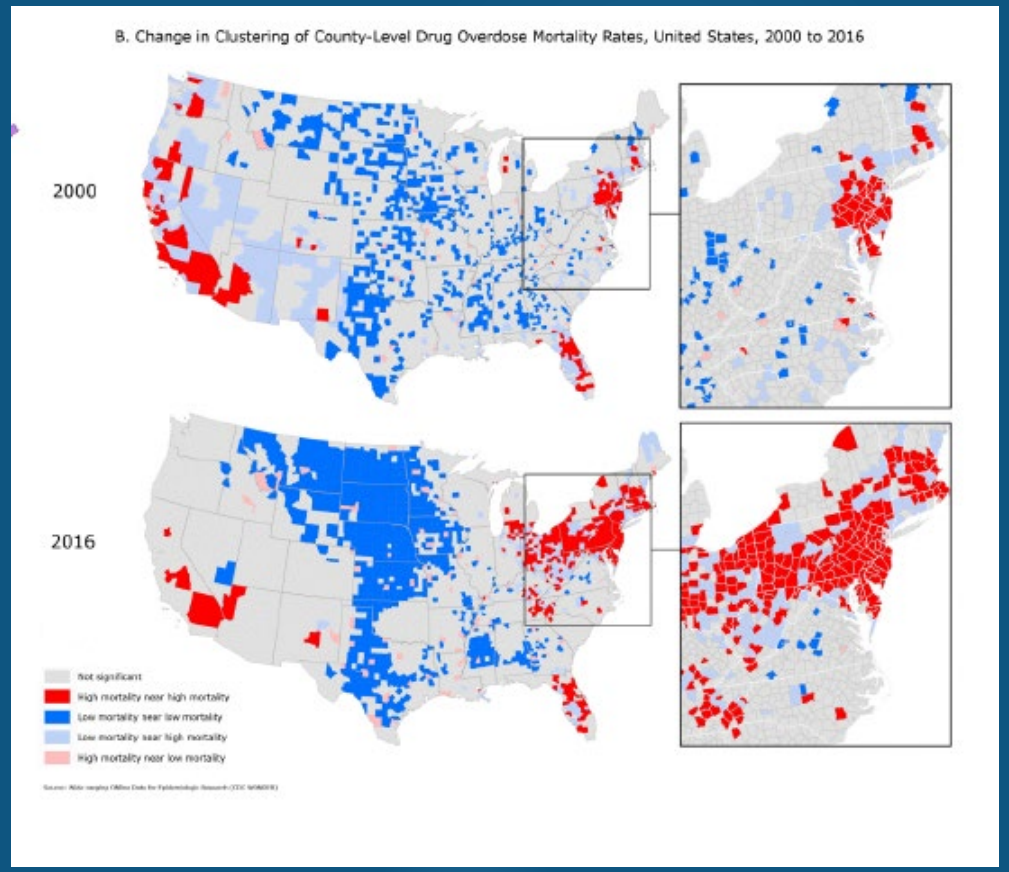
- Residential Burglaries[3] - The idea that proximity to a house that has been burglarized increases the risk for those in the same area
- Houses next to a burgled home are at a higher risk of being burglarized
- Most repeats occur within 1 week of the initial burglary
- Why? Offenders return to areas where they are successful

- Philadelphia Shootings[5]
- Elevated risk within 2 weeks and one city block of previous incidents
- 33% greater than expected
- Crime prevention implications

[3] Townsley at el (2003)
[4] Bowers and Johnson (2005)
[5] Ratcliffe and Rengert (2008)

Applying Spatial Analysis – Drug Overdoses[6]

- Research evaluating the drug overdose mortality rates over time to evaluate the spread
- Data
  - CDC WONDER
  - American Community Survey
  - County-level
- Goal
  - Identify areas of potential risk for intervention and targeting resources at the county level
- Spatial analysis on drug overdoses with fatal/nonfatal shootings



[6] Wilt et al (2019)

Moving Forward with Spatial Analysis

Software

- ArcView – Spatial Analyst
- CrimeStat
- Near Repeat Calculator

Data Considerations

- Census data
- Collaborating with jurisdictional IT/GIS department
- Law enforcement data
- Probation/parole/other agencies

Trainings and Support

- PSN Modules on GIS
- Risk Terrain Modeling
- Additional Models on Crime Analysis
- Social Network Analysis

Contact

Allison Rojek

Michigan State University

School of Criminal Justice

rojekal1@msu.edu

Resources

1. Clarke, R. V., & Eck, J. E. (2005). *Crime analysis for problem solvers in 60 small steps*. Washington, DC: US Department of Justice, Office of Community Oriented Policing Services.
2. Brantingham, P., & Brantingham, P. (1995). Criminality of place. *European journal on criminal policy and research*, *3*(3), 5-26.
3. Townsley, M., Homel, R., & Chaseling, J. (2003). Infectious Burglaries. *British Journal of Criminology*, *43*(3), 615.
4. Bowers, K. J., & Johnson, S. D. (2005). Domestic burglary repeats and space-time clusters: The dimensions of risk. *European Journal of Criminology*, *2*(1), 67.
5. Ratcliffe, J. H., & Rengert, G. F. (2008). Near-repeat patterns in Philadelphia shootings. Security Journal, 21(1-2), 58-76.
6. Wilt GE, Lewis BE, Adams EE. (2019). A Spatial Exploration of Changes in Drug Overdose Mortality in the United States, 2000–2016. *Preventing Chronic Disease* 16:180405.