The Law of Concentrations of Crime at Place

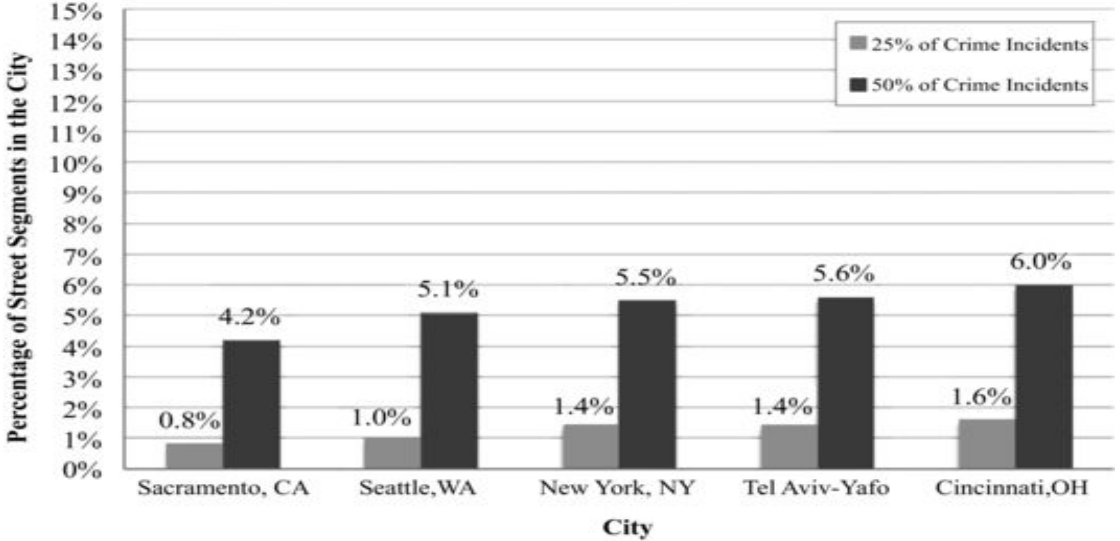
James LeDoux

Agenda

- Context
- Theoretical Underpinnings
- Empirical Methods
- Findings
- Next Steps

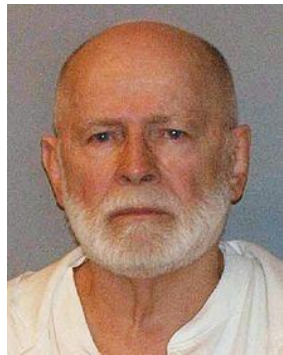
Context: Definition (Weisburd, 2004)

- For a defined measure of crime at a specific microgeographic unit, the concentration of crime will fall within a narrow bandwidth of percentages for a defined cumulative proportion of crime
- While crime hot spots differ, these ratios holds similar across cities



Context: Goals

- Test the law of concentrations of crime at place in new cities and suburban areas
- Explore potential significance to police organizations and policy makers
- Attempt to explain root causes of this effect



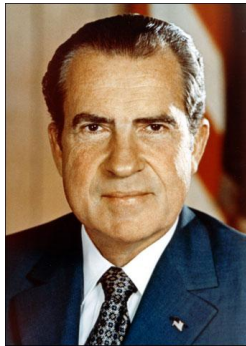
Context: Predictive Policing

- Los Angeles (2014 - Present)
  - 7.4% reduction in crime in targeted “hotspots”
- Atlanta (2014 - present)
  - Crime dropped “noticeably” in zones where implemented
- PredPol
  - Company predicting crime based on historical crime location and type data
  - Currently in use in Atlanta, Los Angeles, and elsewhere
  - Claims to be able to save $9m/year for LAPD
- Controversy:
  - Biased systems lead to biased data
  - Biased data causes models that discriminate

Theory

Rational Choice Theory
Becker, 1968

- Utilitarian belief that man always acts rationally
- Criminals act according to their own utility functions in order to meet their needs for money, social status, entertainment, etc.
- Each crime represents a cost-benefit analysis on the part of the offender
- Crime can be controlled by adjusting the swiftness, severity, and certainty of punishment



Routine Activity Theory
Cohen and Felson, 1979

- A practical branch of Rational Choice Theory
- Routine activity patterns influence crime patterns through the convergence in space and time of:
  - Motivated offenders
  - Suitable targets
  - The absence of capable guardians against crime
- Explanations of crime across place and time require the study of how the environment facilitates the the transition of criminal intents into actions
- Examples:
  - Unemployment rates
  - Women joining the workforce, 1940s

Crime Pattern Theory
Brantingham and Brantingham, 1993

- Crime can only occur at the intersection of an offender and a victim's activity space
- Crime can be understood at the city-level as the extent to which criminal and innocent activity spaces intersect
    - The places where routine activities intersect in ways that make for tempting criminal opportunities
    - Criminals are most likely to offend along the paths they use in their everyday lives
- Places framework:
    - Crime generators
    - Crime attractors
    - Crime neutral
    - Fear generators

The Criminology of Place

Distinguishing Features:

- Motivation agnostic
- Microgeographic focus
- Largely empirical

Analyses of place:

- Crime generators vs. crime attractors
- Fear generators and crime-neutral spaces

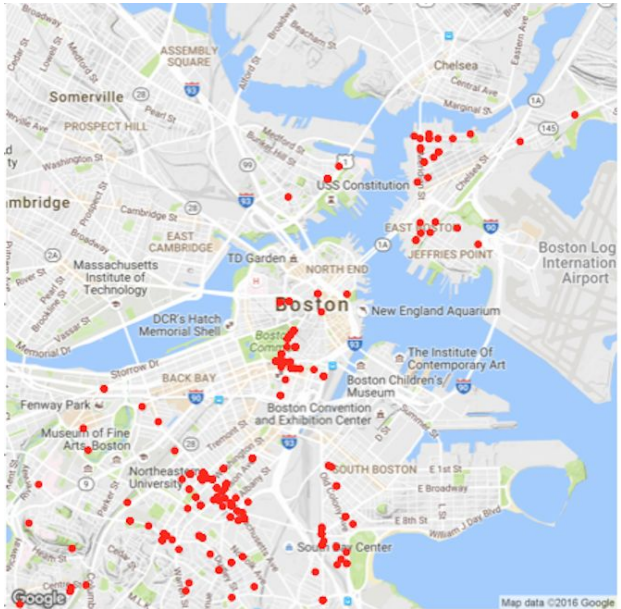
Data and Methods

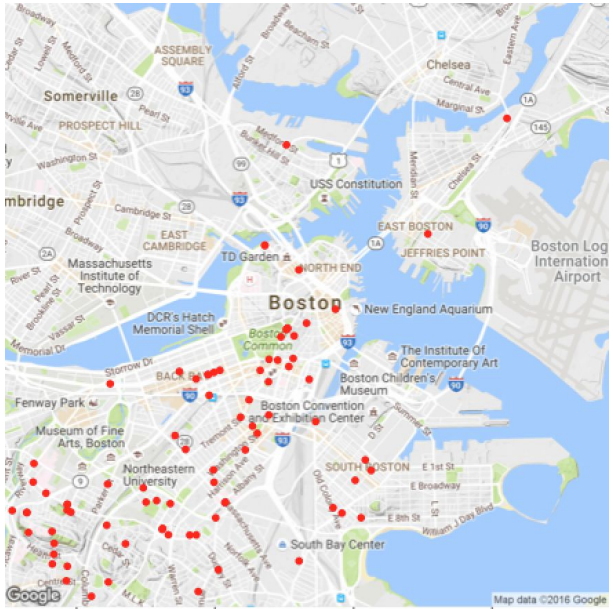
Open Data: Incident Reports

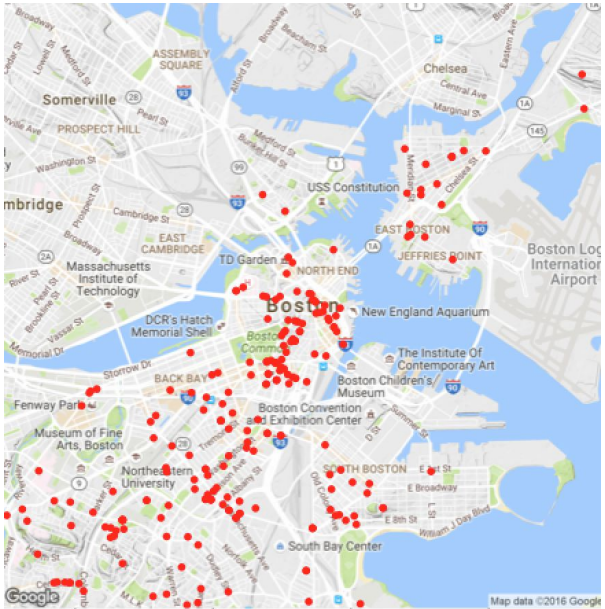
- Reports written by police officers after an incident has occurred
- More serious than a 911 call, less serious than an arrest report
- Common features:
  - Date and time
  - Class of crime (assault, traffic, vandalism, arson, etc.)
  - Location (latitude, longitude, police district)
  - Weapon type
- Data typically ranges from 2000 to present
- Currently have:
  - Boston, Chicago, Baton Rouge, Seattle, Detroit, LA, San Francisco, 9 others

More Open Data: Boston, October 2016

INCIDENT No.	OFFENSE CODE GROUP	OFFENSE DESCRIPTION	DISTRICT	SHOOTING	DATE	DAY OF WEEK	STREET	LAT	LONG
I162090563	Property Lost	PROPERTY - LOST	E13		11/4/16 22:24	Friday	CENTRE ST	42.3099772	-71.115262
I162090568	Larceny	LARCENY SHOPLIFTING	B3		11/4/16 22:22	Friday	MORTON ST	42.2818706	-71.087512
I162090574	Medical Assistance	SICK/INJURED/MEDICAL -	D4		11/4/16 22:05	Friday	BOYLSTON ST	42.3498018	-71.07841
I162090571	Towed	TOWED MOTOR VEHICLE	A15		11/4/16 21:50	Friday	HIGH ST	42.3770641	-71.064591



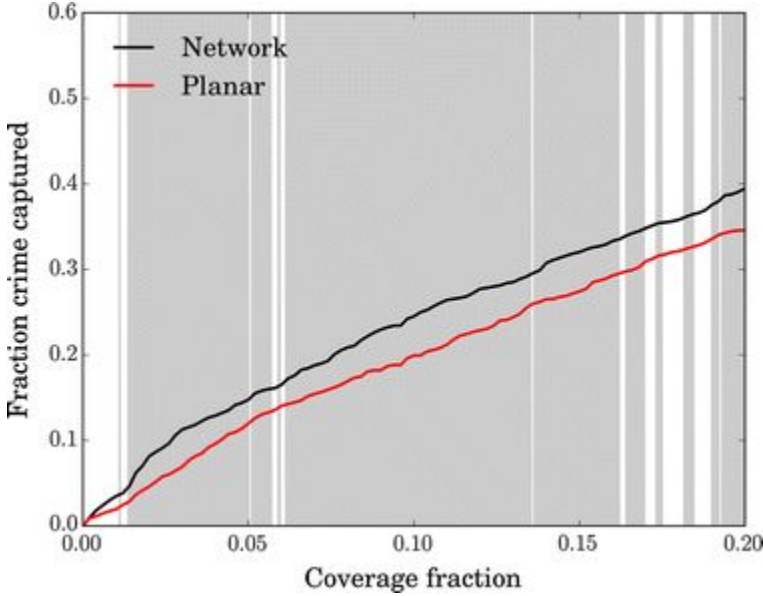


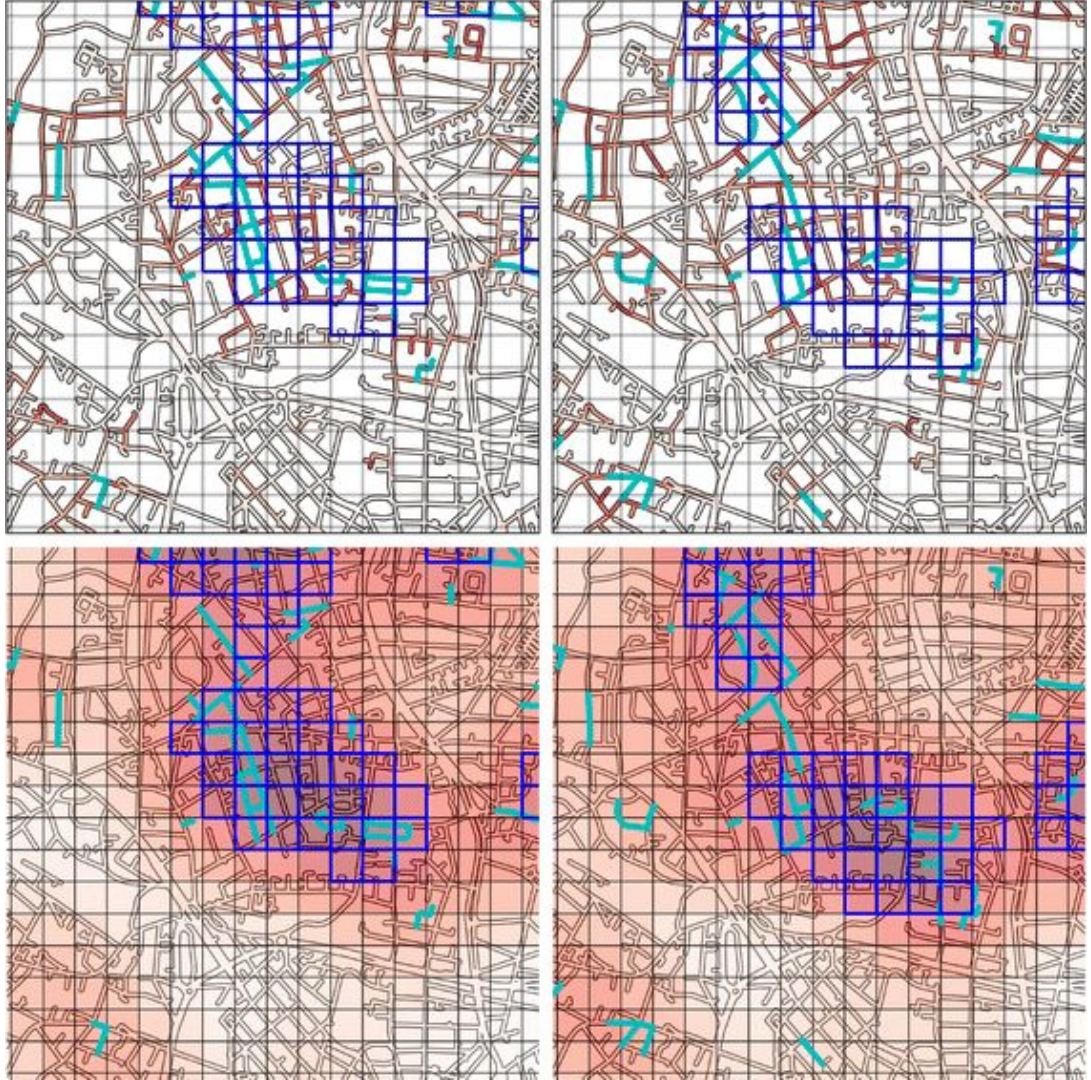


Grids vs. Networks

Rosser, Davies, Bowers, Johnson and Cheng

- Grid-based approach
  - Breaks cities into n x n grids, predicts crime frequency by geographic square
- Network-based approach
  - Place vertices at crime locations, place edges between any pairs of crimes that are connected by a street
  - Similar to street-segment approach
- Argues that a grid-based approach to crime mapping / prediction ignores the physical reality of the space
- Shows empirically that a network-based approach performs better out of sample

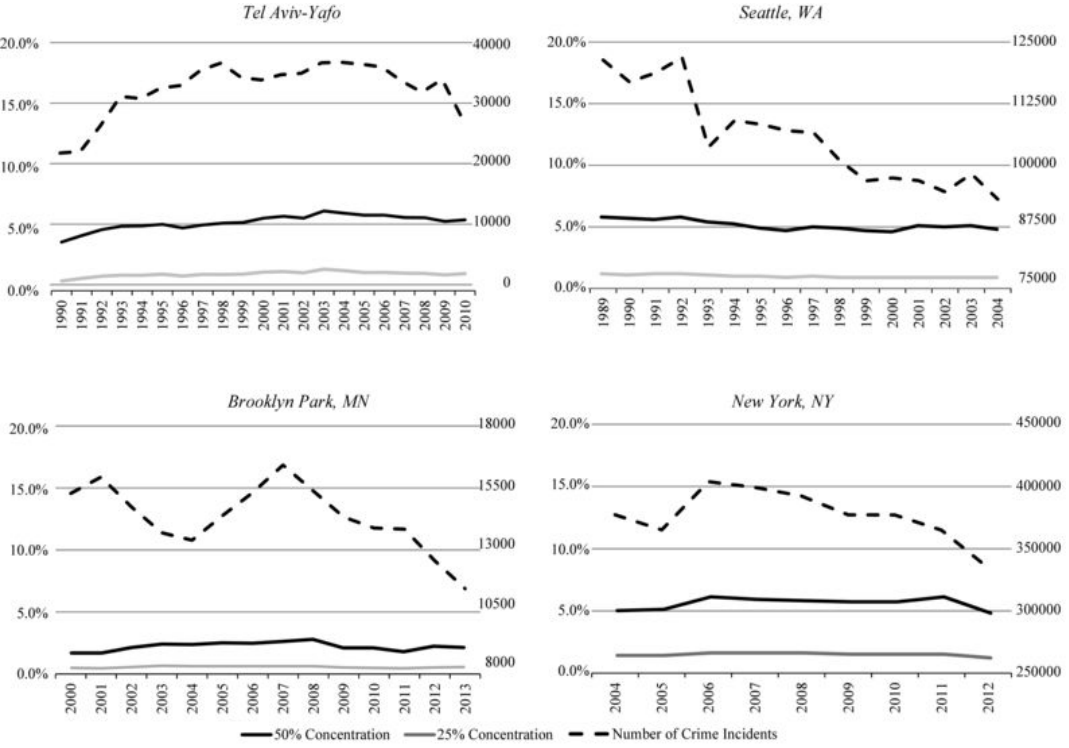


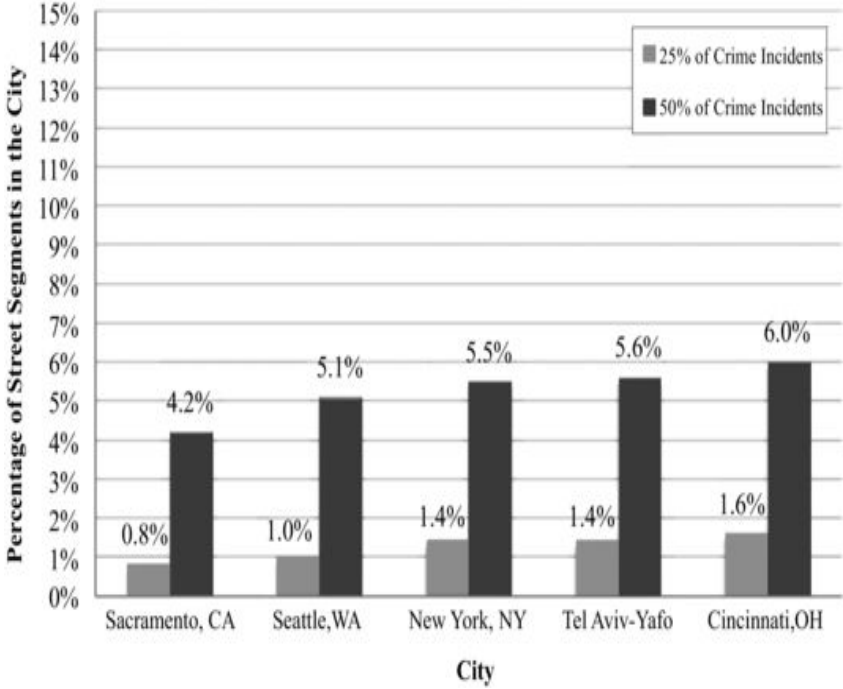


Models and Methods

- Logistic regression and maximum likelihood estimation
- Epidemic-type aftershock sequence (ETAS) models
- Kernel density estimation
- Simple aggregations

Key Weisburd Findings

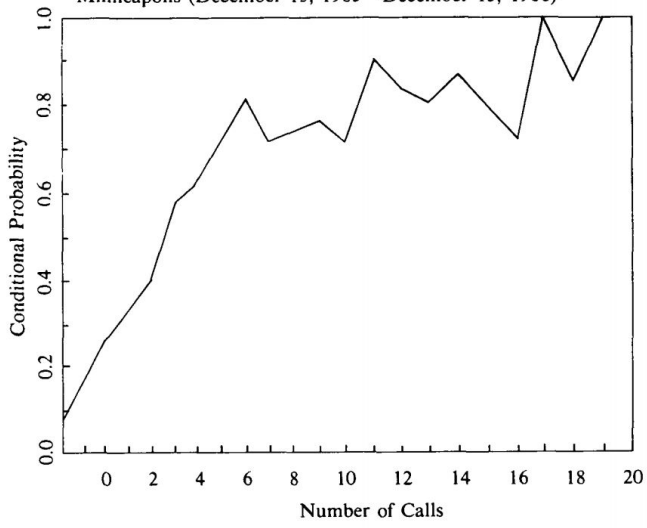


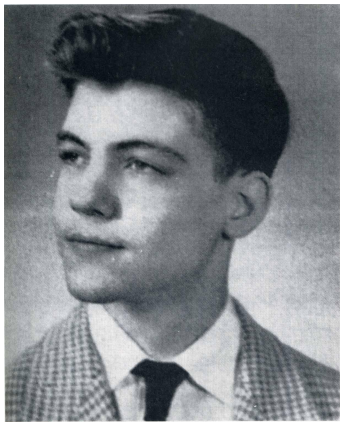


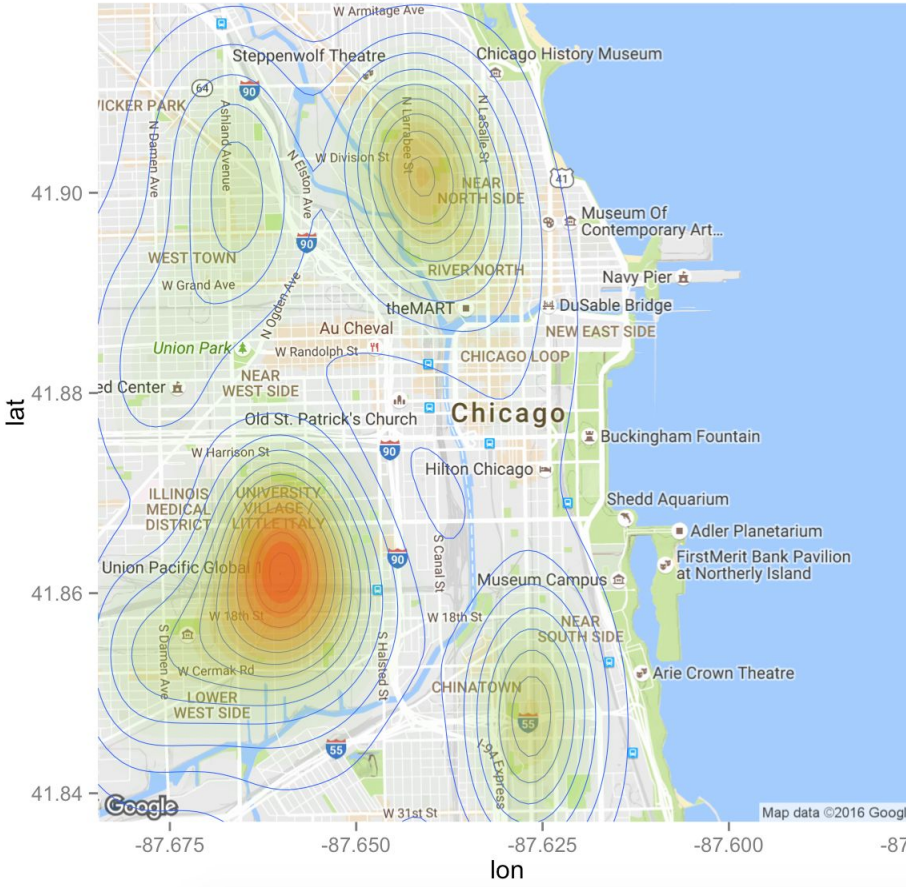
Sherman, Gartin, and Buerger Findings

- Crime recurrence is predictable*
- 90% of robberies occurred on 7 main avenues
- Top hotspots included: bars, hotels, apartment buildings, a bus depot

Figure 1 Conditional Probability of k + 1 Calls Given k Calls for Rape/ Criminal Sexual Conduct, Robbery, and Auto Theft in Minneapolis (December 15, 1985—December 15, 1986)



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Museum Of Contemporary Art...
WEST TOWN
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RIVER NORTH
Navy Pier
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Au Cheval
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Union Park
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NEAR WEST SIDE
Old St. Patrick's Church
Chicago
Buckingham Fountain
W Harrison St
Hilton Chicago
ILLINOIS MEDICAL DISTRICT
UNIVERSITY VILLAGE / LITTLE ITALY
Shedd Aquarium
Adler Planetarium
Union Pacific Global
S Canal St
Museum Campus
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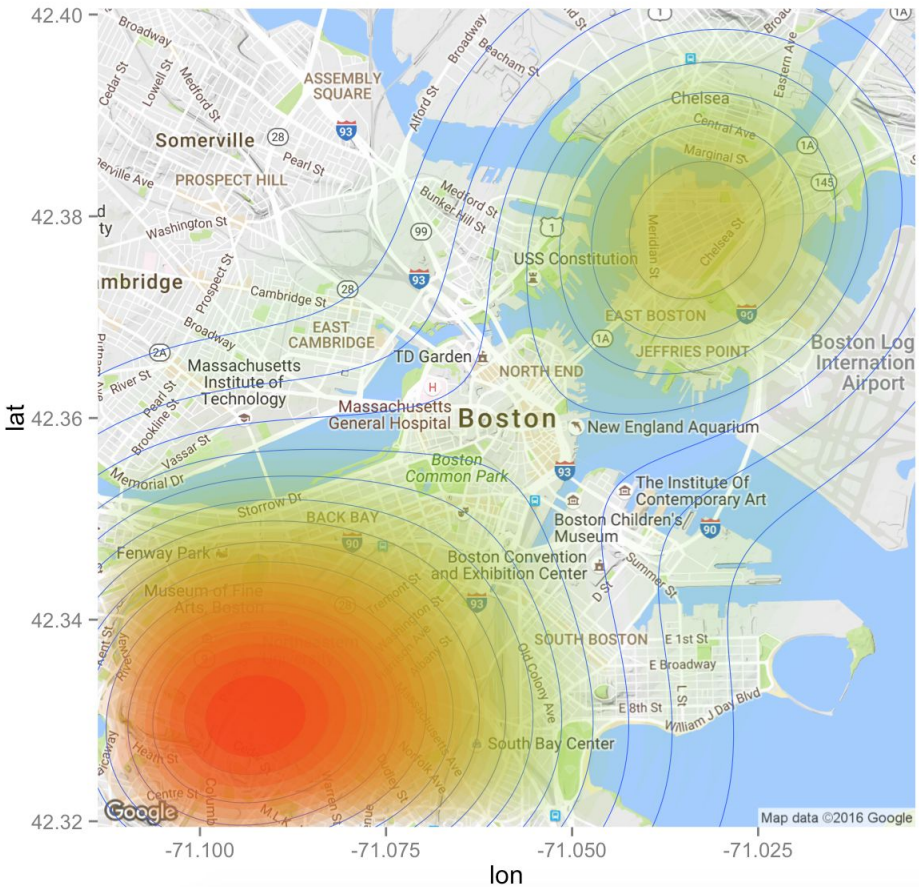
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USS Constitution
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EAST CAMBRIDGE
JEFFRIES POINT
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TD Garden
Massachusetts Institute of Technology
NORTH END
River St
Pearl St
Brookline St
Massachusetts General Hospital
Boston
New England Aquarium
Vassar St
Memorial Dr
Boston Common Park
The Institute Of Contemporary Art
Storrow Dr
BACK BAY
Boston Children's Museum
Fenway Park
Boston Convention and Exhibition Center
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Museum of Fine Arts, Boston
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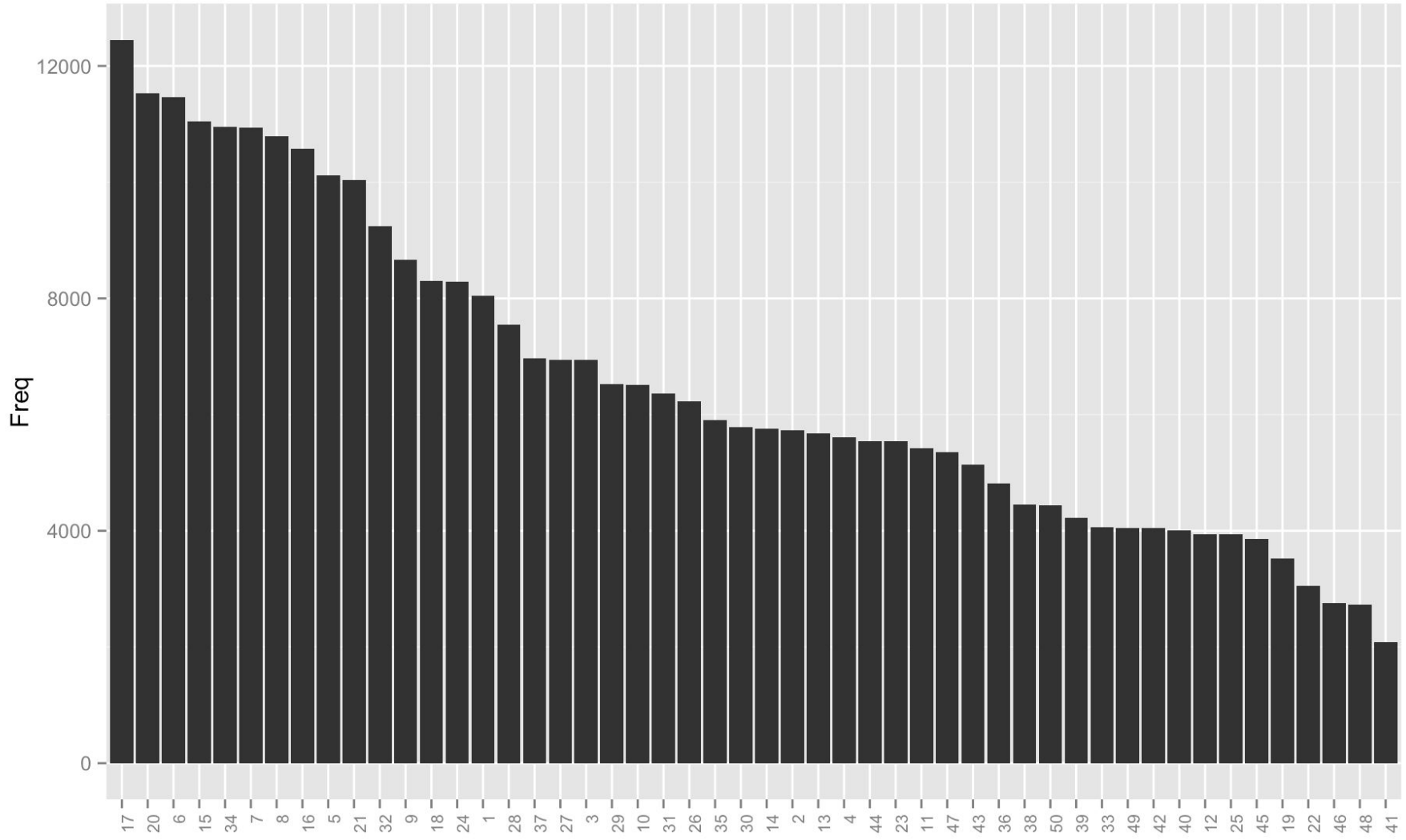
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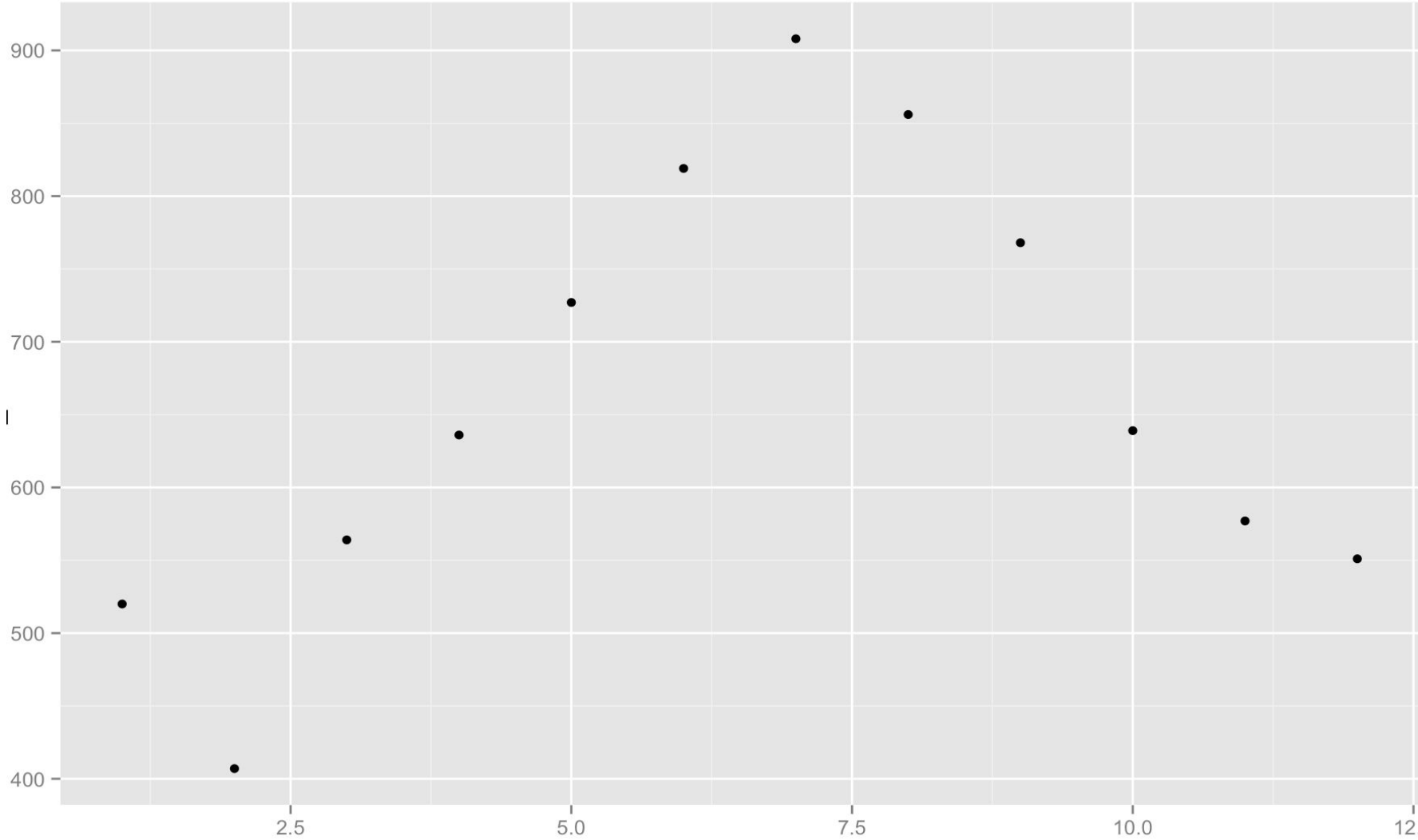
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What’s Next

- Standardize incident report data across cities
- Replicate Weisburd’s street segment experiment, test across new cities
- Test stability of these findings over time
- Explore the question of what causes a street segment to become a criminal hotspot