

Data and the State

PUBPOL 2130 / INFO 3130

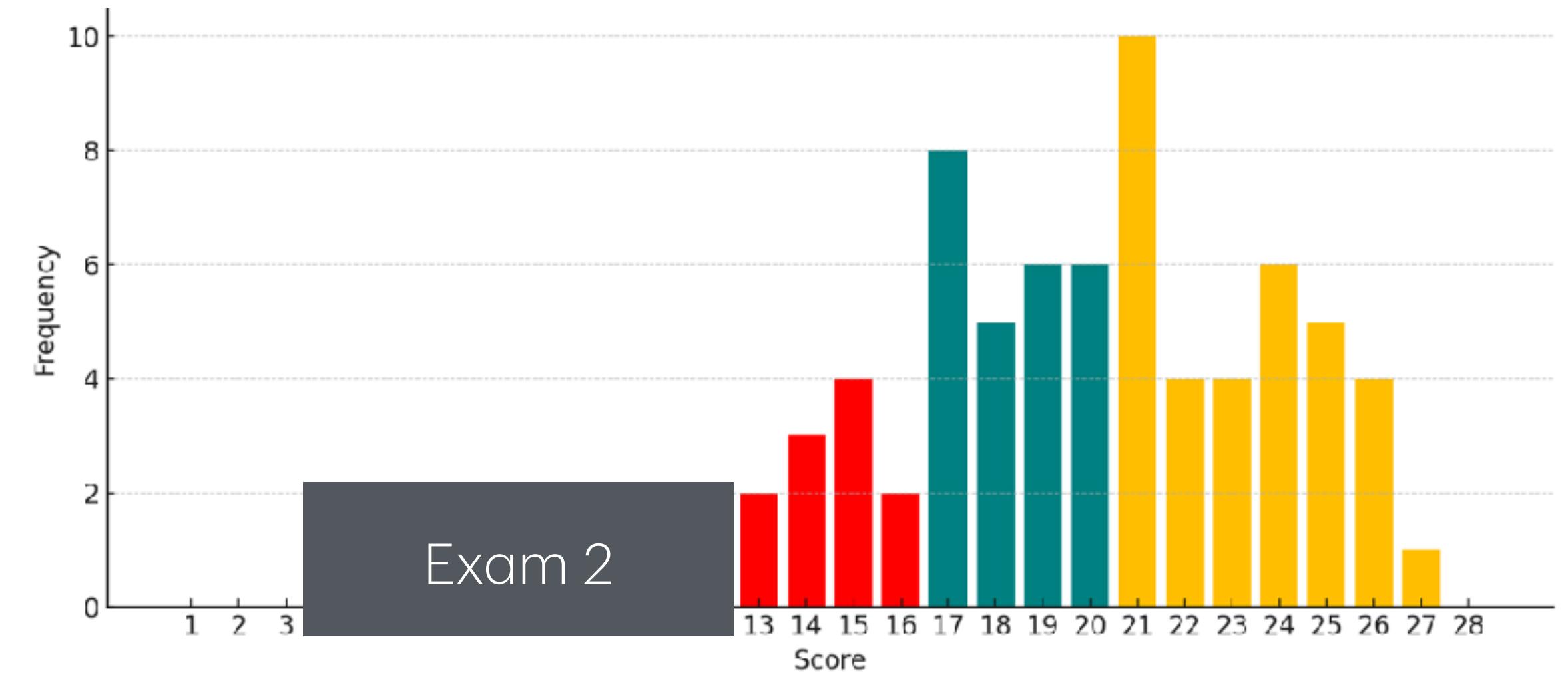
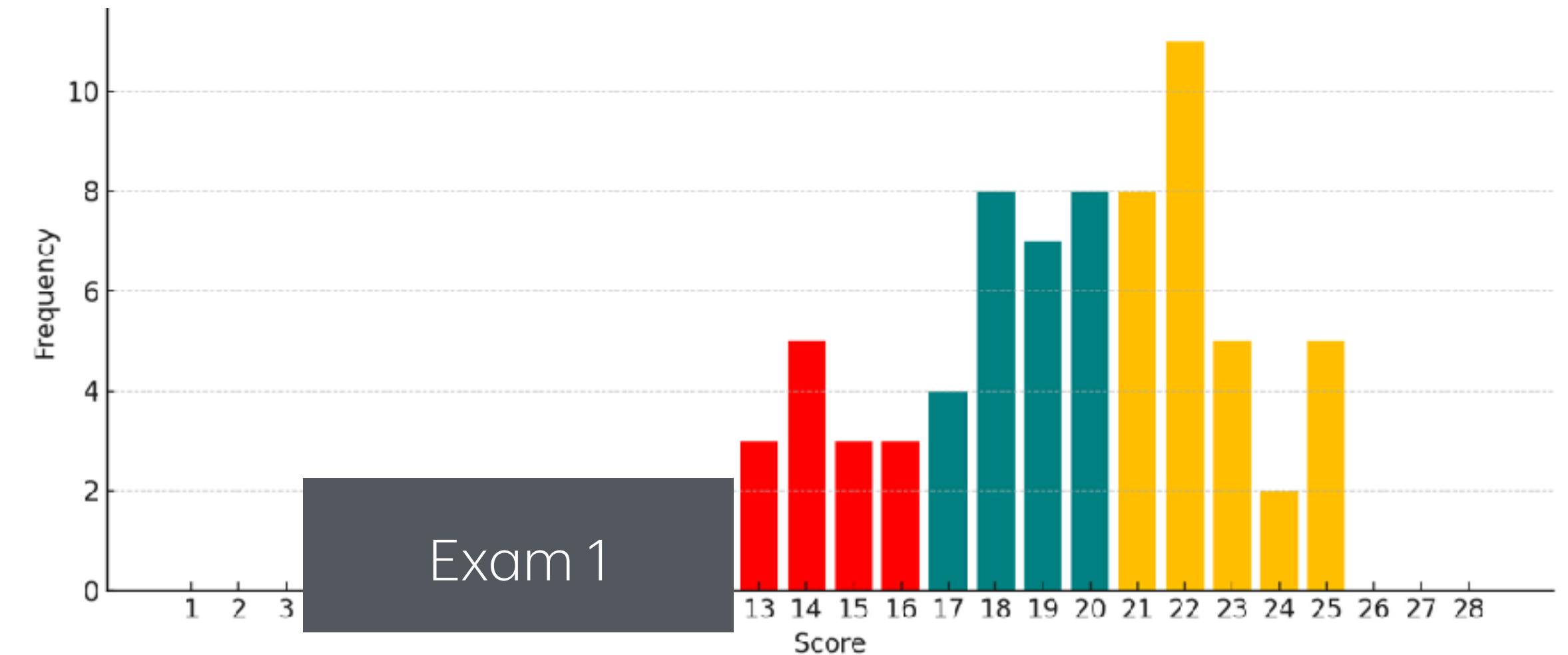


Policing and
incarceration

Lecture 17, Thursday Mar 27

Exam 2

- Exams are graded! The median was exactly the same as last time: **20**/28
- The mean was fractionally higher this time, but still between 19 and 20
- Overall comments: your writing has improved! Biggest place to keep improving is to use **specificity** from the readings



Third broad unit of the course: **Where we live**

- We will look at geospatial data that illuminates policy questions about neighborhoods, residences, regions, and communities
- We will try to understand the **places** we associate with home and the **policies** that form them
 - Built environment
 - Daily experience
- Our authors have mentioned affordable housing, accessibility of employment (including transit infrastructure), and consumption opportunities as factors in mobility
- Let's discuss how they shape our experience of home



Policing

- A major factor shaping the experience of a living environment is the perception — and reality! — of crime, both property crime and violent crime
- The state has mechanisms to handle crime, including **police** forces and the criminal justice system of **courts** and **carceral facilities** (jails, prisons)
- Early in the history of the U.S., there was a more ad hoc policing structure in place, with constables or night watchmen organized locally
- Only in mid-19th century did U.S. cities like New York (1845) and Chicago (1855) establish police forces
 - 1900s-1930s: increased professionalization of police
 - 1940s-1950s: population/urban boom drives increased policing
 - 1970s-1980s: “War on Drugs” keys period of militarization
 - post-Sept 11, 2001: accelerated militarization for “counter-terrorism”

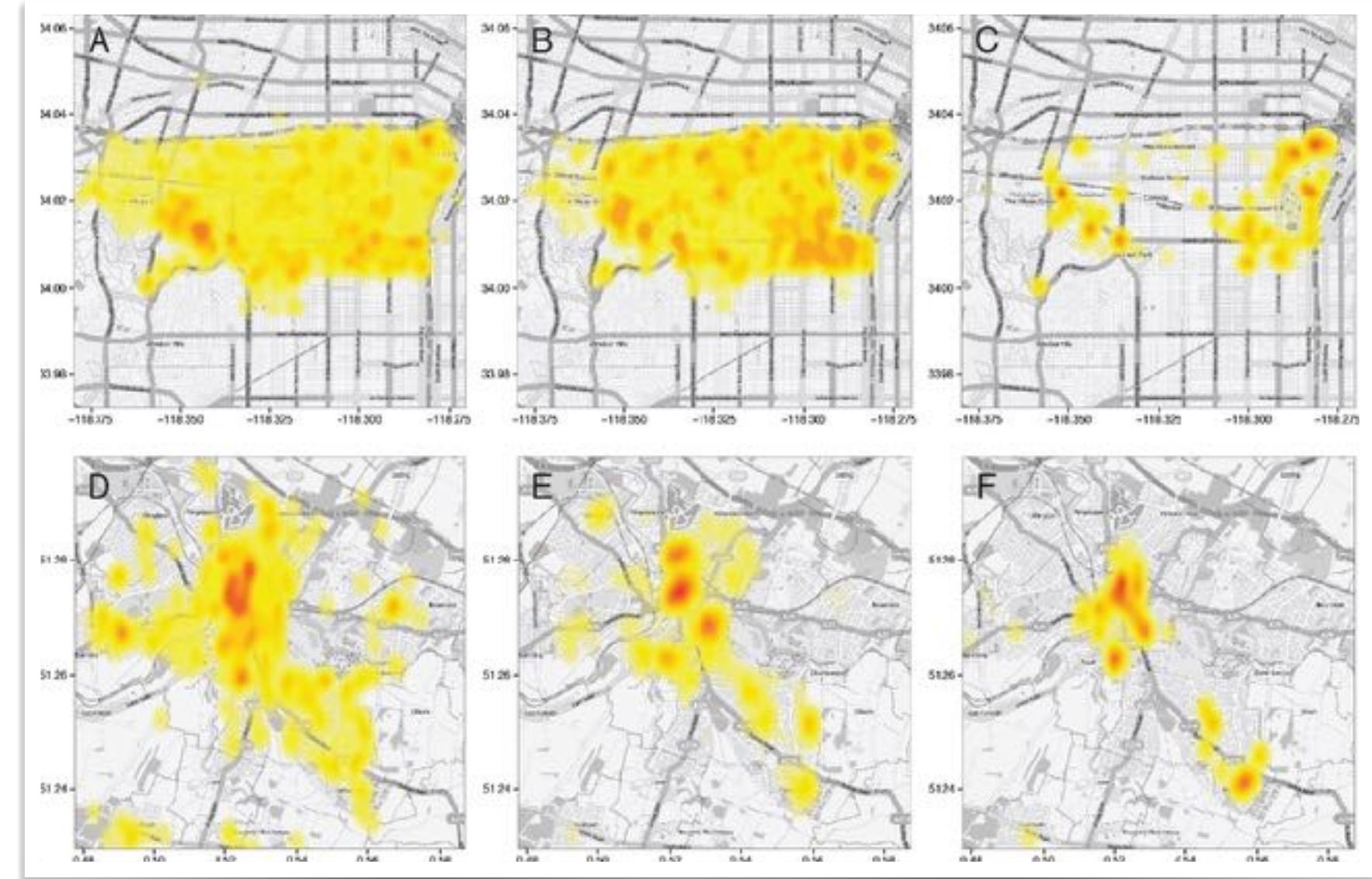
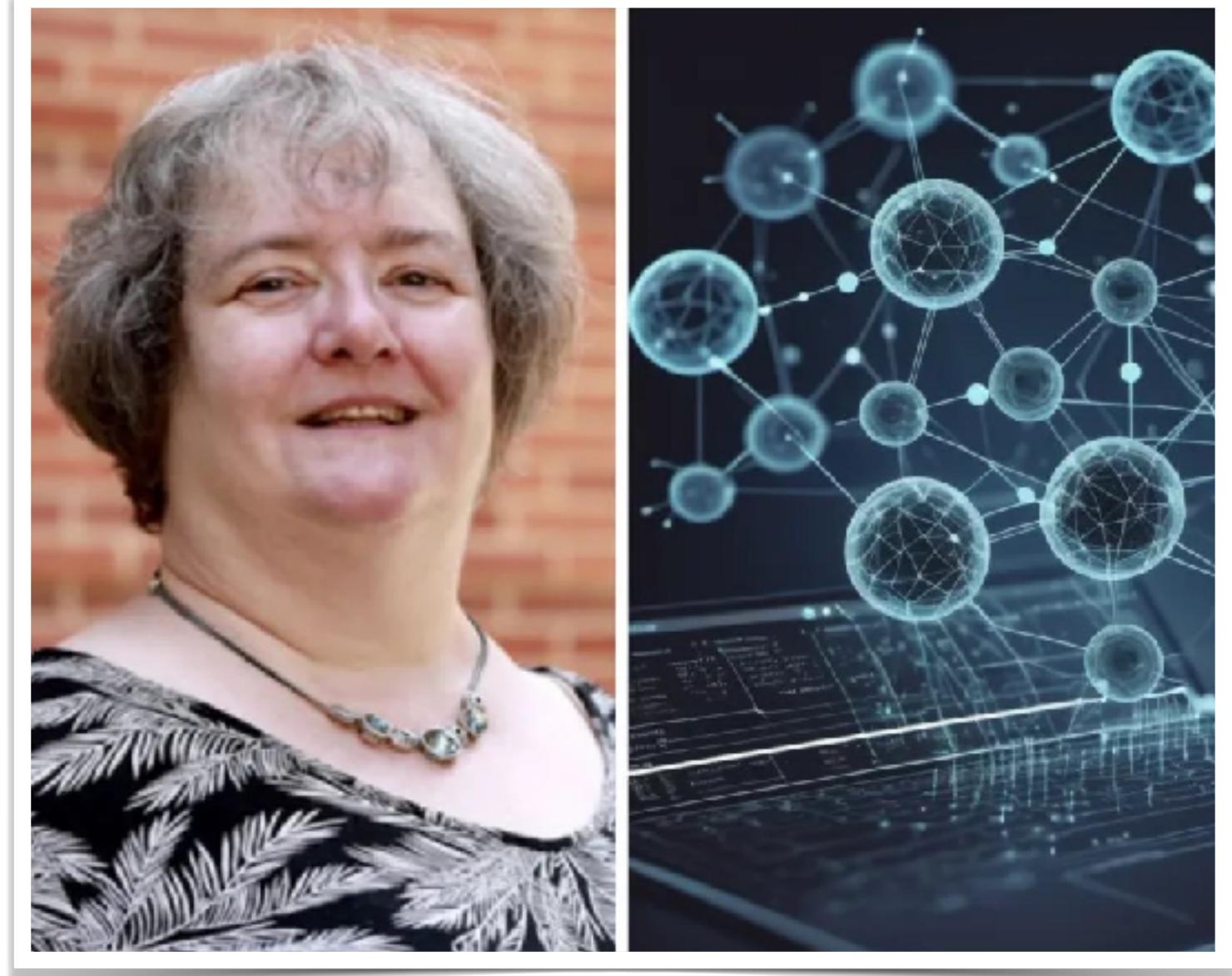


Policing Strategy	Description	When Active?	Where Used?	Current Status
Broken Windows	Policing minor disorder to prevent major crimes	1980s–2000s	New York City (under Giuliani and Bratton)	Largely discredited ; shown to increase low-level arrests with little crime reduction
Stop-and-Frisk	Stopping and searching individuals based on "reasonable suspicion"	1990s–2010s	New York City (esp. under Bloomberg)	Legally challenged and scaled back , but some versions persist
Hotspot Policing	Concentrating police in areas with statistically high crime rates	1990s–present	Kansas City, MO; Chicago; Los Angeles	Still popular ; increasingly paired with community or tech-based approaches
CompStat/ "Data-Driven"	Using real-time crime data to drive accountability and deployment	1994–present	New York City (NYPD); widely adopted	Institutionalized and still in use , though critiqued for gaming/manipulation
Zero Tolerance	Strict enforcement of all offenses, even minor ones	Late 1990s–2000s	Baltimore; NYC	Falling out of favor ; widely criticized for over-policing
Predictive Policing	Using algorithms and past data to predict where crimes will occur	2010s–early 2020s	Los Angeles; Oakland	Retired or under review in many places due to racial bias and lack of effectiveness
Community Policing	Building trust and collaboration between police and residents	1980s–present	Boston; Chicago; various suburbs	Still widely promoted , though criticized as insufficient reform
Order Maintenance	Policing behaviors to maintain "public order" rather than respond to crime	1990s–present	NYC; San Francisco; gentrifying areas	Still practiced , often rebranded as quality-of-life enforcement

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CompStat/ "Data-Driven"	Using real-time crime data to drive accountability and deployment	1994–present	fundamentally grounded in geospatial data	Institutionalized and still in use , though critiqued for gaming/manipulation
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Andrea Bertozzi

- Famous applied mathematician, Professor of Mathematics and Mechanical & Aerospace Engineering at UCLA
- Led a team at UCLA that developed mathematical models to predict where crimes were likely to occur, based on historical crime data.
- These models formed part of the scientific basis for **PredPol** (Predictive Policing Inc.), one of the most widely deployed predictive policing tools in the U.S.
- One approach was to model crime as a “self-exciting point process”— like an aftershock pattern in earthquake forecasting. The idea is that one crime can trigger more nearby in time and space.
- But basically she tried everything! Threw every math model in the world at the problem.



Nonlinear Patterns in Urban Crime: Hotspots, Bifurcations, and Suppression*

M. B. Short[†], A. L. Bertozzi[†], and P. J. Brantingham[‡]

Abstract. We present a weakly nonlinear analysis of our recently developed model for the formation of crime patterns. Using a perturbative approach, we find amplitude equations that govern the development of crime “hotspot” patterns in our system in both the one-dimensional (1D) and two-dimensional (2D) cases. In addition to the supercritical spots already shown to exist in our previous work, we prove here the existence of subcritical hotspots that arise via subcritical pitchfork bifurcations or transcritical bifurcations, depending on the geometry. We present numerical results that both validate our analytical findings and confirm the existence of these subcritical hotspots as stable states. Finally, we examine the differences between these two types of hotspots with regard to attempted hotspot suppression, referencing the varying levels of success such attempts have had in real world scenarios.

Key words. bifurcations and instability, pattern formation, crime modeling

AMS subject classifications. 70K50, 70K60, 91D99

DOI. 10.1137/090759069

1. Introduction. The study of pattern forming systems has a long and interesting history in the physical sciences, biological (see, as a small sample, the work of Turing [1952] and systems [30, 14], to name but a few), and completely unrelated, the mathematical sciences. Consequently, a robust, powerful, and general theory is needed to study such systems, and the emphasis is on the analysis of pattern forming systems, regardless of their physical origin.

Chin. Ann. Math. Ser. B
40(6), 2019, 949–966
DOI: 10.1007/s11401-019-0168-y

Deep Learning for Real-Time Crime Forecasting and Its Ternarization*

Bao WANG¹ Penghang YIN¹ Andrea Louise BERTOZZI¹
P. Jeffrey BRANTINGHAM² Stanley Joel OSHER¹ Jack XIN³

(Dedicated to Professor Andrew J. Majda on the occasion of his 70th birthday)

Abstract Real-time crime forecasting is important. However, accurate prediction of when and where the next crime will happen is difficult. No known physical model provides a reasonable approximation to such a complex system. Historical crime data are sparse in both space and time and the signal of interests is weak. In this work, the authors first present a proper representation of crime data. The authors then adapt the spatial temporal residual network on the well represented data to predict the distribution of crime in Los Angeles at the scale of hours in neighborhood-sized parcels. These experiments as well as comparisons with several existing approaches to prediction demonstrate the superiority

COPS ON THE DOTS IN A MATHEMATICAL MODEL OF URBAN CRIME AND POLICE RESPONSE

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Investigating Clustering and Violence Interruption in Gang-Related Violent Crime Data Using Spatial-Temporal Point Processes With Covariates

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ABSTRACT

Reported gang-related violent crimes in Los Angeles, California, from 1/1/14 to 12/31/17 are modeled using spatial-temporal marked Hawkes point processes with covariates. We propose an algorithm to estimate the spatial-temporally varying background rate nonparametrically as a function of demographic covariates. Kernel smoothing and generalized additive models are used in an attempt to model the background rate as closely as possible in an effort to differentiate inhomogeneity in the background rate from causal clustering or triggering of events. The models are fit to data from 2014 to 2016 and evaluated using data from 2017, based on log-likelihood and superthinned residuals. The impact of nonrandomized violence interruption performed by The City of Los Angeles Mayor’s Office of Gang Reduction Youth Development (GRYD) Incident Response (IR) Program is assessed by comparing the triggering associated with GRYD IR Program events to the triggering associated with sub-sampled non-GRYD events selected to have a similar spatial-temporal distribution. The results suggest that GRYD IR Program violence interruption yields a reduction of approximately 18.3% in the retaliation rate in locations more than 130 m from the original reported crimes, and a reduction of 14.2% in retaliations within 130 m.

ARTICLE HISTORY
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KEYWORDS
Criminology; Gang violence;
Point processes; Self-exciting;
Violence interruption

1. Introduction

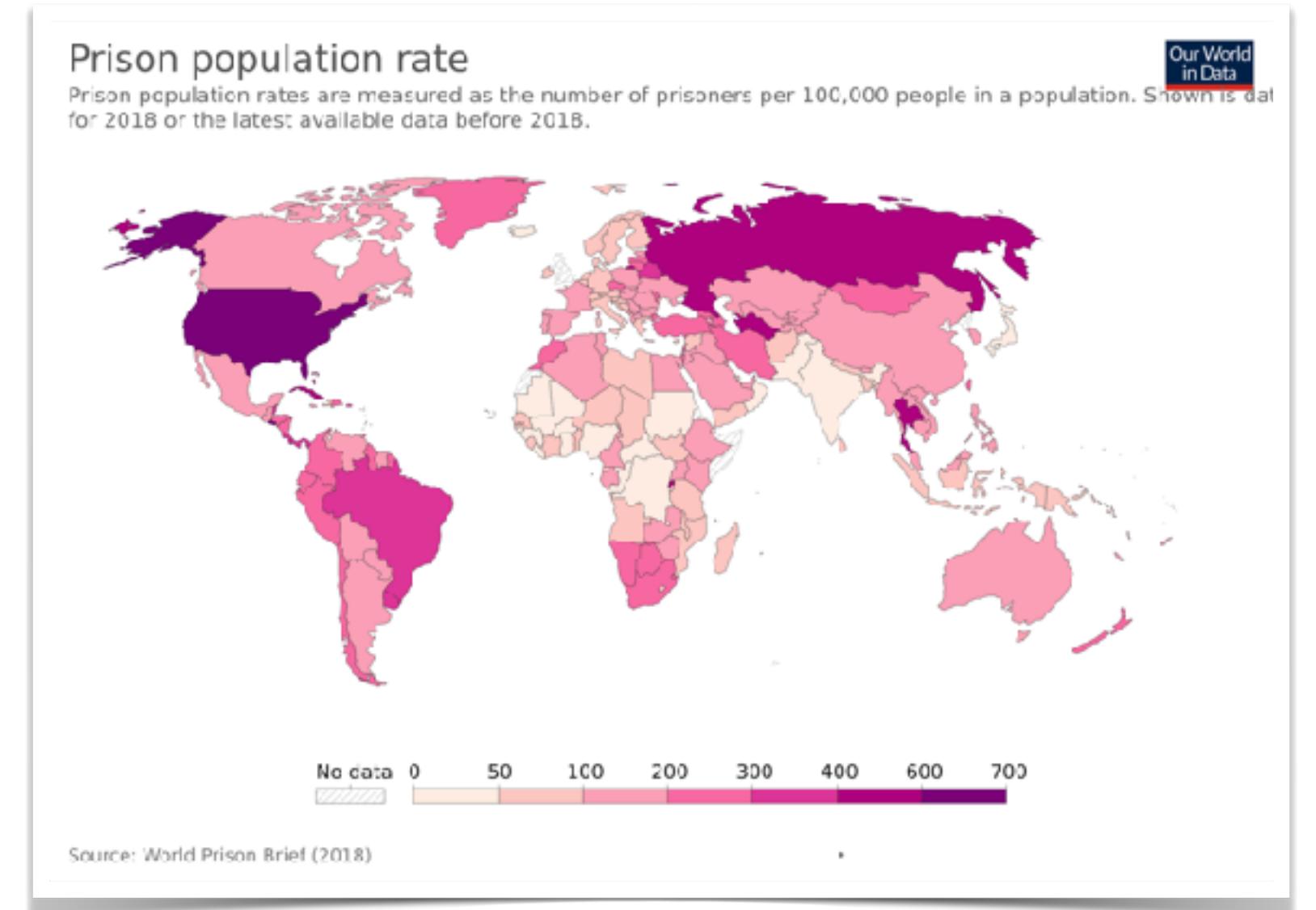
Crime occurrences are highly clustered in space and time (Weisburd 2016, Mohler 2019). Theory suggests that the observed clustering in crime event data is driven by two main effects: (i)

therefore tends to cluster where gangs are most active, particularly along gang territorial boundaries (Tita and Ridgeway 2007; Brantingham 2012). Moreover, since gang territories can be large (e.g., covering whole neighborhoods), or small (e.g., limited to a single street block), very fine-grained spatial het-

Policing is tied to incarceration

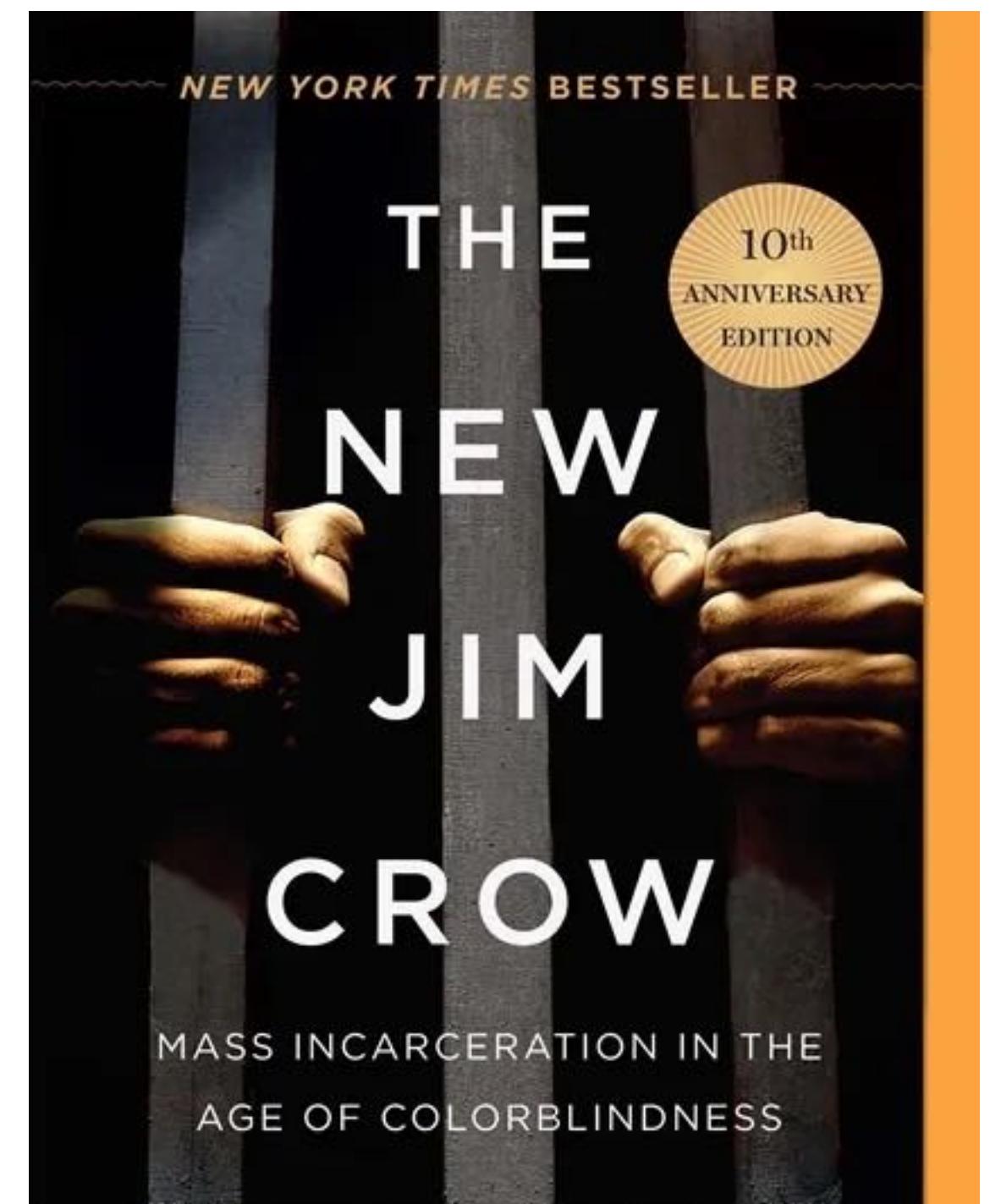
2018 map

- I combined a bunch of stats from different (reasonable) sources to get the following summary of how many people are incarcerated, per 100,000 adults.
 - 1940 - **201**, 1950 - **176**, 1960 - **193**, 1970 - **161**, 1980 - **220**, 1990 - **457**
 - 2000 - **683**, 2010 - **731**, 2020 - **505**, 2022 - **541**
- (NB: be slightly careful with these numbers due to different data sourcing)
- This is massively more than (most of) the rest of the world. According to World Prison Brief from 2024, Russia/Brazil in **300-400** range, UK **140**, Croatia **115**, South Africa **249**, Turkey **424**, Sweden **96**, Japan **33**
 - (China's official estimate is **120-130**, but this clearly excludes many classes of detainees.)
 - El Salvador's Nayib Bukele is making a major authoritarian play to lead the world in incarceration — declared a state of emergency in 2022 and now estimates put incarceration rate at whopping **1659**



Alexander

- Michelle Alexander is a civil rights attorney and sometime columnist
- She argues that the dynamics of mass incarceration make it function like a racial caste system
- 1990s saw “moral panic” over youth violence, together with increasingly racialized media portrayals of crime and bipartisan support for punitive laws
- Alexander points a major finger at the War on Drugs: “Approximately a half-million people are in prison or jail for a drug offense today [2010], compared to an estimated 41,100 in 1980—an increase of 1,100 percent.”
- Formerly incarcerated people face legalized discrimination in employment, voting, and many other areas of life
- Incarceration policies are **facially neutral** — “color-blind” — but have massively disproportionate impact because of **which** crimes are treated **how**



2010

Hinton

- Elizabeth Hinton is a historian and legal scholar at Yale
- Many [perhaps Michelle Alexander?] think the era of mass incarceration began in the Reagan Era (1980s) with the “War on Drugs” ...but actually Hinton locates its seeds in liberal anti-poverty policy of the 1960s
- Urban crime was subjected to greatly increased surveillance and control — this amounts to **criminalization of poverty**, enabled by 1960s liberal faith in social science and “bureaucratic management” (think Scott, *Seeing Like a State!*)
- The symptoms of urban neglect became causes for police intervention, driving an explosion in the carceral state
- By mid-1970s, prison population had changed: “a ‘typical inmate,’ according to social scientists, was a twenty-six-year-old black high school dropout serving a six-and-a-half year sentence for violent crime.”
- President Jimmy Carter tried to change course (reduce police, provide job guarantees, more public housing assistance), but the **punitive** political consensus was too strong



ELIZABETH HINTON

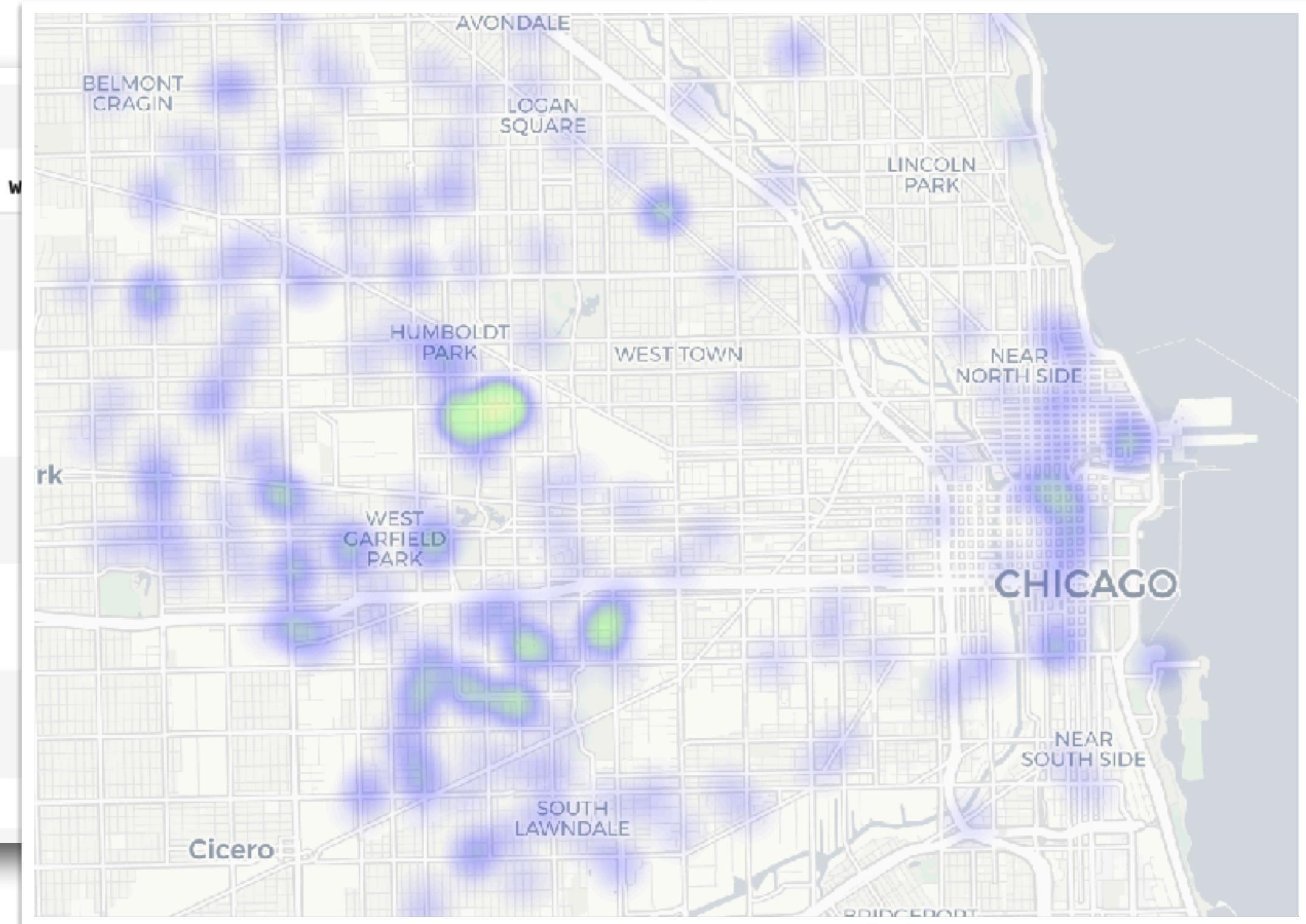
2016

What does crime data look like?

- We'll construct dataframes on police interactions from Chicago and San Francisco
- And we'll use a mapping library called Folium to visualize

[] chicago_arrests_df

	case_number	date	block	iucr	type	Description	location_type	is Domestic	beat	district	w
0	JC100006	2018-12-31 23:56:00	018XX S ALLPORT ST	0440	BATTERY	AGG: HANDS/FIST/FEET NO/MINOR INJURY	OTHER	0	1233	12	
1	JB574407	2018-12-31 23:44:00	047XX N RACINE AVE	1330	CRIMINAL TRESPASS	TO LAND	MOVIE HOUSE/THEATER	0	1913	19	
2	JC100036	2018-12-31 23:43:00	071XX S VINCENNES AVE	143A	WEAPONS VIOLATION	UNLAWFUL POSS OF HANDGUN	GAS STATION	0	731	7	
3	JC100004	2018-12-31 23:42:00	030XX N MARMORA AVE	2022	NARCOTICS	POSS: COCAINE	ALLEY	0	2514	25	
4	JC100117	2018-12-31 23:40:00	088XX S COTTAGE GROVE AVE	1477	WEAPONS VIOLATION	RECKLESS FIREARM DISCHARGE	STREET	0	632	6	
...



▶ sf_arrests_df

	incident_datetime	report_datetime	incident_category	incident_subcategory	incident_description	intersection	police_district	reporter_agency
0	2021-07-07 08:18:00	2021-07-07 08:28:00	Assault	Simple Assault	Battery	23RD ST \ MISSION ST	Mission	SFPD
1	2021-06-04 09:40:00	2021-06-04 09:42:00	Assault	Simple Assault	Battery	GEARY ST \ POLK ST	Northern	SFPD
2	2022-05-07 21:02:00	2022-05-07 21:25:00	Assault	Simple Assault	Battery	MASON ST \ DERBY ST	Central	SFPD
3	2021-09-30 09:00:00	2021-09-30 09:22:00	Assault	Simple Assault	Battery	16TH ST \ MISSION ST	Mission	SFPD
4	2021-12-18 00:45:00	2021-12-18 00:45:00	Other Miscellaneous	Other	Investigative Detention	POLK ST \ FERN ST	Northern	SFPD
...
179764	2025-03-13 19:12:00	2025-03-13 19:15:00	Drug Offense	Drug Violation	Narcotics Paraphernalia, Possession of	EDDY ST \ LEAVENWORTH ST	Tenderloin	SFPD
179765	2025-03-14 13:35:00	2025-03-14 13:35:00	Other Miscellaneous	Loitering	Lodging Without Permission	19TH ST \ MISSION ST	Mission	SFPD
179766	2025-03-14 11:03:00	2025-03-14 11:03:00	Larceny Theft	Larceny Theft - From Building	Theft, From Building, >\$950	BOARDMAN PL \ BRYANT ST	Southern	SFPD
179767	2025-03-14 09:07:00	2025-03-14 09:07:00	Drug Offense	Drug Violation	Narcotics Paraphernalia, Possession of	05TH ST \ MISSION ST	Southern	SFPD

