Mapping the Unequal Risk of Police Violence:
A Critical Response to Predictive Policing

Elisabeth Sedano
Christopher Hayner
November 2, 2022
Law enforcement agencies in the US increasingly use “predictive policing” methods to evaluate risk and deploy law enforcement officers.

Predictive policing programs rely on data of prior crimes and/or environmental factors.

Crime data is severely biased towards Black and Latino populations, given long-standing institutional racism, and so the danger is that predictions carry this bias forward.

Flawed predictive policing may create disparate police interactions, and unfortunately may also serve as a proxy for the risk of police violence.
Motivation

- The motivation for the Police Violence Risk Map stemmed from the cultural zeitgeist following the deaths of George Floyd, Breonna Taylor, and Ahmaud Arbery in the summer of 2020.

- The moment not only sparked a national discussion on policing, but also long-standing institutional racism that contributes to disparate access to opportunity ladders, unequal exposure to risk, and disparate attainment of generational wealth.

- As geographers impassioned by racial equity issues, we seek to be useful allies in this discussion.
Proposal

• We propose a Police Violence Risk Map as a counter to predictive crime prevention maps.

• Our goal is to highlight the varying risks across cityspace suffered by different populations via a counter-map that casts a critical eye on the data and methods of policing strategy.

• Counter-maps have a powerful legacy in critical geography of revealing the harsh realities of marginalized groups.

• While we mimic the flawed inputs and methods of predictive policing, the root objective is subverted to expose the vulnerability of at-risk populations.

The ‘Million Dollar Block’ project sought to visualize the cost of imprisonment in minority neighborhoods like Brownsville in Brooklyn, NY. 
https://c4sr.columbia.edu/projects/million-dollar-blocks
NYC was chosen as a location to deploy the first Police Violence Risk Map.

The availability of data was one of the driving factors in piloting here.

NYPD crime data for all summons and arrests is available and geocoded beginning in 2006.

The diverse but segregated population also makes it a good test case.

Finally, high profile police violence, such as Eric Garner, and the notoriety of NYPD policies, like “broken windows” policing and “stop and frisk” also make it an interesting study area.
We use the machine-learning software Maxent, which applies maximum entropy theory for habitat suitability modeling.

Maxent takes the known locations of the species – the “presence data” – and models the environmental factors that underpin its location to predict other suitable locations.

Researchers are employing the program well beyond habitat suitability, to model spatial patterns of human activity.

Maxent’s “presence only” data requirement aligns with the nature of police violence and data of its occurrence.
We utilize the Fatal Encounters dataset as “presence data” in NYC – the locations where fatal police encounters have occurred.

Fatal Encounters is a volunteered geographic information dataset created by journalist D. Brian Burghart in collaboration with researchers at USC.

Violence (fatal and non-fatal) committed by police officers are often unreported in local and national data.

The dataset is compiled through a mix of inputs by paid researchers, public records requests, and crowdsourced information.
Variables

Variable category (Reference for inclusion)

Crime data (PredPol program (Mohler et al. 2011)):
• “Quality of Life” Summons Data
• Misdemeanor Arrests

Environmental data (Risk Terrain Modeling program (Caplan & Kennedy 2016)):
• Land uses, inc. liquor stores, vacant lots
• Public transit
• Bridges and highway overpasses
• Land cover, inc. tree canopy and grasses/shrubs

Demographic data (Carbado 2016)
• Vulnerable populations, e.g. homeless shelters
• Segregation data

Police Presence (Carbado 2016)
• “Stop and Frisk” data

Amount of police presence impacts amount of police violence (Carbado 2016).
Crime data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Quality of Life” Summons, including:</td>
<td>NYPD</td>
</tr>
<tr>
<td>• Public consumption of alcohol</td>
<td>• Loitering</td>
</tr>
<tr>
<td>• Public urination</td>
<td>• Trespassing</td>
</tr>
<tr>
<td>• Possession of marijuana</td>
<td>• Disorderly Conduct</td>
</tr>
<tr>
<td>• Spitting</td>
<td>• Bicycle on sidewalk</td>
</tr>
<tr>
<td>• Graffiti</td>
<td>• Jaywalking</td>
</tr>
<tr>
<td>• Littering</td>
<td>• No Tax Stamp (e.g. selling loose cigarettes)</td>
</tr>
<tr>
<td>• Panhandling</td>
<td>• Windshield washing</td>
</tr>
<tr>
<td>• Noise</td>
<td>• Indecent exposure</td>
</tr>
</tbody>
</table>

Misdemeanor Arrests, including: | NYPD |
| Dangerous Drugs (e.g. marijuana possession) | Frauds |
| Petit Larceny | Possession of stolen property |
| Assault | Unauthorized use of a vehicle |
| Criminal mischief | Offenses against the person / public administration |
| Aggravated harassment | Dangerous weapons |
| Criminal trespass | Administrative Code and other misdemeanors (e.g. gambling) |
| Vehicle and Traffic Laws | |
## Environmental data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
</table>
| Land use parcel data, including:  
  - Vacant land  
  - Transient accommodations (hotels, motels and SROs)  
  - Auto-related uses (e.g. parking facilities, car repair)  
  - Cultural and Recreational spaces (e.g. YMCAs, playgrounds)  
  - Retail and Services | NYC Planning  
  - Institutional and Educational uses (e.g. court houses and schools)  
  - Religious Institutions  
  - Hospitals and Health Facilities |
| NYS-permitted alcohol-serving establishments, including liquor stores, bars and taverns | NYS Liquor authority |
| Sidewalk infrastructure, including:  
  - Pay phones  
  - WiFi kiosks | DoITT  
  - Bus shelters  
  - City benches | DOT |
| Subway station entrances | MTA |
| Ramps, overpasses, bridges, elevated trains | NYC Planning |
| Land cover data, including:  
  - Tree cover  
  - Grass and brush | NYC  
  - Tree cover  
  - Grass and brush  
  - Parkland  
  - Other natural areas | Dept. of Parks and Recreation |
Demographic data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segregation Indices, including:</td>
<td></td>
</tr>
<tr>
<td>• White – Black Dissimilarity</td>
<td>US Census</td>
</tr>
<tr>
<td>• White – Others Dissimilarity</td>
<td></td>
</tr>
<tr>
<td>• Black – Others Dissimilarity</td>
<td></td>
</tr>
<tr>
<td>• White Isolation</td>
<td></td>
</tr>
<tr>
<td>• Black Isolation</td>
<td></td>
</tr>
<tr>
<td>Homeless shelters, by bed capacity</td>
<td>NYC DHS</td>
</tr>
</tbody>
</table>
‘Stop and Frisk’

- The NYPD has a ‘stop, question, and frisk’ policy that allows officers to detain, question, and search suspects under reasonable suspicion of criminal activity (a Terry stop).
- It was expanded greatly during the Bloomberg administration as a means to get guns off the streets.
- At its peak, stops numbered in the hundreds of thousands annually, and disproportionately targeted Black and Latino suspects.
- In 2013, stops dropped dramatically after Floyd v. City of New York. The percentage of Black and Latino suspects remains skewed, however.
Results

- Early results show that the spatial characteristics correlated with White victims of police violence are disbursed across cityspace.
Results

• Early results show that the spatial characteristics correlated with White victims of police violence are disbursed across cityspace.

• The spatial pattern of heightened suitability for Black victims is quite different – it is much more concentrated.
Results – Side by Side

Locations across NYC with conditions more correlated with White victims

Locations across NYC with conditions more correlated with Black victims
• The most impactful factor in the models for both Black and White fatal police encounters – by far – is the density of Stop and Frisk events.

### Key variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent contribution</th>
<th>Permutation importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop and Frisk - Black</td>
<td>62.9</td>
<td>51.4</td>
</tr>
<tr>
<td>Misd. Dangerous drugs</td>
<td>14.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Seg. Black isolation</td>
<td>6.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Landcover tree canopy</td>
<td>5.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Summons noise</td>
<td>5.3</td>
<td>23.4</td>
</tr>
<tr>
<td>Homeless shelters</td>
<td>4.8</td>
<td>5.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent contribution</th>
<th>Permutation importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop and Frisk - White</td>
<td>50.8</td>
<td>60.6</td>
</tr>
<tr>
<td>Misd. Fraud arrests</td>
<td>12.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Parcels - vacant</td>
<td>11.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Liquor stores</td>
<td>9.7</td>
<td>9.2</td>
</tr>
<tr>
<td>Parcels - motel</td>
<td>5.2</td>
<td>11.6</td>
</tr>
<tr>
<td>Subway entrances</td>
<td>4.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Seg. White-black dissimilarity</td>
<td>3.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Public payphones</td>
<td>2.8</td>
<td>5.5</td>
</tr>
</tbody>
</table>
Key variable

- We’ve seen that the numbers of Stop and Frisks of Black people far exceed those of White people.
- Yet these encounters were also spatially disproportionate. Certain neighborhoods, even certain blocks, were subject to intense police presence.
• We’ve seen that the numbers of Stop and Frisks of Black people far exceed those of White people.

• Yet these encounters were also spatially disproportionate. Certain neighborhoods, even certain blocks, were subject to intense police presence.

• The block with the highest density of stops of White people logged 1,771 events while the highest density of stops of Black people was 7,869.
Results – Side by Side

Stop and Frisks of White persons by NYPD, 2006-2020

Stop and Frisks of Black persons by NYPD, 2006-2020

Stop and Frisks of White persons by NYPD, 2006-2020

Stop and Frisks of Black persons by NYPD, 2006-2020

Mapping the Unequal Risk of Police Violence
Results – Side by Side

Stop and Frisk of White persons by NYPD, 2006 - 2020

Stop and Frisk of Black persons by NYPD, 2006 - 2020
Results – Side by Side

Stop and Frisk of White persons by NYPD, 2006 - 2020

Stop and Frisk of Black persons by NYPD, 2006 - 2020
Secondary results

- Removing Stop and Frisk data from the program, we achieve models with similar performance and similar spatial patterns, as the secondary variables from the prior models increase in contribution.

- The pattern of spatial factors related to fatal police violence against Black persons continues to be concentrated.
Secondary results

- Removing Stop and Frisk data from the program, we achieve models with similar performance and similar spatial patterns, as the secondary variables from the prior models increase in contribution.

- The pattern of spatial factors related to fatal police violence against Black persons continues to be concentrated.

- The pattern of spatial factors related to fatal police violence against White persons continues to be disbursed.

- This is explained by the nature of the variables.

Locations across NYC with heightened police violence risk for Black persons
Key secondary variables

For the suitability model of Black police violence, key variables are density of misdemeanor drug arrests, density of summons issued for violations of noise regulations, index of local segregation – isolation of Black population, and density of land cover of grass and shrubs; a mix of crime, demographic and environmental factors.
For the suitability model of White police violence, key variables show much more relative influence of environmental characteristics rather than police activity, and these tend to be more evenly distributed. Liquor stores, vacant parcels and pay phones are important environmental criteria along with the tree canopy. Black isolation remains important, even in predicting white risk.
Concluding thoughts

- Locations with fatal police encounters in New York City can be modeled using spatial variables including locations of police activity and the urban environment, yet the patterns vary distinctly by the race of the victim.

- Stop and frisk locations are the most informative variable but, without it, police activity is more impactful on models of violence against Black victims while environmental features are more impactful with respect to White victims.

- Next we will tune the models and explore the data spatiotemporally, given mayoral shifts in policing strategy.
References

