

Mapping the Unequal Risk of Police Violence:

A Critical Response to
Predictive Policing

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Background

- Law enforcement agencies in the US increasingly use “predictive policing” methods to evaluate risk and deploy law enforcement officers.
- Predictive policing programs rely employ 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.



An example of crime heatmaps generating target deployment areas for policing.
<https://americanpoliceofficersalliance.com/police-tech-predictive-technology/>

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.



A mural of George Floyd unveiled on the side of a grocery store in Brooklyn, NY.
<https://medium.com/waospi/resources-for-talking-to-students-about-police-violence-and-the-murder-of-george-floyd-d23d6a0bf4fo>

Proposal

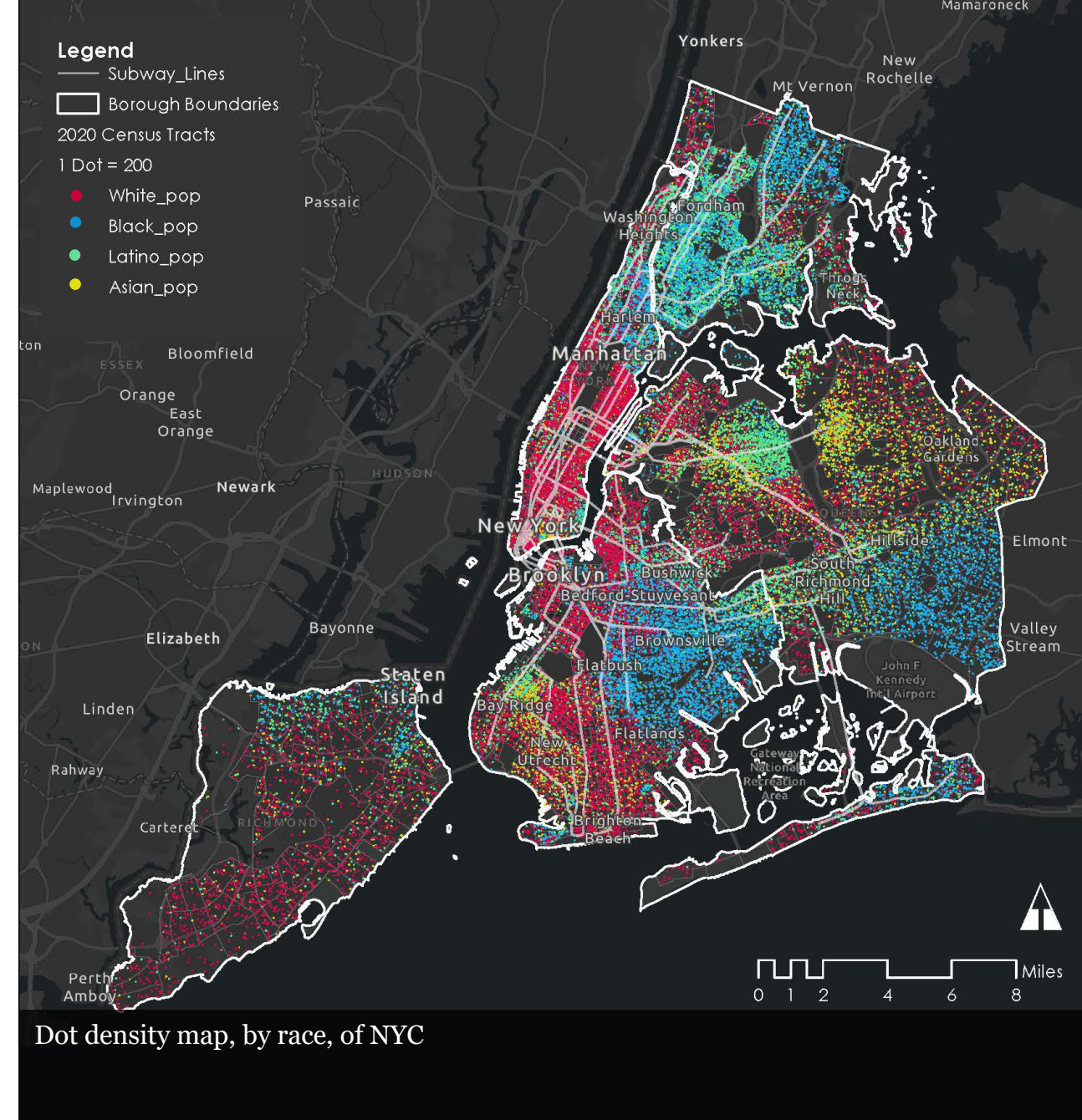
- We propose a Police Violence Risk Map as a counter to predictive crime prevention maps.
- Our goal is to highlight the varying risks across cityspace suffered by different populations via a counter-map that casts a critical eye on the data and methods of policing strategy.
- Counter-maps have a powerful 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>

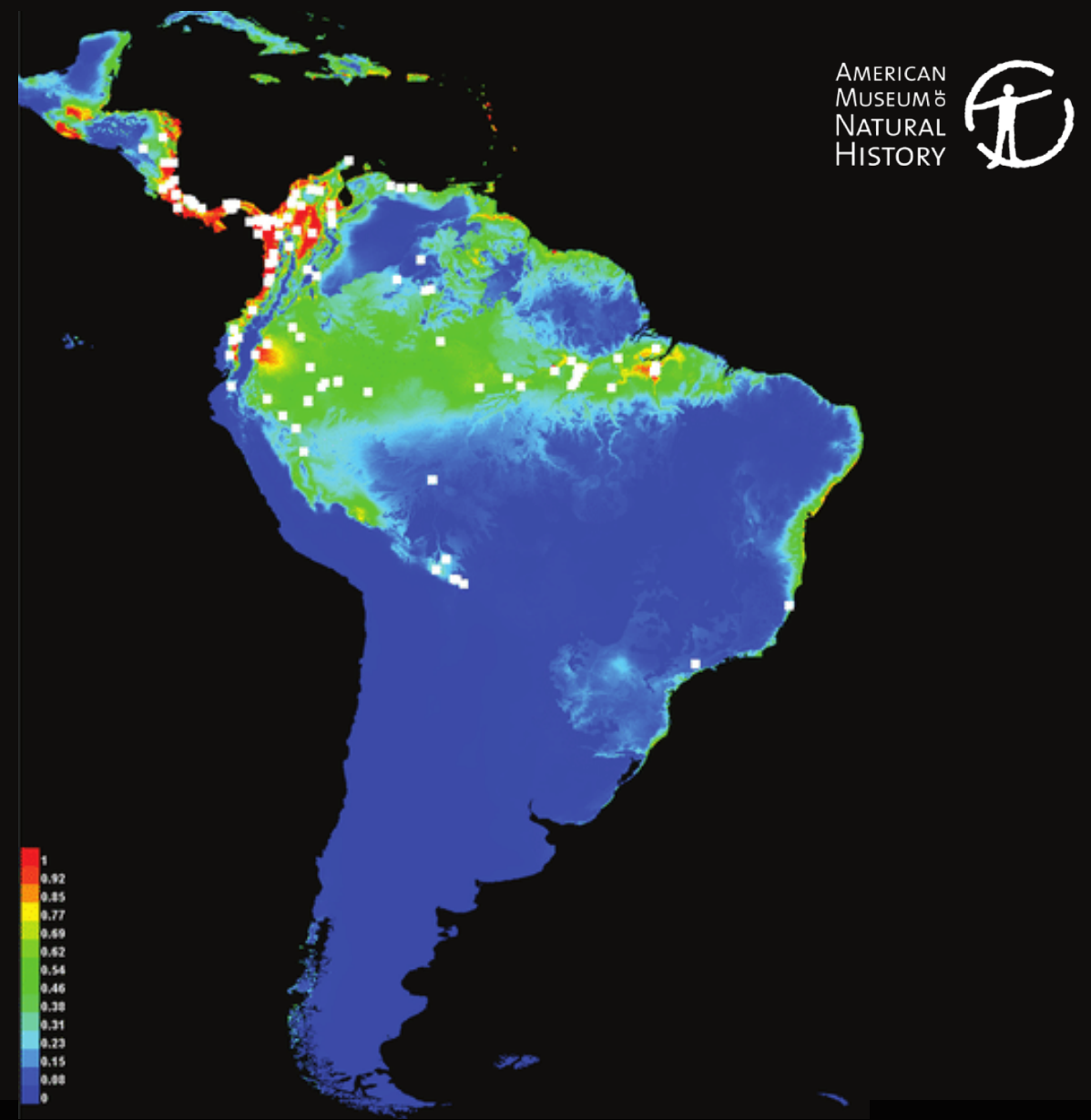
Study Area - NYC

- 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.



Modeling method

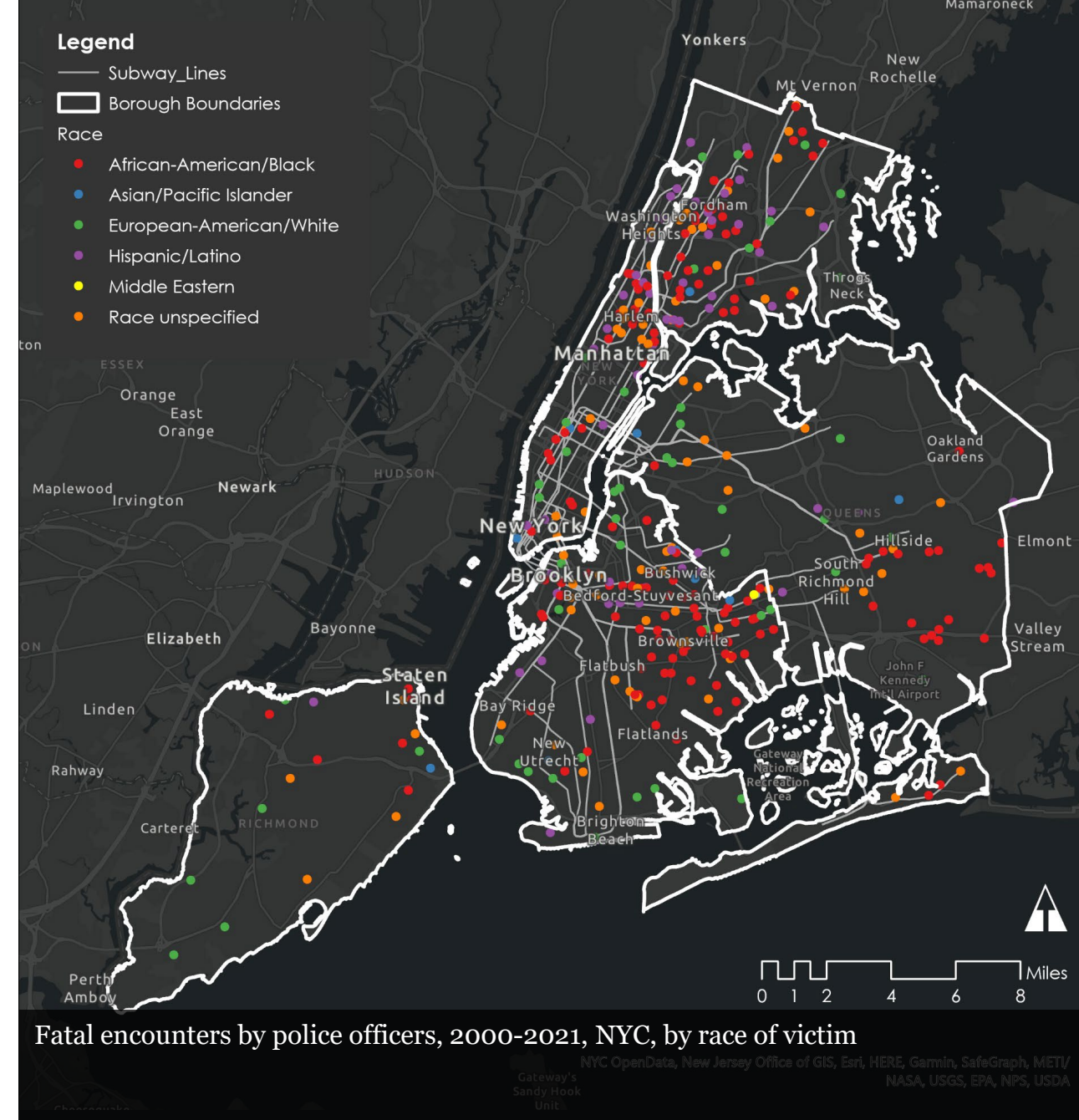
- We use the machine-learning software Maxent, which applies maximum entropy theory for habitat suitability modeling.
- Maxent takes the known locations of the species – the “presence data” – and models the environmental factors that underpin its location to predict other suitable locations.
- Researchers 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.



Maxent output of predicted suitable habitat for three-toed sloth range.
https://biodiversityinformatics.amnh.org/open_source/maxent/Maxent_tutorial2017.pdf

Fatal Encounters data

- 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)):

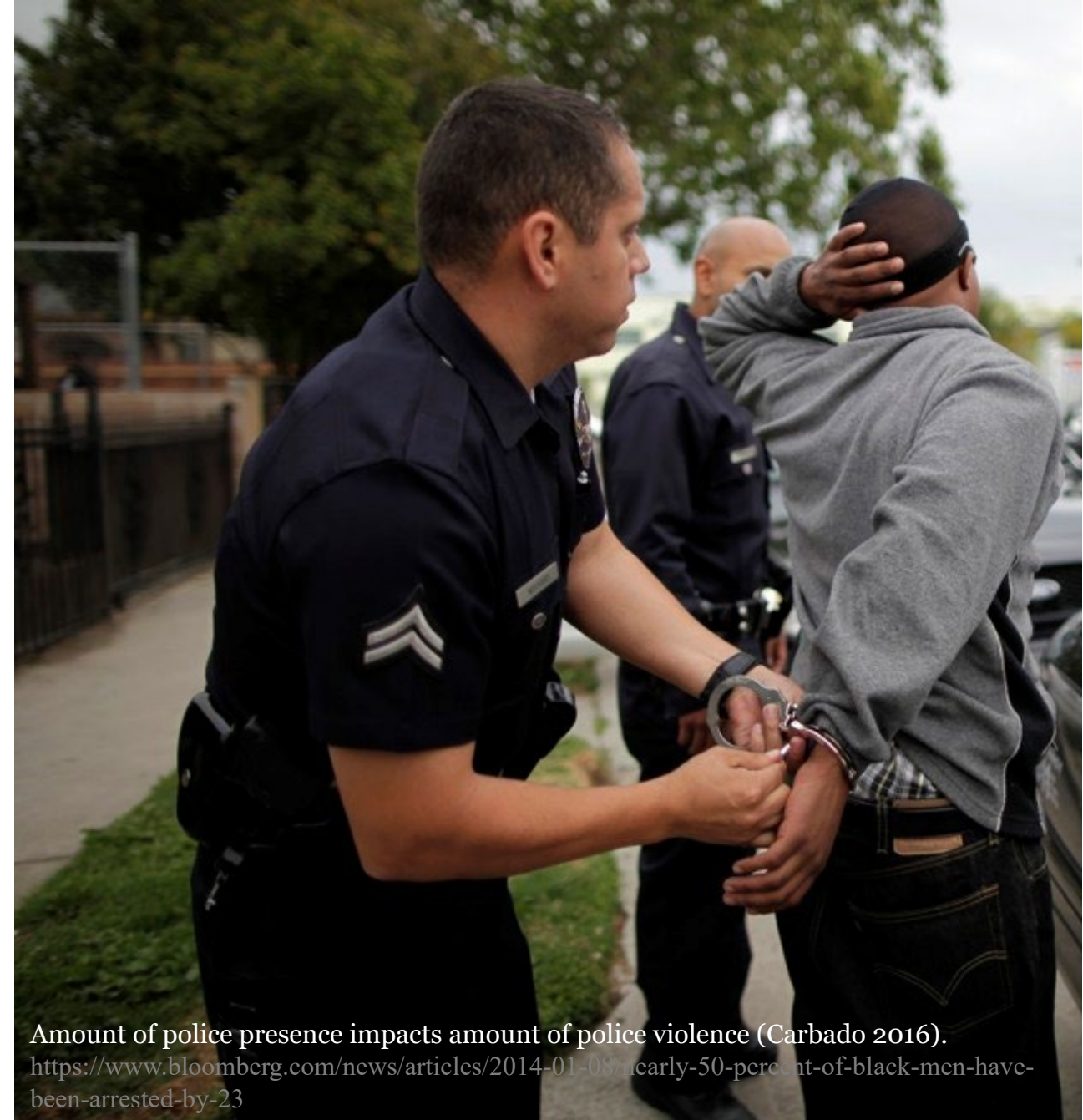
- Land uses, inc. liquor stores, vacant lots
- Public transit
- Bridges and highway overpasses
- Land cover, inc. tree canopy and grasses/shrubs

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).
<https://www.bloomberg.com/news/articles/2014-01-08/nearly-50-percent-of-black-men-have-been-arrested-by-23>

Crime data

Variable	Source
<div><div>“Quality of Life” Summons, including:</div><div><div><ul style="list-style-type: none">Public consumption of alcoholPublic urinationPossession of marijuanaSpittingGraffitiLitteringPanhandlingNoise</div><div><ul style="list-style-type: none">LoiteringTrespassingDisorderly ConductBicycle on sidewalkJaywalkingNo Tax Stamp (e.g. selling loose cigarettes)Windshield washingIndecent exposure</div></div></div>	NYPD
<div><div>Misdemeanor Arrests, including:</div><div><div><ul style="list-style-type: none">Dangerous Drugs (e.g. marijuana possession)Petit LarcenyAssaultCriminal mischiefAggravated harassmentCriminal trespassVehicle and Traffic Laws</div><div><ul style="list-style-type: none">FraudsPossession of stolen propertyUnauthorized use of a vehicleOffenses against the person / public administrationDangerous weaponsAdministrative Code and other misdemeanors (e.g. gambling)</div></div></div>	NYPD

Environmental data

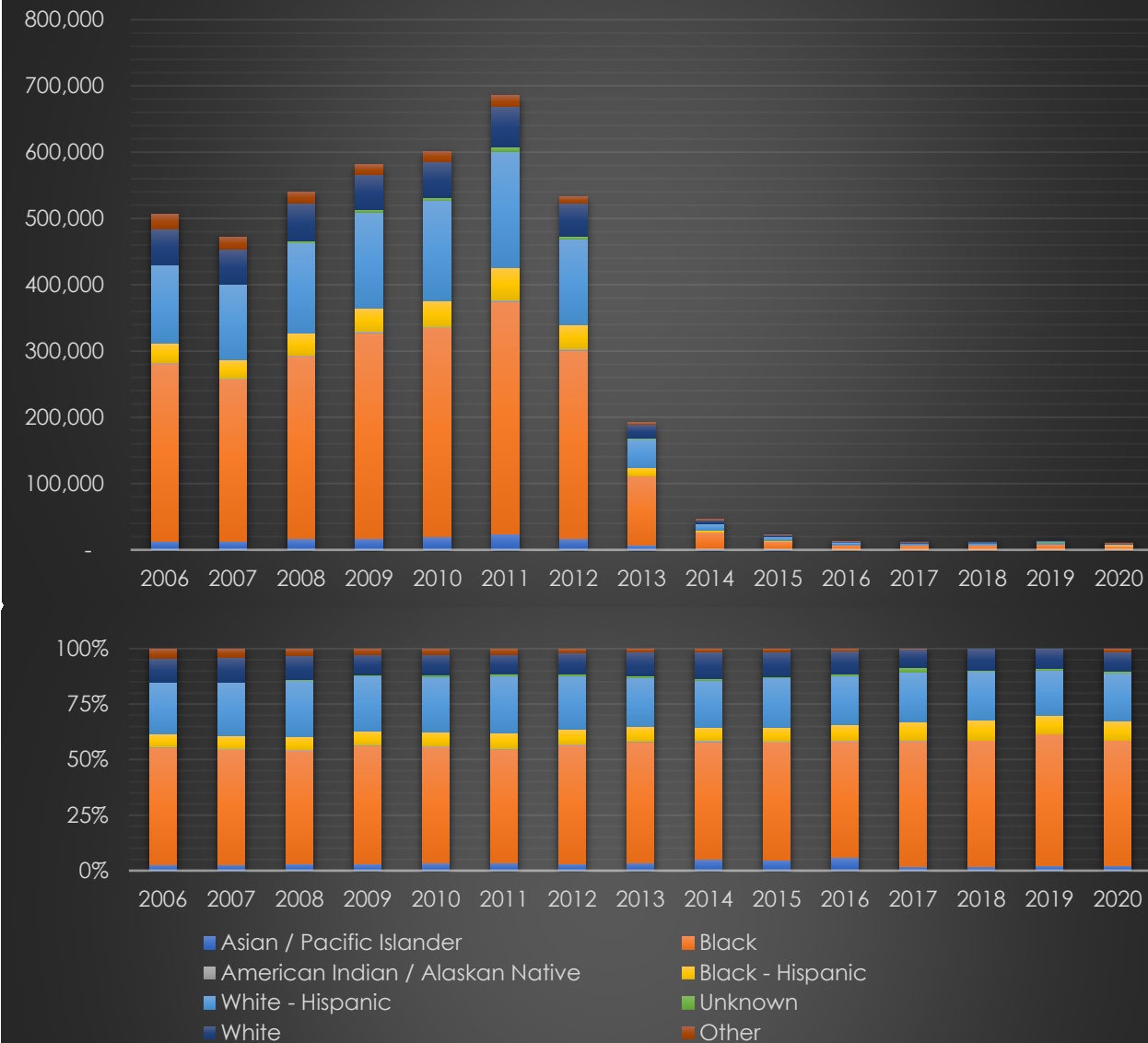
Variable	Source
Land use parcel data, including: <ul style="list-style-type: none">• Vacant land• Transient accommodations (hotels, motels and SROs)• Auto-related uses (e.g. parking facilities, car repair)• Cultural and Recreational spaces (e.g. YMCAs, playgrounds)• Retail and Services• Institutional and Educational uses (e.g. court houses and schools)• Religious Institutions• Hospitals and Health Facilities	NYC Planning PLUTO data
NYS-permitted alcohol-serving establishments, including liquor stores, bars and taverns	NYS Liquor authority
Sidewalk infrastructure, including: <ul style="list-style-type: none">• Pay phones• WiFi kiosks• Bus shelters• city benches	DoITT DOT
Subway station entrances	MTA
Ramps, overpasses, bridges, elevated trains	NYC Planning
Land cover data, including: <ul style="list-style-type: none">• Tree cover• Grass and brush	NYC Dept. of Parks and Recreation

Demographic data

Variable	Source
Segregation Indices, including: <ul style="list-style-type: none">• White – Black Dissimilarity• White – Others Dissimilarity• Black – Others Dissimilarity• White Isolation• Black Isolation	US Census
Homeless shelters, by bed capacity	NYC DHS

'Stop and Frisk'

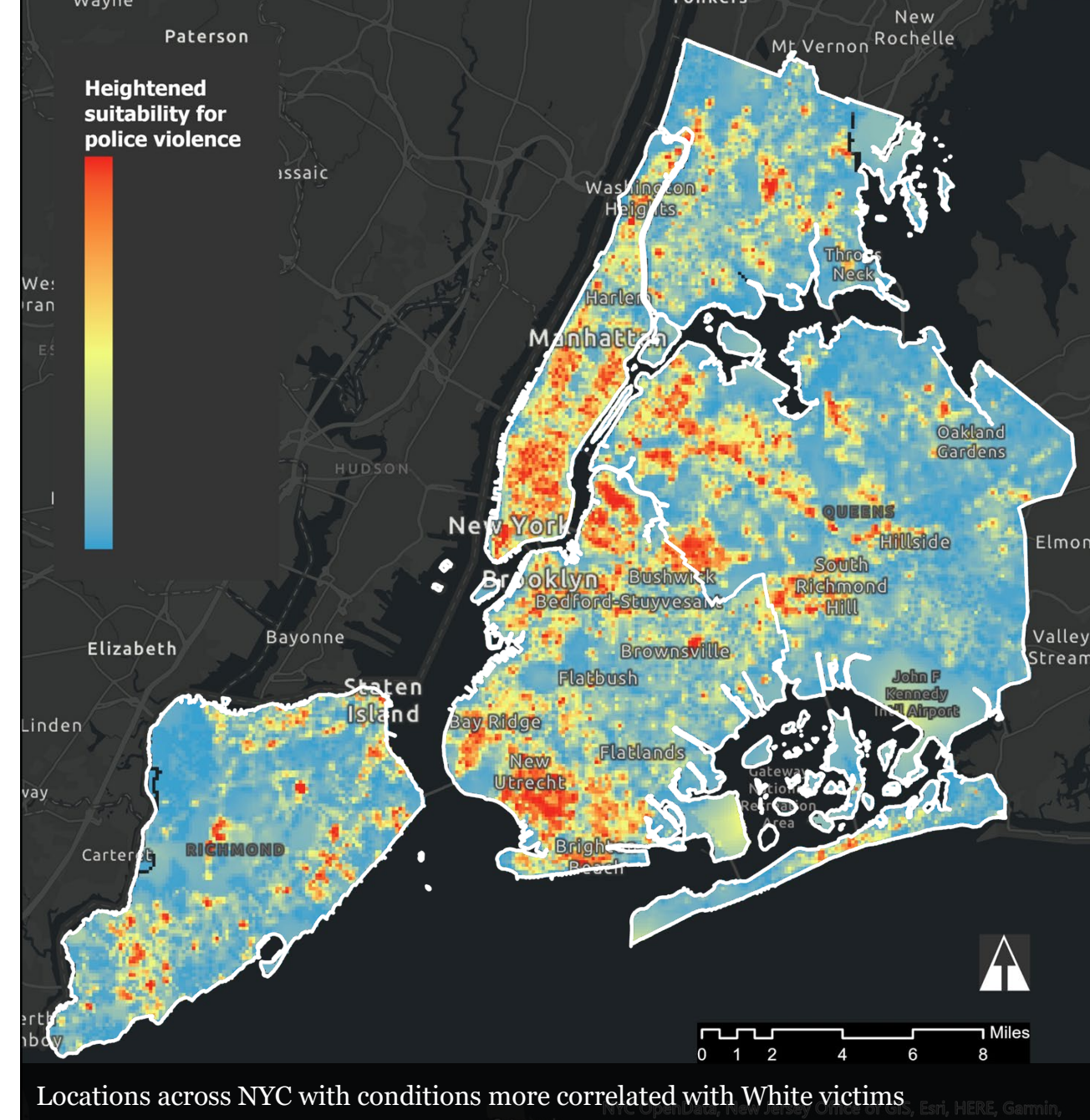
- The NYPD has a 'stop, question, and frisk' policy that allows officers to detain, question, and search suspects under reasonable suspicion of criminal activity (a Terry stop).
- It was expanded greatly during the Bloomberg administration as a means to get guns off the streets.
- At its peak, stops 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.



'Stop and Frisk' numbers by year and race, top, and as a percentage of total stops, bottom.

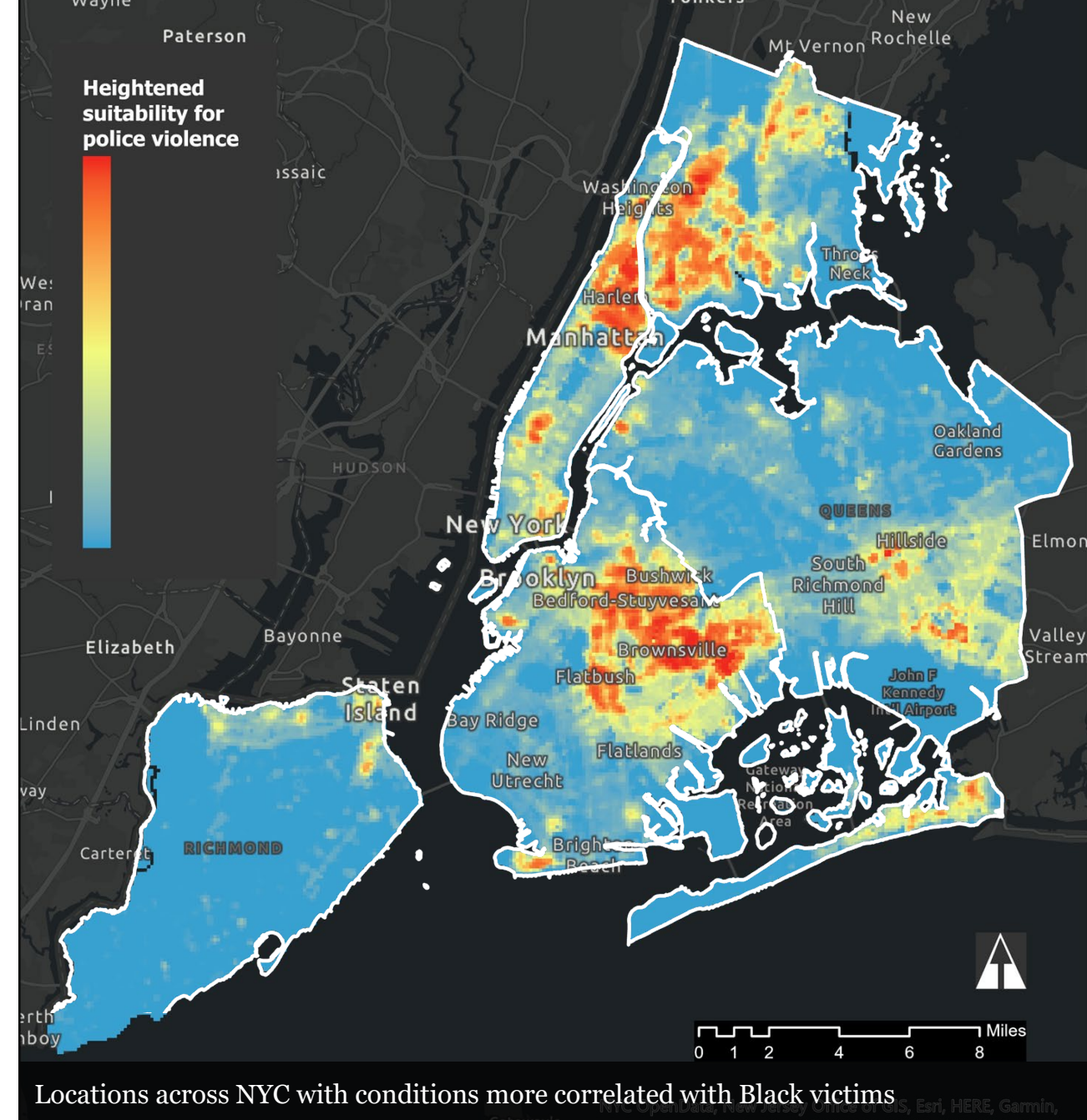
Results

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

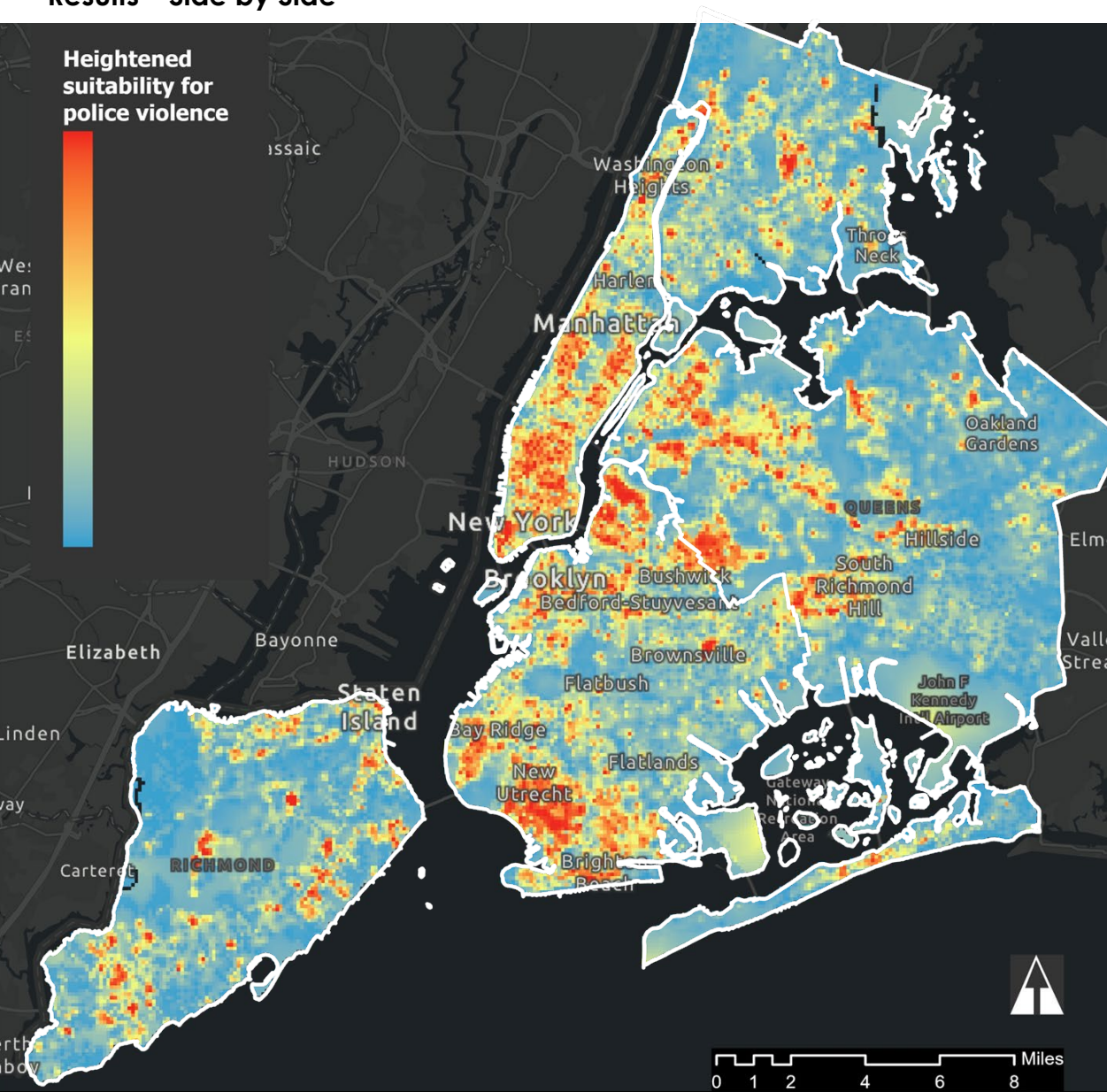


Results

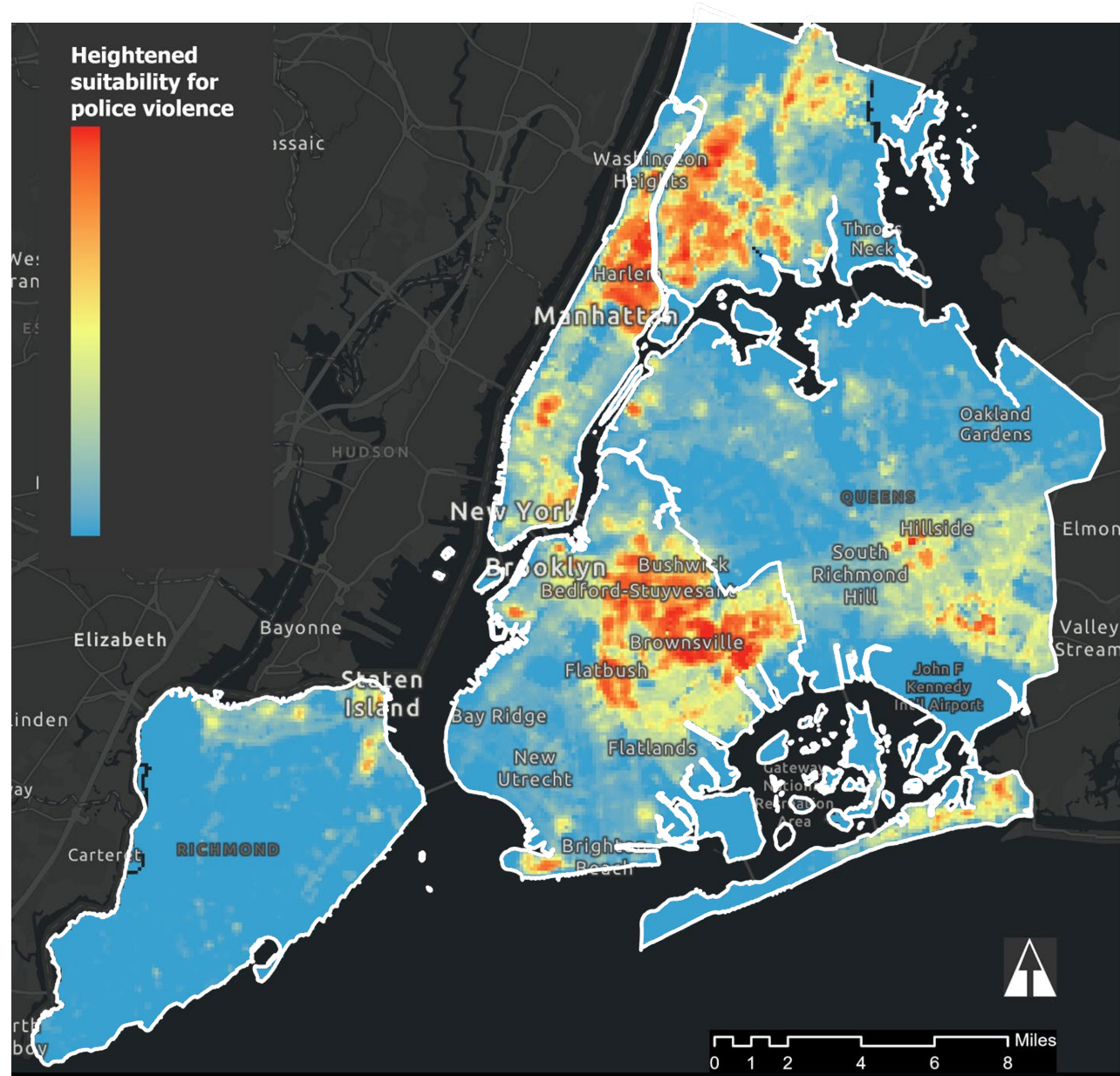
- Early results show that the spatial characteristics correlated with White victims of police violence are disbursed across cityspace.
- The spatial pattern of heightened suitability for Black victims is quite different – it is much more concentrated.



Results – Side by Side



Locations across NYC with conditions more correlated with White victims



Locations across NYC with conditions more correlated with Black victims

Key variables

- 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.

Black victims

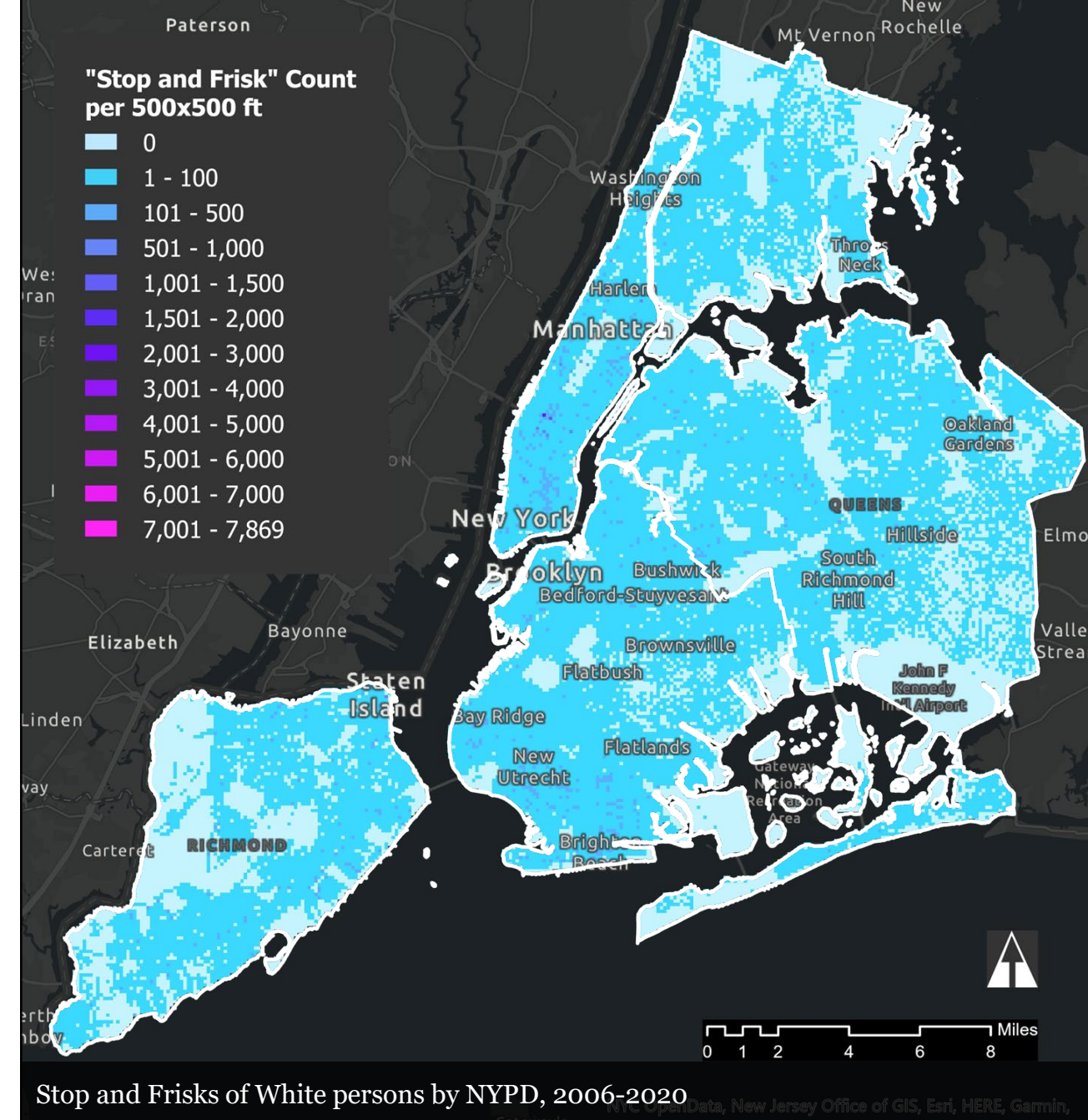
Variable	Percent contribution	Permutation importance
Stop and Frisk - Black	62.9	51.4
Misd. Dangerous drugs	14.5	4.8
Seg. Black isolation	6.7	7.9
Landcover tree canopy	5.8	7.3
Summons noise	5.3	23.4
Homeless shelters	4.8	5.2

White victims

Variable	Percent contribution	Permutation importance
Stop and Frisk - White	50.8	60.6
Misd. Fraud arrests	12.9	4.1
Parcels - vacant	11.2	4.1
Liquor stores	9.7	9.2
Parcels - motel	5.2	11.6
Subway entrances	4.4	0.5
Seg. White-black dissimilarity	3.1	4.5
Public payphones	2.8	5.5

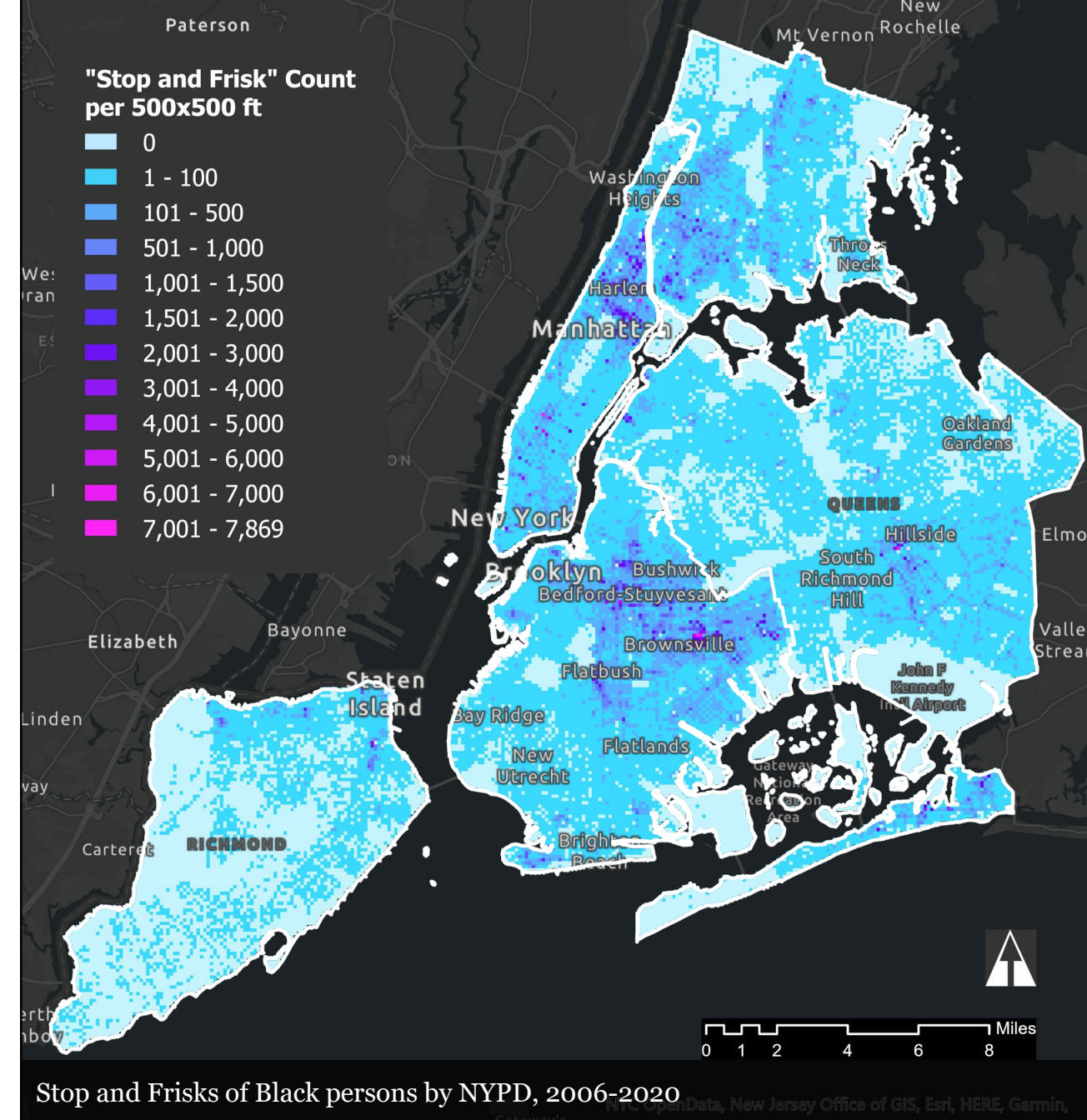
Key variable

- 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.

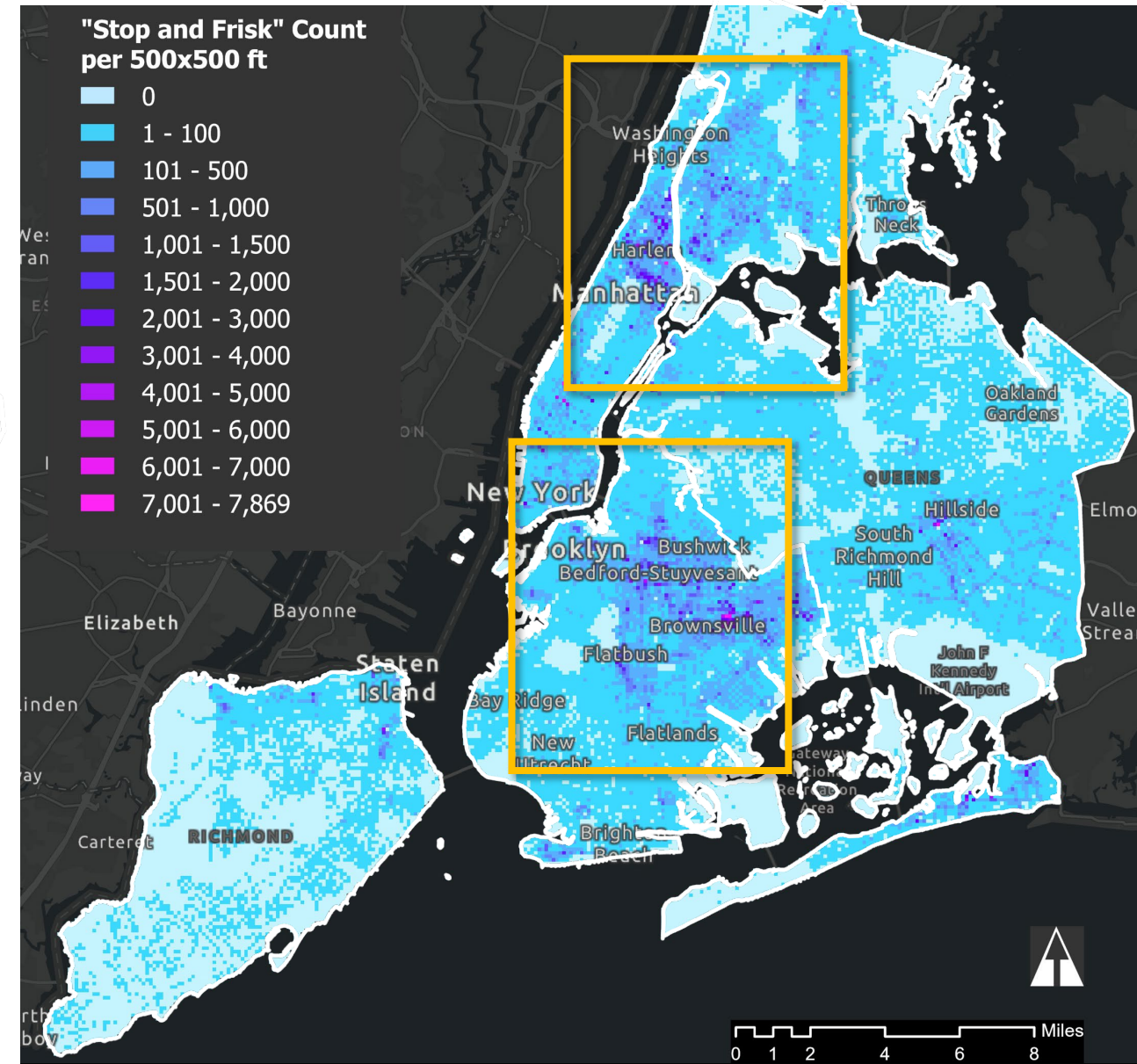
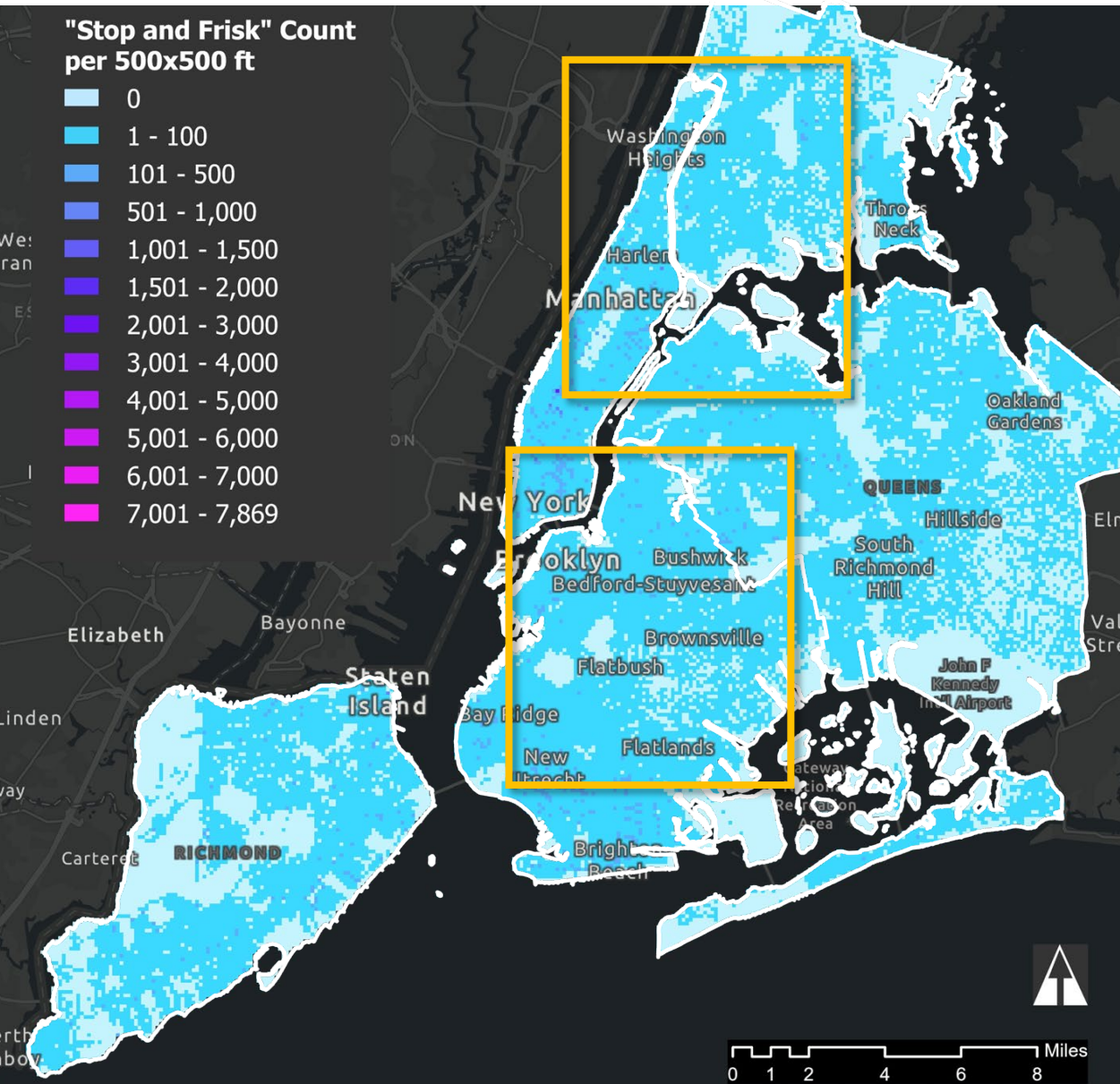


Key variable

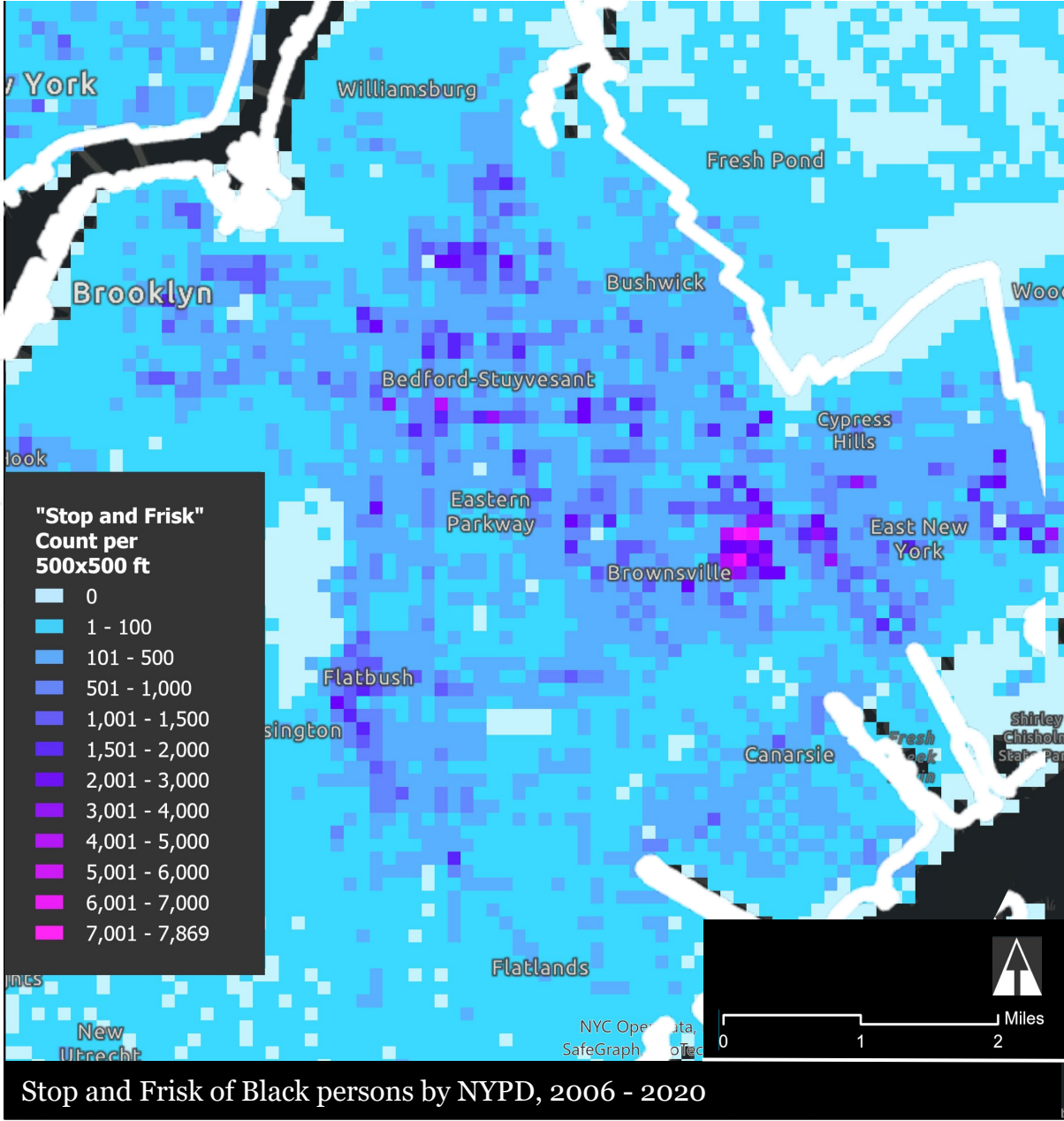
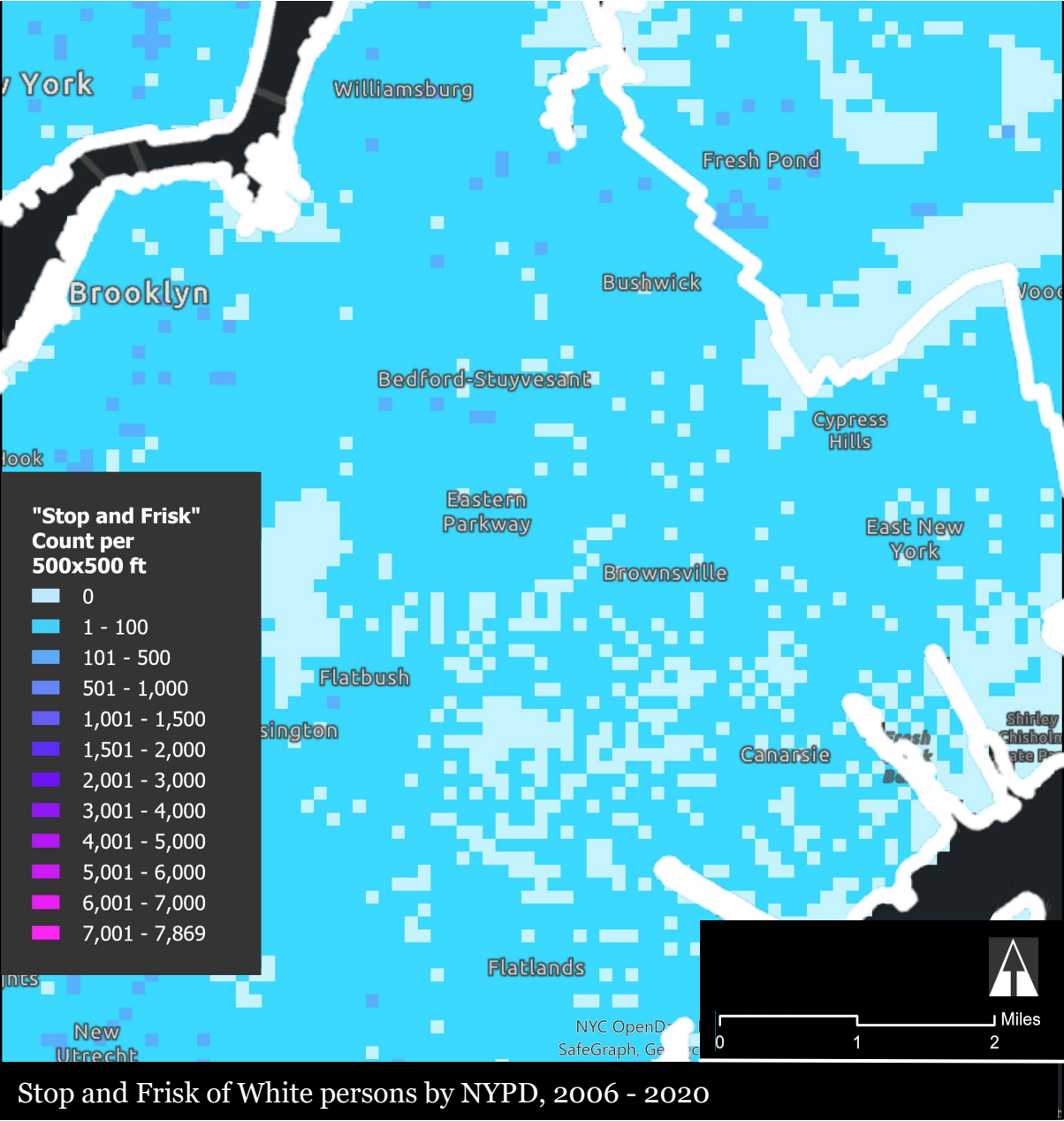
- We've seen that the numbers of Stop and Frisks of Black people far exceed those of White people.
- Yet these encounters were also spatially disproportionate. Certain neighborhoods, even certain blocks, were subject to intense police presence.
- The block with the highest density of stops of White people logged 1,771 events while the highest density of stops of Black people was 7,869.



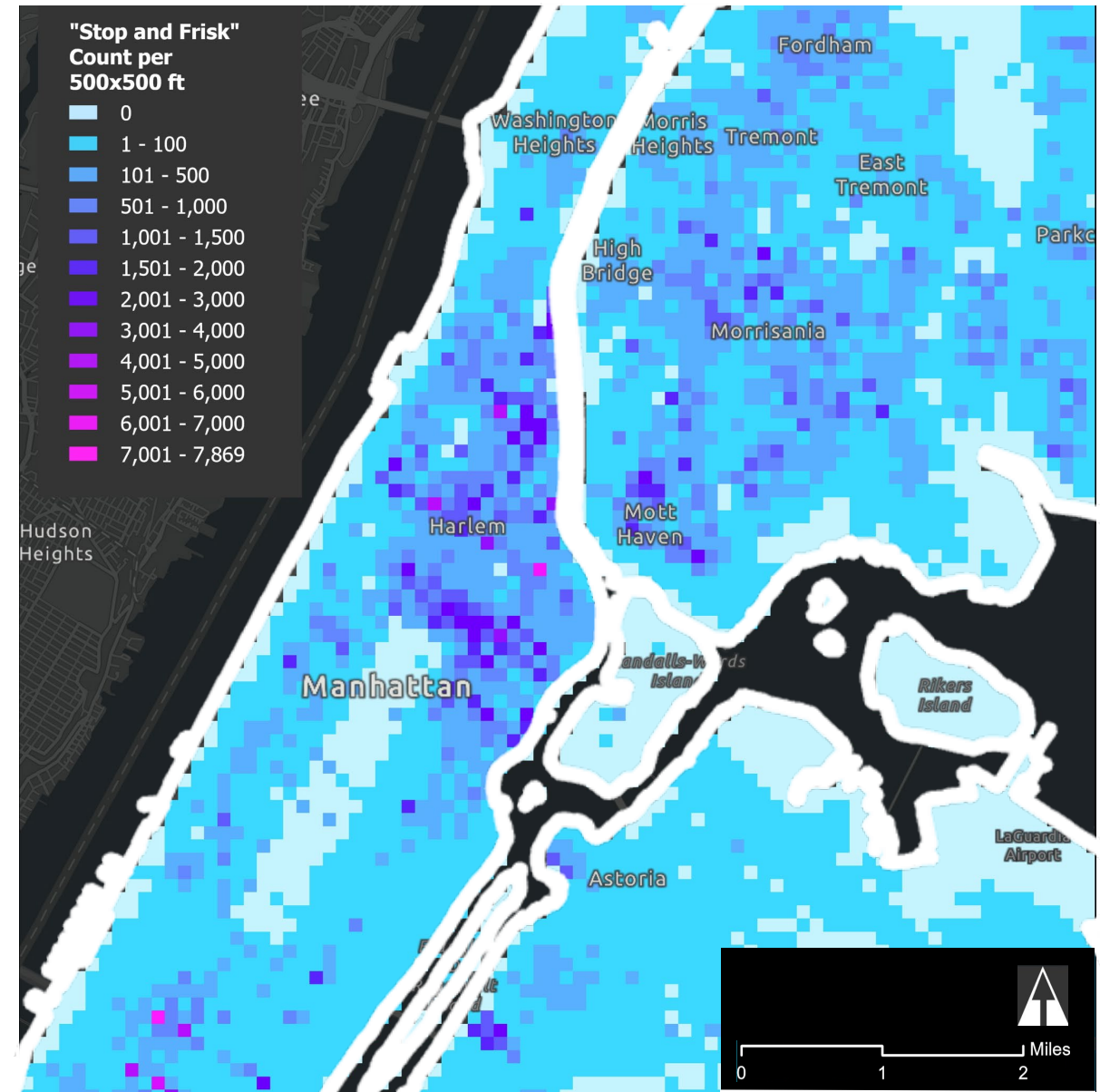
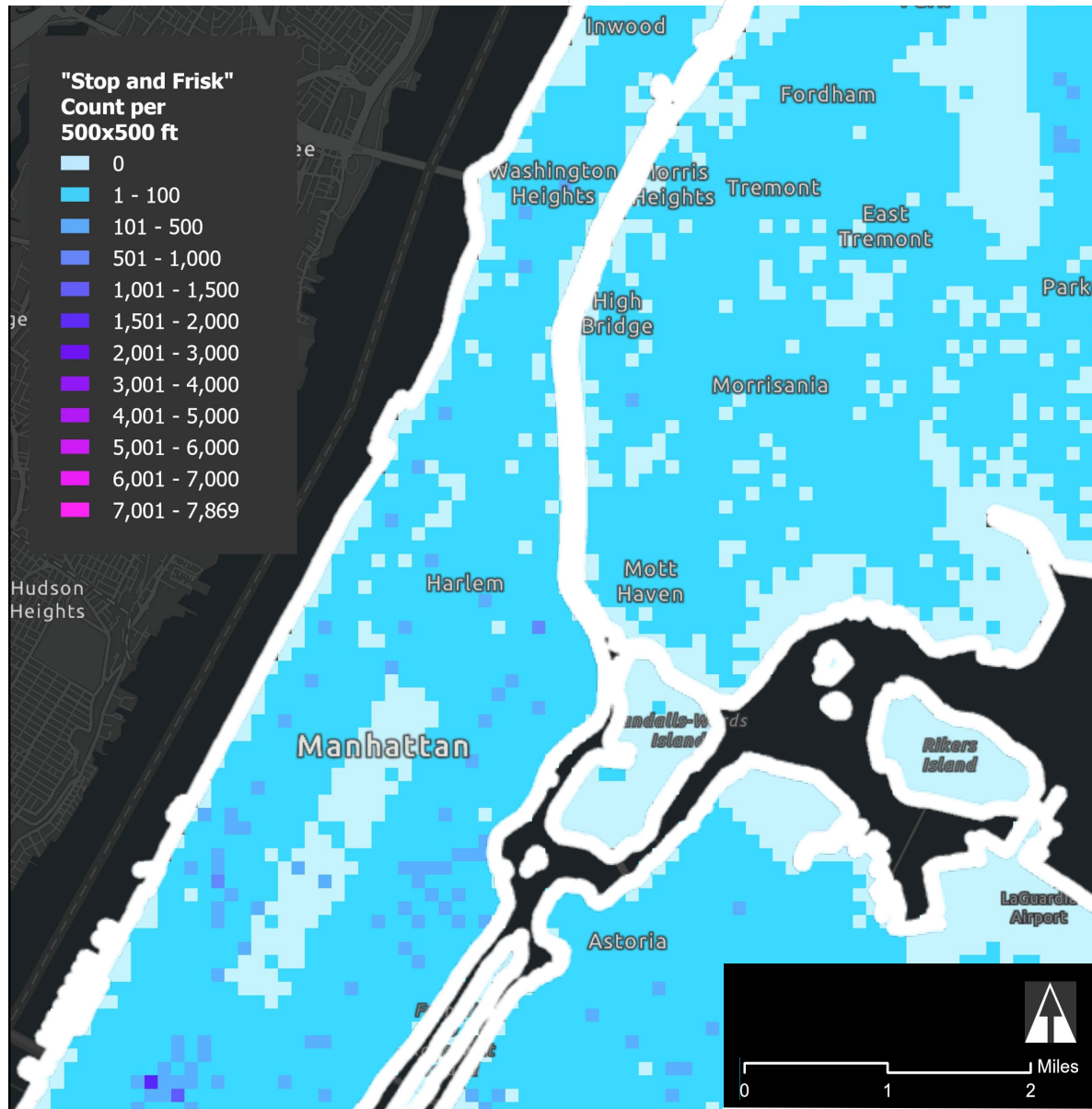
Results – Side by Side



Results – Side by Side

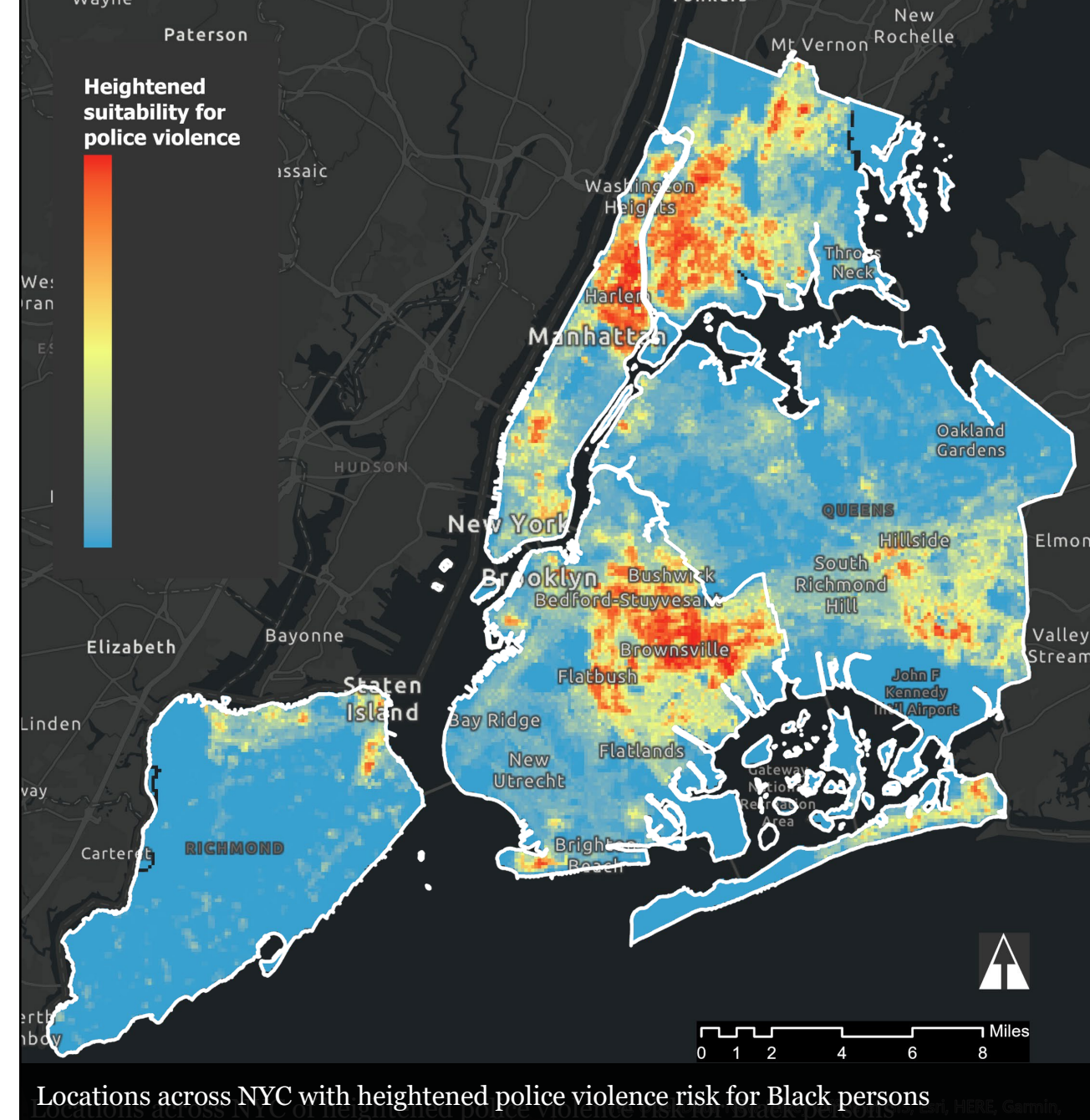


Results – Side by Side



Secondary results

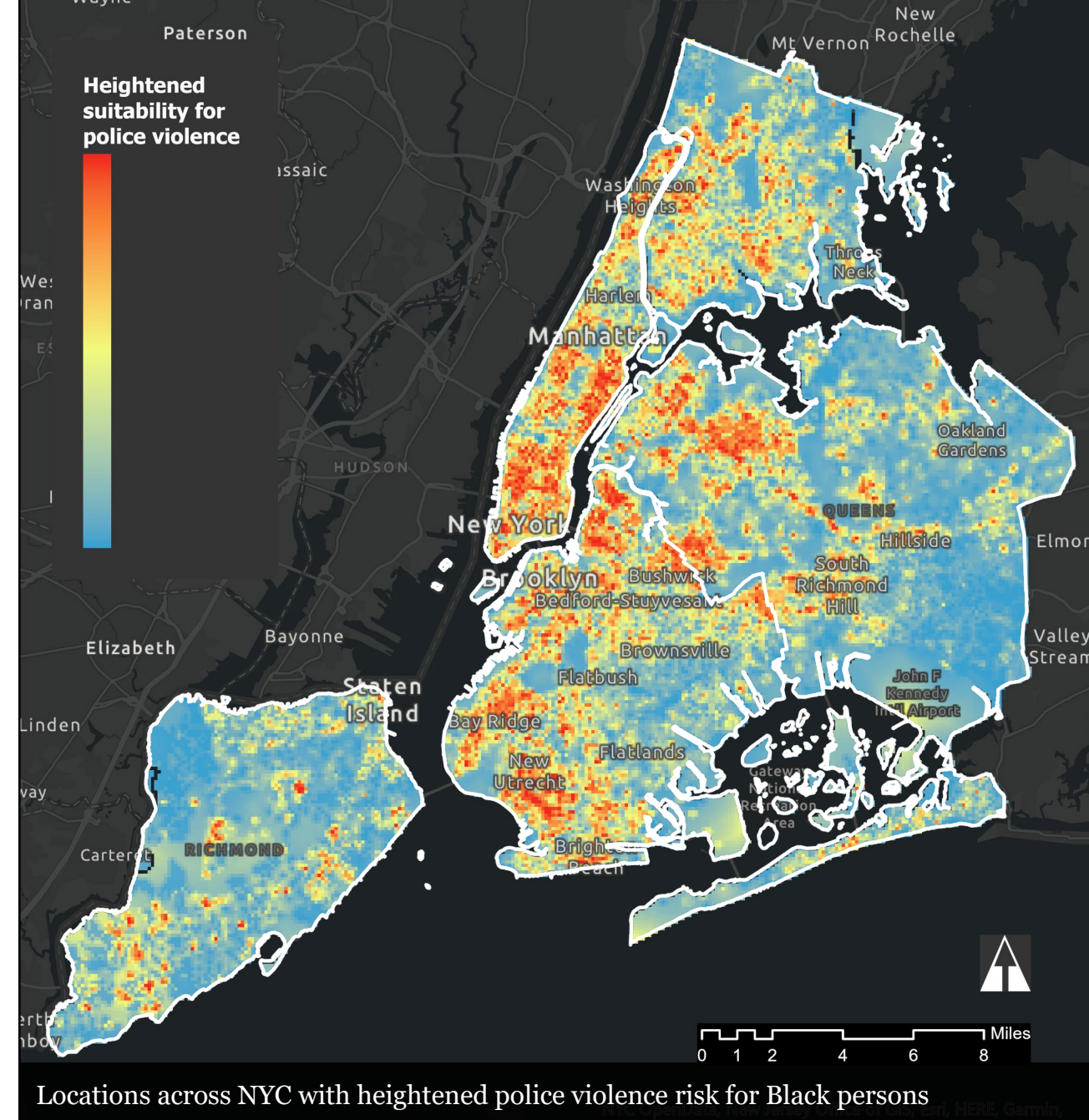
- Removing Stop and Frisk data from the program, we achieve models with similar performance and similar spatial patterns, as the secondary variables from the prior models increase in contribution.
- The pattern of spatial factors related to fatal police violence against Black persons continues to be concentrated.



Locations across NYC with heightened police violence risk for Black persons

Secondary results

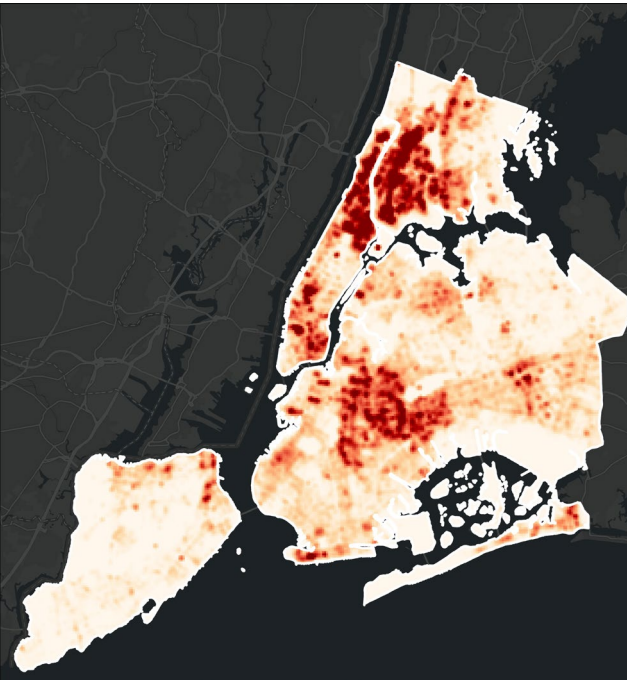
- Removing Stop and Frisk data from the program, we achieve models with similar performance and similar spatial patterns, as the secondary variables from the prior models increase in contribution.
- The pattern of spatial factors related to fatal police violence against Black persons continues to be 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.



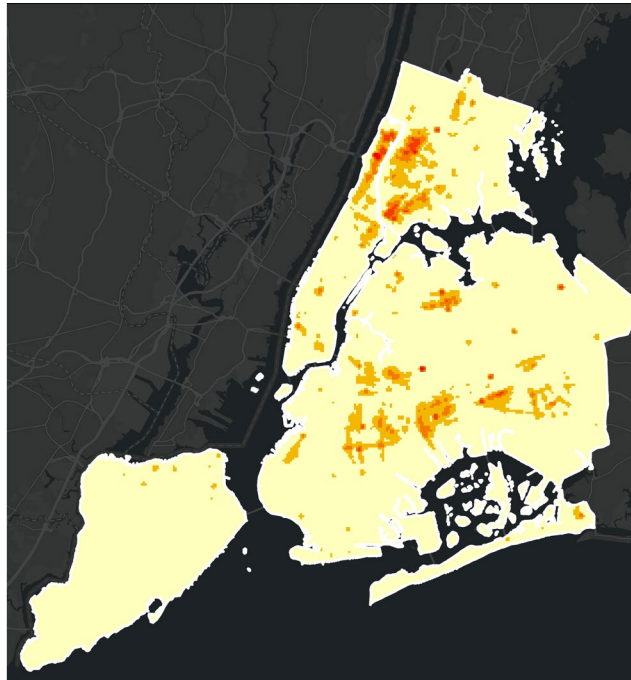
Key secondary variables

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.

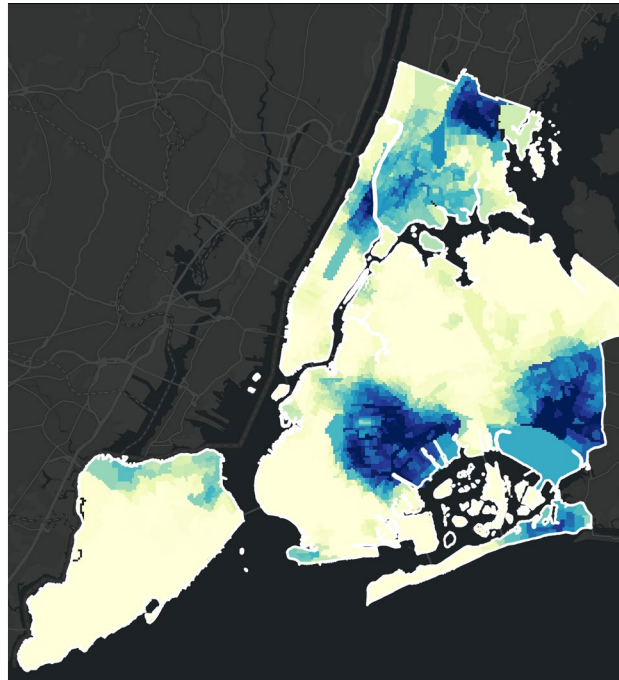
Summons Issued for Noise Violation



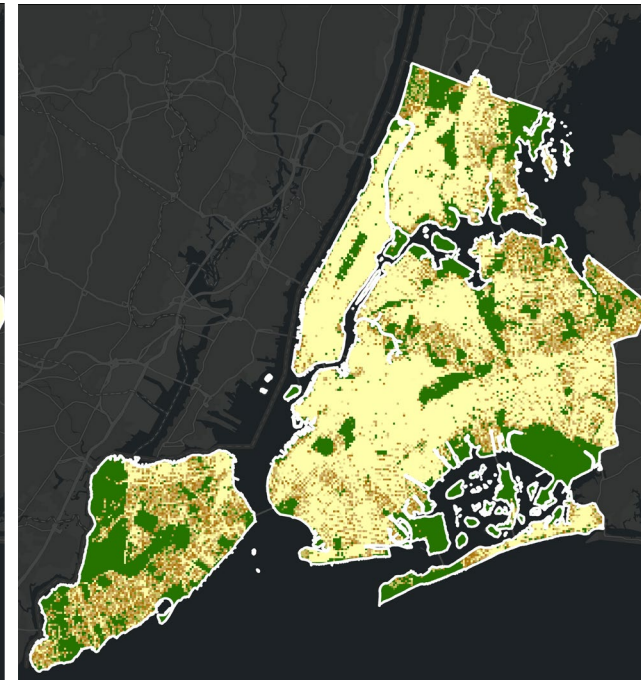
Misdemeanor Drug Arrests



Segregation – Black isolation



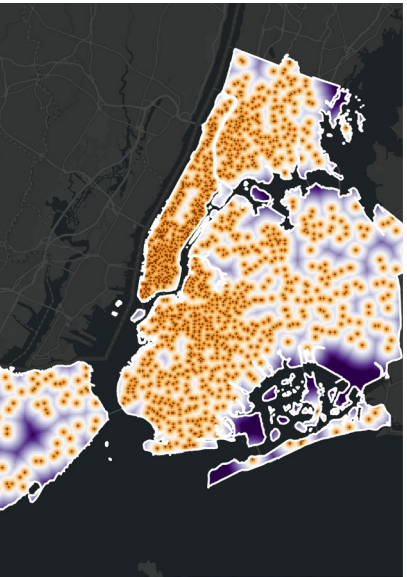
Density of Grass and Shrubs



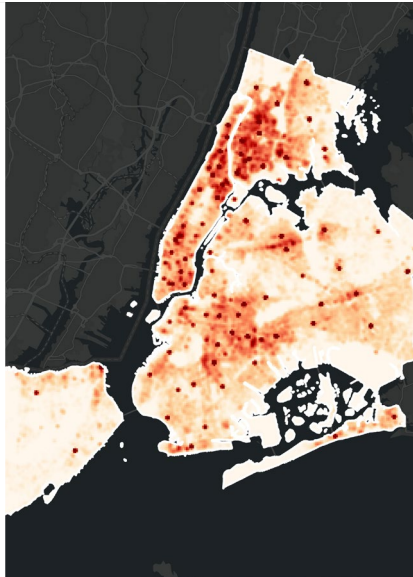
Key secondary variables

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.

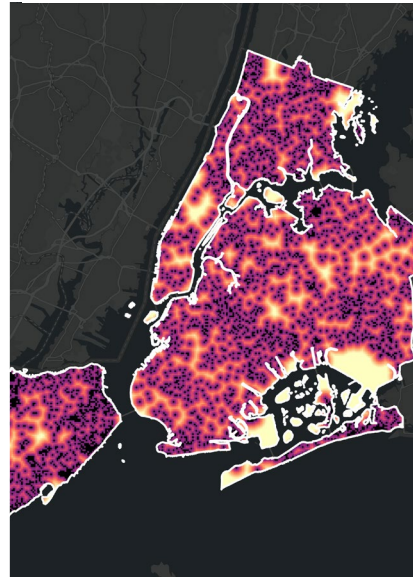
Liquor Stores



Misdemeanor Assaults



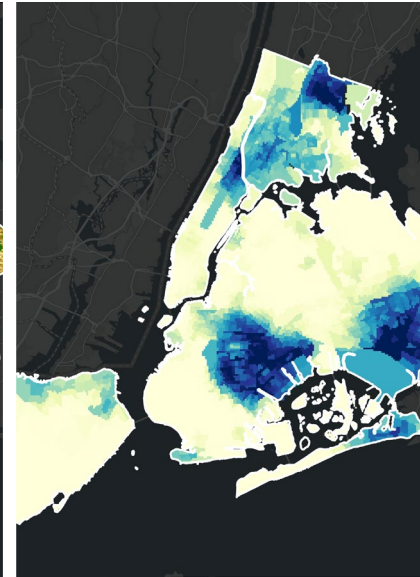
Vacant Parcels



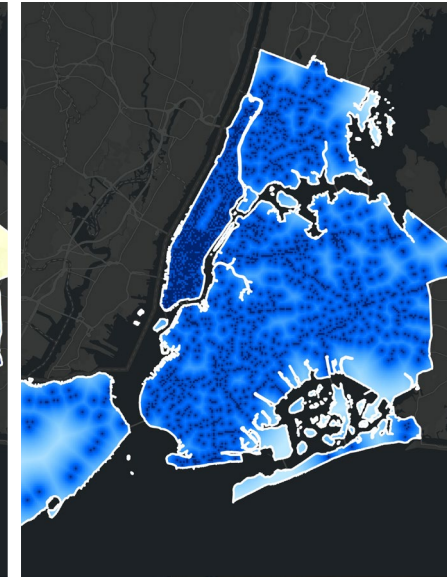
Tree canopy



Black isolation

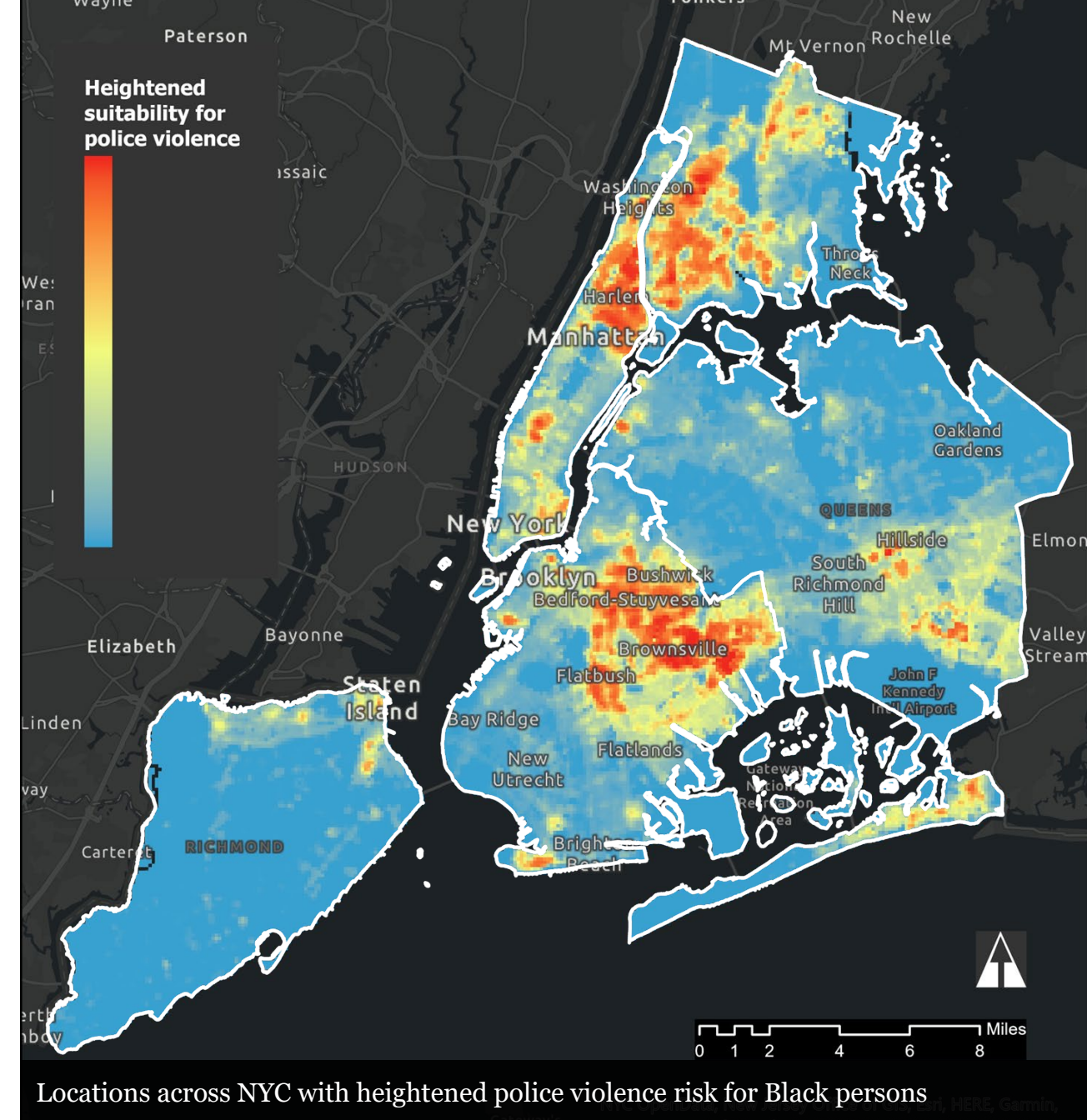


Pay phones



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

- Caplan, J.M., & Kennedy, L.W. (2016). Risk Terrain Modeling: Crime prediction and risk reduction. University of California Press.
- Carbado, D.W. (2016). Blue-on-black violence: A provisional model of some of the causes. Georgetown Law Journal, 104(6), 1479-1530.
- Mohler, G.O., Short, M.B., Brantingham, P.J., Schoenberg, F.P. & Tita, G.E. (2011). Self-exciting point process modeling of crime. Journal of the American Statistical Association, 106(493), 100-108.