

PPUA 5263: GIS for Urban & Regional Policy

# BOSTON CRIME ANALYSIS

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# Background



## ISSUE

- How safe is the city of Boston?
- What parts of the city are the most vulnerable (i.e. most concentrated crime areas)?
- Is there a spatial or temporal relationship?
- Are other factors contributing?

## WHY DOES IT MATTER?

- Better understanding on how crime has evolved in the city over time
- Help law enforcement develop more effective strategies in resolving incidents
- Develop data-driven crime prevention initiatives

## ■ Research QUESTION



What are the general crime trends in the city of Boston? Is there a relationship between the distribution of crime on and certain demographic factors (i.e. race, education level, income)?



# Crime Incidents DATASET

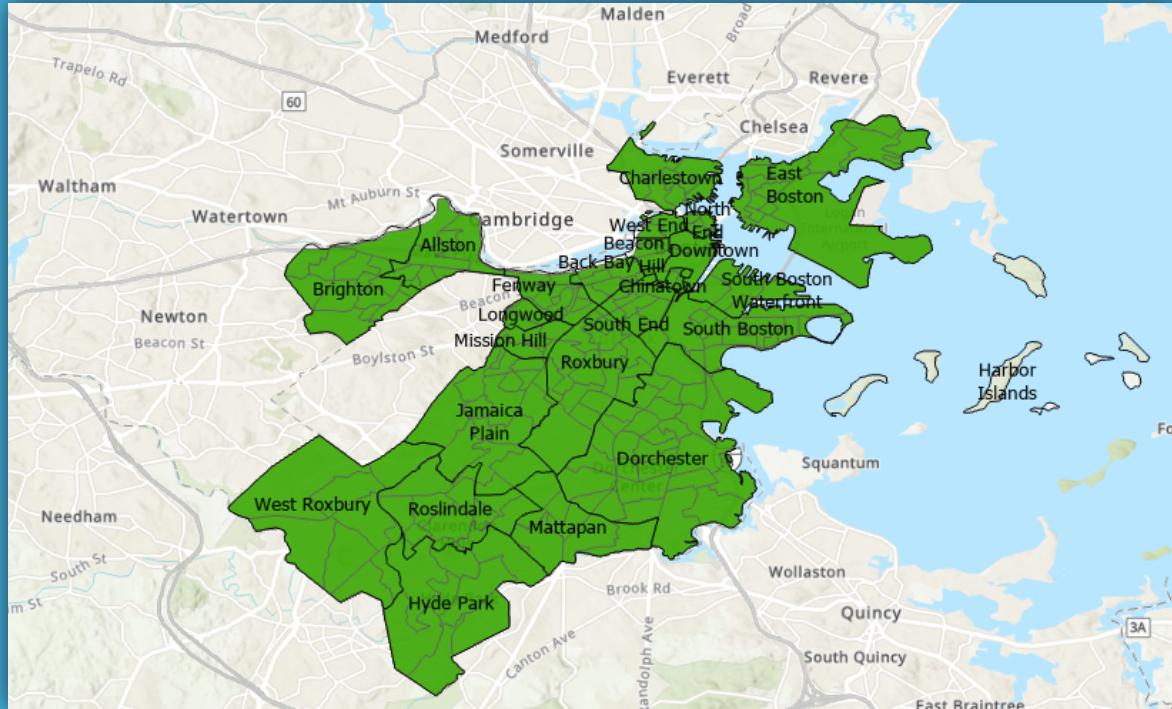


Boston Police Department (BPD) Crime Incidents Report:

INCIDENT_NUMBER	OFFENSE_CODE_GROUP	DISTRICT	OCCURRED_ON_DATE	Location
I192082859	Auto Theft	E18	10/13/2019 9:28:24 AM	(42.25951765, -71.12156299)
I192078645	Vandalism	B3	9/29/2019 6:00:00 AM	(42.259181580, -71.07244098)
I192078638	Aggravated Assault	A1	9/29/2019 4:46:00 AM	(42.36433126, -71.06319318)

\* Table is subset of columns and rows from original dataset

# Geography



# Analytic STRATEGY



## Crime Analysis

- Crime Type frequency
- Time intervals
- Heat Map (via kernel density)
- Emerging Hot Spot Analysis

## Crime & Demographics

- Created metrics
- Race
- Income
- Education
- Specific crimes

## Preliminary Regression

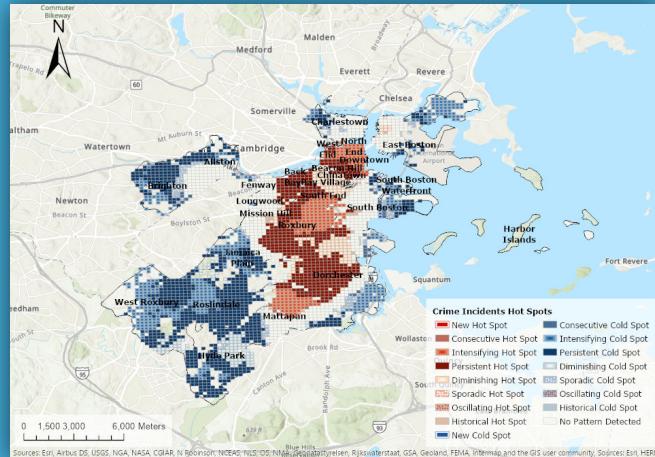
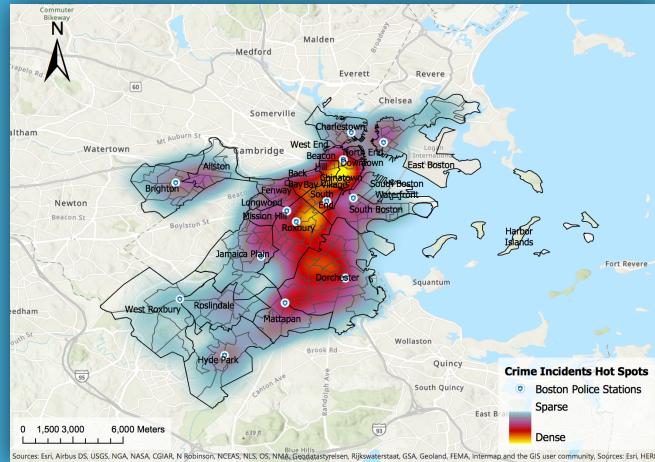
- Ordinary Least Squares (OLS) analysis

# KEY FINDING #1



## *General Crime Analysis:*

- Significant clustering of crimes in Dorchester, Roxbury, downtown Boston
  - Police stations
- Emerging and diminishing hot spots
- Little temporal variation

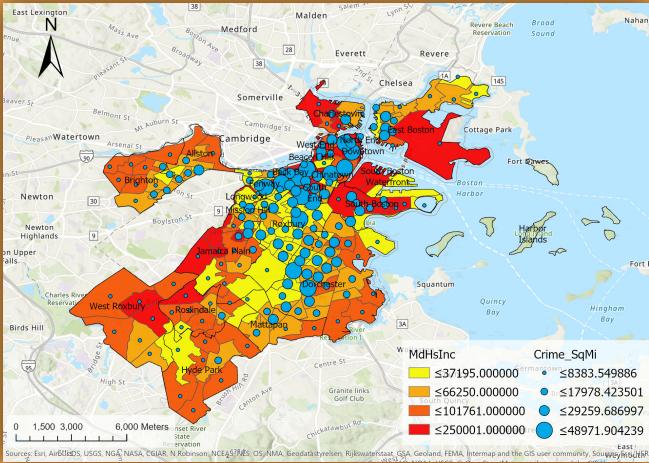
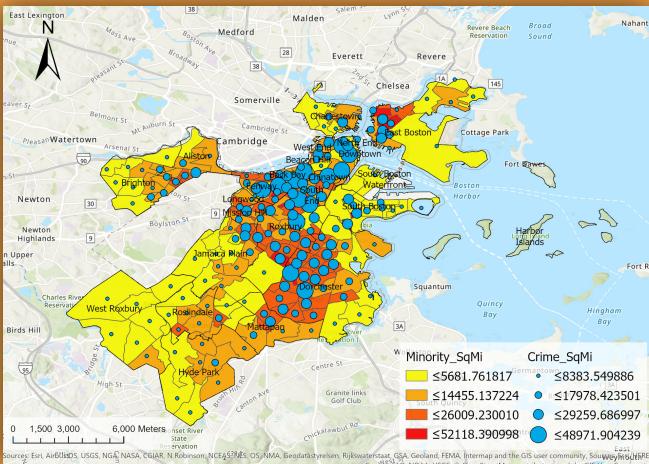


# KEY FINDING #2



## *Crime & Demographics Analysis:*

- Minority populations are disproportionately concentrated in high crime areas
  - Aggravated assault
- Large crime counts bordering high median income areas

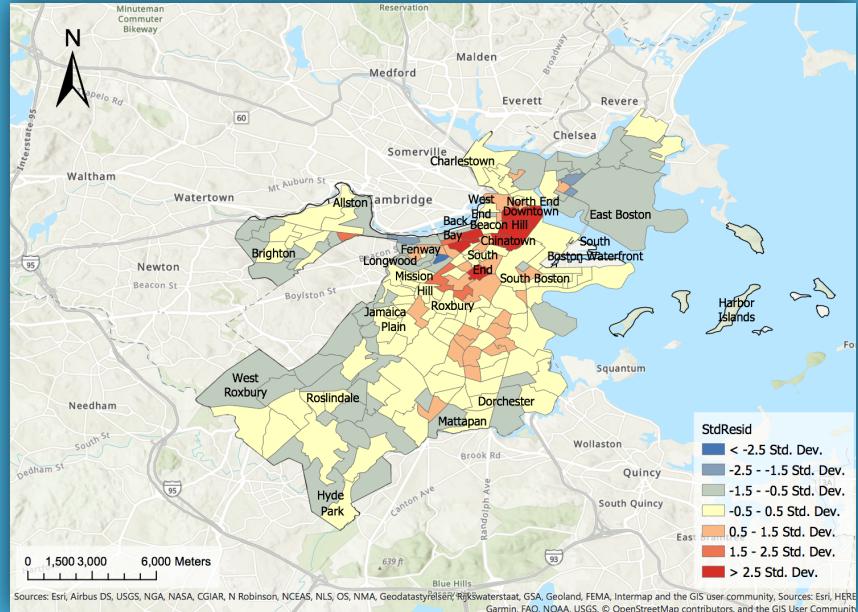


# KEY FINDING #3



*Initial OLS Analysis:*

- Predicting crimes per square mile using demographics
  - Minority and higher education
- Biased model
- Adjusted-R<sup>2</sup> of around 0.40



## ■ Future STUDIES



More detailed exploration and analysis could include :

- Temporal trends
  - Larger time interval
  - Granularity (i.e. weekly trends)
- General crime types (violent, property, etc.)
- Geographically weighted regression (GWR)

# References



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9. Bell, B., Costa, R., & Machin, S. (2018, October 14). **Why education reduces crime.** Retrieved October 10, 2019, from <https://voxeu.org/article/why-education-reduces-crime>.
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