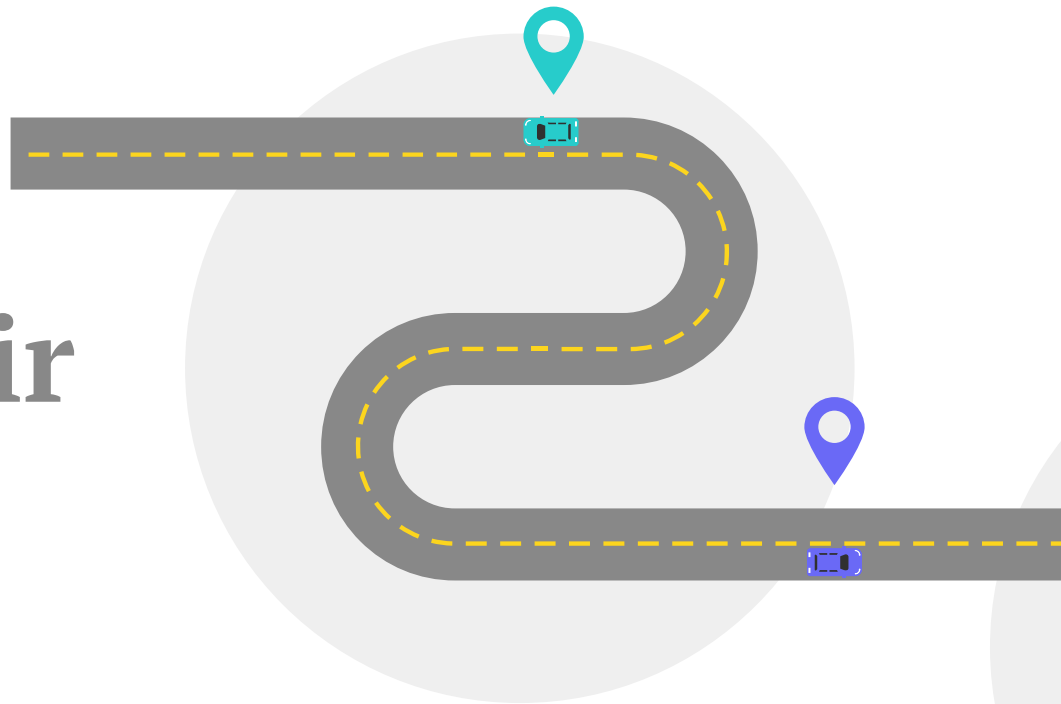


# City of Boston: Transit & Air Quality F

Hemanshu Bhojwani, Xinzhu Liang,  
Ziliang Wang, Anulika Nnadi



# Project Motivation

*Air quality is a critical concern for the wellbeing of Boston residents. Poor air quality could be detrimental to public health, causing respiratory issues such as Asthma. To address the issue of air quality around Boston, we are looking at how public transportation can play a crucial role in reducing emissions and increasing air quality.*

<u>Goals</u>	<u>Background Needed for Project</u>
Improving Air Quality in Boston	Basics of Air Quality and Pollution: Understanding what constitutes air quality, the common pollutants, and how they affect health
Understanding Air Quality Variability	Understanding the relationship between vehicle emissions, traffic congestion, and air quality.
Understand how public transportation can contribute to reducing emissions	Geographical and Demographic Factors in Boston
Engage and educate the community in Boston about air quality issues.	Understanding the principles of environmental policy, urban planning, and how they can be leveraged to improve air quality.
Inform and guide decision-making processes with data	Data Analysis and Research Methods

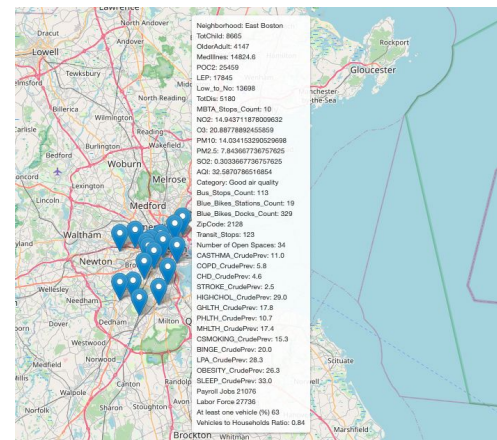
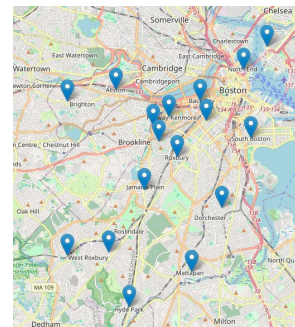
# Extension Project

In our extension project, we've included bus routes to take into account their crucial part in the public transport system and capture their role in reducing pollution. We're also examining Blue Bikes availability as a public infrastructure. Additionally, we're exploring green space data to see their effect on air quality and carbon absorption. For a more holistic overview of urban dynamics, we are taking a look at population by age, labor force statistics, payroll job numbers, and insights into vehicle ownership to gain a comprehensive overview of the socioeconomic characteristics.

## Data Used/Processing:

*Each dataset was cleaned and then merged into a folium map of Boston and divided into neighborhoods*

- MBTA Bus Stops
- Blue Bikes Number of Bikes and Docks
- Open Spaces and Green Spaces
- Neighborhoods of Boston: Population by Age, Labor Force, Payroll Jobs, Vehicle Ownership



The slide features a stylized, minimalist design with decorative road and car graphics. In the top left, a grey road with yellow dashed lines curves upwards, with a small orange car icon on it. In the bottom right, a grey road with yellow dashed lines curves downwards, with a small purple car icon on it. Large, light grey circular shapes are scattered in the background, creating a modern, abstract feel.

# Q1

How does the number of jobs and public transit availability affect air quality in different neighborhoods?

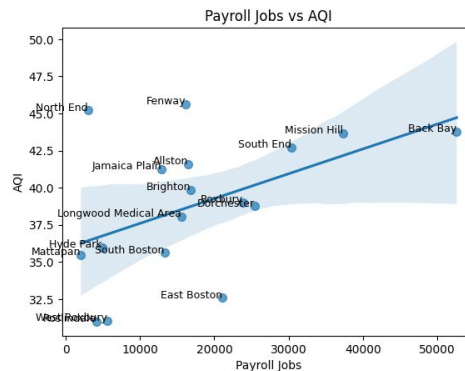
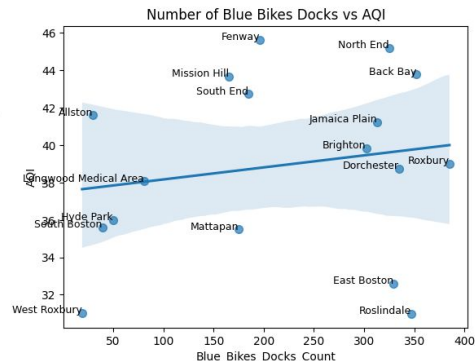
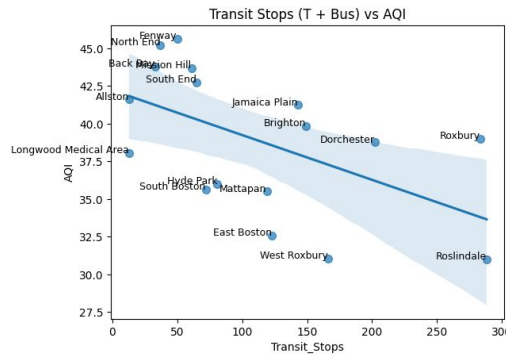
- Blue Bikes
- Train + Bus

# Q1 Insights

Multiple factors interact to shape air quality outcomes

Example: Roxbury vs. Roslindale

- Both have high number of transit stops
- Roxbury has more blue bike docks
- Key difference: Roxbury has more jobs available
- the presence of transit stops generally indicates better air quality, but the situation varies depending on other influential factors like job availability
  - More commuters (trains + buses + cars) coming in = more polluted air



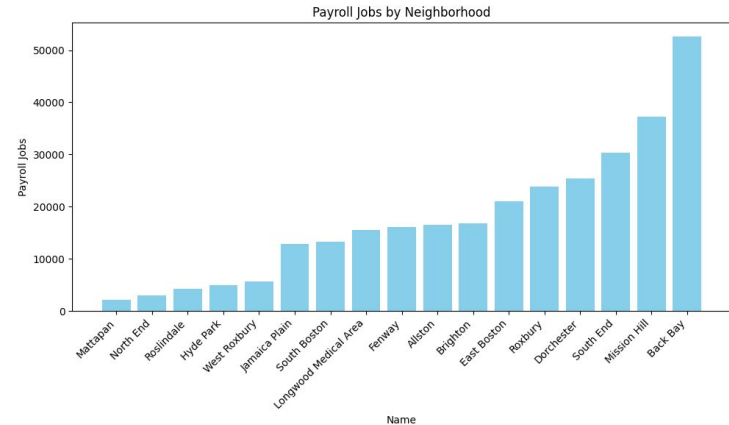
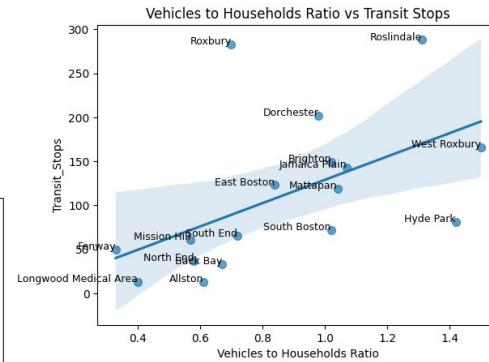
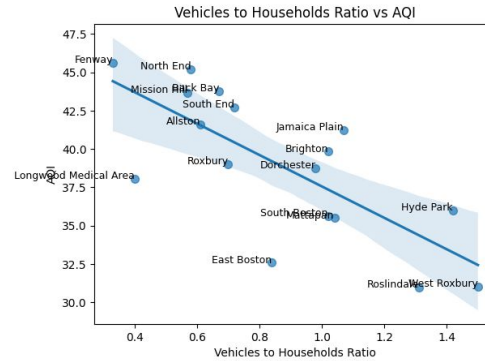
The slide features a light gray background with stylized road graphics. In the top left, a gray road with yellow dashed lines curves upwards, with a small orange car icon on it. In the bottom right, a gray road with yellow dashed lines curves downwards, with a small purple car icon on it. Large, light gray circular shapes are also present in the corners.


## Q2

How does vehicle ownership compare to public transportation in various neighborhoods, and does this impact air quality?

# Q2 Insights

- Neighborhoods with a greater vehicle to household ratio tend to have worse air quality. This stood out to us.
- However, there is a very strong positive correlation between the number of vehicles per household and the transit stops and the number of payroll jobs.
- This shows that areas with more payroll jobs have greater transit activity through either cars or public transit and therefore have poorer air quality.
  - This also helps explain previous limitations from our base analysis as to why areas with more transit access had poorer air quality.



The slide features a stylized, minimalist design with decorative elements. In the top left, a grey road with yellow dashed lines curves upwards, with a small orange car driving on it. In the bottom right, another grey road with yellow dashed lines curves downwards, with a small purple car driving on it. Large, light grey circles are positioned in the top right and bottom left corners, partially overlapping the road graphics.

# Q3

How does the open areas in various neighborhoods (i.e. Parks), impact air quality and affect overall physical health?

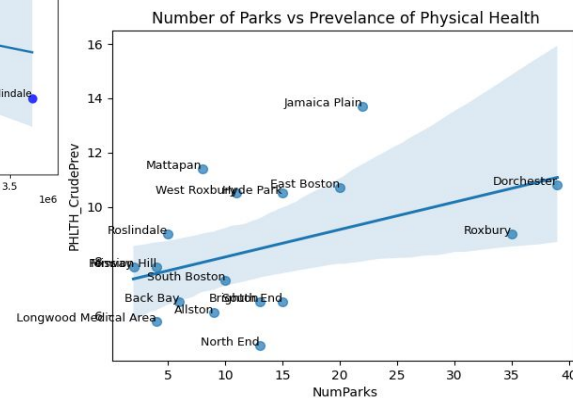
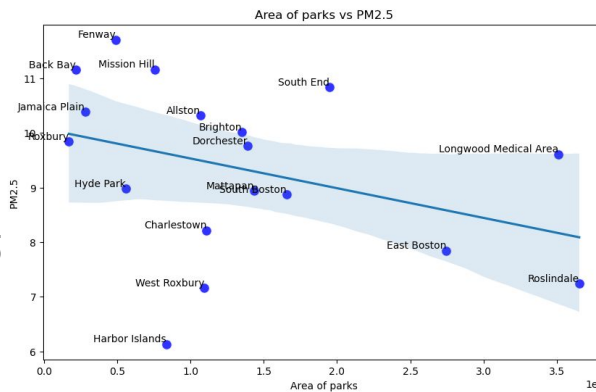
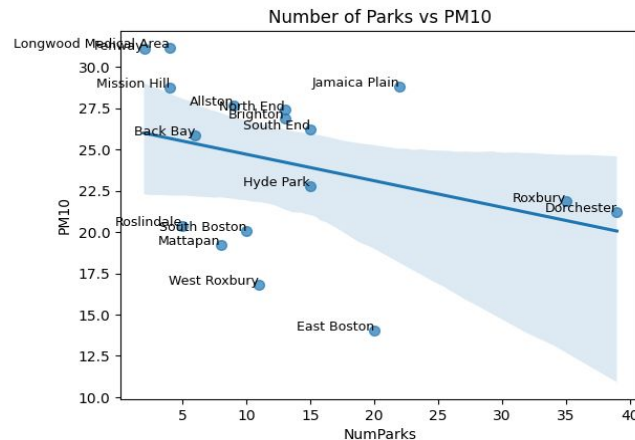


# Q3 Insights

Gathered the open space data for the Boston area, and count number of parks in every neighborhood. Get the approximation of area for every neighborhood by calculating through the map.

There is a negative correlation between number of parks and PM10. It shows that neighborhoods with larger proportion of open space area tend to have lower PM2.5 values.

There is a positive correlation between number of parks and physical health.



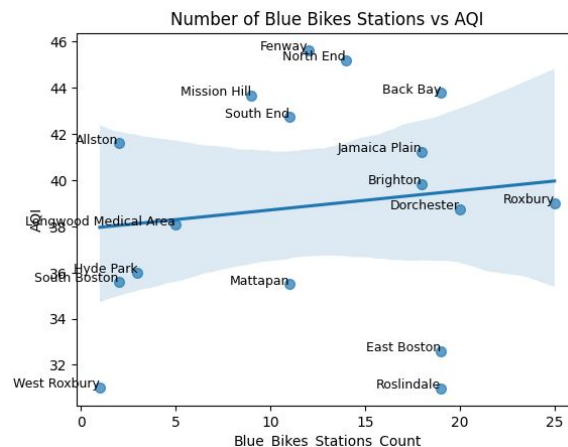
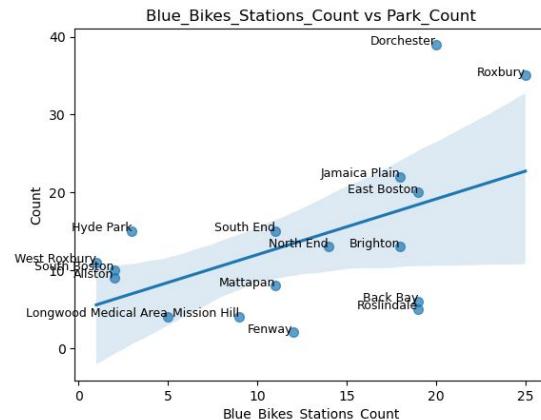
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# Q4

How does the availability of green spaces and blue bikes affect the air quality across Boston's neighborhoods?

# Q4 Insights

- There is a strong positive relationship between blue bike stations and green spaces.
- However, there's a weak positive relationship between the number of blue bike stations and the AQI.
- With more Blue bikes and green spaces, the AQI becomes lower.
- The number of Blue bike stations doesn't help improve air quality meaning other factors come into play.



# Conclusions

From the base project, we had conclusion that areas with more transit tend to have poorer air quality.

In the extension project, we found that although the presence of transit stops generally indicated better air quality, there are a lot of additional factors affecting Boston air quality such as job availability, vehicle ownership, and open spaces.

There is a strong positive correlation between number of vehicles per household and job availability. It also shows that more job availability tend to have more transit activity, impacting on air quality.

We saw that green spaces such as parks helped improve air quality and resulted in improved physical health. Areas with more parks contained more blue bike stations, however, this did not help improve air quality meaning that other transportation methods had a greater effect.

# Individual Contribution

**Anulika Nnadi:** I did the project motivation slide and the analysis for Q1. I also did research on the amount of vehicles and population in each neighborhoods and created new datasets for both.

**Ziliang Wang:** Q4, Finding sufficient datasets, as well as processing the data, provided an ample dataset for extension problem.

**Xinzhu Liang:** Slide for Q3, Finding relationships between number and area of open spaces and air quality. Also did the conclusion slide.

**Hemanshu Bhojwani:** I worked on graphs for all the questions, the neighborhood stats, blue bikes, and bus stop datasets. I also updated our folium map and summarized dataset file, did the extension intro slide and Q2 analysis.