Air Quality - Team E - Extension

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Problem Statement & Data Description

GOAL

What is the relationship between these **yearly changes in air quality for Boston residents and health outcomes** (e.g. asthma rates, lung cancer rates)

DATA

Aqicn- Air Quality Data
1. Mean estimations
2. 5 number summary statistics

CDC- Places Health Outcomes
1. Crude prevalence rates for various diseases
2. Number of new cases per 100,000 at risk

Initial Findings

Using AQI data from new sensors, we estimated the mean for each provided zip code, as well as Boston as a city and were able to more accurately visualize the yearly changes in AQI below.

Zipcode	PM2.5_2022	PM2.5_2023	PM2.5_Change
2111	6.73753	9.4645	2.72697
2113	7.9084	9.96361	2.05521
2118	8.30109	10.5777	2.27656
2124	7.21404	9.10869	1.89465
2127	7.75032	10.5325	2.78215
2128	7.08768	9.64689	2.55921
2130	7.12675	8.7106	1.58385
2135	6.94934	8.87072	1.92138
2139	5.53174	9.11105	3.57931

PM 2.5 levels have increased(~2.37 cubic meters) from 2022 to 2023.
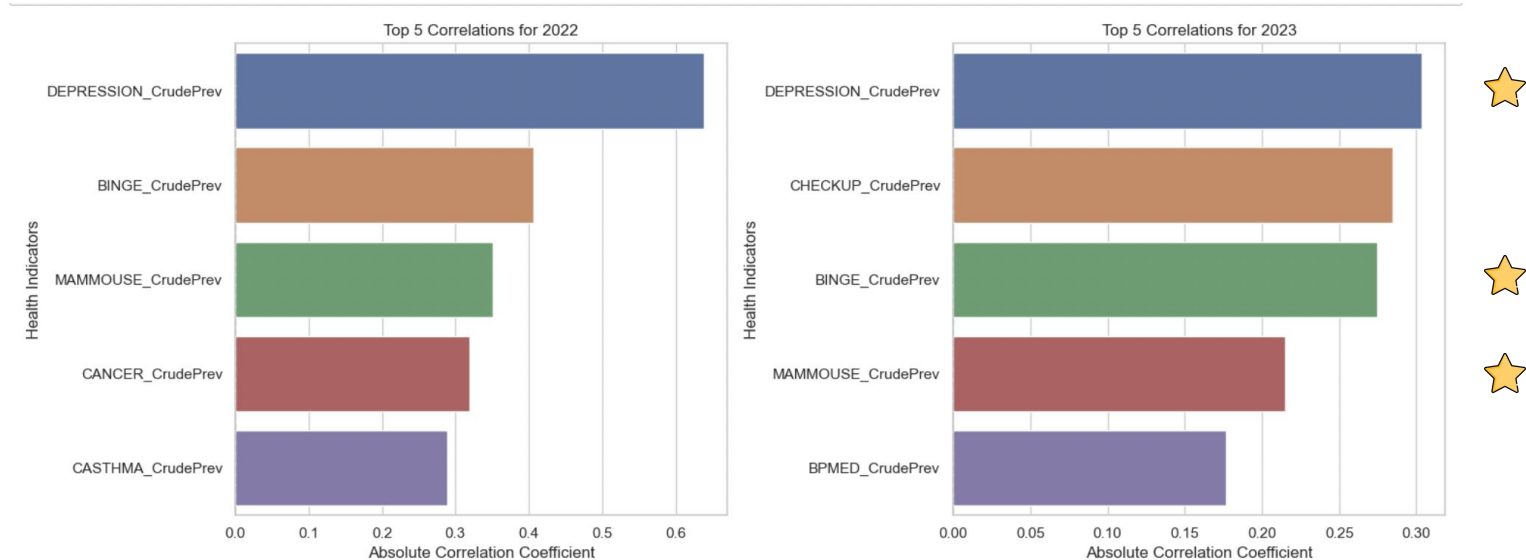

Yearly PM2.5 Levels in Boston (2020-2023)
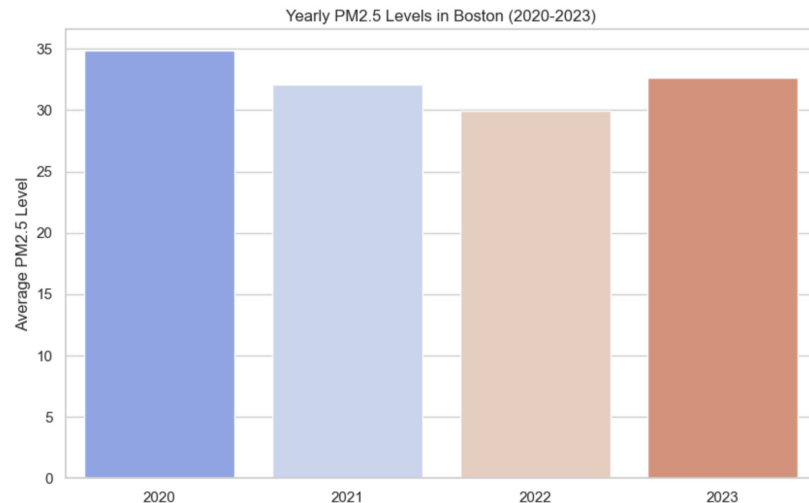
Boston's Air Quality has been improving since 2020*
*2022-23 saw a slight increase

Air Quality and Health Outcomes - Zip Code

- To understand air quality and health outcomes, we analyzed data by **zip code** and aggregated Boston view.
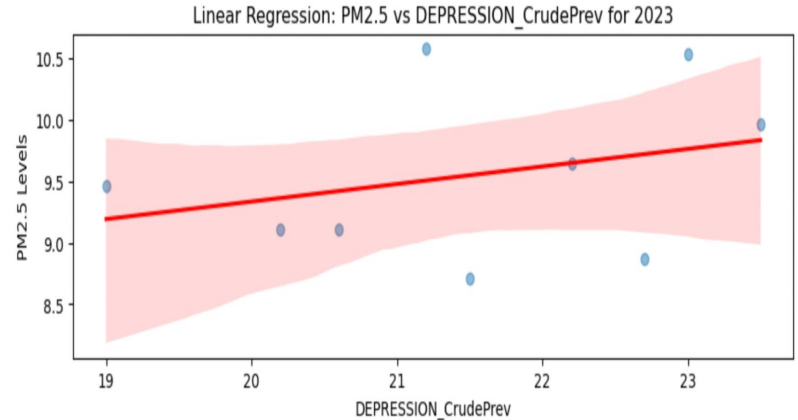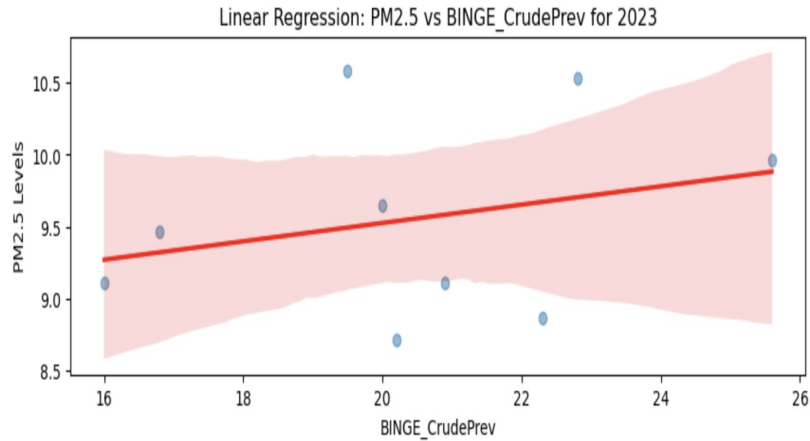

Appeared as most correlated with AQI for 2022 and 2023

Air Quality and Health Outcomes - Zip Code

- **Depression:**
  - There's growing evidence linking poor air quality, especially high levels of pollutants like particulate matter and nitrogen dioxide, to an increased risk of mental health conditions, including depression. Pollutants can affect brain health by causing inflammation and oxidative stress.
- **Binge Drinking:**
  - Binge drinking is typically related to behavioral and psychological factors and is not directly linked to air quality. However, environmental stressors, including living in an area with poor air quality, can influence mental health and potentially contribute to behaviors like binge drinking indirectly.
- **Asthma:**
  - Poor air quality, especially with high levels of pollutants like ozone, particulate matter, and sulfur dioxide, can trigger asthma attacks and exacerbate existing asthma conditions.
- **Cancer:**
  - Long-term exposure to polluted air can increase the risk of certain types of cancer, particularly lung cancer. Pollutants like benzene and formaldehyde are known carcinogens.
- **BPMED:**
  - There's some evidence suggesting that air pollution can affect cardiovascular health, which might necessitate the use of blood pressure medications.
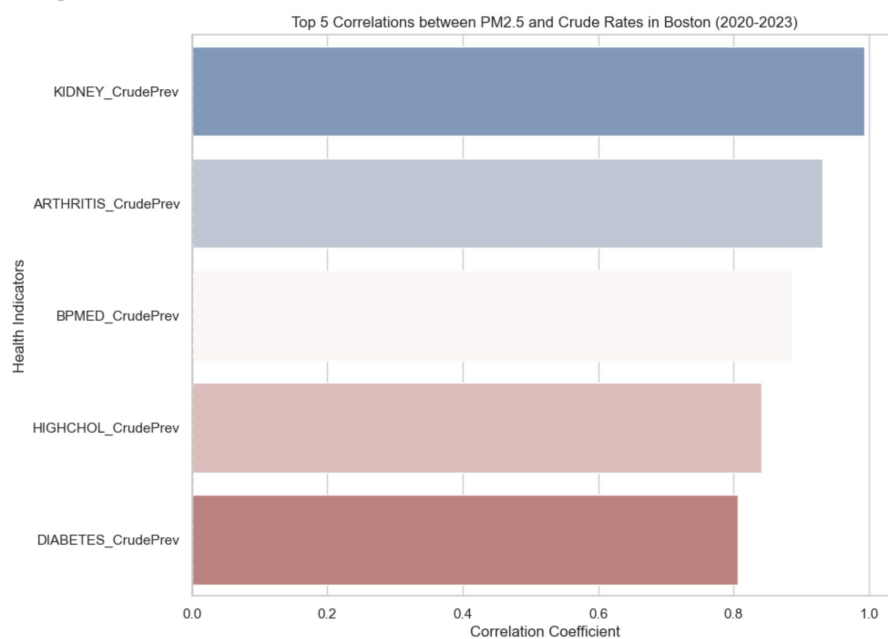
Air Quality and Health Outcomes – Zip Code

Linear Regression: PM2.5 vs BINGE_CrudePrev for 2023

Linear Regression: PM2.5 vs DEPRESSION_CrudePrev for 2023

- Depression & Binge_CrudePrev were 2 of the **most** correlated variables that depict a strong positive correlation for PM 2.5 AQIs and health factors.

Air Quality and Health Outcomes - Boston

- To understand air quality and health outcomes, we analyzed data by zip code and **aggregated Boston view**.

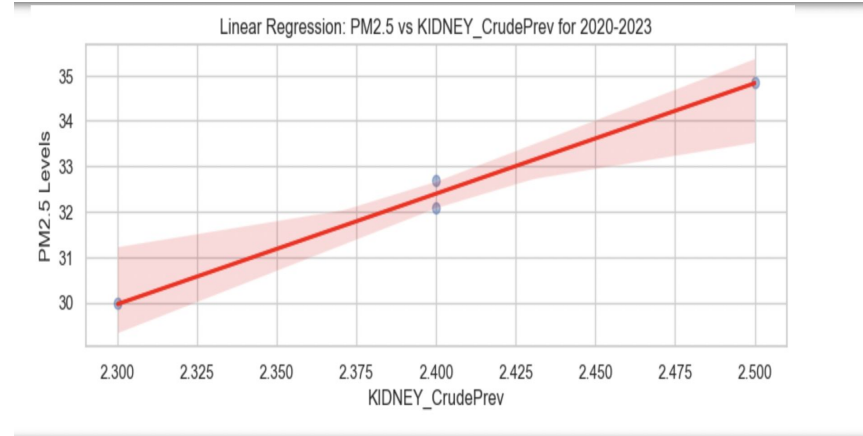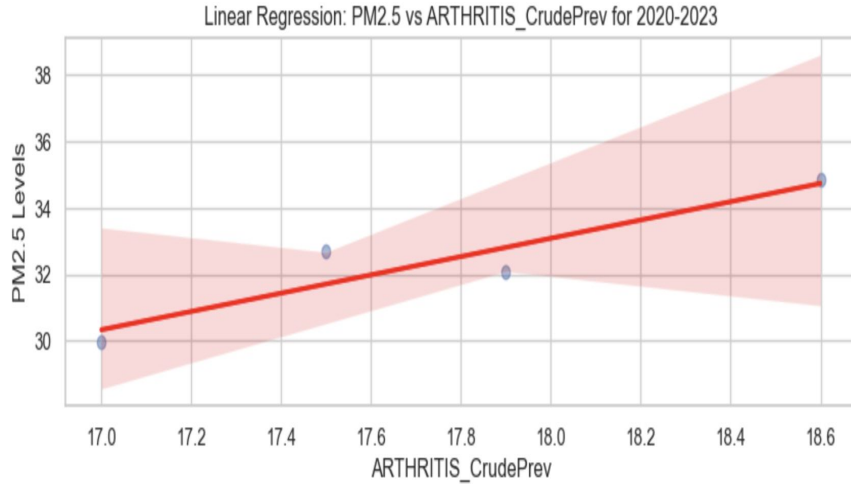Top 5 Correlations between PM2.5 and Crude Rates in Boston (2020-2023)

Air Quality and Health Outcomes - Boston

- **Kidney Diseases:**
  - Research suggests that poor air quality, particularly exposure to fine particulate matter (PM2.5), can increase the risk of developing kidney diseases. The kidneys filter blood and remove waste from the body, and air pollutants can cause damage to the kidneys over time, potentially leading to conditions like chronic kidney disease.
- **Arthritis:**
  - The relationship between air quality and arthritis is less direct. However, some studies have suggested that exposure to certain air pollutants can increase inflammation in the body, potentially aggravating inflammatory conditions like rheumatoid arthritis. More research is needed to fully understand this link.
- **Diabetes:**
  - Studies have indicated a link between air pollution and an increased risk of diabetes. Air pollutants can cause inflammation and oxidative stress, which may impair the body's ability to regulate blood sugar, thus contributing to the development or exacerbation of diabetes.
- **High Cholesterol:**
  - While the direct link between air pollution and high cholesterol is not as well-established as with other conditions, some studies suggest that exposure to certain pollutants can affect metabolism and the way the body processes fats, potentially leading to higher levels of cholesterol. This is an area of ongoing research.

Air Quality and Health Outcomes - Boston

Linear Regression: PM2.5 vs ARTHRITIS_CrudePrev for 2020-2023

Linear Regression: PM2.5 vs KIDNEY_CrudePrev for 2020-2023

- The two **most relevant** health factors that displayed some sort of positive correlation with PM2.5 AQI were arthritis and kidney