

Written Report: The Curious Case of Springfield, Asthma & Gas Leak

Introduction

Air quality and its impact on public health are pressing issues, especially in urban environments. This report examines the relationship between air quality fluctuations and asthma hospitalization trends in Springfield, MA, using data spanning over two decades. The goal is to uncover insights that can inform policymakers, healthcare providers, and residents, addressing unresolved questions about environmental factors' role in public health.

Background/Related Work

Air Quality Index (AQI) data, obtained from the EPA's Air Quality System, covers Springfield's air quality from 1999 onwards. The data revealed an unusual spike in smoke impact in 2013, which correlated with a major gas explosion in late 2012. Previous studies have shown that particulate matter (PM_{2.5}) is linked to respiratory conditions like asthma. The asthma hospitalization data, sourced from the Ephtracking government website, provides a comprehensive view of trends in asthma cases at the county level from 1999 to 2021. These datasets form the foundation for our hypothesis: that the spike in air pollution correlates with short-term increases in health complications, followed by longer-term mitigation through policy interventions.

Methodology

Our analysis incorporates several stages:

1. **Data Collection:** AQI and asthma hospitalization data were collected from EPA and public health sources.
2. **Data Cleaning:** Missing values were handled through interpolation; anomalies, such as the 2013 spike, were carefully examined.
3. **Analytical Methods:**
 - **Time Series Analysis:** Examining trends in PM_{2.5} levels and asthma cases.
 - **Correlation Analysis:** Assessing the relationship between pollution levels and health outcomes.
4. **Human-Centered Considerations:** Ethical aspects include data privacy compliance and ensuring data representativeness to avoid biases in public health decisions.

Findings

Key insights include:

- **AQI Trends:** There was a marked spike in PM2.5 in 2013, correlating with the Springfield gas explosion.
- **Asthma Hospitalizations:** Hospitalization rates showed a gradual decline from 2014 onwards, suggesting the effectiveness of targeted health initiatives.
- **Policy Impact:** Stricter air quality regulations and community-based interventions, such as those by the Pioneer Valley Asthma Coalition (PVAC), contributed significantly to improved health outcomes.

Visual Findings:

Graphs and figures illustrate the decline in PM2.5 levels and asthma rates post-2013, reinforcing the connection between environmental policies and health improvements.

Discussion/Implications

The findings underscore the critical role of proactive environmental policies and community health programs in mitigating pollution-related health issues. City officials and policymakers must continue to invest in air quality monitoring and public health education. Immediate actions could include stricter emission controls and community outreach programs focusing on asthma management.

Human-Centered Impact:

Our approach emphasized ethical data use and focused on addressing the needs of vulnerable populations, ensuring that interventions are inclusive and equitable.

Limitations

Key limitations include:

- **Data Granularity:** County-level data may not fully capture city-specific trends.
- **Causal Inference:** While correlations are evident, definitive causal relationships require more controlled studies.
- **External Factors:** Other environmental or socioeconomic factors influencing asthma trends were not fully explored.

Conclusion

This study highlights the interplay between air quality and respiratory health in Springfield. Through data-driven insights, we demonstrated the effectiveness of policies and community

interventions in reducing asthma-related hospitalizations. Future research should continue to refine these findings with more granular data and explore broader environmental influences.

References

1. **EPA Air Quality Data Repository**

This repository provides comprehensive air quality data, including historical and current PM2.5 levels from various monitors across the U.S. The data is used for public health assessments and environmental studies. For Springfield-specific data, the Air Quality System (AQS) API is a primary source.

Source: [US EPA Air Quality Data](#)
[US EPA](#)

[US EPA](#)

2. **CDC Asthma Hospital Discharge Data**

This dataset offers detailed information on asthma hospitalizations across different counties, including trends and demographic breakdowns. It highlights the public health impact and can be linked with air quality data to identify correlations.

Source: [CDC Asthma Surveillance Data](#)
[CDC](#)

3. **Massachusetts Air Quality and Health Monitoring Initiatives**

The Pioneer Valley Asthma Coalition (PVAC) collaborates with local agencies to monitor air quality, particularly focusing on Springfield. Their efforts include using data from multiple AQI monitoring stations and linking it with healthcare outcomes.

Source: [PVAC Air Quality Project](#)
[IQAir | First in Air Quality](#)

4. **IQAir Real-Time Springfield Data**

Provides historical and real-time PM2.5 data for Springfield, which can be integrated with health datasets to analyze pollution's impact on asthma rates.

Source: IQAir Springfield Data
[IQAir | First in Air Quality](#)

5. **Springfield Gas Explosion, 2012**

The natural gas explosion in Springfield, Massachusetts, on November 23, 2012, resulted from a gas leak due to human error during maintenance. The explosion caused significant environmental and public health impacts, with 42 buildings damaged and a spike in air pollutants, particularly particulate matter (PM2.5). This incident emphasized the need for stricter safety protocols and reinforced the importance of enhanced air

quality monitoring in affected areas.
Source: Popular Science

[Popular Science](#)

Data Sources

1. EPA AQI Data: [EPA AQI API](#)
2. Asthma Data: [Ephtracking Asthma Data](#)