## Is There a Relationship Between NYC Zip Codes and Indoor Environmental Complaints?

### Executive Summary

In New York City, there are thousands of indoor environment complaints made to 311 every year. This study found evidence in support of an association between zip code and indoor environmental complaints in New York City.

### Practical Question

There are thousands of indoor environmental complaints made to 311 in New York City every year. Knowing where there exists a higher concentration of certain types of complaints can enable New York City to selectively target these nuisances where they are most commonly found. While it is difficult to pinpoint why one zip code has a higher rate of indoor environmental complaints, some possible explanations could include: Differences in housing quality: There may be differences in the quality of housing or building maintenance in different zip codes, which could result in more indoor environmental problems such as mold, pests, or poor ventilation. Factors such as age of the buildings, presence of water damage or leaks, or lack of adequate cleaning and maintenance could all contribute to differences in indoor environmental quality across zip codes.

Another reason could be differences in demographic characteristics: Zip codes may differ in terms of the demographics of their residents, such as income, race/ethnicity, or age. These differences could lead to variations in indoor environmental complaints, as certain groups may be more likely to experience health problems related to poor indoor air quality or have limited resources to address environmental issues in their homes.

A final difference can be varying environmental exposures: Zip codes may differ in terms of their proximity to sources of environmental pollutants or other environmental hazards that can affect indoor air quality. For example, areas near industrial sites, major roadways, or other sources of pollution may have higher levels of indoor environmental complaints than areas further away.

Overall, there are likely to be complex and multifaceted reasons for any association between indoor environmental complaints and zip code in New York City. This study is interested in whether or not there exists a correlation between zip code and indoor environmental complaints in New York City.

### Data and Methods

This study uses the New York City Department of Health and Mental Hygiene (DOHMH) Indoor Environmental Complaints. This dataset contains information about 311 environmental complaints, dating back to 2010, that can be used to help determine if the DOHMH has received an environmental complaint from a particular address. It is important to note that the listing of a particular address does not indicate that a condition or violation was found, only that a complaint was made to DOHMH.

As of February 19, 2023 there were 77,282 complaints. Of these 77,282 complaints, 24 were missing a zip code. These complaints were removed from the sample frame leaving 77,258 complaints. Of the 77,258 complaints, 3,310 were missing the type of complaint. These complaints were removed from the sample frame leaving 73,948 complaints. Of the 73,948 complaints, 13 had an invalid zip code. These complaints were removed from the sample frame leaving 73,935 complaints. Of the 73,935 complaints, 6 had an error value for complaint type. Since these complaints are less than 0.009% of the sample frame, these complaints were removed from the sample frame, leaving 73,929 complaints in the sample frame.

The objective is to determine whether there exists an association between zip code and indoor environmental complaints in New York City. Given that both of the scales are categorical, we will use crosstabs and a chi-squared test to test this question.

### Findings

| **zip code** | **Indoor Air Quality** |  | **zip code** | **Asbestos** |  | **zip code** | **Indoor Sewage** |  | **zip code** | **Mold** |  | **zip code** | **Cooling Tower** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11379 | 1360 |  | 10025 | 130 |  | 11226 | 115 |  | 10001 | 115 |  | 10027 | 2 |
| 10031 | 1114 |  | 10462 | 128 |  | 11216 | 113 |  | 10306 | 87 |  | 10010 | 1 |
| 10025 | 1069 |  | 10467 | 116 |  | 11233 | 98 |  | 10314 | 83 |  | 10012 | 1 |
| 10024 | 976 |  | 11226 | 102 |  | 11207 | 96 |  | 10019 | 73 |  | 10013 | 1 |
| 11226 | 934 |  | 10016 | 85 |  | 11221 | 84 |  | 11201 | 71 |  | 10016 | 1 |

Table 1: 5 Zip codes with the highest number of complaints by complaint type

### Results to Solve the Question

There is evidence for an association between zip code and indoor environmental complaints in New York City, with a p-value 2.2e-16, a probability far less than our 0.05 cutoff. In other words, knowing what zip code within New York City you are currently in does provide meaningful insight into predicting the type of indoor environmental complaint that will be made.

Some of the things I wonder include how does reporting bias influence these results as this dataset is made of self-reported observations. It is also possible that there may be differences in the likelihood of reporting indoor environmental complaints across different zip codes. For example, residents in certain neighborhoods may be more likely to report complaints to local authorities, while others may be less likely to do so. Additionally, I wonder what are the other underlying factors that cause this association. Further research would be needed to fully understand the underlying causes of this association.

This study hopes that these findings can be put to use by New York City to reduce the overall number of indoor environmental complaints in New York City. By knowing what zip codes have the highest number of complaints, divided by complaint type, it appears feasible to specifically address the problem zip codes with direct actions that specifically reduce the relevant noise complaint.