

1 Introduction

You do not have a genuine New York City experience if you have not spotted a rat on the street or in the subway. There is a saying that there are more rats than humans in NYC. Is that true? An alum of the Department of Statistics at Columbia, Dr. Jonathan Auerbach, examined this question using available open data in 2014. In our project, we worked with Dr. Auerbach to replicate his published methods using recent data and to validate the estimates using potential other indirect indicators.

To estimate NYC rat population, we used NYC Open Data and the mark-recapture method. Open Data is free public data from NYC agencies and includes a record of all 311 calls. 311 is New York City's non-emergency call center that allows residents to make service requests, file complaints, and get additional information about the City.

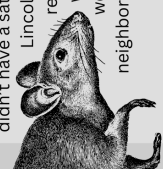
2 Objectives & Goals

1. Give New Yorkers data-driven estimations of the rat problem that has plagued the City for as long as it has been around.
2. Debunk or Confirm the myth of there being 1 rat per person in New York City.
3. Create a sense of urgency for the city inhabitants and government to diminish the rate of proliferation of disease-carrying rats throughout the City.

3 Methods

In order to estimate the number of rats roaming around NYC we employed the Lincoln-Petersen method (mark-recapture). Unable to capture and release thousands of rats in the city, we used a proxy: 311 Calls reporting rat sightings. These reports include the bounding block in which the rat was sighted, and assuming that an address "captured" in consecutive years was infested with a rat colony, we were able to estimate the number of rats in NYC.

We also wanted to break down the number of rats in each of NYC's neighborhoods. In communities that didn't have a satisfactory number of calls, applying the Lincoln-Petersen method led to unreliable results with huge variance. To solve that, we developed a dynamic function that would use NYC's recapture factor for neighborhoods with fewer calls.



The Rat Problem of NYC

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Want to see more? Scan this QR code to visit our R ShinyApp!

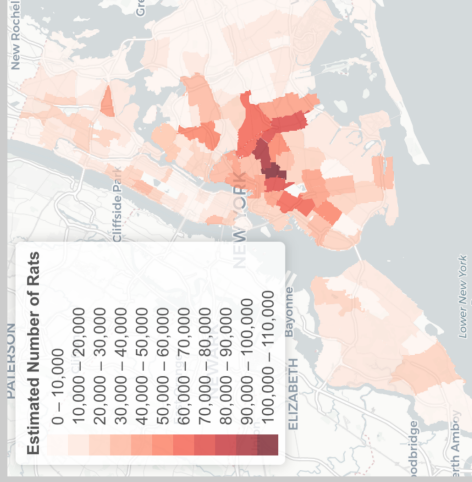
6 Conclusion

The project is an attempt at iterative improvement over a similar 2014 project spearheaded by the project owner. Through the use of a modified Mark-Recapture method, a method commonly used in ecology to estimate animal populations, the team was able to apply this method in an urban environment and obtain estimates down to the ZIP level.

The data used to extrapolate the rat populations are publicly available at NYC OpenData. That said, the reliability of the data remains to be validated. As such, the numbers on this project need to be taken with a grain of salt. However, we believe it is a step in the right direction.

The next step to further this project would be to create a repeatable method to ascertain the validity of 311 calls, which is an essential component of estimating the rat population of the city.

4 Findings

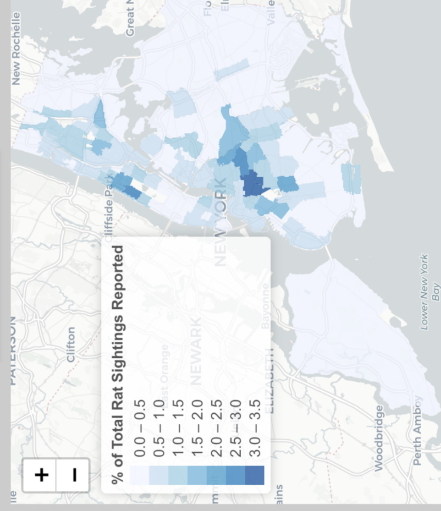


Estimated 2021 Rat Population by ZIP

Rat population estimated through our dynamic mark-recapture.

5 Analysis

When you spot a rat, you can report it to NYC311. This heat map visualizes the Rat Sightings Reports from 2021's NYC OpenData.



2021 Rat Sighting Reports by ZIP

It is important to note the discrepancy between 311 call rates and the estimated rat population in the zip codes. A ZIP code may have high volumes of 311 calls, but a relatively low estimated rat population. This indicates that, at least for the rat problem, 311 calls are not completely representative.

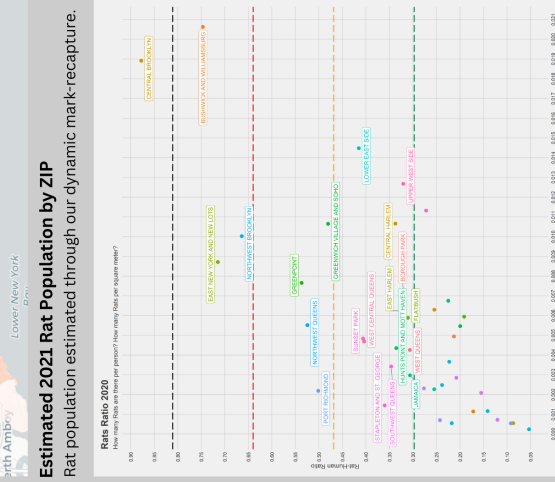
7 References

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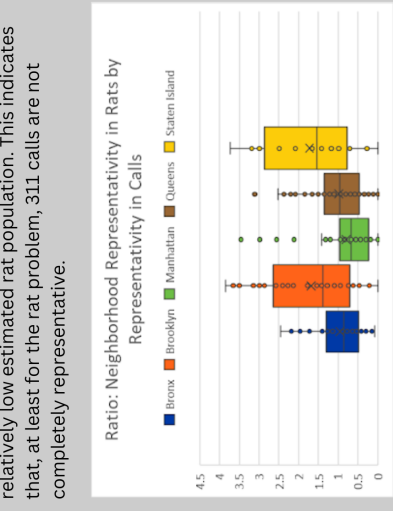
Project Owner: Dr. Jon Auerbach and his 2014 paper: "Does New York City Really Have as Many Rats as People?"

Mentors: Shanyue Zeng and Owen Ward, Ph.D



Rat Population in Each Borough Over Time

Are there really as many rats as humans in New York? Thankfully...no! This graph tackles this myth, showing the Rat-Human ratio by Rat per square meter for each neighborhood. The first green line indicates the mean, and each line above it represents a standard deviation.



Ratio: Neighborhood Representativity in Rats by Representativity in Calls

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