Smart "Healthy" City Decision Support with New York City Restaurant Inspection Results

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Abstract

The New York City Department of Health conducts unannounced inspections of restaurants at least once a year. Inspectors check for compliance in food handling, food temperature, personal hygiene and vermin control. The collected dataset includes restaurant inspection date, type, violation description, grades and adjudication information, and is made publicly available as part of the open data initiative. We analyze a list of all NYC restaurants which have been inspected from November 2011 to February 2016 to address policy making decisions for the city government and to help citizens and tourists to be aware of the health status of the restaurants. Specifically, we are interested in finding the types of inspection violations and the locations that occur more often. The geospatial correlations of violations exists with the socio economic status of the neighborhoods, and the general trends of health violations across different regions by the different type of restaurants. The frequent set mining methods, time series analysis and forecasting to predict the health status of restaurants are applied. These analyses intends to answer the locational hotspot detection of violations, temporal changes, and predictions of health inspections for particular type of restaurants. We discuss a mobile application design to navigate and recommend the restaurants in the NY City, not only by locational proximity but also by the health status.

Background

In July 2010, The NYC Health Department began requiring restaurants in all five boroughs to post letter grades summarizing their sanitary inspection scores to help inform the public about a restaurant's inspection results in a simple, accessible way; to improve sanitary conditions and food safety practices in restaurants; and to reduce illnesses associated with dining out.

Research has demonstrated that most bacterial, viral and contaminant-based foodborne illnesses occur because of poor hygiene, improper storage and handling, and inadequate cooling and heating of food. The Health Department requires restaurants to follow food safety rules that are grounded in science and based on federal and state guidelines and laws.

When a restaurant fails to follow these and other basic food safety practices, patrons are more likely to become sick. New Yorkers eat at restaurants nearly a billion times each year. While most do not get sick, foodborne bacteria, viruses and other contaminants cause millions of cases of illness each year. It is estimated that more than 6,000 New Yorkers are hospitalized and 20,000 visit emergency rooms each year because of foodborne illnesses. Each year, the City receives approximately 2,700 complaints about restaurant-acquired foodborne illnesses and another 3,000 complaints about restaurant hygiene.

Objectives

- Determine the types of inspection violations and the locations they occur more often
- Determine the geospatial correlations of violations
  - Socio economic status of the neighborhoods
  - Household Average Income (year ending 2015)
- The general trends of health violations across NYC filtered by zip code

Questions

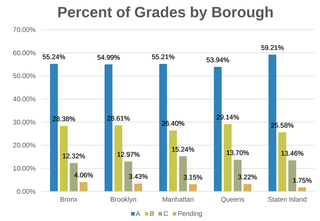
- What is the grade distribution for restaurants by borough?
- What are the top Five(5) Violations?
  - Since 2011 has violations counts improved?
- Is there a correlation between household income and health grades?

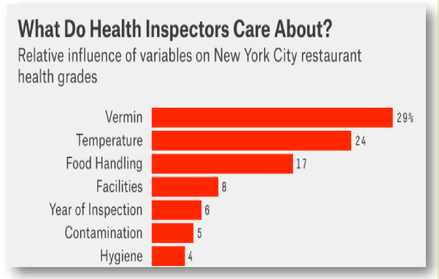
How The Restaurant's Are Graded

Score	Grade
0-13	A
14-27	B
28+	C*

Not every restaurant receives one of these letter grades; inspectors can give other scores, primarily P or Z, or some version of "grade pending."

*Based on how severe the violations are a business may be shut down





Roughly,

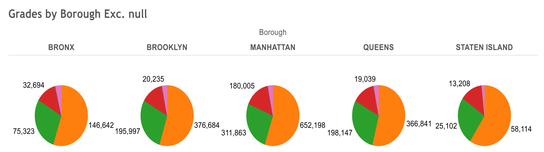
50% of the Restaurants in New York City received the Grade of an A.

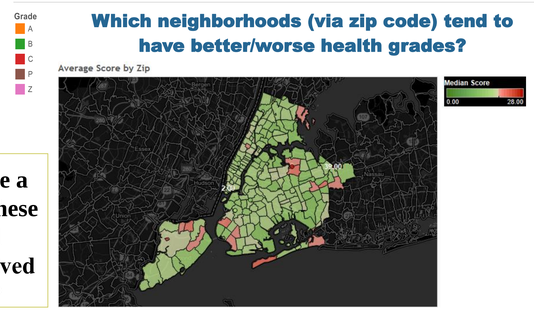
Borough	A	B	C	P	Z
Bronx	146,642	75,323	32,694	1,514	9,269
Brooklyn	376,684	195,997	88,815	3,258	20,235
Manhattan	652,198	311,863	180,005	3,822	33,356
Queens	366,841	198,147	93,162	2,863	19,039
Staten Island	58,114	25,102	13,208	317	1,405

Results

After taking a closer look at the restaurant grades by zip code, we can better see the consolidation of higher scores.

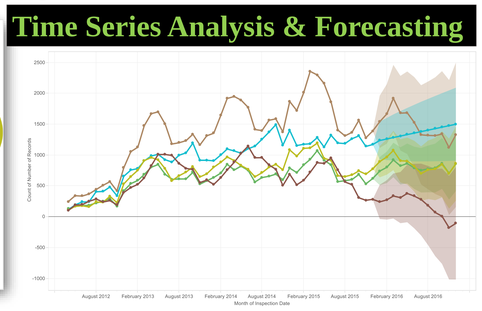
Q. Might there be a factor as to why these neighborhood restaurant's received higher scores?



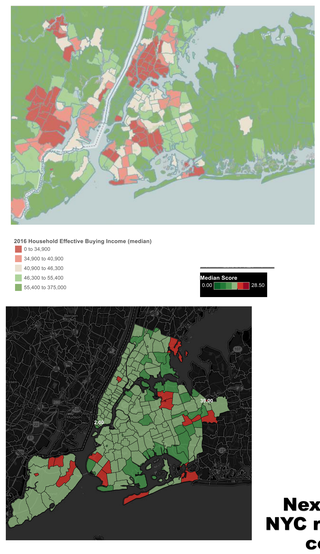


Results

Top Five (5) Violations :



Average Household Income Compared with Grades by Zip code



Restaurant sanitary practices have improved citywide since 2011, but many restaurants need to make further improvements to meet the high standards set by the health department.

Inspections are still finding::

- Find evidence of mice in 7.05 percent of city restaurants
- Measure cold food at excessively warm temperatures in 6.03 percent of restaurants
- Uncover the potential for vermin's to come in contact with the facility and raw ingredients, such as poultry and other meats in 9.54 percent of restaurants
- Observe food being prepared on dirty or greasy surfaces 6.07 percent of the time
- Non-food contact surface are still being improperly constructed, and non-food contact surfaces are being used to prep food in 13.24 percent of restaurant's.

Next Step: Further analysis is planned with NYC rodent(mice/rat sightings) and sanitations conditions. (NYC public recycling bins)

Conclusions

- More Progress in Food Safety Practices is Necessary to Further Protect New Yorkers
- Based on forecast of the top 5 violations there seems to be a steady decline of violations how ever the trend over all does seem to be inclining.
  - This could be because more restaurants are being established
  - The number of inspections are increasing and could affect the forecast model
- An A grade as incentive and more frequent inspections to monitor and educate poorer-performing restaurant operators will help to continue improve and reduce rates of foodborne illnesses, making dining out cleaner and safer
- Based on this dataset there does not seem to be a high correlation between household average income and restaurant grades by zip code