

Visualizing health determinants with open data: An interactive GIS application for monitoring New York City 311 service requests



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BACKGROUND

Open data and open source software present exciting no-cost opportunities for better understanding public health. Open data on New York City 311 requests for non-emergency services are available from 1/01/2010 to present, and are updated daily. New York City agencies that respond to 311 service requests span multiple sectors, including health, transportation, housing, and law enforcement. These data offer insights into social and environmental determinants of health. Examples of complaints and service requests with public health implications include: air quality, asbestos, cigarette sales to minors, food establishment violations, food poisoning, heat/hot water housing deficiencies, homeless person assistance, indoor air quality, lead kit requests, rodent sightings, sanitation conditions, senior center complaints, traffic signal conditions, and water system deficiencies. However, the large tabular format of the open dataset is a barrier to the data being accessed and utilized to their full potential.

OBJECTIVE

To analyze and visualize frequencies and geographic distributions of New York City 311 service requests in a user-friendly online data application.

METHODS

- An interactive web application was developed using R version 3.5.1, as well as the open source tidyverse, shinydashboard, leaflet, highcharter, and DT packages.
- The Socrata Open Data API was leveraged for downloading all New York City 311 data from the latest day for which complete data are available in the open dataset.
- Boundaries of civil geographies and public infrastructures were downloaded from NYC Open Data, and incorporated as displayable mapping layers.

RESULTS

The interactive web application presents New York City 311 service request data in spatial, graphical, and tabular formats. It incorporates filters to select calls by complaint type, and displays dynamically updating frequencies, citywide and by borough, based on users' filter settings. The application maps and color codes the locations of 311 service requests, and a hover over feature displays the borough, community district, date/time, type, description, assigned agency, status, and resolution of any mapped request. Users can select GIS overlays to see civil geographies and public infrastructures in relation to 311 service request locations. The application is hosted online on RStudio's free shinyapps.io server.

CONCLUSIONS

This project demonstrates an implementation of open source software for accessing, visualizing and communicating open data. It points to use cases for open data and open-source software as tools for engaging public health, health care, and community-based organizations in planning and implementing community health improvement. Future efforts can further improve this application by incorporating time-period selection, adding active and passive reporting features, and implementing spatiotemporal cluster identification mechanisms that account for constituents' propensities for placing service requests. Given that public health organizations operate under financial constraints, open data and open-source software are obtainable resources for growing data capacity. Community members and health officials are encouraged to explore health promotion strategies that leverage open data and open source software.

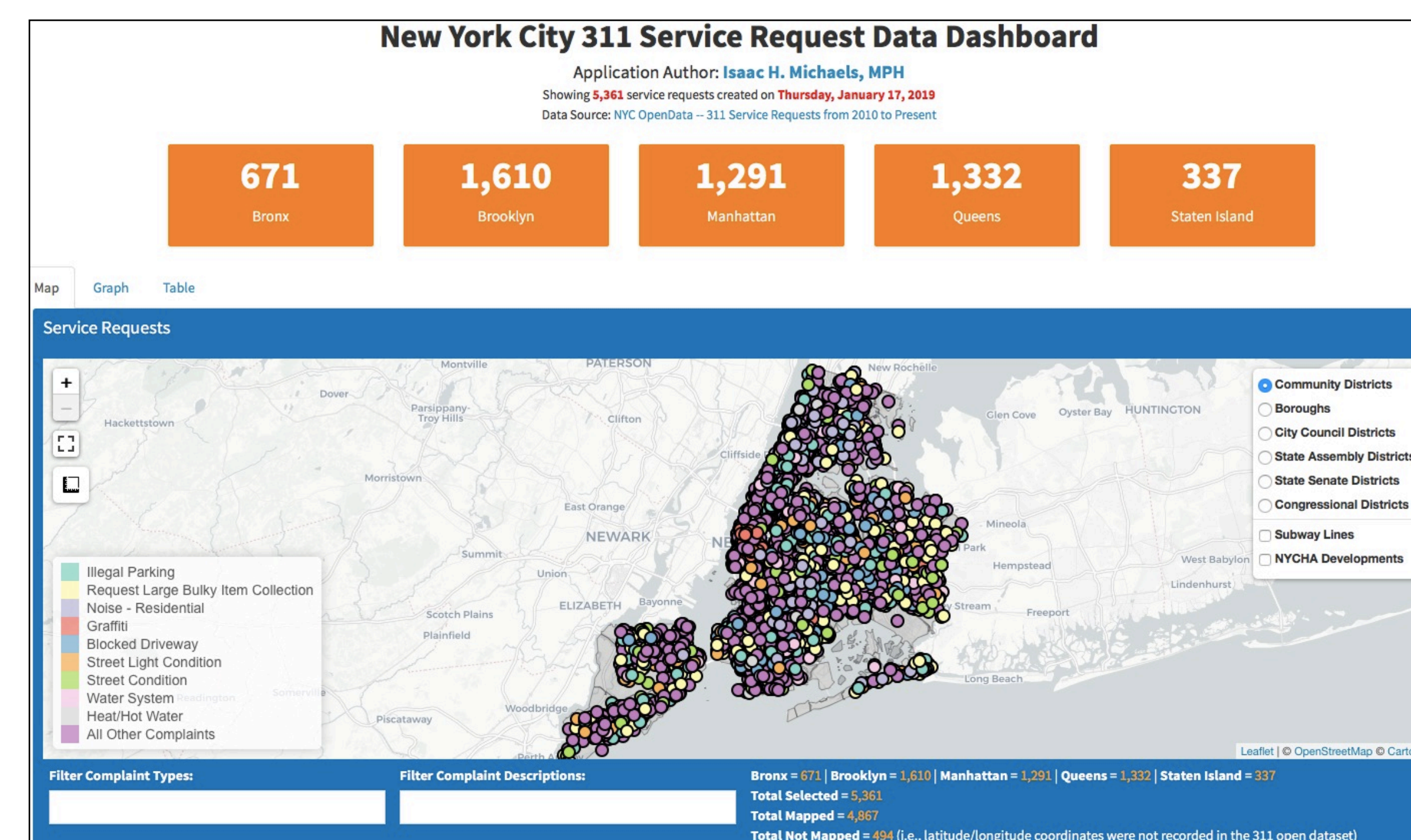
ABOUT THE AUTHOR

Isaac Michaels is a practicing epidemiologist. He has served in community-based roles in hospital, non-profit, government, and international settings, and is dedicated to integrating public health research and practice. Michaels earned his BA in both mathematics and anthropology from Binghamton University, as well as a master of public health (MPH) degree from the University at Albany, where he is now pursuing a doctorate of public health (DrPH) degree with a concentration in epidemiology.

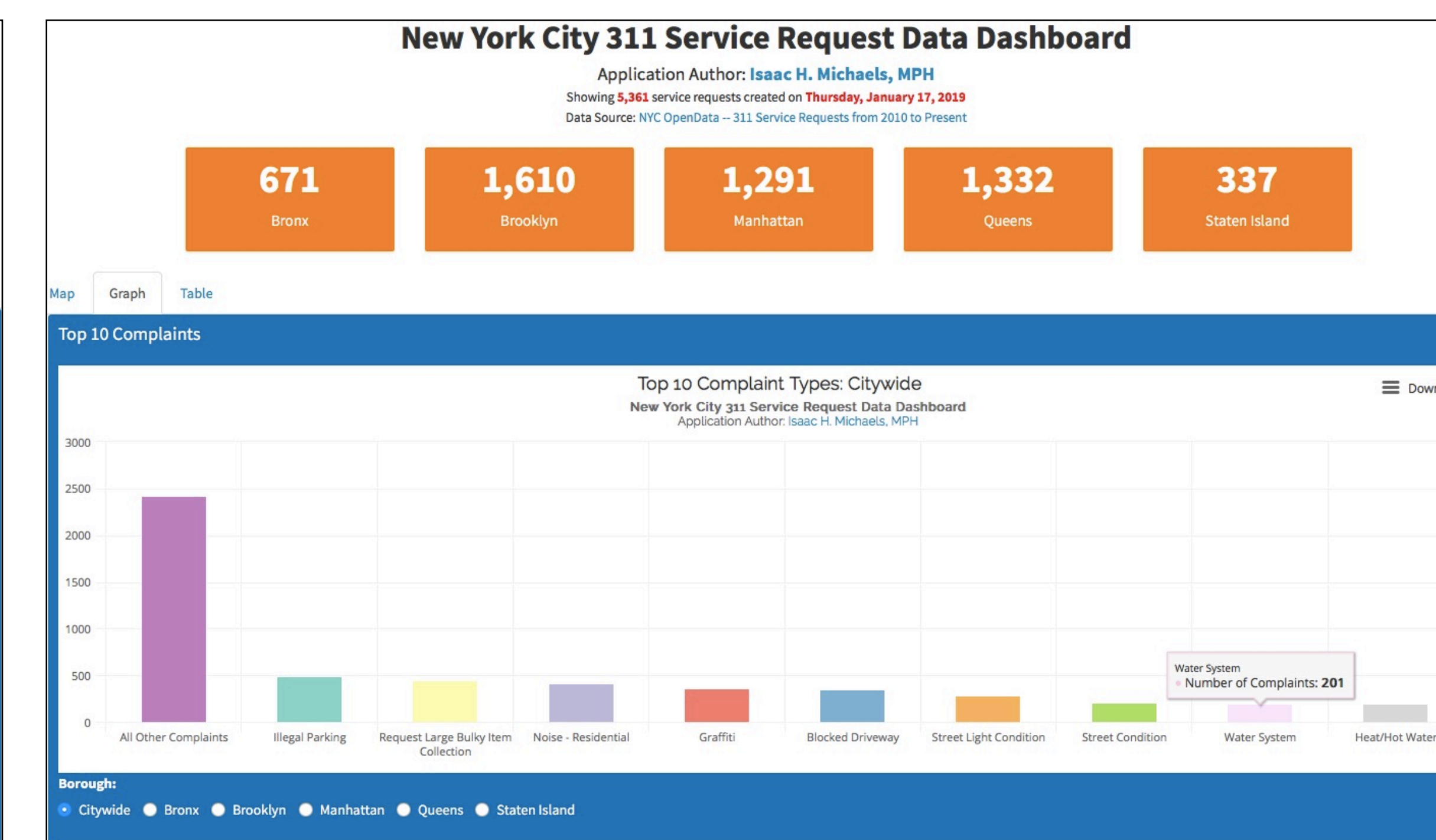
Conflicts of Interest: None.

Website: isaac-michaels.shinyapps.io/NYC_311_Dashboard/

Interactive Map



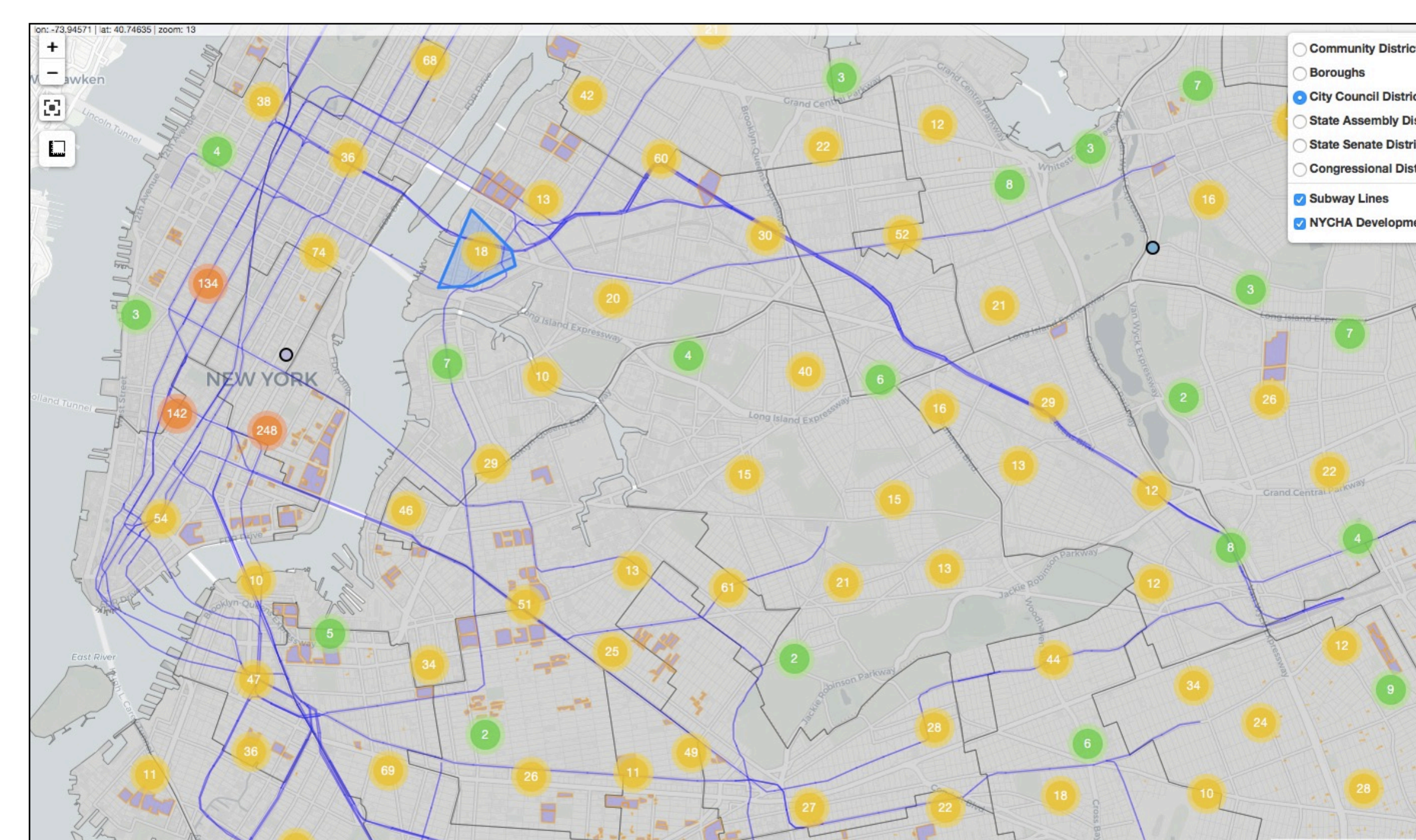
Interactive Graph



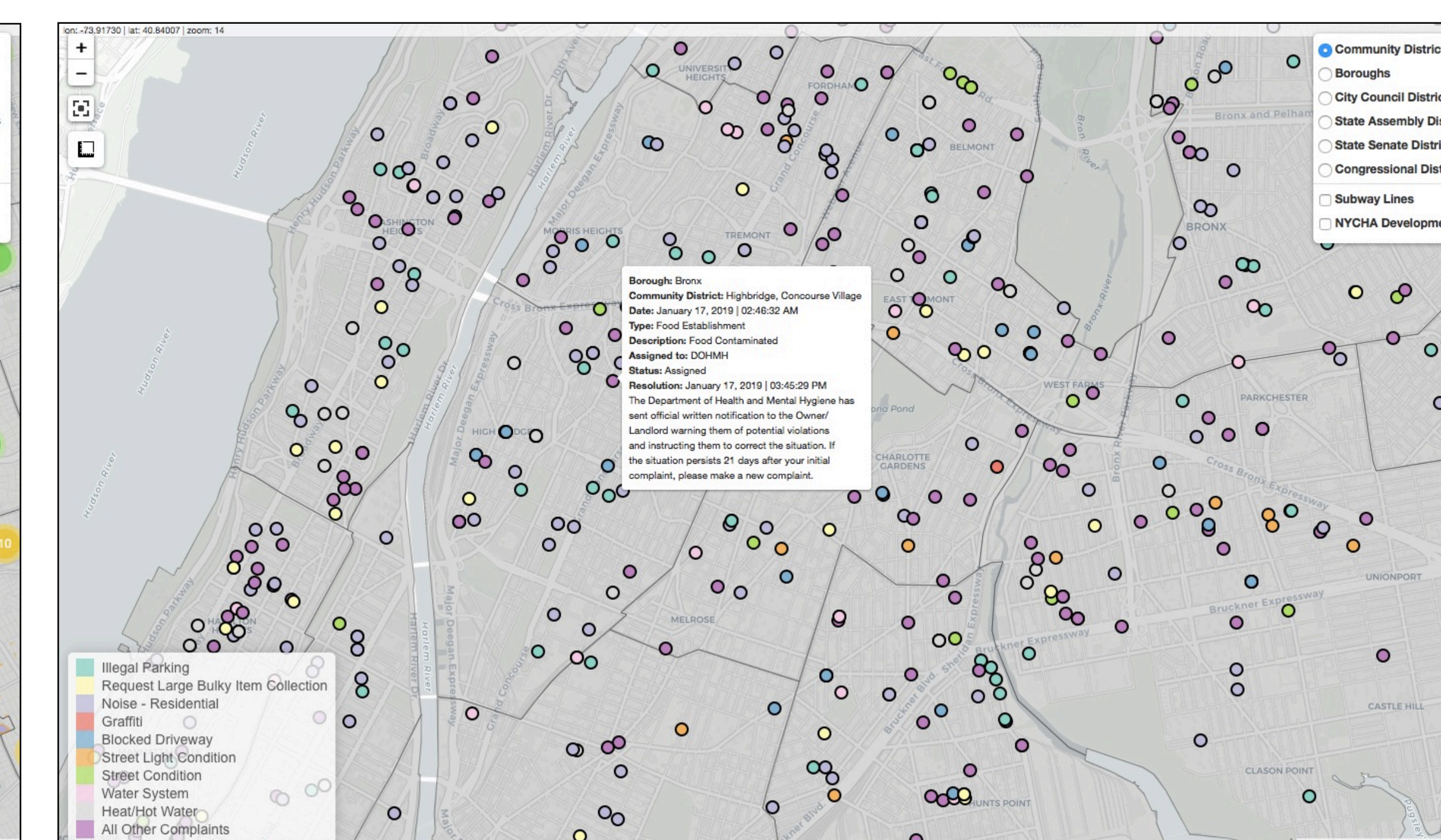
Interactive Table

Date Created	Borough	Community District	Complaint Type	Descriptor	Agency	Status
January 17, 2019 17:06:55	Bronx	Highbridge, Concourse Village	Heat/Hot Water	Apartment Only	HPD	Closed
January 17, 2019 13:07:18	Manhattan	Washington Heights, Inwood	Heat/Hot Water	Apartment Only	HPD	Closed
January 17, 2019 09:36:39	Brooklyn	Bensonhurst, Bath Beach	Heat/Hot Water	Apartment Only	HPD	Closed
January 17, 2019 09:50:55	Bronx	Wakefield, Williamsbridge	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 18:00:14	Bronx	Hunts Point, Longwood	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 18:00:23	Brooklyn	Bedford Stuyvesant	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 10:14:21	Bronx	Melrose, Mott Haven, Port Morris	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 00:14:01	Brooklyn	Flatbush, Midwood	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 03:12:22	Bronx	Bedford Park, Norwood, Fordham	Heat/Hot Water	Entire Building	HPD	Closed
January 17, 2019 03:48:36	Manhattan	Washington Heights, Inwood	Heat/Hot Water	Entire Building	HPD	Closed

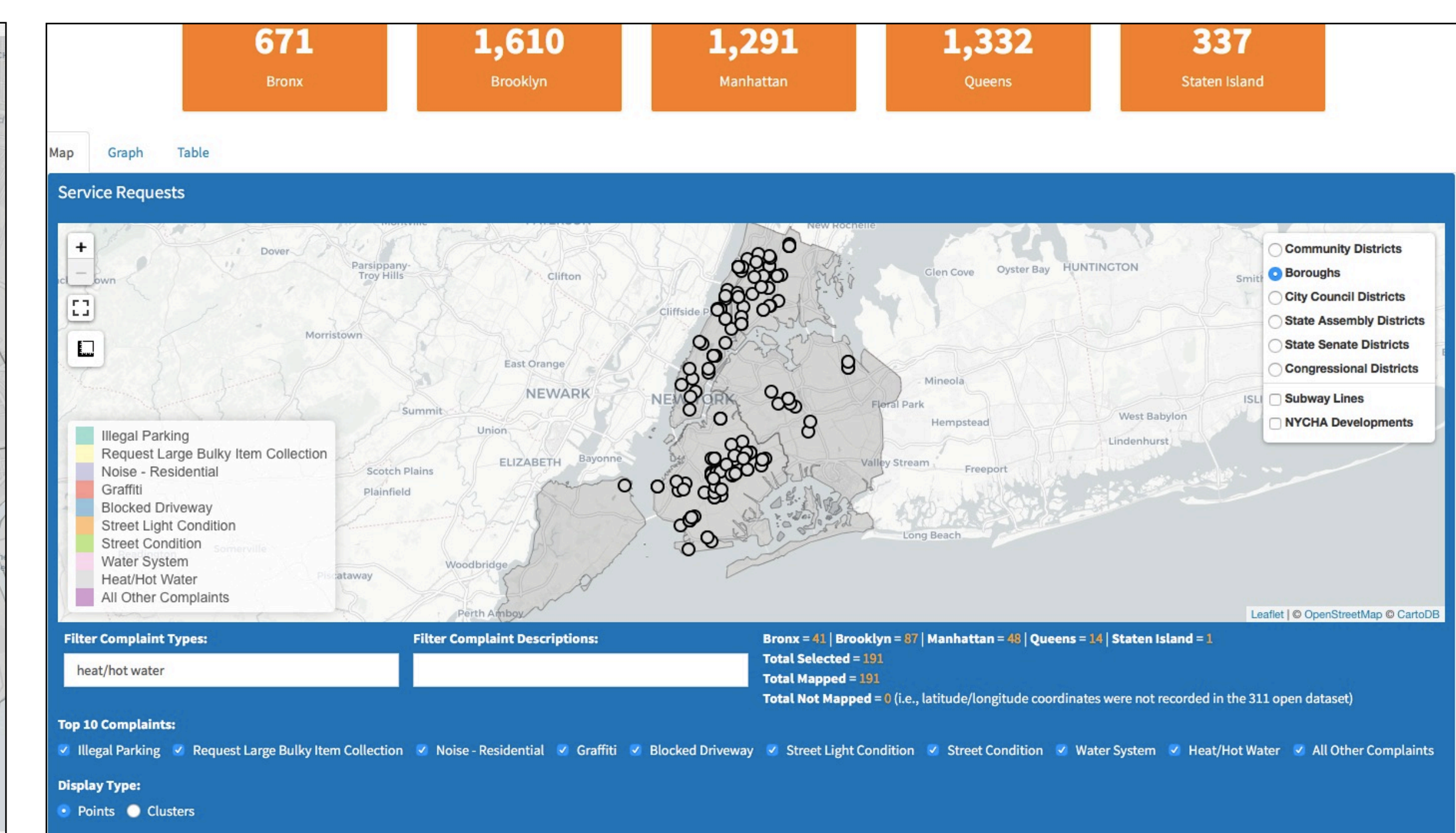
Cluster Display



Hover Over Data



Dynamic Filters



Dynamic Counts

