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

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.

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Cluster Display



Filter Complaint Types:

heat/hot water

Hover Over Data

Dynamic Counts

Filter Complaint Descriptions:

Total Selected = 52 Total Mapped = 52



Interactive Table

		New TO	Application Showing 5,361 ser Data Source: NYC C	on Author: Isaac H. Mich vice requests created on Thursda OpenData 311 Service Requests	CSL DALA DAS naels, MPH ny, January 17, 2019 from 2010 to Present	induaru		
	671 Bronx	1 ,	,610 Brooklyn	1,291 Manhattan	1,33 Queen:	32	337 Staten Island	
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Dynamic Filters

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Map Graph Table				
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	forristown	00 group		State Sena
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J L T X	Summit NEWARK NE	CORK CON Fieral	Park	ISLI 🗌 Subway Li
Illegal Parking	Union	8	Hempstead	West Babylon
Request Large Bulky Item Collecti	on Scotch Plains ELIZABETH Bayonne	Valley s	tream	Reality -
Graffiti	Plainfield	B B A A A A A A A A A A A A A A A A A A	Sale USU State	
Street Light Condition	A ASAN	O A CARD	APP DAY STORE	
Street Condition Water System	The second second in	00	Long Beach	
Heat/Hot Water	Piscataway			
All Other Complaints	Perth Amboy			Leaflet © OpenSt
Filter Complaint Types:	Filter Complaint Descriptions:	Bronx = 41 Brooklyn =	= 87 Manhattan = 48 Queens = 14	Staten Island = 1
heat/hot water		Total Mapped = 191		
1989 (P		Total Not Mapped = 0 (i	i.e., latitude/longitude coordinates v	vere not recorded in the 311 open datase
Top 10 Complaints:				

Bronx = 14 | Brooklyn = 4 | Manhattan = 31 | Queens = 2 | Staten Island = 1

Total Not Mapped = ((i.e., latitude/longitude coordinates were not recorded in the 311 open dataset)