

Comparison and Analysis of NYC and Detroit Water Quality

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Introduction

- [US News](#) ranked states by air and water quality in 2019
 - Method: Public Water System Violations/1,000 residents
- [Lawnstarter](#) blog studies ranked city drinking water quality for 2021
 - Method: Measured Consumer Satisfaction, Compliance, and Infrastructure Vulnerability

Source: [US News State Rankings](#)



Rank	State	Urban Air Quality	Drinking Water Quality
7	New York	12	16
35	Michigan	34	35

Source: [Lawnstarter City Rankings](#)



Rank	City	Score	Consumer Satisfaction	Compliance	Infrastructure Vulnerability
84	New York	70.5	100	102	72
175	Detroit	62.6	115	114	179

LawnStarter Metrics



Metric	Weighting	Min. Value	Max. Value
Satisfaction with Overall Water Quality	18.75	8.33	100
Satisfaction with Drinking Water Quality and Accessibility	18.75	25	100
"Consumer Satisfaction" Category Total	37.50		
Total Water Quality Violations	12.50	0	56748
Increase in Water Quality Violations	18.75	-896	3362
"Compliance" Category Total	31.25		
Share of Homes Lacking Plumbing or Kitchen Facilities	12.50	0.31%	4.34%
Share of Homes with Sewage Disposal Breakdowns in Last 3 Months	12.50	0.51%	1.97%
Natural Hazards Index Score	6.25	9	20
"Infrastructure Vulnerability" Category Total	31.25		
Overall Total	100.00		



Motivation

- Original project idea would not give a clear conclusion
 - Too many factors affecting COVID
 - Wanted to still do something with water
- Switched to analysis of water quality in worst city for drinking water and best city for drinking water
- Hopeful analysis will bring light to persistent issues in the US

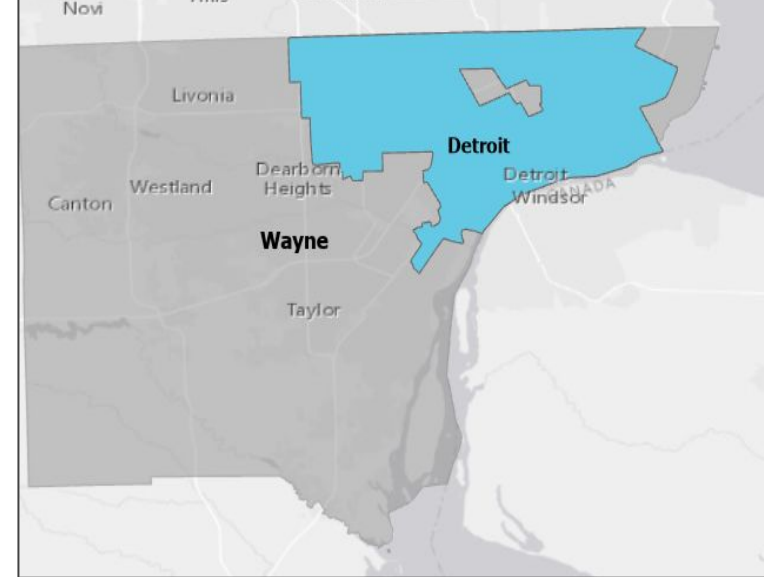


Research Question

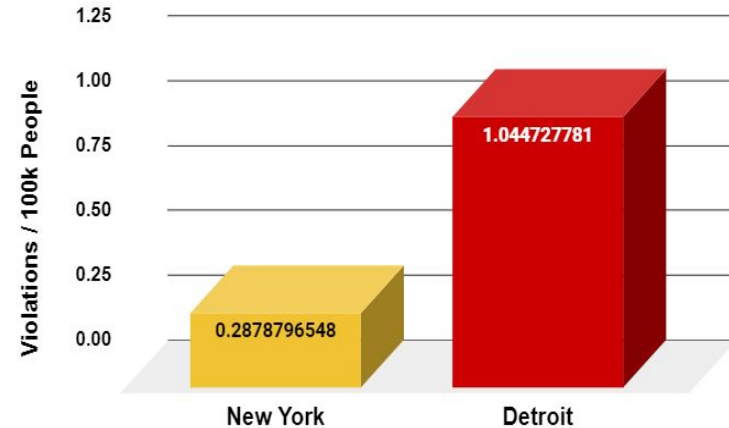
Why does New York City have better water quality than Detroit? What characteristics make one city's water better than the other?

Data

- Water Infrastructure Sites
(www.waterqualitydata.us/portal/)
- US-County Boundaries
(www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html)
- NYC EPA Violations since
 - 1990 - 24
- Detroit EPA Violations
 - since 1990 - 7



EPA Water Violation Rate per 100k People





Data

Income & Poverty	Q Detroit city, Michigan	Q New York city, New York
Population estimates, July 1, 2019, (V2019)	670,031	8,336,817
PEOPLE		
Income & Poverty		
Median household income (in 2019 dollars), 2015-2019	\$30,894	\$63,998
Per capita income in past 12 months (in 2019 dollars), 2015-2019	\$18,621	\$39,828
Persons in poverty, percent	35.0%	17.9%

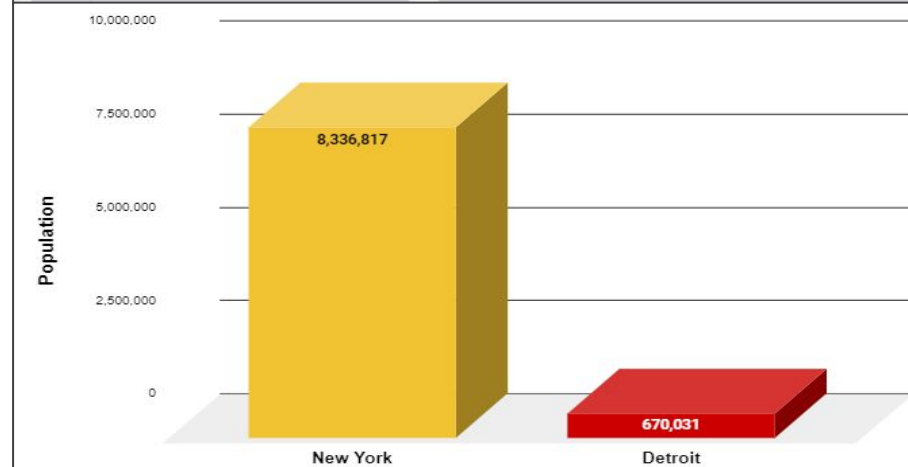
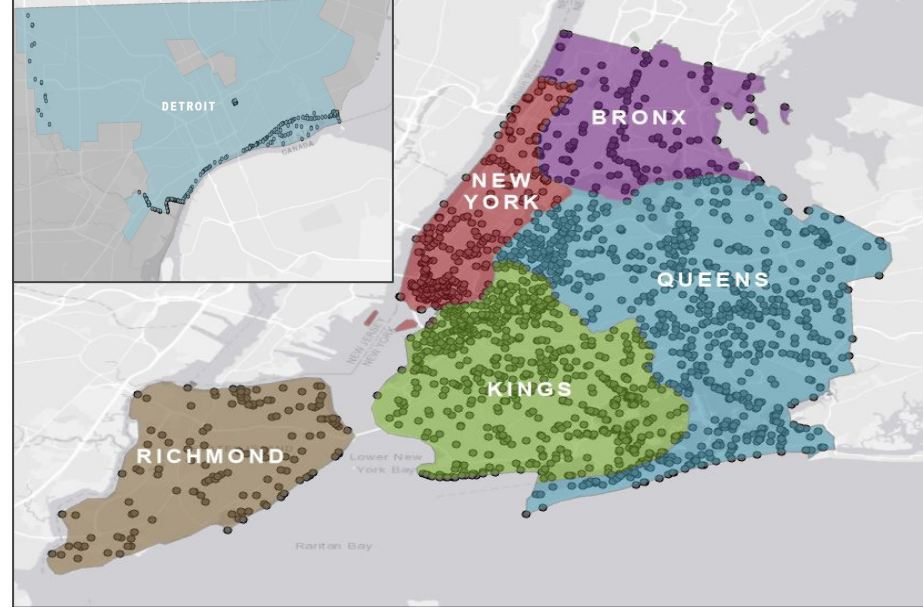
- Race, Income, Population data
 - <https://www.census.gov/quickfacts/fact/table/newyorkcitynewyork,detroitcitymichigan/PST045219>

Race and Hispanic Origin	Q Detroit city, Michigan	Q New York city, New York
Population estimates, July 1, 2019, (V2019)	670,031	8,336,817
PEOPLE		
Race and Hispanic Origin		
White alone, percent	14.7%	42.7%
Black or African American alone, percent (a)	78.3%	24.3%
American Indian and Alaska Native alone, percent (a)	0.4%	0.4%
Asian alone, percent (a)	1.7%	14.1%
Native Hawaiian and Other Pacific Islander alone, percent (a)	0.0%	0.1%
Two or More Races, percent	1.8%	3.6%
Hispanic or Latino, percent (b)	7.7%	29.1%
White alone, not Hispanic or Latino, percent	10.5%	32.1%

Population	Q Detroit city, Michigan	Q New York city, New York
Population estimates, July 1, 2019, (V2019)	670,031	8,336,817
PEOPLE		
Population		
Population estimates, July 1, 2019, (V2019)	670,031	8,336,817
Population estimates base, April 1, 2010, (V2019)	713,898	8,175,031
Population, percent change - April 1, 2010 (estimates base) to July 1, 2019, (V2019)	-6.1%	2.0%
Population, Census, April 1, 2010	713,777	8,175,133
Population, Census, April 1, 2020	X	X

Visualization Methods

- Water Resource Sites
 - Filtered by type/county
 - Streams, Reservoirs, Wells, Groundwater, etc.
 - Clipped to fit Regional boundary
 - Kernel Densities expose major water sources
 - Sites and Boundaries are linked to WGS 1984
- Charts outlining Number of Sites and Demographic Data





Results + Discussion

- **Better Overall Infrastructure in NYC**
 - NYC boroughs represent 8.27 million people
 - Great water infrastructure benefits public health
- **Detroit's Lower Ranking is a Result of Poor Infrastructure**
 - Poor urban planning and funding of infrastructure negatively impacts public health



Challenges + Future Directions

- Data collection
 - NYC consists of 5 total boroughs (different county designations)
 - Funding Reports are not always up-to-date
 - EPA Water Quality Reports are not always public
- Race, income, and population
 - Plays important role in how funded infrastructure will be
 - Unsure of how to visualize it on map
- Overall project
 - More definitive than the previous idea with COVID
 - Spent too much time brainstorming and research instead of project product development