DELIVERABLE 3

Final Project Report Draft

Abdullah Albijadi, Audrey McMillion, Gordon Ng, Ji Zhang, Thachathum Amornkasemwong

Summary of Results

Overarching Project Question: Are there any overarching racial voting patterns in Boston on the Ward-Precinct level, and how does this vary across election type over the past decade?

- We have found a variety of racial voting patterns on the Ward-Precinct level in Boston across election type during the past decade.
- Most of the answers to this question are incorporated into our key questions that we explore below.

Key Questions and Principal Findings:

1. How do racial voting patterns differ by election type?
    a. Generally, across election type, Black candidates tend to receive support from precincts with high black populations.
    b. Turnout for city council elections which coincide mayoral elections is generally much higher than turnout for stand-alone city council elections.
    c. For certain elections, such as the 2018 U.S. House Democratic primary, race of the candidate does not seem to be a primary factor in determining whether or not the candidate will win a specific precinct.

2. What are the key predictors in determining support for Black candidates for Boston?
    a. There is a strong positive correlation between the percentage of votes Black candidates receive and the higher the Black population in a specific precinct.
    b. There seems to be a slight correlation between certain Black candidates (Tito Jackson and DA Rollins) winning a given precinct and that precinct's median income and average educational attainment.

3. How has voter turnout by precinct changed across city council election year?
    a. Precincts which have the most volatile voter turnout are concentrated in East Boston and West Roxbury and are either majority Hispanic or majority white.
    b. Precincts which have experienced the greatest change in share of voter turnout are more dispersed ethnically, and are concentrated in areas of Dorchester and Downtown Boston.
    c. Micheal F. Flaherty is in the election from 2015 to 2019. His voter turnout increased from 2015 to 2017 but decreased from 2017 to 2019. His voter turnout, in general, increased from 2015 to 2019.
    d. Precincts which have experienced the greatest change in share of Micheal F. Flaherty's voter turnout all have a large white population (above 50%).
    e. Michelle Wu is in the election from 2013 to 2019. Her voter turnout only increased in 2017 and decreased in general from 2013 to 2019.
    f. Precincts which have experienced the greatest change in share of Michelle Wu's voter turnout all have a large white population (above 50%). Wu has more supporters in precincts with more Aisn population, especially in precinct 0308 and 0501.

4. What are changes in District 3 particularly?

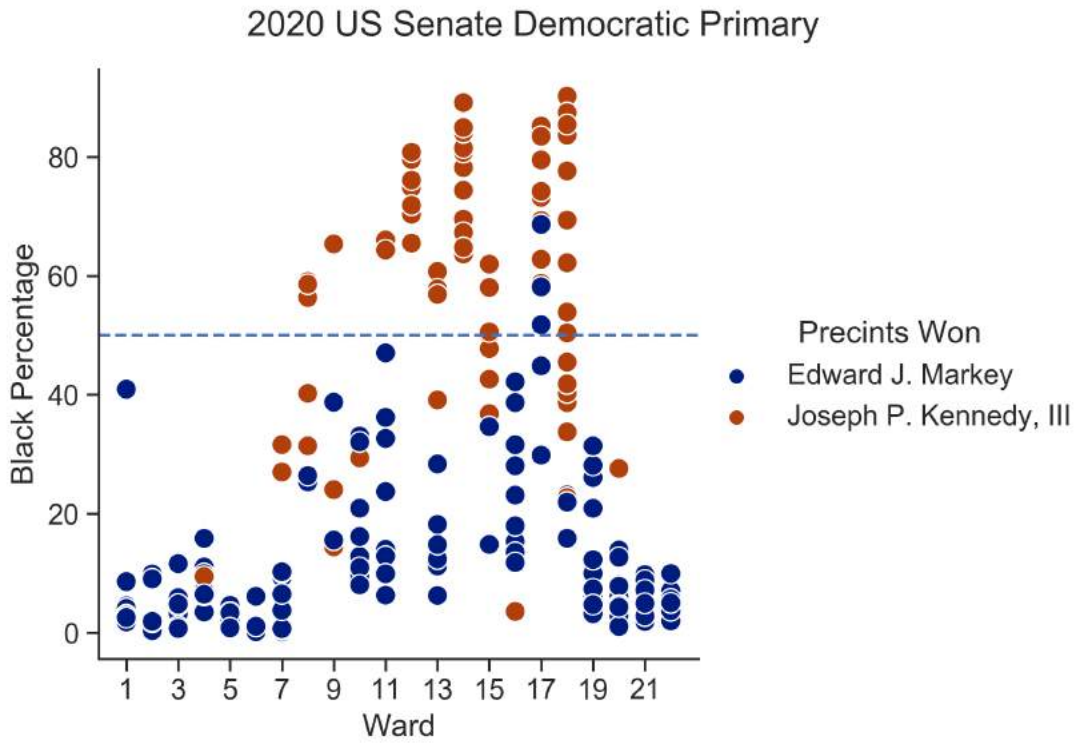
a. The trends in City Council voter turnout for District 3 follow the same general pattern as Boston overall.
b. The trends in Micheal F. Flaherty's voter turnout for District 3 is slightly different from the general pattern. Unlike the general pattern, his voter turnout, in general, decreased from 2015 to 2019. Precincts which have experienced the greatest change in share of Micheal F. Flaherty's voter turnout do not have a strong correlation with a single race population.
c. The trends in Michelle Wu's voter turnout for District 3 follow the same general pattern as Boston overall.

Key question: How have voting patterns of Black populations in Boston changed by election type?

PROCESS: After collecting missing data, we performed some preliminary analysis focusing mainly on how voting patterns change with Black demographics.

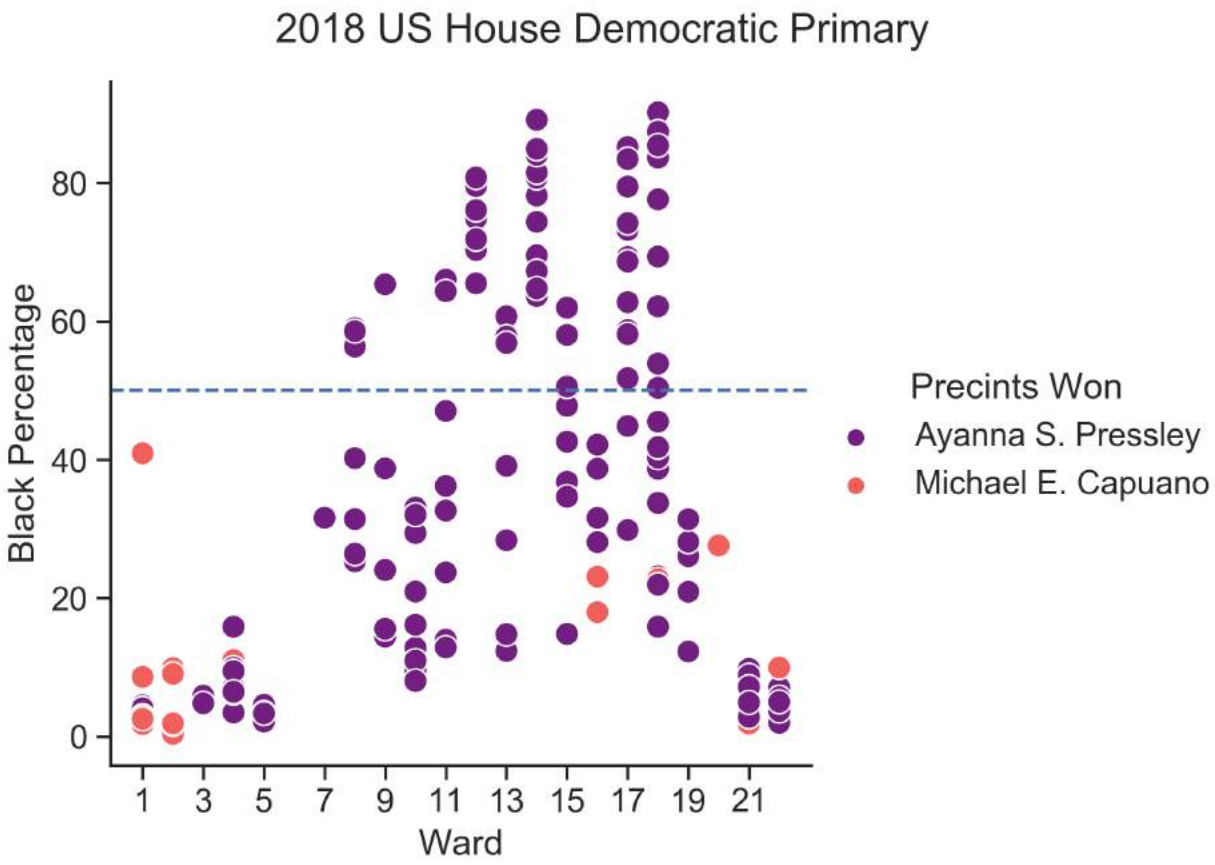
Part 1: Senate 2020 Demorcratic Primaries and 2018 US Democratic House Primaries

1. For the Senate 2020 Democratic Primaries, here is what we found:



Here we found a clear racial pattern. Across all Wards, Kennedy won most of the precincts with Black majority as we can notice above the horizontal line, while Markey dominated the precincts with Black minority, and specifically the ones with lowest Black percentage living there.

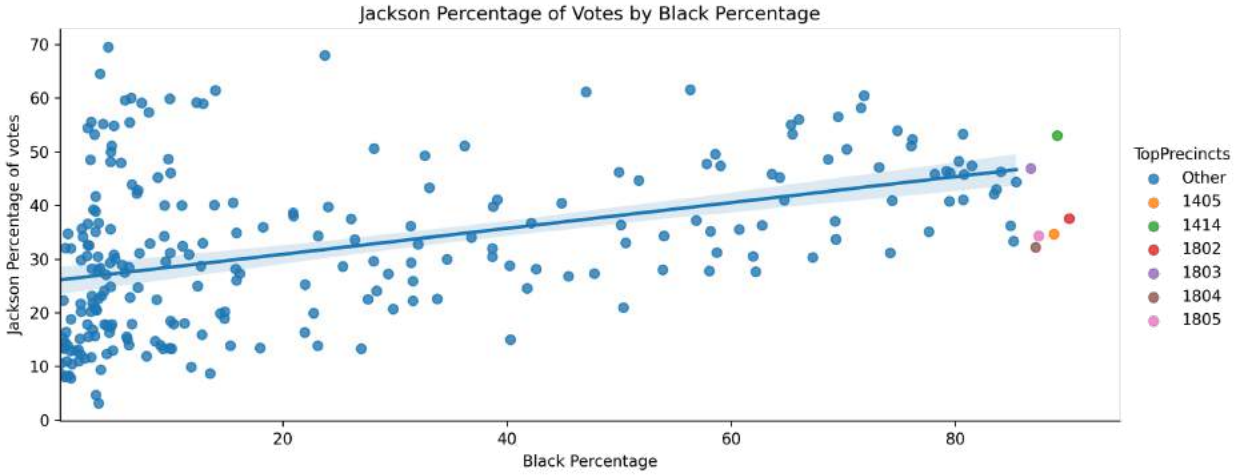
2. And for the 2018 US Democratic House Primaries:



Similarly, another racial pattern. Across all Wards, Pressley won all of the precincts with Black majority as we can notice above the horizontal line, while Capuano' wins were in the precincts with Black minority, with most of them being in lowest Black percentage precincts.

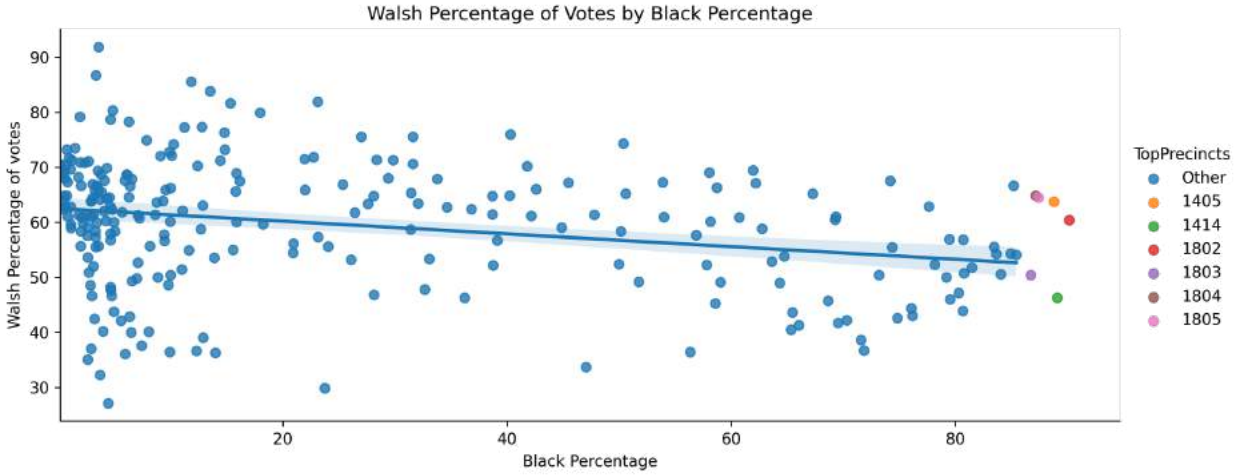
Part 2: Mayoral 2017 Preliminary Race and Mayoral 2017 General Turnout Race

1. For the Mayoral 2017 Preliminary Race, we obtained the following results:



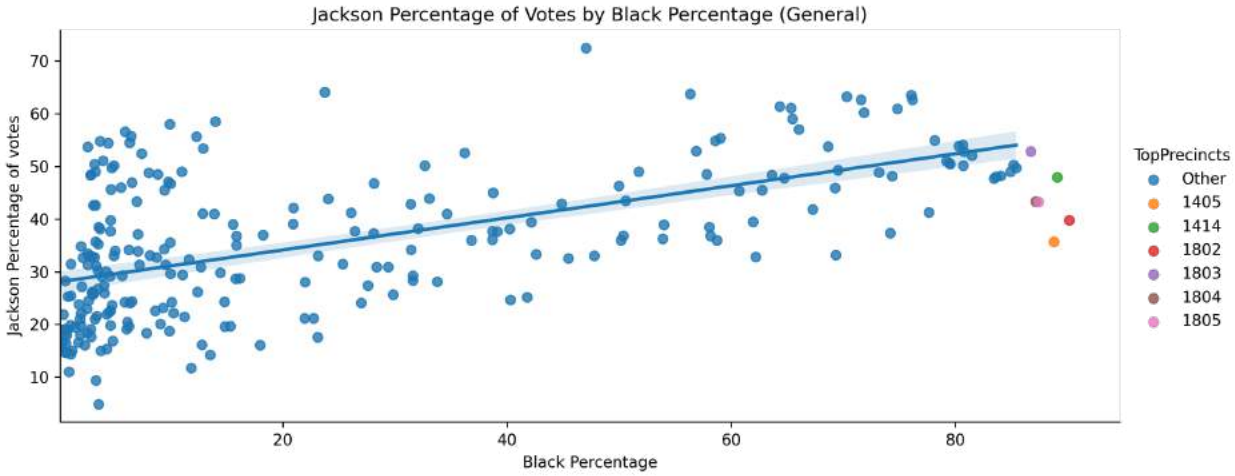
Here, we found that there is a slight positive correlation (correlation coefficient: 0.42) between a higher Black population and greater percentage of votes for Tito Jackson.

Similarly, we analyzed Marty Walsh's percentage of votes by Black Percentage:



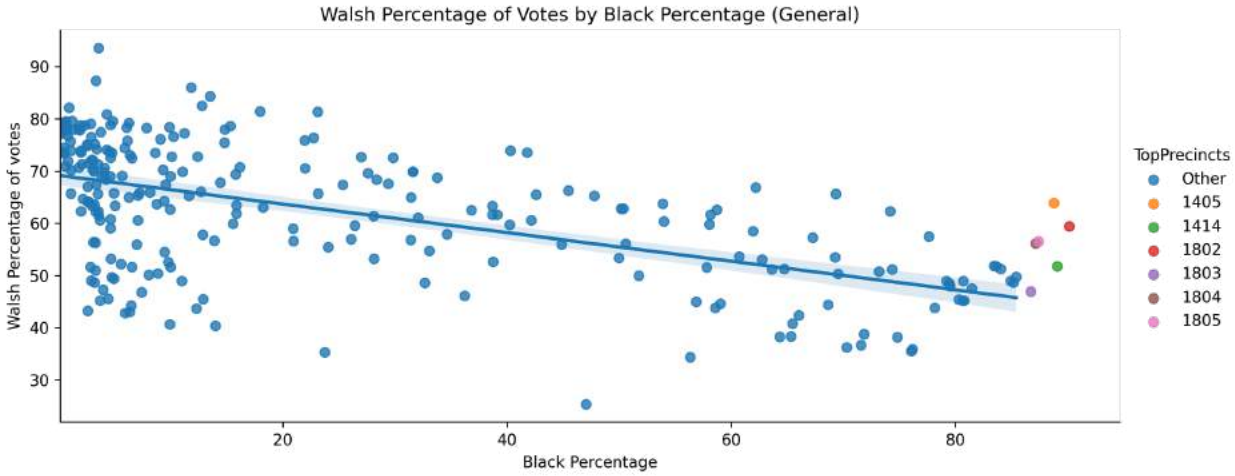
Finding that there is a slight negative correlation (coefficient: -0.25) between the two.

2. For the Mayoral 2017 General Turnout Race, we obtained the following results:



In the general race, there was a slightly stronger positive correlation between Jackson's percentage of votes and the Black population per precinct, with correlation coefficient of 0.58.

Similarly, analyzing Marty Walsh's percentage of votes by Black Percentage:

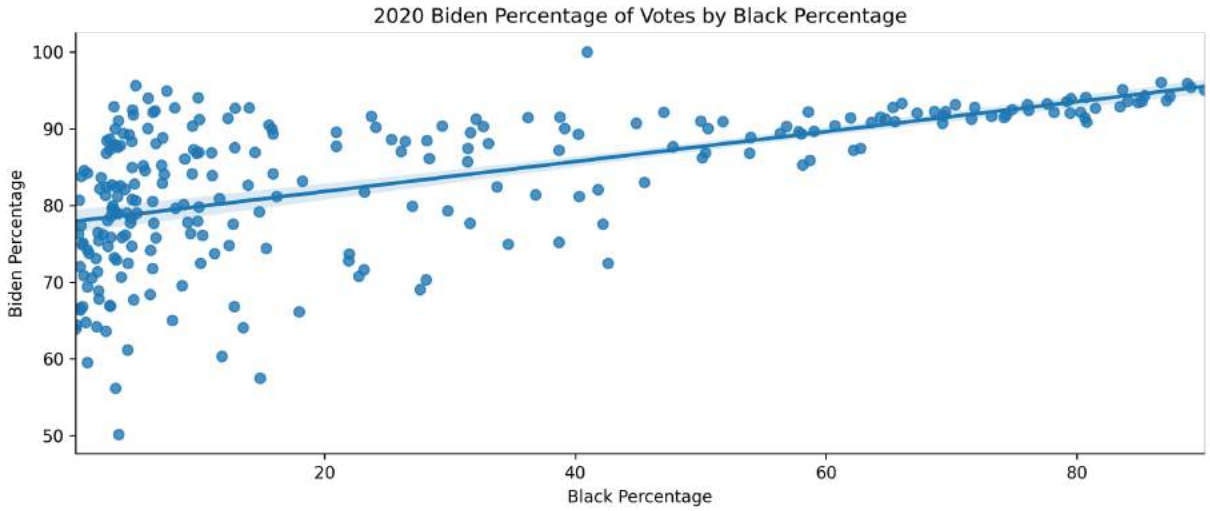


Here, we found a much stronger negative correlation of -0.56.

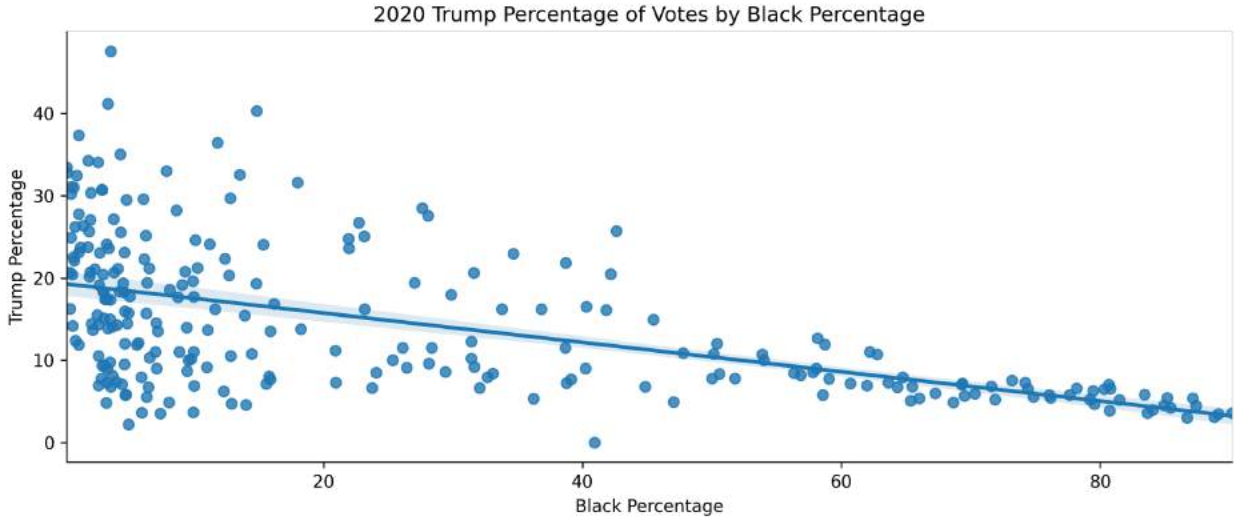
Part 3: Presidential Elections 2020 and 2016 Presidential Elections

1. For the Presidential Elections, we obtained the following results:

First, we analyzed the 2020 Trump/Biden race by Black Percentage per Boston precinct:



Here, we have a correlation coefficient of 0.58, indicating a positive correlation.



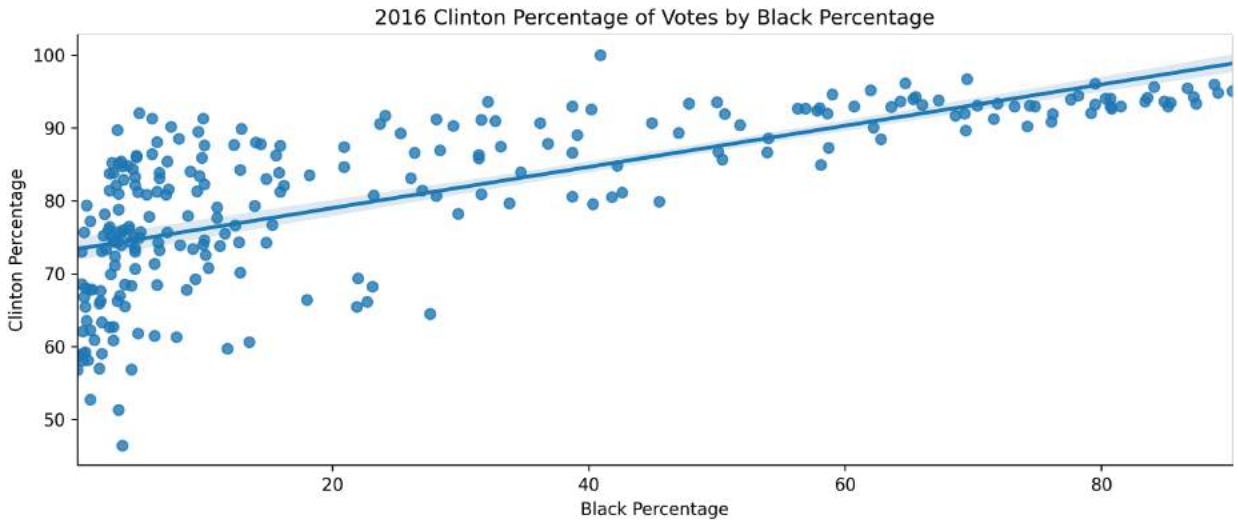
Here, we have a correlation coefficient of -0.55, indicating a negative correlation between Black Percentage per precinct and Trump's percentage of votes.

Sorting our precincts by By Black Population Percentage:

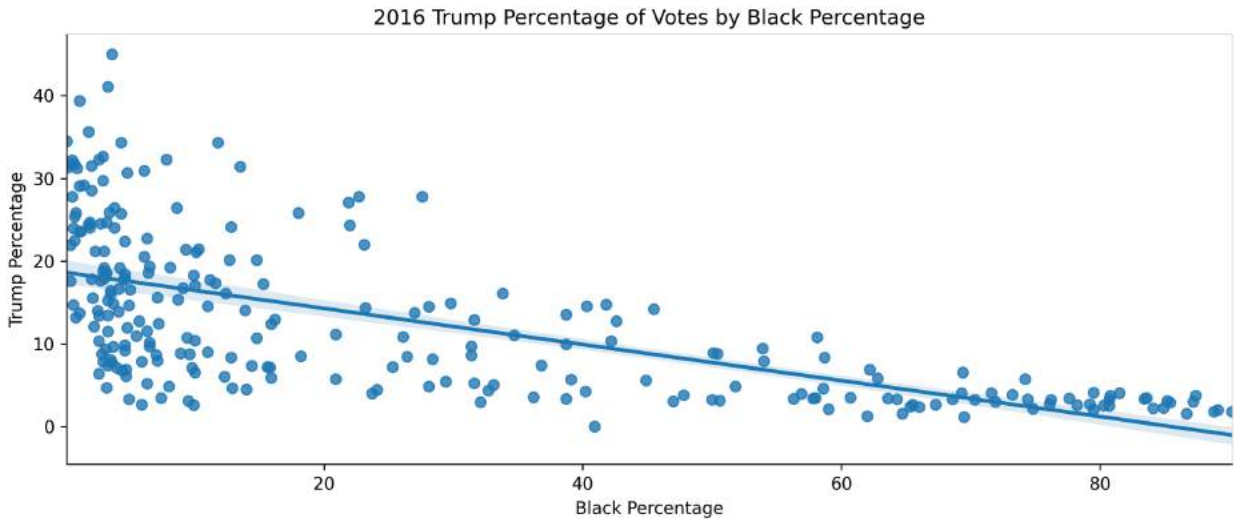
	City/Town	Ward	Pct	Joseph R. Biden, Jr.	Donald J. Trump	Jo Jorgensen	Howard Hawkins	All Others	No Preference	Blanks	...	Two or More Races/Ethnicities (alone)	Black Percentage	Native American Percentage	Asian Percentage	Ha
61	Boston	7	1.0	731	383	12	1	8.0	0.0	9.0	...	3.0	0.146735	0.000000	0.880411	
59	Boston	6	8.0	823	419	19	4	7.0	0.0	5.0	...	10.0	0.194175	0.064725	0.647249	
20	Boston	2	5.0	1,054	286	14	8	10.0	0.0	9.0	...	8.0	0.374532	0.000000	1.373283	
18	Boston	2	3.0	1,054	212	18	0	13.0	0.0	9.0	...	15.0	0.423729	0.181598	1.452785	
58	Boston	6	7.0	948	430	21	0	17.0	0.0	7.0	...	8.0	0.458716	0.065531	0.786370	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
173	Boston	18	4.0	1,161	67	5	2	1.0	0.0	3.0	...	40.0	87.154150	0.247036	0.444664	
174	Boston	18	5.0	1,203	57	5	5	2.0	0.0	5.0	...	37.0	87.415497	1.248050	0.208008	
125	Boston	14	5.0	702	23	2	1	2.0	0.0	2.0	...	28.0	88.811675	0.347464	0.764420	
134	Boston	14	14.0	773	28	4	1	2.0	0.0	2.0	...	29.0	89.111111	0.222222	0.370370	
171	Boston	18	2.0	984	37	1	7	2.0	0.0	4.0	...	43.0	90.180587	0.451467	0.959368	

253 rows × 37 columns

2. Next, we analyzed the 2016 Trump/Clinton race by Black Percentage per Boston precinct:



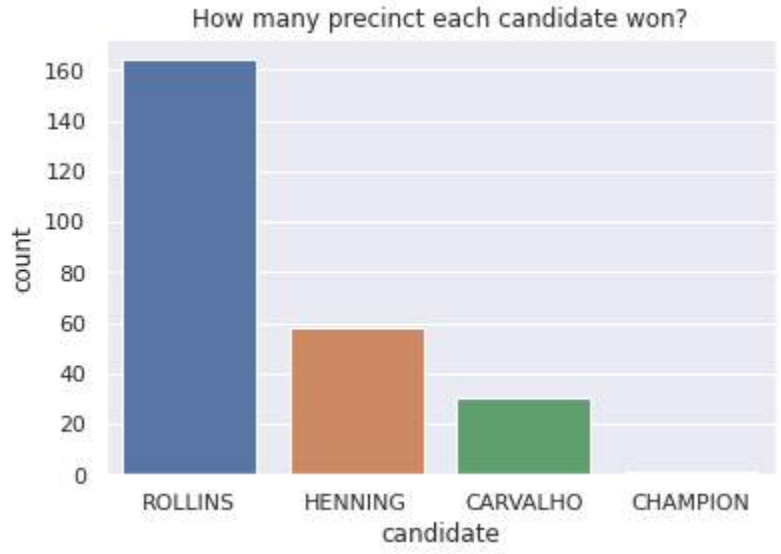
Here, we have a correlation coefficient of 0.71, indicating a strong positive correlation.

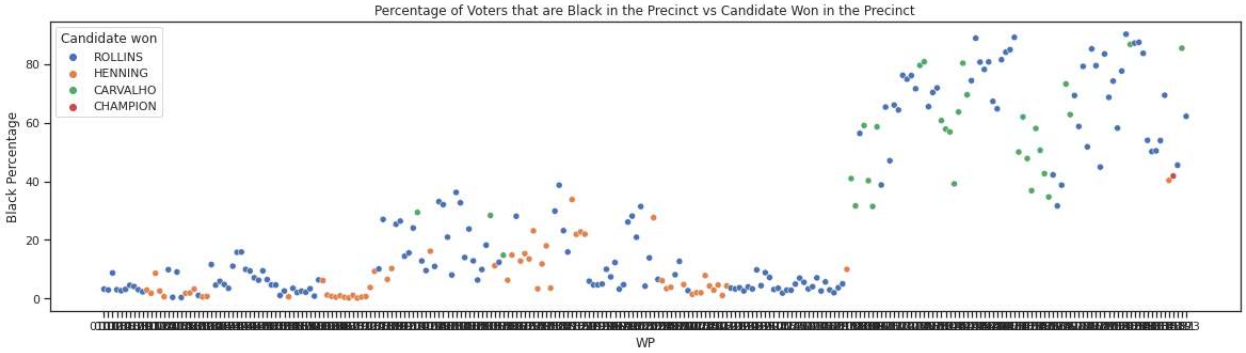


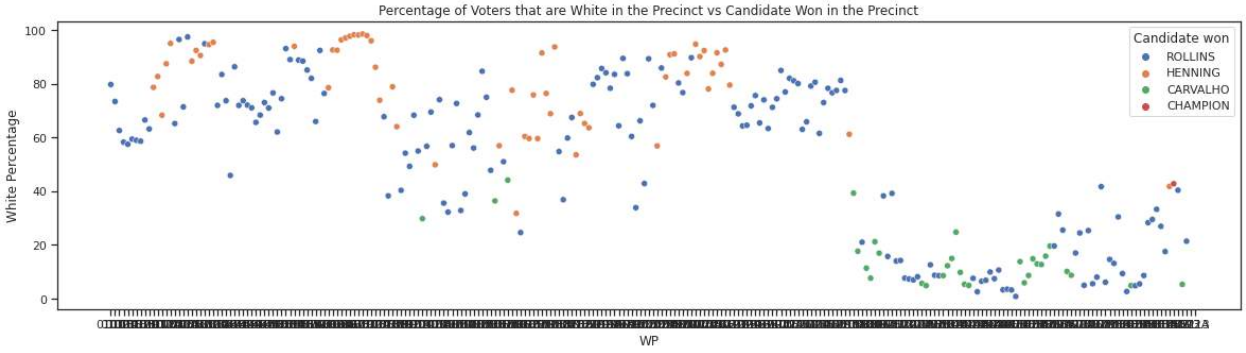
Here we have a correlation coefficient of -0.63, indicating a strong negative correlation.

Part 4: DA Race Turnout 2018

1. For the DA Race Turnout 2018, we obtained the following results:





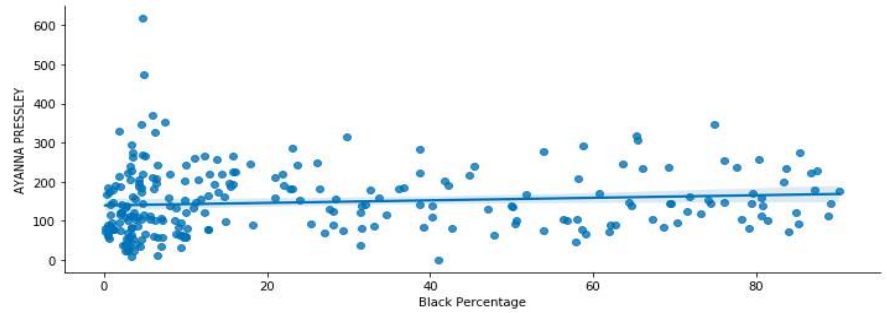


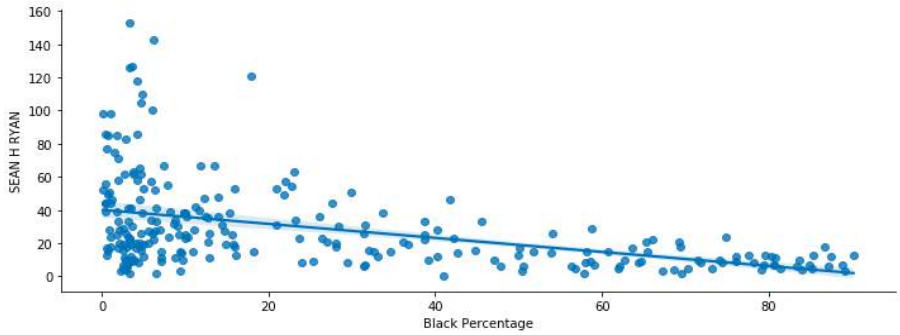
For precincts with a high percentage of voters that are black, the candidate, Rolling, seems to be favored more than other candidates. Henning, who also won a lot of precincts, doesn't seem to be favored by black people as most of his winning precincts are from precincts with a dense white population.

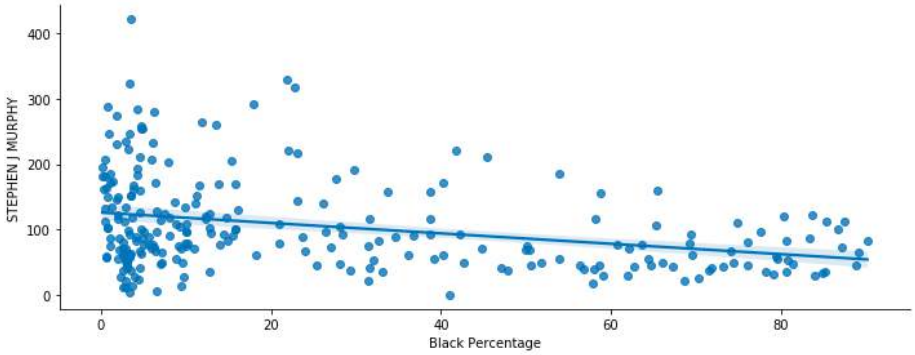
Part 5: City Council Result Analysis including 2011, 2013, 2015, 2017 and 2019

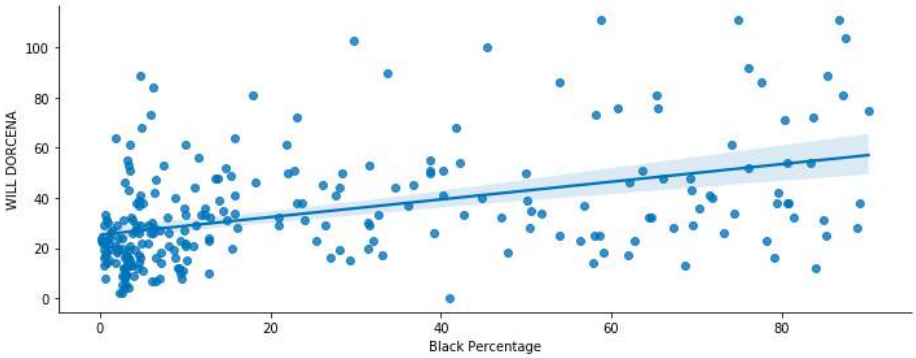
1. 2011 City Council Result

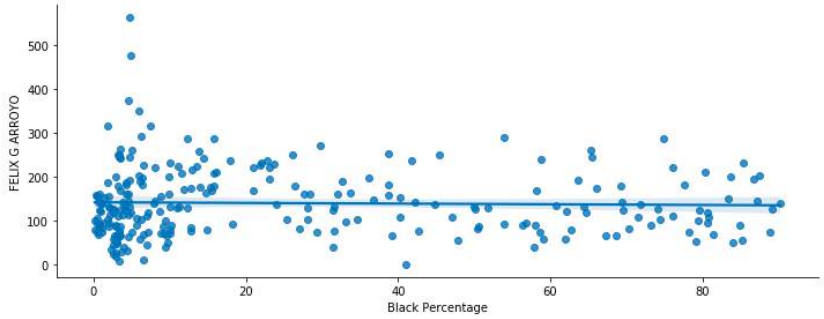
- Individual vote counts vs black percentage

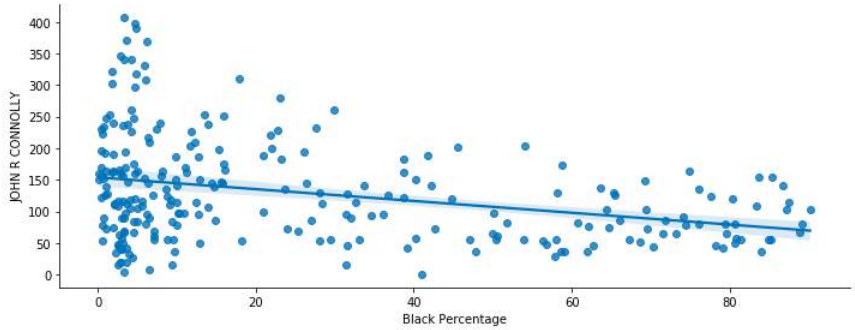


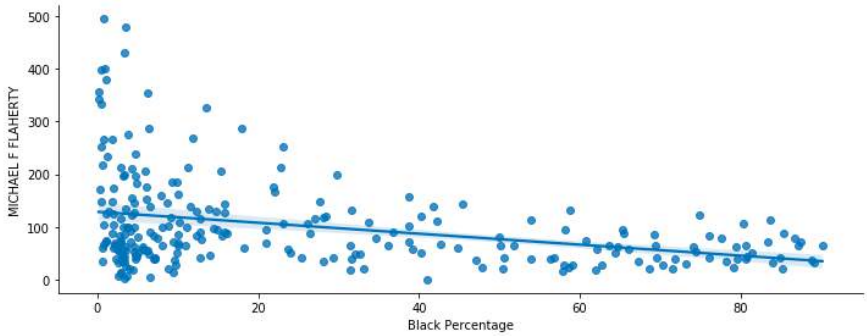






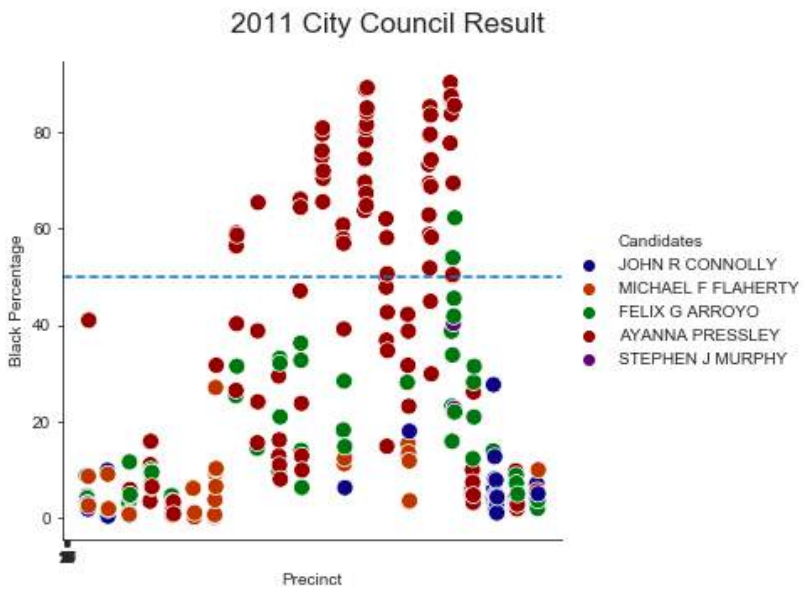






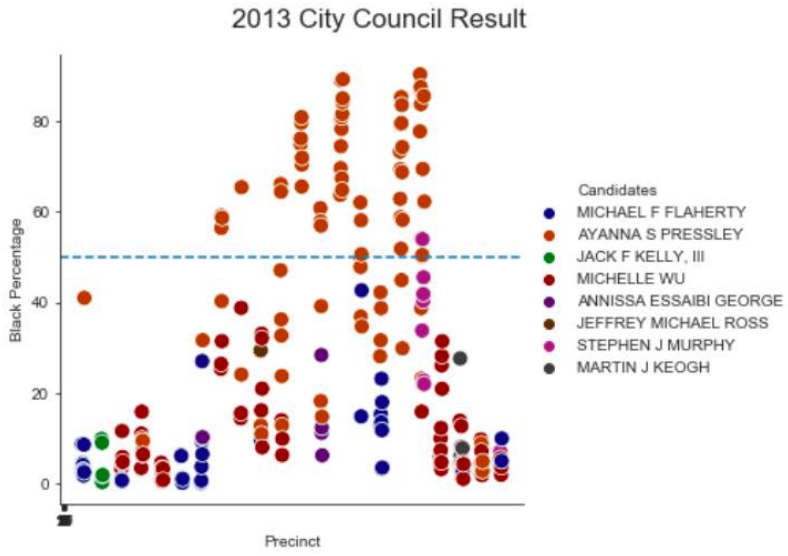
From the plot, we can see that Will Dorcena has the strongest positive correlation between black percentage and vote counts. Ayanna Pressley has a slight positive correlation. John R Connoly, Michael F Flaherty and Sean H Ryan all have negative correlation. According to Wikipedia, Ayanna Pressley is a black woman and Will Dorcena is a black man. The rest of the candidates are white men. Thus, the finding is not surprising and it confirms the hypothesis that black voters are more likely to vote black candidates.

- Winner in each precinct vs black percentage



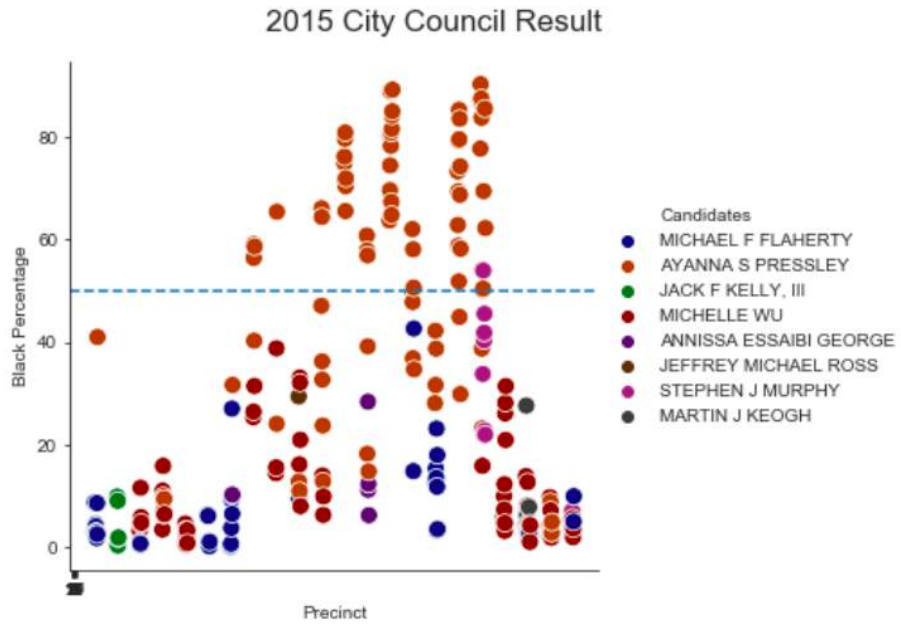
From the graph we can see that Ayanna Pressley is leading in precincts that have large black percentages. Felix, who has similar vote counts with Ayanna, his supporters are mostly in neighborhoods that have large white populations.

2. 2013 City Council Result General Analysis



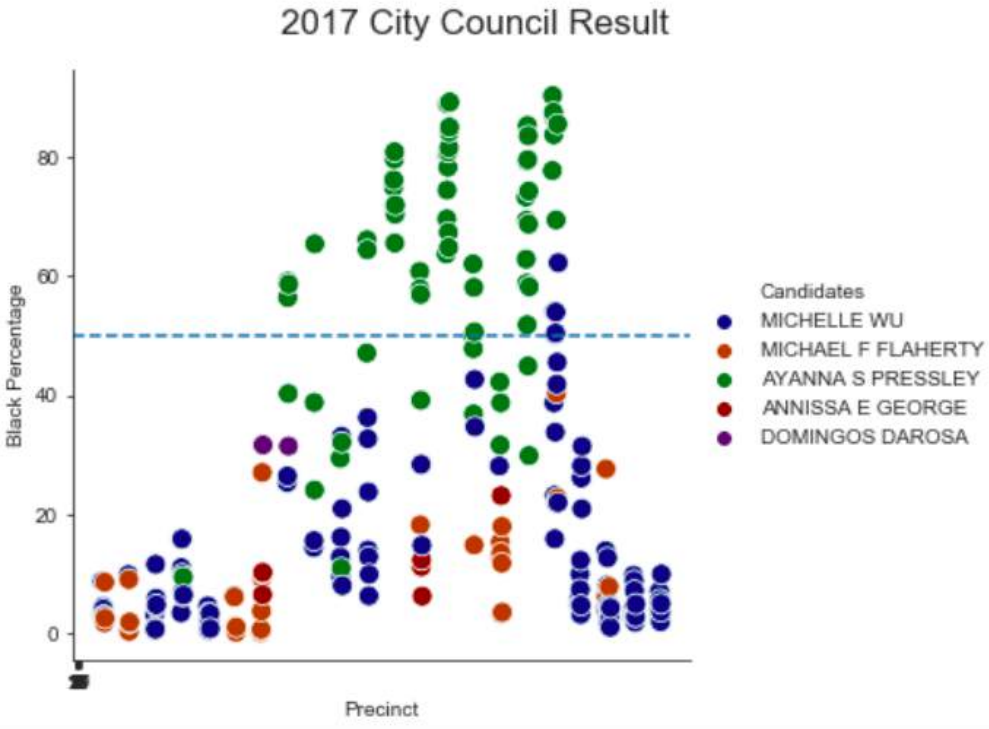
We can see that Ayanna Pressley, the only black candidate, is still leading in precincts that have large black percentages.

3. 2015 City Council Result General Analysis



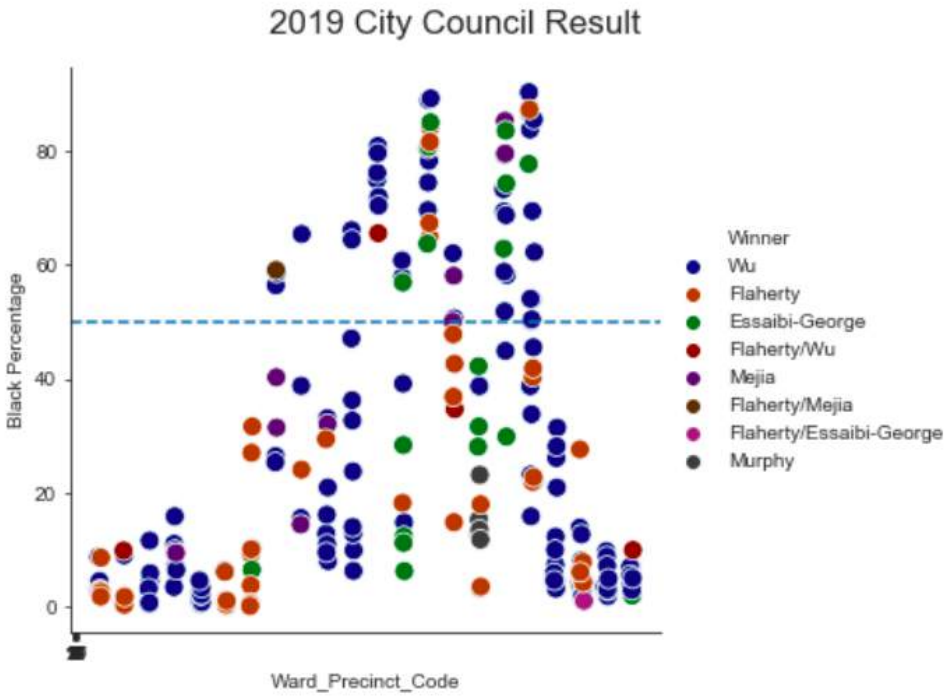
We can see that Ayanna Pressley, the only black candidate, is still leading in precincts that have large black percentages.

4. 2017 City Council Result General Analysis



We can see that Ayanna Pressley, the only black candidate, is still leading in precincts that have large black percentages.

5. 2019 City Council Result General Analysis

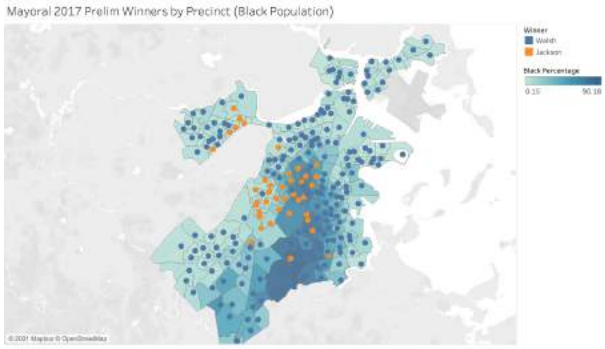


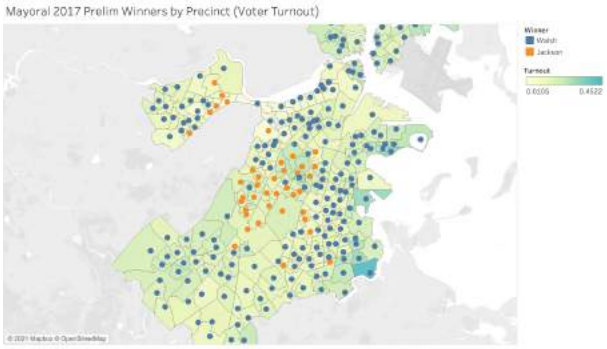
In 2019, there is no black candidate, so the winner in precincts that have a large black population is pretty random.

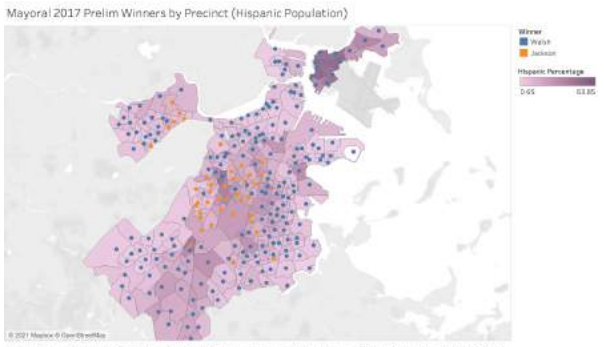
Visualizing on Boston Maps How Racial Voting Patterns Differ by Election Type

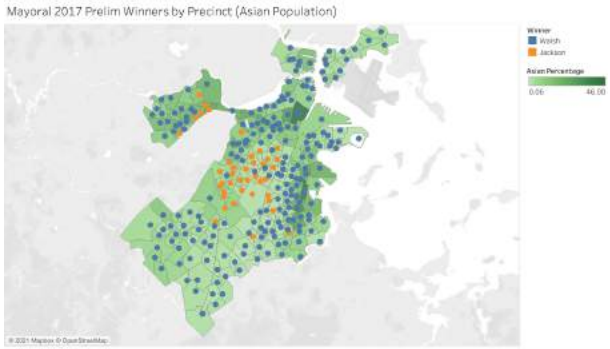
Mayoral 2017 Elections

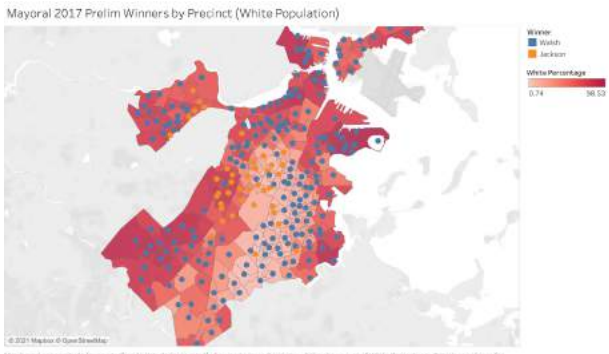
Preliminary Race:





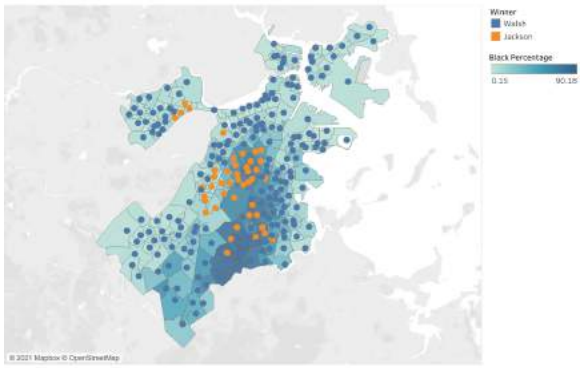






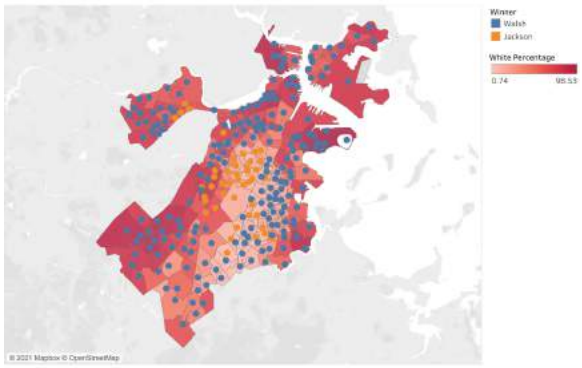
General Race:

Mayoral 2017 General Winners by Precinct (Black Population)



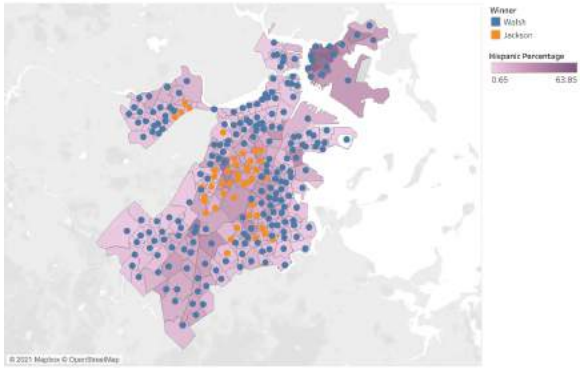
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Mayoral 2017 General Winners by Precinct (White Population)



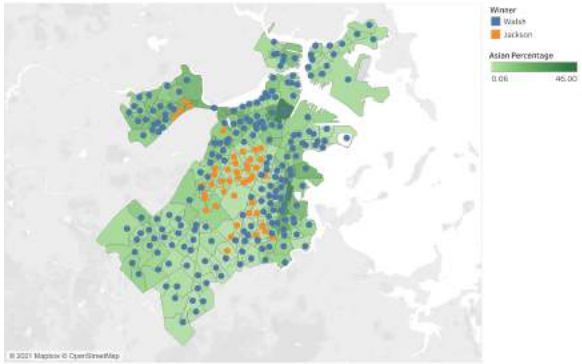
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Mayoral 2017 General Winners by Precinct (Hispanic Population)



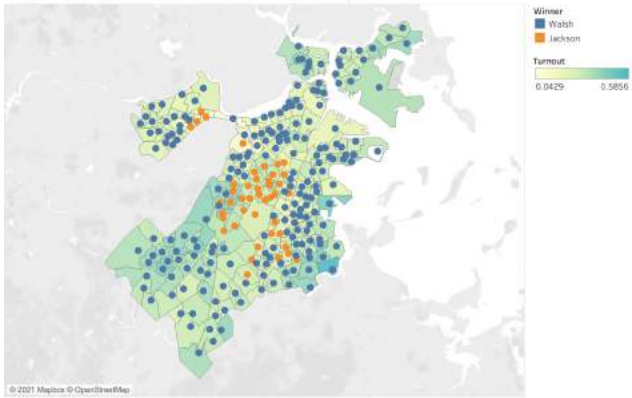
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Mayoral 2017 General Winners by Precinct (Asian Population)



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Mayoral 2017 General Winners by Precinct (Tunout)



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

2019 City Council Analysis

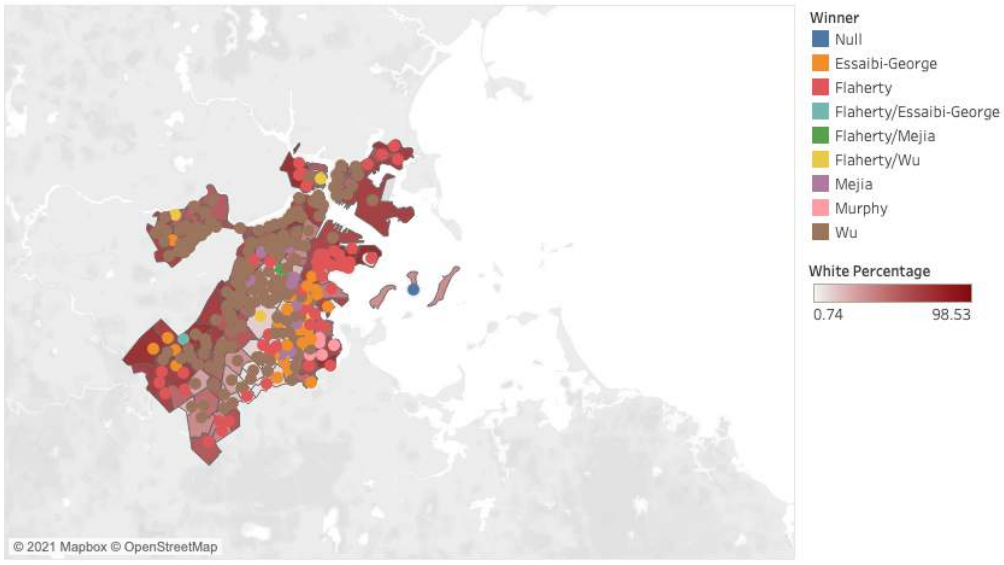
Winner and Black Percentage - 2019 cc

Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Winner and Hispanic Percentage - 2019 cc

Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Winner and White Percentage - 2019 cc

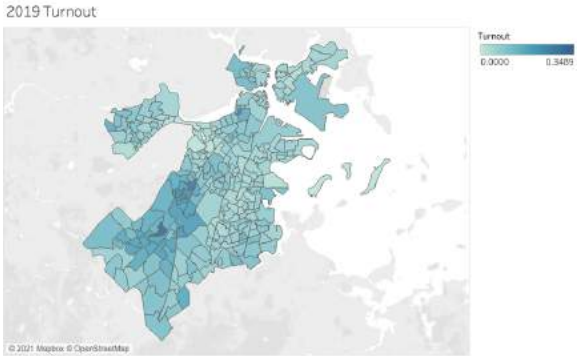


Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

Winner and Asian Percentage - 2019 cc

Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci.

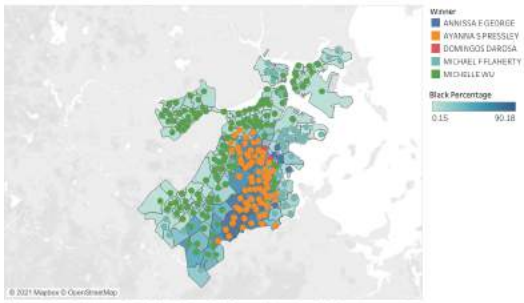
2019 Turnout



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Turnout. Details are shown for Ward Preci.

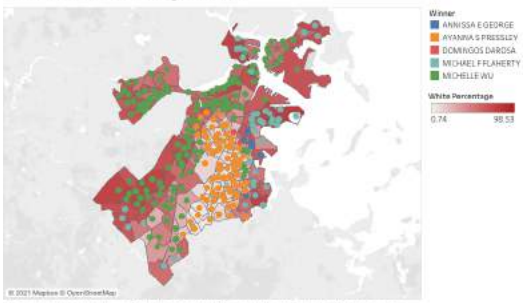
2017 City Council Analysis

Winner and Black Percentage - 2017 cc



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Prec. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Prec.

Winner and White Percentage - 2017 cc

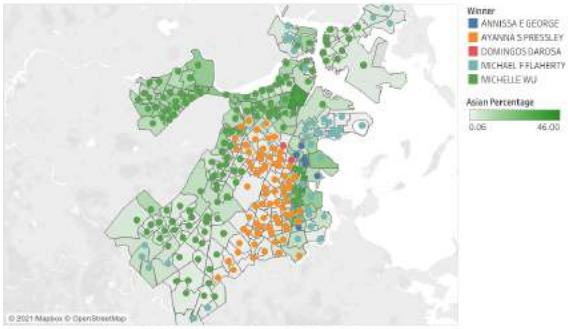


Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Prec. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Prec.

Winner and Hispanic Percentage - 2017 cc

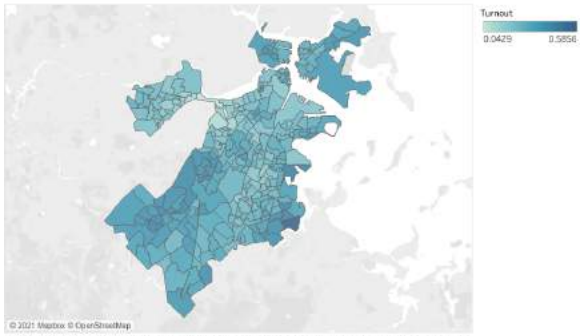
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Prec. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Prec.

Winner and Asian Percentage - 2017 cc



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Prec. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Prec.

2017 Turnout



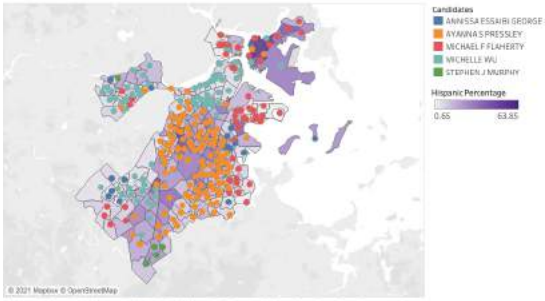
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Turnout. Details are shown for Ward Prec.

2015 City Council Analysis

Winner and Black Percentage - 2015 cc

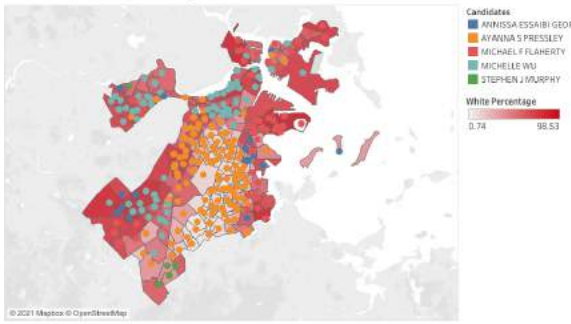
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Candidates. Details are shown for Ward Preci.

Winner and Hispanic Percentage - 2015 cc



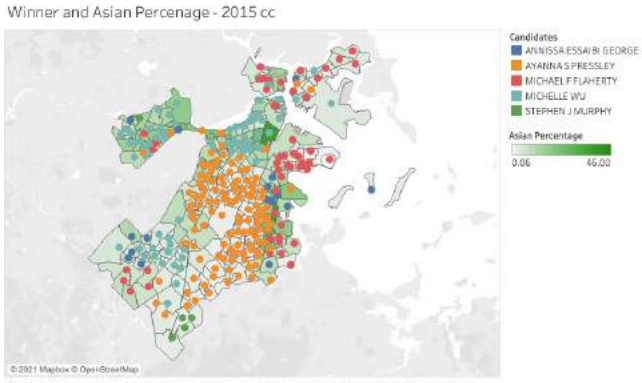
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Candidates. Details are shown for Ward Preci.

Winner and White Percentage - 2015 cc



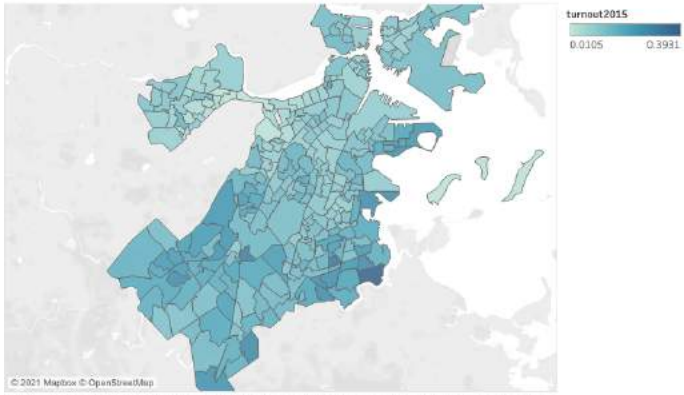
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Candidates. Details are shown for Ward Preci.

Winner and Asian Percenage - 2015 cc



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Candidates. Details are shown for Ward Preci.

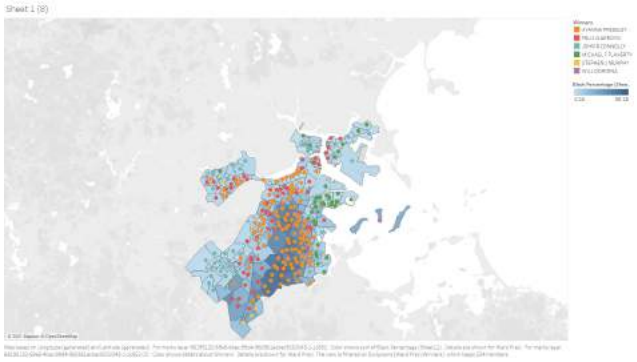
Sheet 5



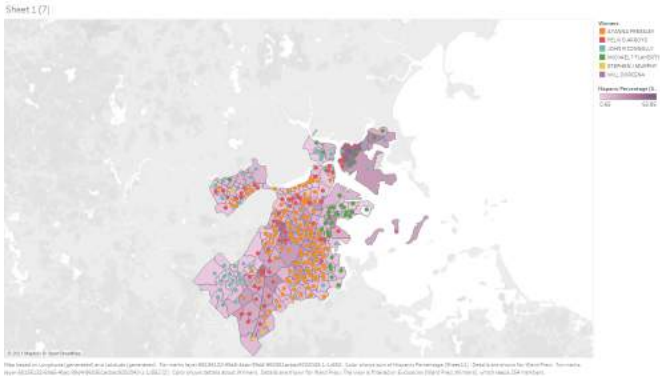
Map based on Longitude (generated) and Latitude (generated). Color shows sum of turnout2015. Details are shown for Ward Preci.

2013 City Council Analysis

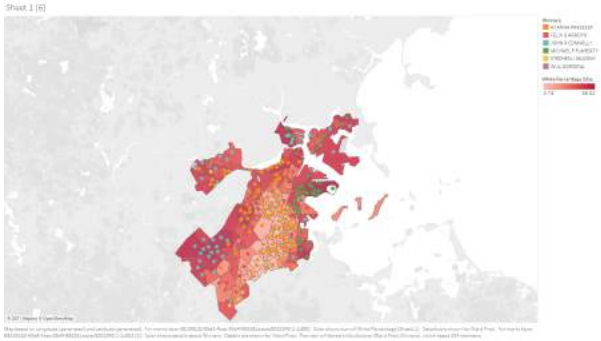
Black Percentage & Candidates



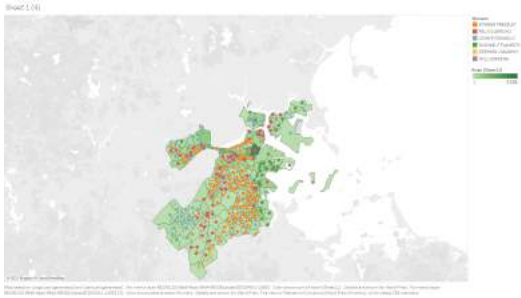
Hispanic Percentage & Candidates



White Percentage & Candidates

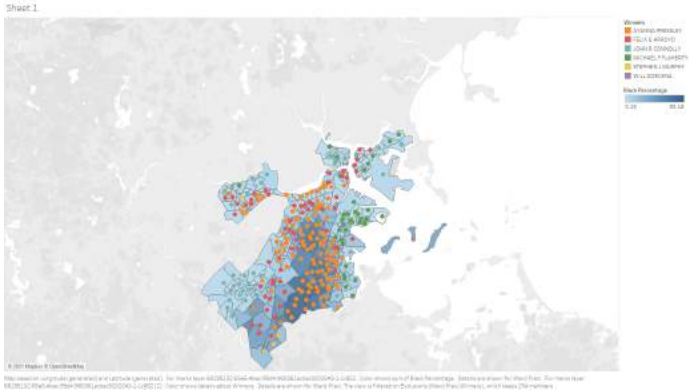


Asian Percentage & Candidates

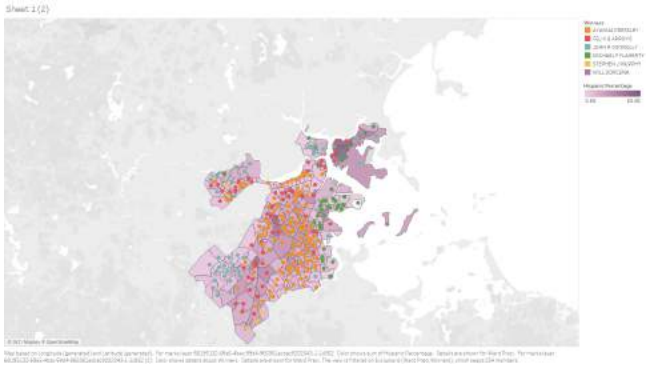


2011 City Council Analysis

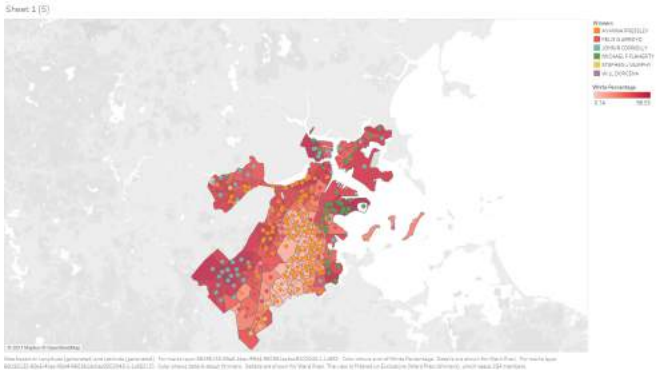
Black Percentage & Candidates



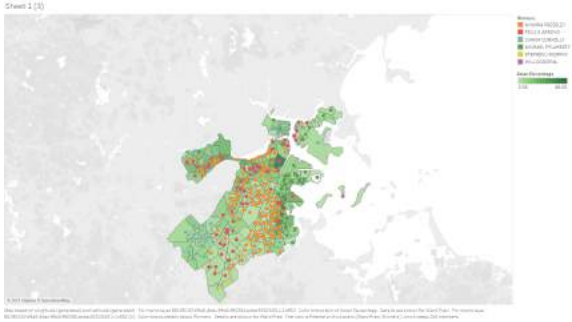
Hispanic Percentage & Candidates



White Percentage & Candidates

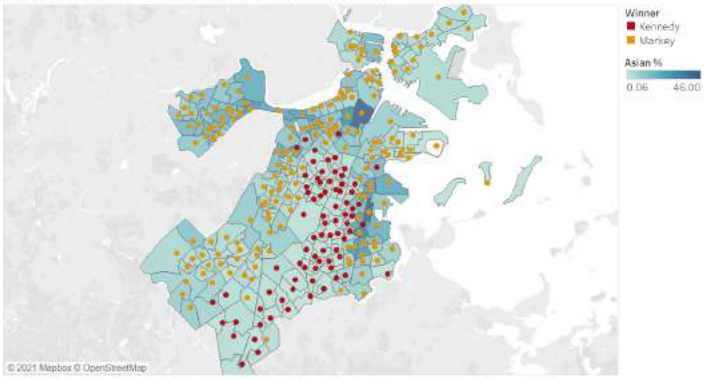


Asian Percentage & Candidates



2020 US Senate Democratic Primary

2020 US Senate Democratic Primary Winners By Precinct

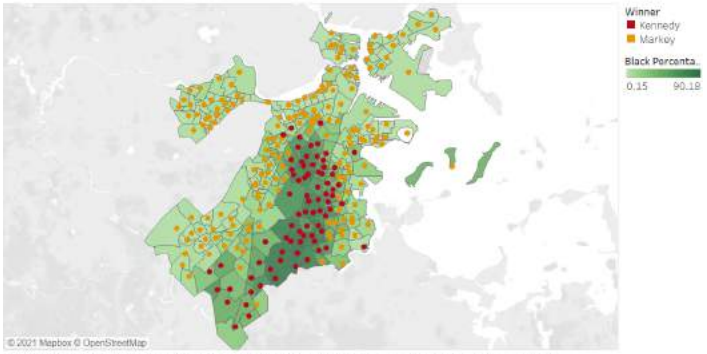


Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci. The view is filtered on Ward Preci, which keeps 255 of 255 members.

2020 US Senate Democratic Primary Winners By Precinct - (White Population)

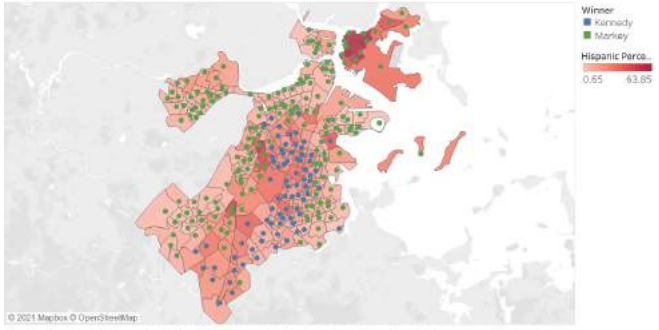
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci. The view is filtered on Winner, which keeps Kennedy and Markey.

2020 US Senate Democratic Primary Winners By Precinct - (Black Population)



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci. The view is filtered on Winner, which keeps Kennedy and Markey.

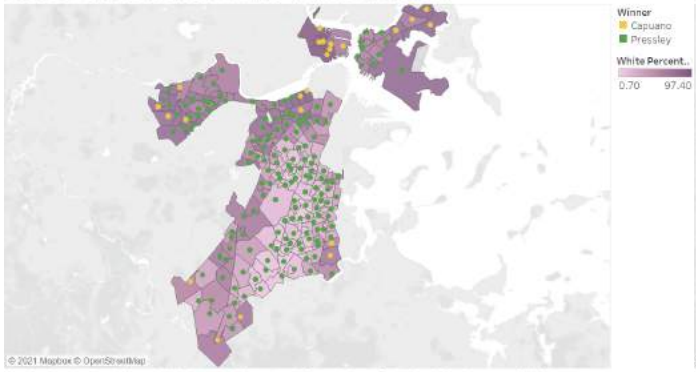
2020 US Senate Democratic Primary Winners By Precinct - (Hispanic Population)



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Winner. Details are shown for Ward Preci. The view is filtered on Winner, which keeps Kennedy and Markey.

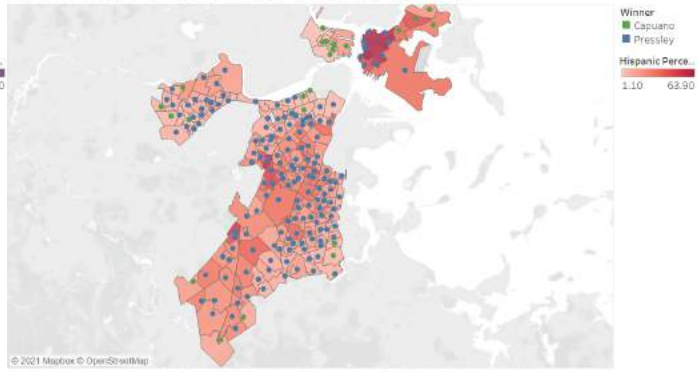
2018 US House Democratic Primary

2018 US House Democratic Primary - (White Population)



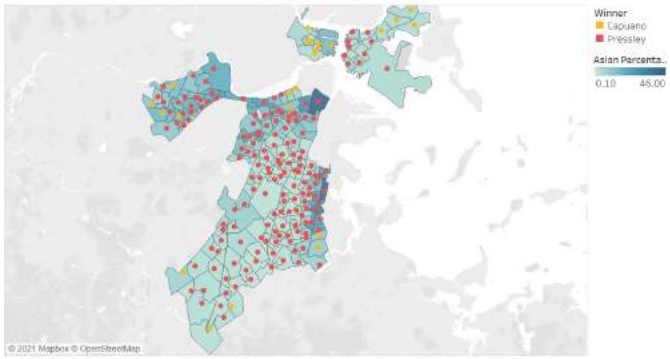
Map based on Longitude (generated) and Latitude (generated). For marks layer Pcnts.shp: Color shows sum of White Percentage. Details are shown for Ward Prec. For marks layer Pcnts.shp (2): Color shows details about Winner. Details are shown for Ward Prec. The view is filtered on Winner, which keeps Capuano and Pressley.

2018 US House Democratic Primary - (Hispanic Population)



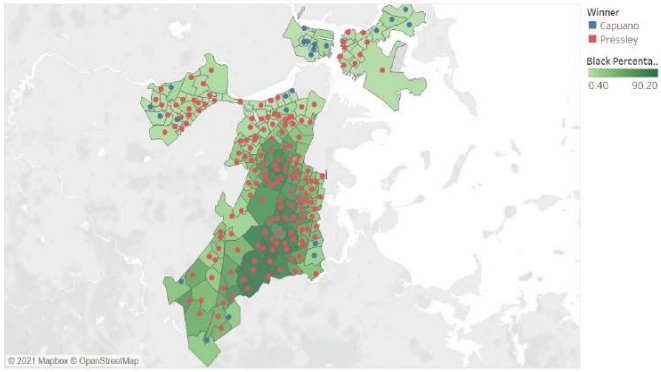
Map based on Longitude (generated) and Latitude (generated). For marks layer Pcnts.shp: Color shows sum of Hispanic Percentage. Details are shown for Ward Prec. For marks layer Pcnts.shp (2): Color shows details about Winner. Details are shown for Ward Prec. The view is filtered on Winner, which keeps Capuano and Pressley.

2018 US House Democratic Primary - (Asian Population)



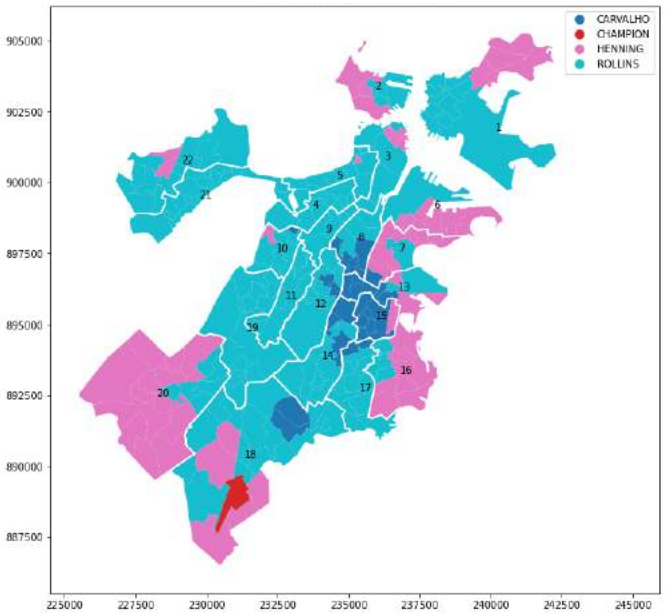
Map based on Longitude (generated) and Latitude (generated). For marks layer Pcnts.shp: Color shows sum of Asian Percentage. Details are shown for Ward Prec. For marks layer Pcnts.shp (2): Color shows details about Winner. Details are shown for Ward Prec. The view is filtered on Winner, which keeps Capuano and Pressley.

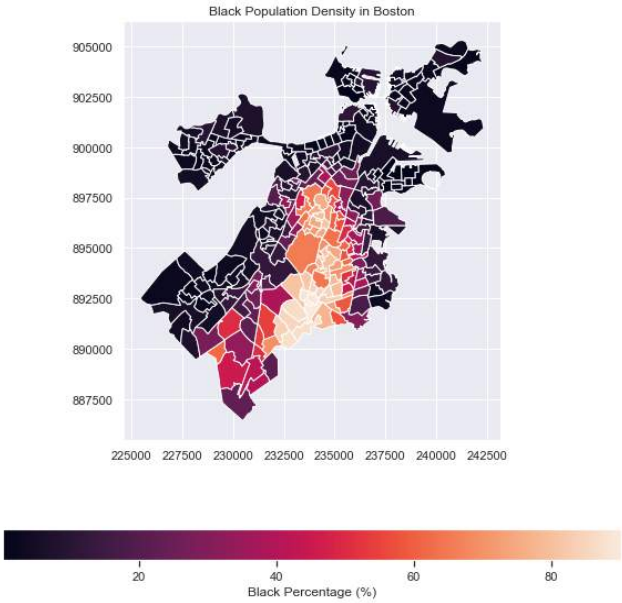
2018 US House Democratic Primary - (Black Population)

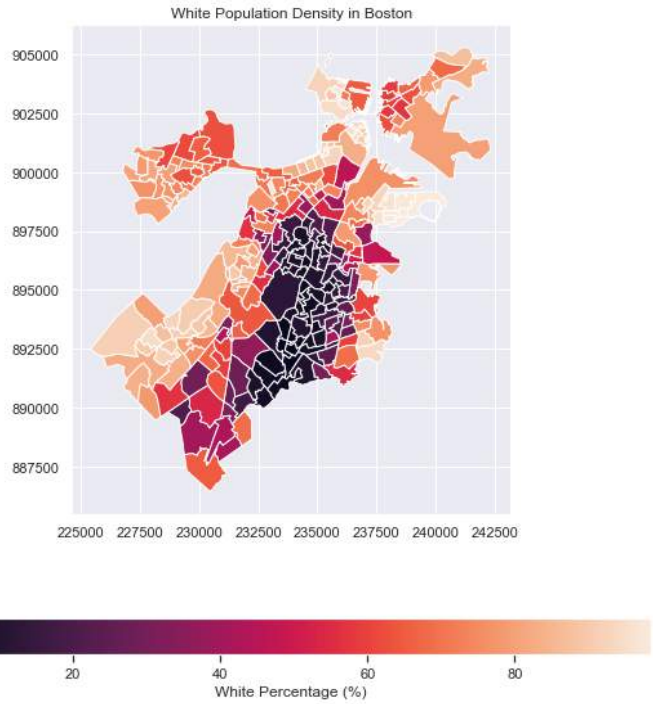


Map based on Longitude (generated) and Latitude (generated). For marks layer Pcnts.shp: Color shows sum of Black Percentage. Details are shown for Ward Prec. For marks layer Pcnts.shp (2): Color shows details about Winner. Details are shown for Ward Prec. The view is filtered on Winner, which keeps Capuano and Pressley.

DA Race 2018


CARVALHO
CHAMPION
HENNING
ROLLINS
905000
902500
900000
897500
895000
892500
890000
887500
225000 227500 230000 232500 235000 237500 240000 242500 245000


Black Population Density in Boston
905000
902500
900000
897500
895000
892500
890000
887500
225000 227500 230000 232500 235000 237500 240000 242500
20
40
60
80
Black Percentage (%)


White Population Density in Boston
905000
902500
900000
897500
895000
892500
890000
887500
225000 227500 230000 232500 235000 237500 240000 242500
20
40
60
80
White Percentage (%)

City Council Turnout Analysis

We examine the change in voter turnout over the various CC election years (2011, 2013, 2015, 2017, and 2019). We are answering an essential question: **How has voter turnout by precinct changed across city council election year**?

Part 1: "Volatility" of Voter Turnout

To begin, we examine the volatility of voter turnout in each election year. Here we are examining the voter turnout of each specific precinct, that is, the percentage of registered voters in a specific precinct who cast a ballot in the election.

First finding the mean:

```
Mean voter turnout 2011: 18.3 %
Mean voter turnout 2013: 38.5 %
Mean voter turnout 2015: 13.9 %
Mean voter turnout 2017: 28.3 %
Mean voter turnout 2019: 9.0 %
```

As we can see, 2013 has the highest average voter turnout.

Then the median:

```
Median voter turnout 2011: 17.0 %
Median voter turnout 2013: 37.3 %
Median voter turnout 2015: 13.5 %
Median voter turnout 2017: 27.8 %
Median voter turnout 2017: 7.6 %
```

Again, 2013 is the highest.

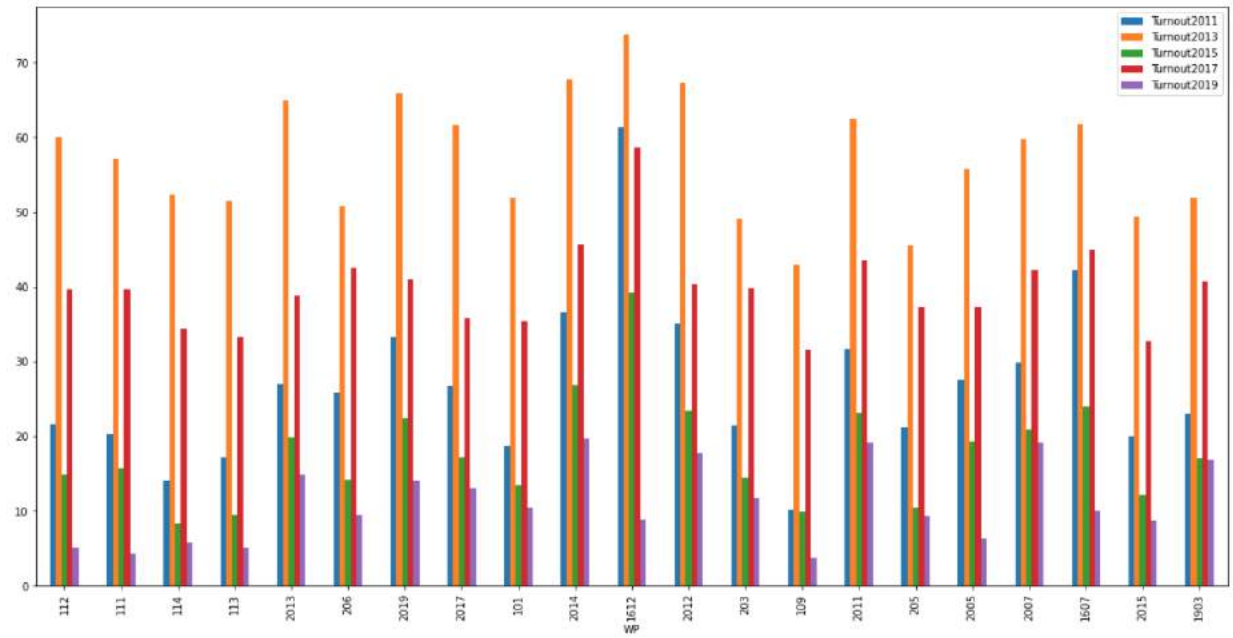
Finding that 2013 and 2017 had the highest voter turnout rates across all precincts due to the fact that they coincided with the Mayoral Elections of those same years.

Next, we determine the "Top 20 Precincts" which have the most volatile voter turnout. That is, have the greatest average change in voter turnout in that specific precinct based on election year. Listed in descending order:

WP	Turnout2011	Turnout2013	Turnout2015	Turnout2017	Turnout2019	AvgChange
112	21.5	60.1	14.8	39.7	5.1	35.8
111	20.3	57.0	15.7	39.7	4.3	34.4
114	14.0	52.4	8.3	34.4	5.7	34.3
113	17.1	51.5	9.5	33.2	5.1	32.1
2013	27.0	64.9	19.8	38.8	14.9	31.5
206	25.8	50.8	14.1	42.5	9.4	30.8
2019	33.2	65.9	22.4	40.9	14.0	30.4
2017	26.7	61.6	17.2	35.8	13.0	30.2
101	18.7	52.0	13.5	35.4	10.5	29.6
2014	36.5	67.8	26.9	45.7	19.7	29.2
1612	61.3	73.8	39.3	58.6	8.9	29.0
2012	35.1	67.3	23.4	40.4	17.7	29.0
203	21.4	49.1	14.4	39.8	11.7	29.0
109	10.2	43.0	9.9	31.5	3.8	28.8
2011	31.7	62.5	23.1	43.5	19.1	28.8
205	21.1	45.5	10.4	37.3	9.3	28.6
2005	27.5	55.8	19.3	37.2	6.3	28.4
2007	29.8	59.7	20.8	42.3	19.2	28.4
1607	42.2	61.8	24.0	44.9	10.0	28.3
2015	20.0	49.4	12.2	32.7	8.7	27.8
1903	23.0	51.9	17.0	40.7	16.9	27.8

Simply from looking at the raw data, we can see that Ward 1 (East Boston), sees a lot of volatility.

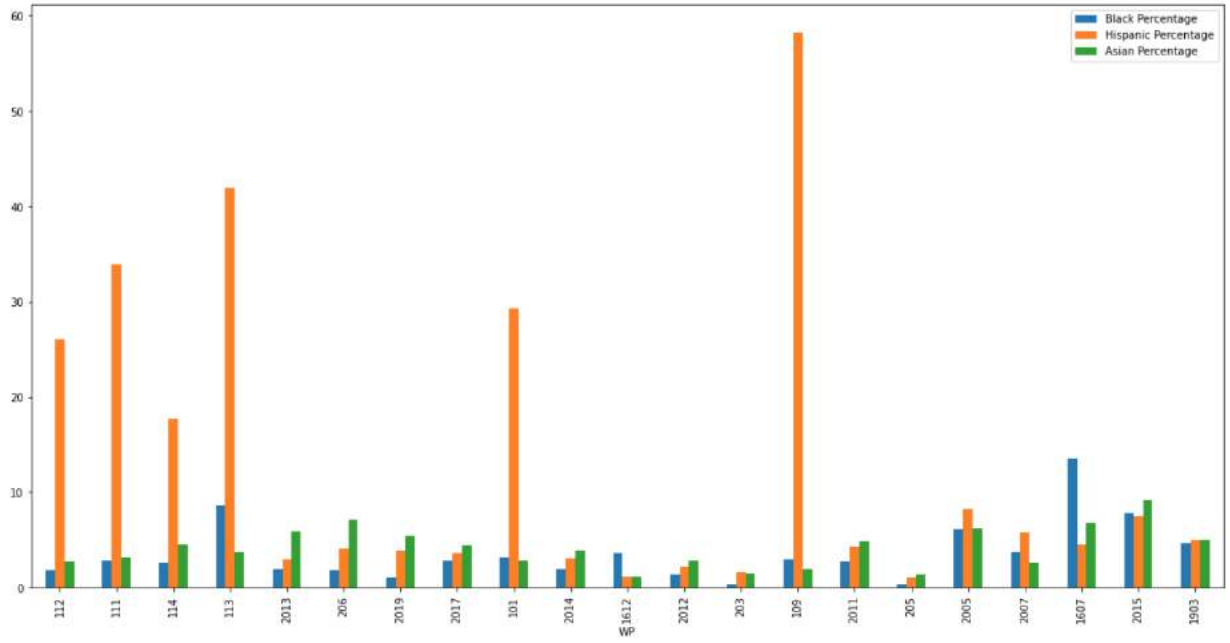
Visualizing this change across elections on a bar chart, we have:



We can clearly see that voter turnout is highly volatile across each of these precincts. Listing the demographic breakdown of each of these precincts:

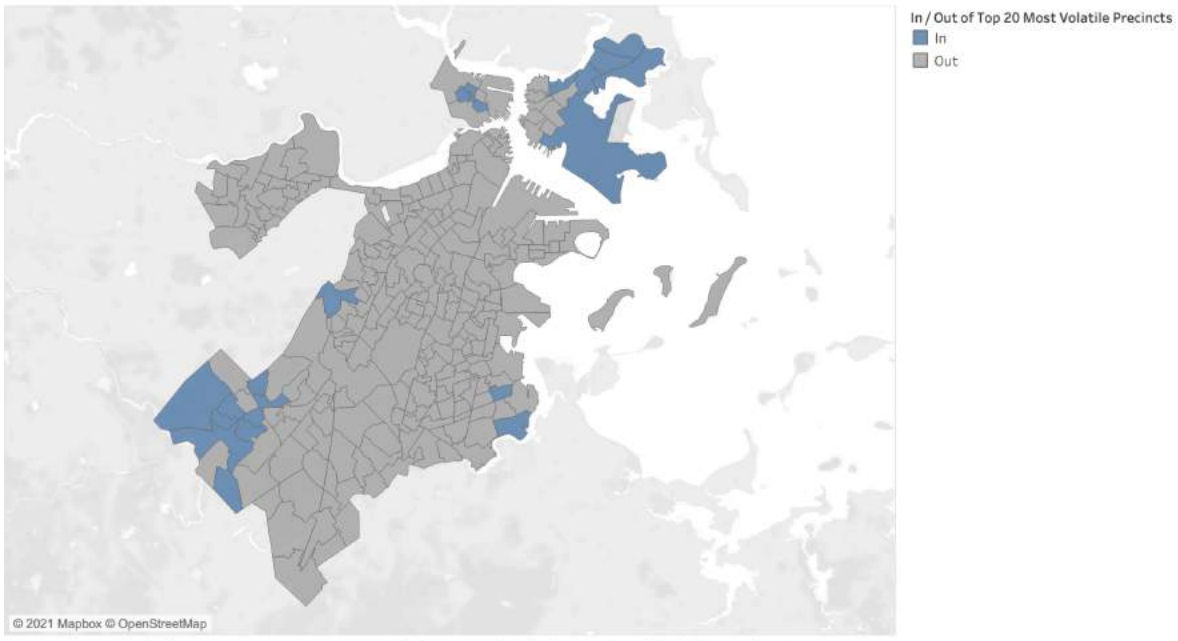
WP	Black Percentage	Hispanic Percentage	Asian Percentage
112	1.8	26.0	2.7
111	2.9	33.9	3.2
114	2.6	17.7	4.5
113	8.6	41.9	3.8
2013	2.0	3.0	5.9
206	1.8	4.1	7.1
2019	1.1	3.9	5.4
2017	2.9	3.6	4.4
101	3.2	29.3	2.9
2014	2.0	3.1	3.9
1612	3.6	1.2	1.2
2012	1.4	2.2	2.9
203	0.4	1.6	1.5
109	3.0	58.3	2.0
2011	2.7	4.3	4.9
205	0.4	1.1	1.4
2005	6.1	8.3	6.2
2007	3.8	5.8	2.6
1607	13.5	4.5	6.8
2015	7.8	7.5	9.1
1903	4.7	5.0	5.0

Now, we do a demographic breakdown of each of these precincts, finding the following:



And viewing these precincts on a Boston map, we again see the concentration of precincts in East Boston as well as a concentration in West Roxbury:

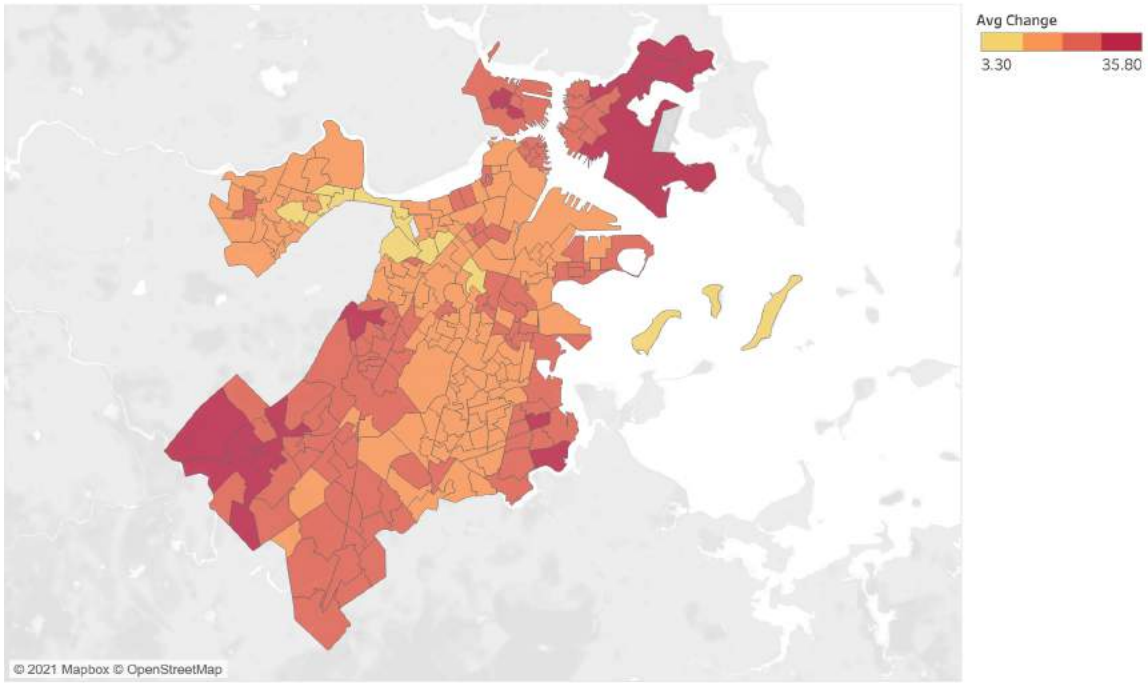
Top 20 Most Volatile Precincts in terms of Voter Turnout (2011-2019)



Map based on Longitude (generated) and Latitude (generated). Color shows details about In / Out of Top 20 Most Volatile Precincts. Details are shown for Ward Preci.

Additionally, we can use a heat map to visualize which districts experience the most volatility across city council elections:

Volatility Heat Map: Average Change in Voter Turnout in City Council Elections from 2011 to 2019



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Avg Change. Details are shown for Ward Preci.

Part 2: Changes in Share of Voter Turnout

We now analyze which precincts experienced the greatest average change in *share of voter turnout* over time. That is, we are analyzing what percentage of the total votes cast for this particular election is from each precinct, and then analyzing the precincts which experienced the greatest change.

Metric: For each precinct, we calculate the percent share of votes: [Number of Ballots Cast in Precinct X]/[Total Ballots Cast in CC Election YYYY] * 100.

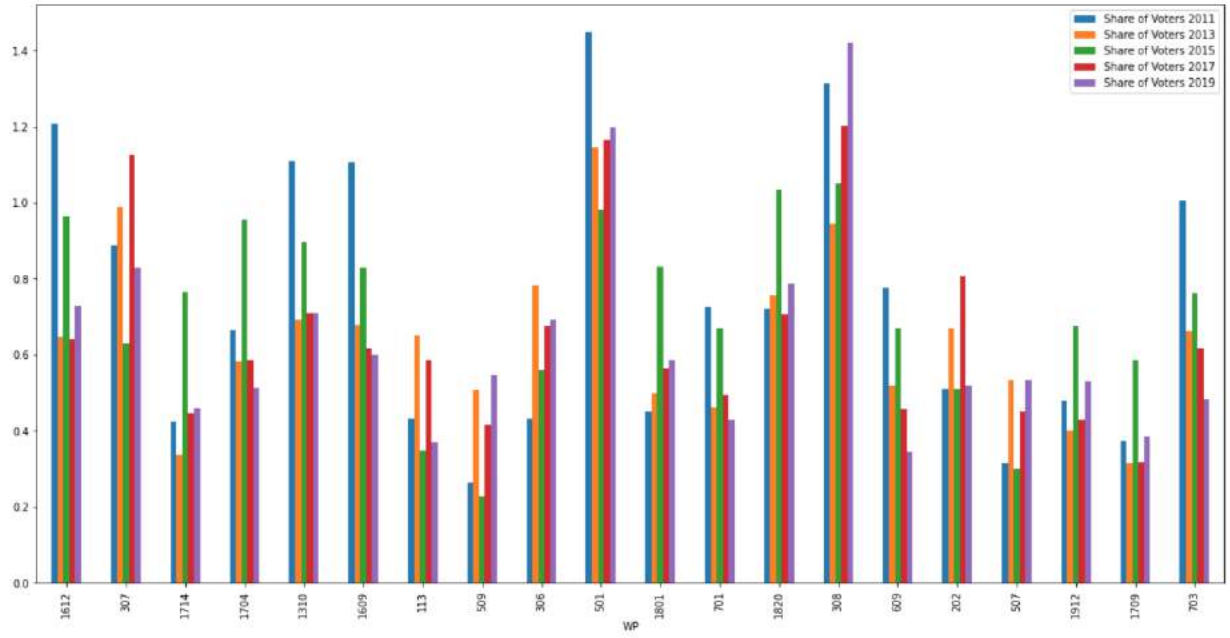
First, we find the top 20 precincts with the greatest average change in share of voters across each election. Note that these top 20 could be experiencing either significant negative or positive change.

Looking at the raw data:

WP	Share of Voters 2011	Share of Voters 2013	Share of Voters 2015	Share of Voters 2017	Share of Voters 2019	AvgChange
1612	1.20712	0.64750	0.96486	0.64263	0.72872	0.29980
307	0.88745	0.98822	0.62943	1.12690	0.82983	0.23926
1714	0.42305	0.33577	0.76557	0.44468	0.45974	0.20949
1704	0.66479	0.58388	0.95499	0.58646	0.51404	0.20514
1310	1.11010	0.69274	0.89580	0.70799	0.70979	0.20206
1609	1.10533	0.67860	0.82871	0.61685	0.60071	0.19717
113	0.43259	0.65104	0.34727	0.58646	0.37009	0.19035
509	0.26401	0.50613	0.22691	0.41430	0.54591	0.17718
306	0.43259	0.78181	0.56037	0.67485	0.69236	0.17128
501	1.44886	1.14656	0.98064	1.16556	1.19892	0.16329
1801	0.45168	0.49906	0.83266	0.56253	0.58576	0.16278
701	0.72523	0.46230	0.66889	0.49440	0.42836	0.16100
1820	0.71886	0.75707	1.03392	0.70523	0.78600	0.16094
308	1.31209	0.94298	1.04970	1.20239	1.41858	0.15713
609	0.77612	0.51744	0.66889	0.45573	0.34369	0.15582
202	0.51052	0.67012	0.51104	0.80558	0.51852	0.15330
507	0.31490	0.53228	0.29992	0.45021	0.53197	0.15001
1912	0.47871	0.40080	0.67481	0.42903	0.52848	0.14943
1709	0.37216	0.31456	0.58602	0.31763	0.38304	0.14936
703	1.00673	0.66022	0.76163	0.61593	0.48116	0.14840
1703	0.44372	0.45947	0.75965	0.49532	0.48365	0.14507

From the raw data, we can see that some of the top 20 precincts that experienced the greatest average change had a significant decrease in the share of voters (Example: WP 703), while others like WP 509 saw significant dips up and down across election year.

Visualizing, on a bar chart, the percent share of voters of each of these top 20 precincts:

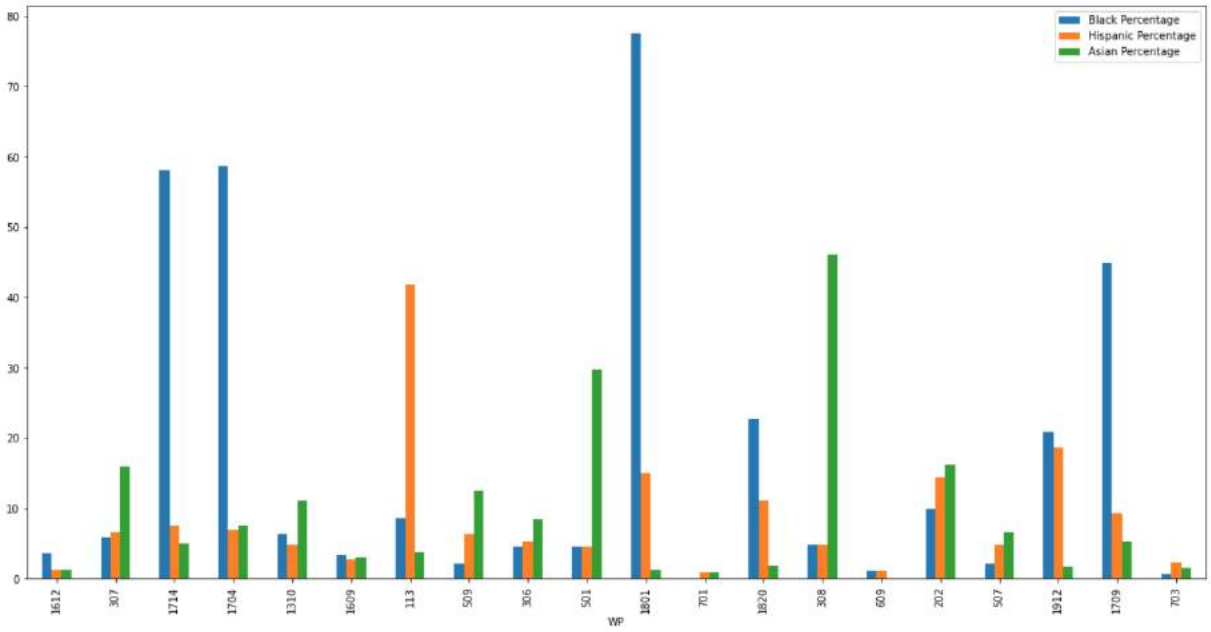


We can clearly see that the voter turnout has changed dramatically across each election in each of these precincts.

Listing the demographic breakdown of these precincts:

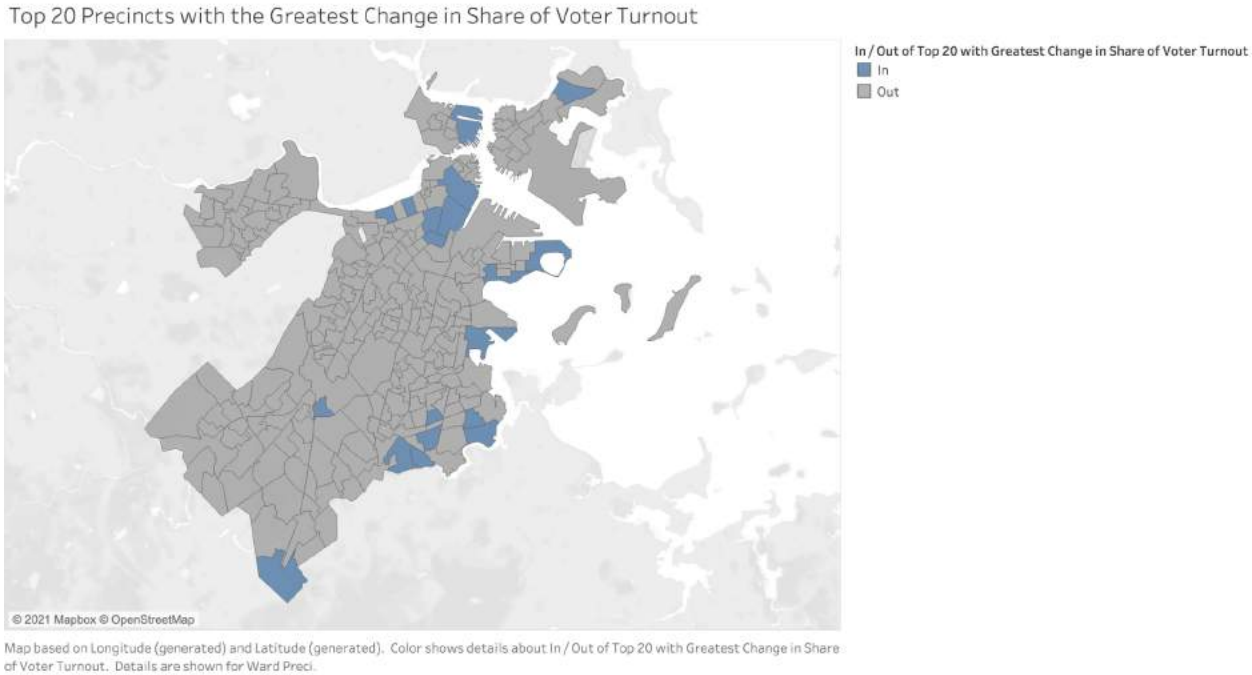
WP	Black Percentage	Hispanic Percentage	Asian Percentage
1612	3.6	1.2	1.2
307	5.9	6.6	15.9
1714	58.1	7.5	5.0
1704	58.7	6.9	7.6
1310	6.3	4.9	11.2
1609	3.3	2.7	3.1
113	8.6	41.9	3.8
509	2.2	6.4	12.5
306	4.6	5.3	8.5
501	4.6	4.5	29.7
1801	77.6	15.0	1.2
701	0.1	0.9	0.9
1820	22.7	11.1	1.8
308	4.8	4.9	46.0
609	1.1	1.1	0.1
202	9.9	14.5	16.2
507	2.1	4.8	6.7
1912	20.9	18.7	1.7
1709	44.9	9.4	5.3
703	0.7	2.3	1.5

Now, visualizing the demographic breakdown of each of these precincts:



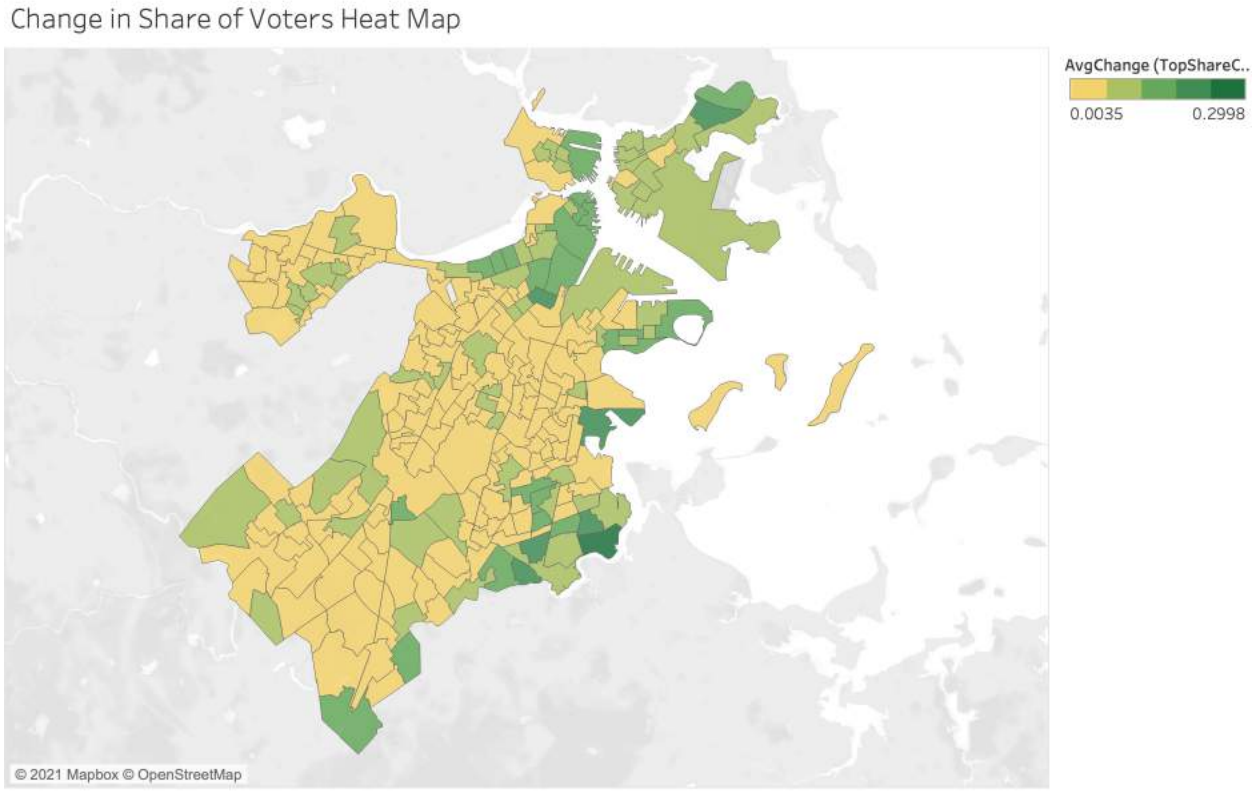
Here, we see the demographic breakdown of those districts which experienced the greatest AVERAGE change in share of total percentage of votes for each city council election. Here, we see that precints with a significant Black population seem to experience a significant average change.

Visualizing on a map the geographic distribution of each of these precincts:



Here, we see that these precincts are a bit more scattered across Boston, but there is a slight concentration in Ward 17, an area of Dorchester. From our previous analysis, we also found that these same districts have a high Black population.

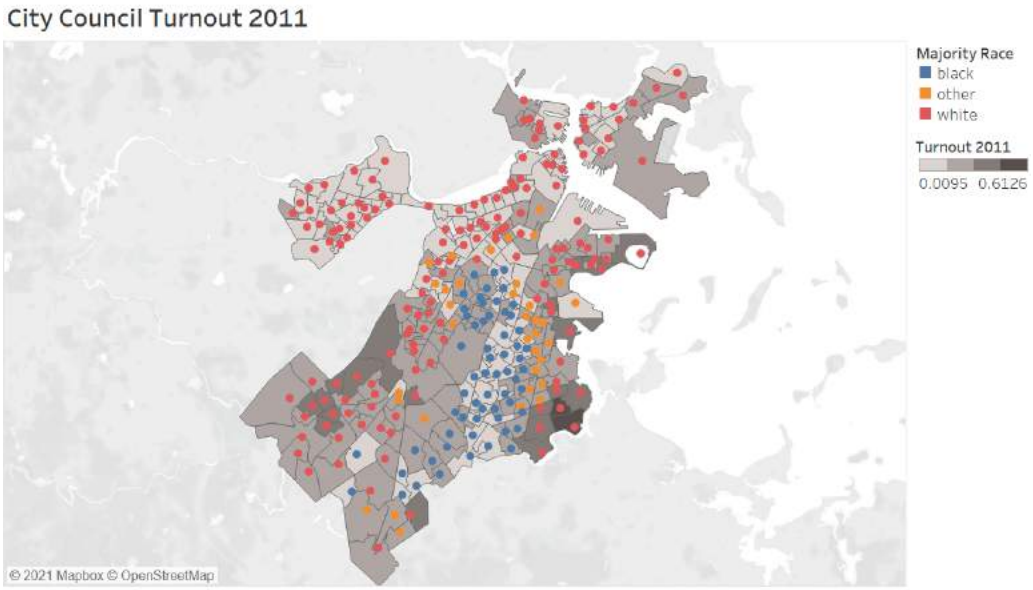
Viewing this information on a heat map:



Here, the greens indicated those districts which have experienced a measurable change in share of total voter turnout. As we can observe, a lot of the intense green is concentrated in the Dorchester neighborhoods, as well as near downtown Boston, Seaport, and East Boston.

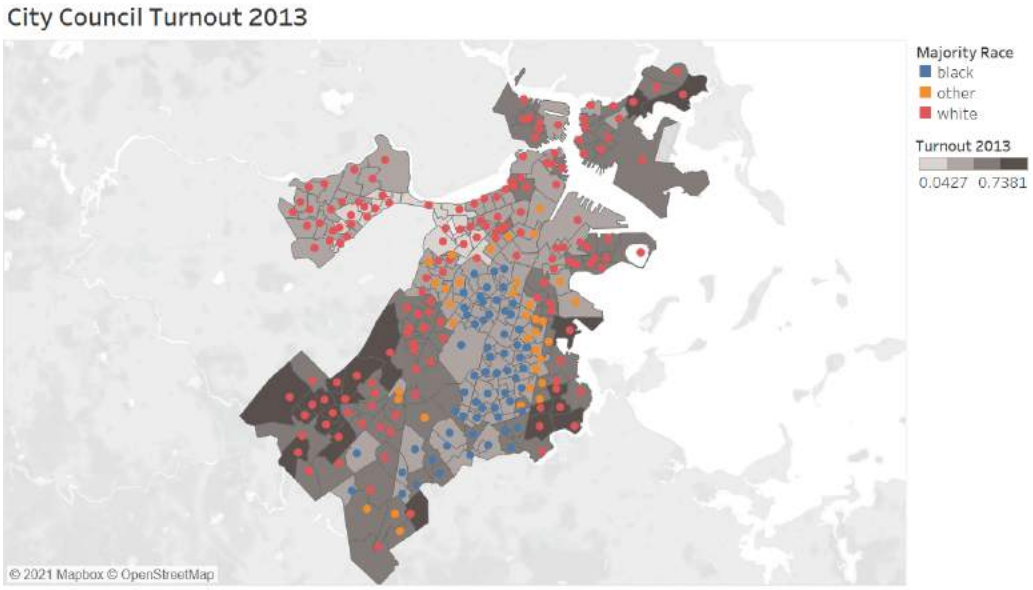
Part 3: Visualizing the Change in Voter Turnout in Majority White/African American Precincts

Analyzing City Council turnout by precinct, based on the majority race of that precinct, we find that in 2011, white population had much higher turnouts:



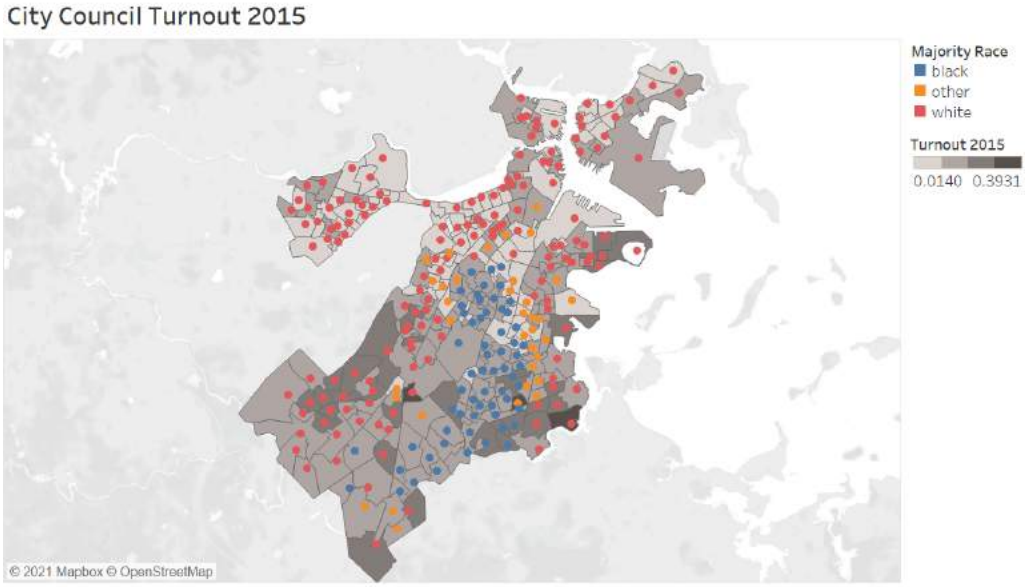
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2011. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

Similarly in 2013, but this time different precincts with majority of whites are having very high turnout rate:



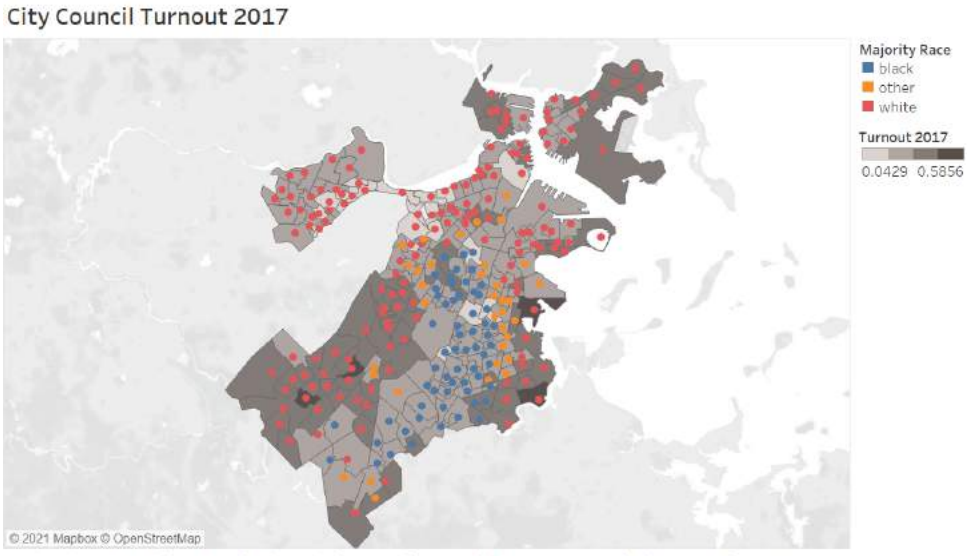
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2013. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

In 2015 however, we saw some majority black precincts show higher turnouts in relative terms, compared to white as you can see below:



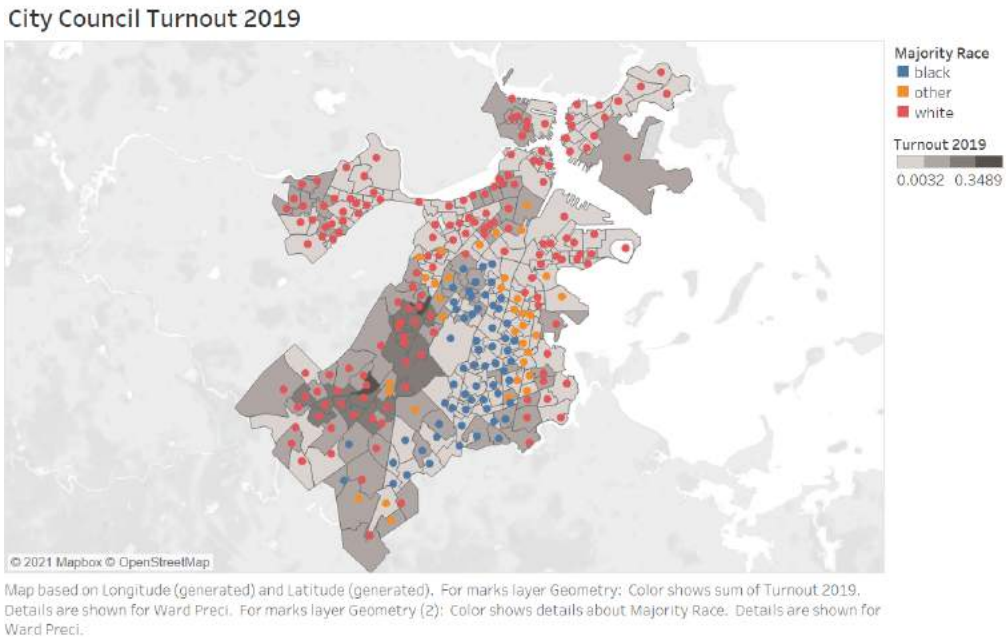
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2015. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

In 2017, we see different majority-black precincts with higher turnouts compared to previous years:



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2017. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

Finally, in 2019 overall turnout has decreased significantly compared to previous years:



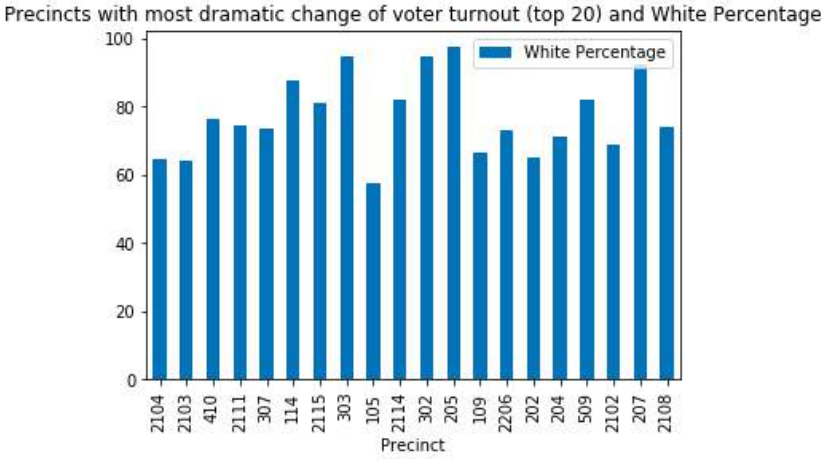
Overall, the turnouts fluctuate from year to year, and as we can see in 2011 the turnout rate ranged from 0.0095-0.612, and in 2013 the range is 0.0427-0.7381, in 2015 the range is 0.014-0.393, in 2017 the range is 0.0429-0.5856, and finally in 2019 the range 0.0032-0.3489. So, clearly there is huge overall fluctuation in turnouts.

On relative terms, the turnout trend for majority black precincts tends to increase across the years, while for majority white precincts is volatile, pretty much reflecting overall fluctuations.

Part 4: How has Michael F. Flaherty's performance changed across districts with large white populations?

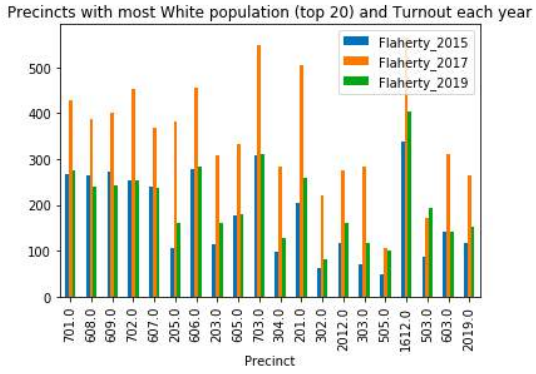
In this section, we are going to find some relations between Michael F. Flaherty's performance and districts with large white populations.

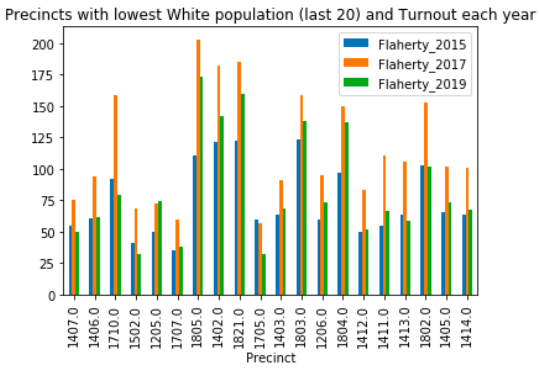
To begin, we made a graph of precincts with the most dramatic change of voter turnout across different races, and printed out the average turnout change for each year. (Flaherty is in the election from 2015 to 2019.)



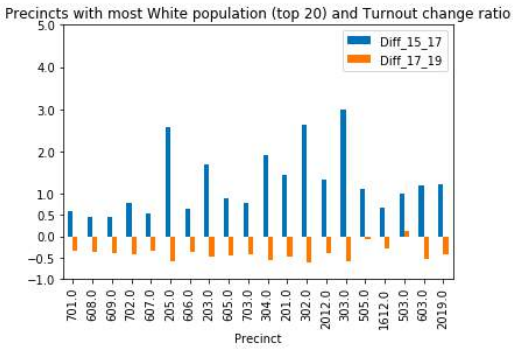

```
Average Turnout Change from 2015 to 2017: 1.1188888888888888
Average Turnout Change from 2017 to 2019: -0.3228571428571428
Average Turnout Change from 2015 to 2019: 0.39827777777777773
```

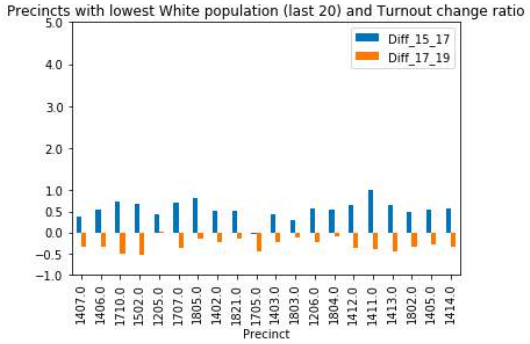
From the graph above, we can see that precincts with the greatest average change in *share of voter turnout* over time have a relatively large white population (all above 50%). Although Flaherty lost some supporters in 2019, in general, he still had more supporters in 2019 than in 2015.



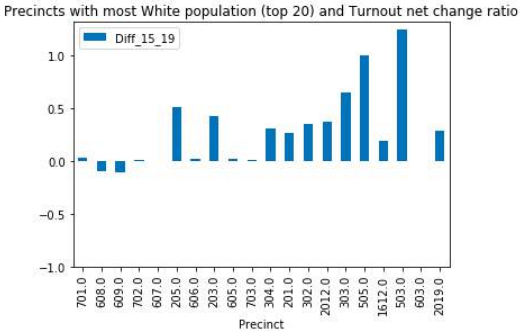


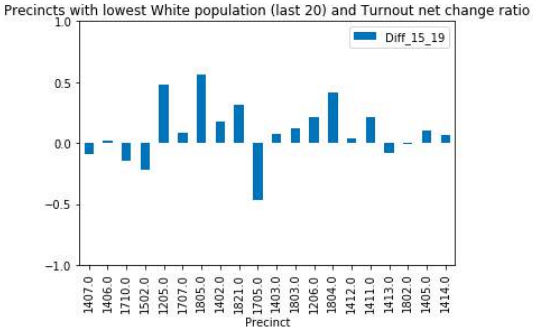
Proven by the graph, He is most popular in 2017 among precincts with more white voters than 2013 and 2019. In 2017, more people voted for him. In 2019, however, he lost this key demographic's support.





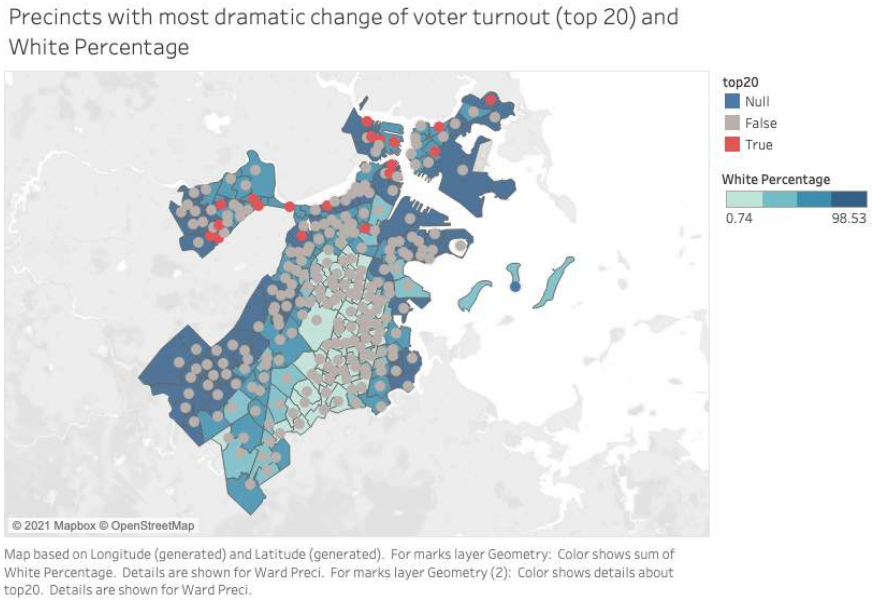
The gain and loss of supporters in precincts with smaller white populations is not as dramatic as that in precincts with larger white populations.





From 2015 to 2019, he gained more supporters in precincts that majorities are white and lost some supporters in districts with fewer white residents.

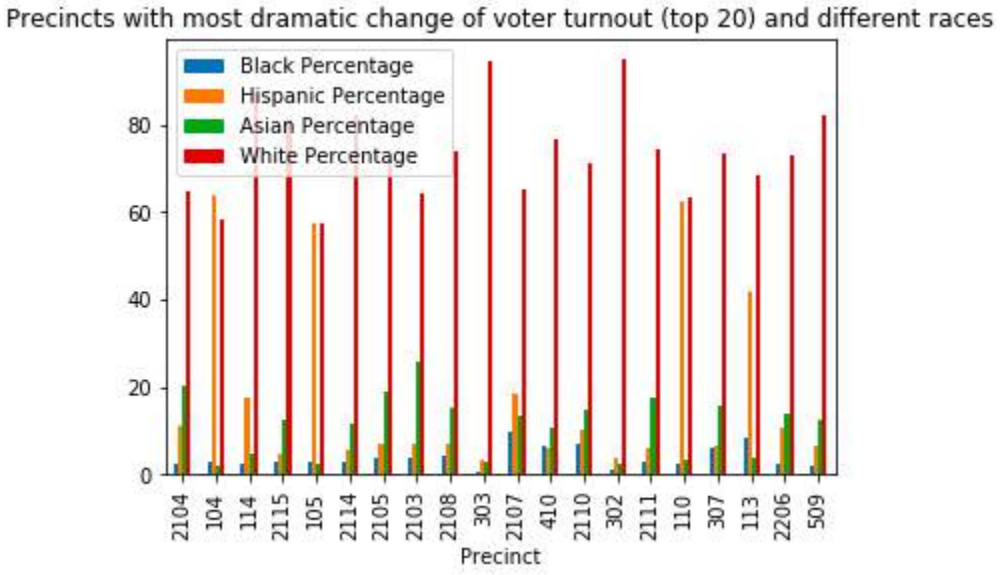
Visualizing it in actual map:



Part 5: How has Michelle Wu's performance changed over time?

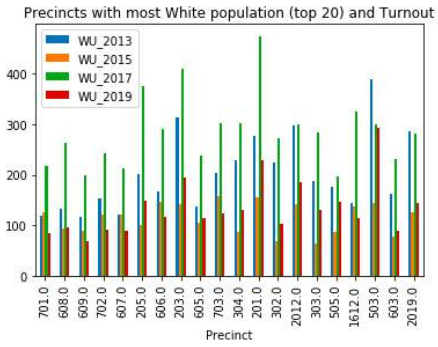
In this section, we will try to find the correlation between Michelle Wu's most dramatic change of voter turnout and different racial demographics.

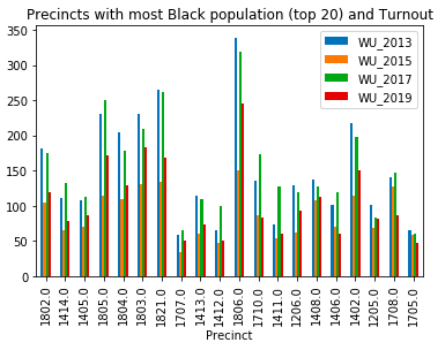
To begin our analysis, we made a graph of precincts with the most dramatic change of voter turnout across different races. We also printed out the average turnout change for each year. (Wu is in the election from 2013 to 2019.)

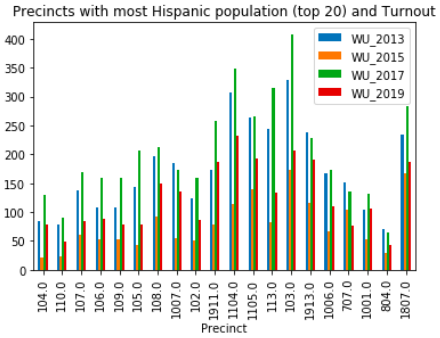


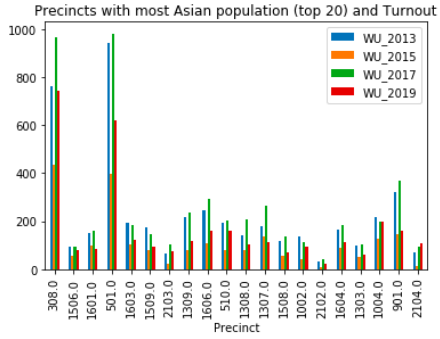

```
Average Turnout Change from 2013 to 2015: -0.5017588932806326
Average Turnout Change from 2015 to 2017: 1.424488095238095
Average Turnout Change from 2017 to 2019: -0.34796031746031747
Average Turnout Change from 2013 to 2019: -0.28663241106719384
```

I found that, in general, she has fewer supporters in 2019 than in 2013. Only in 2017, she had more supporters than the last election (2015). In other years, she had fewer supporters than last elections. 19 out of 20 Precincts with the most dramatic change of voter turnout are with the most white population.

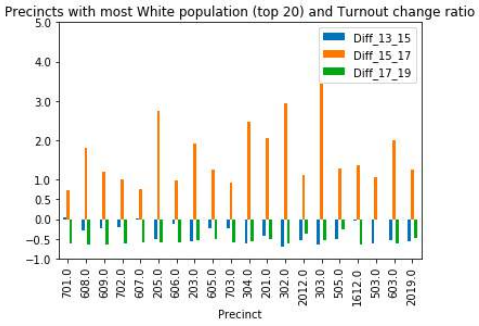


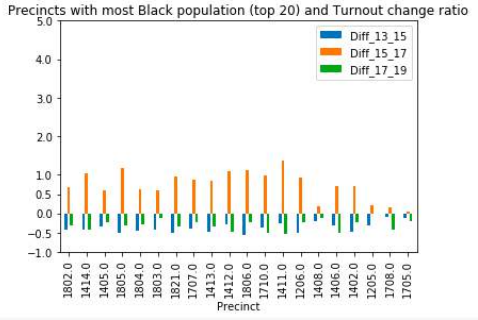


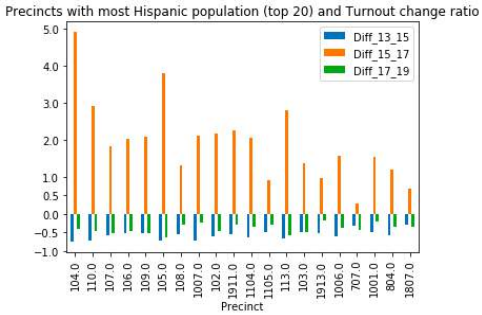


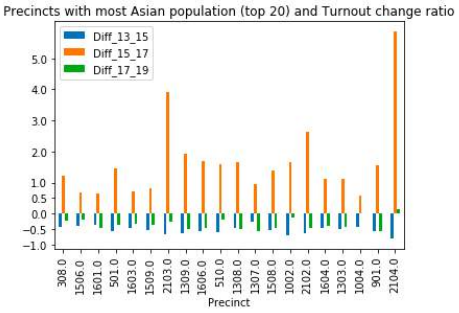


From the graphs, we can see that Wu has more supporters in precincts with more aisn population. Especially in precinct 0308 and 0501, almost 1000 voters voted for her in 2017.









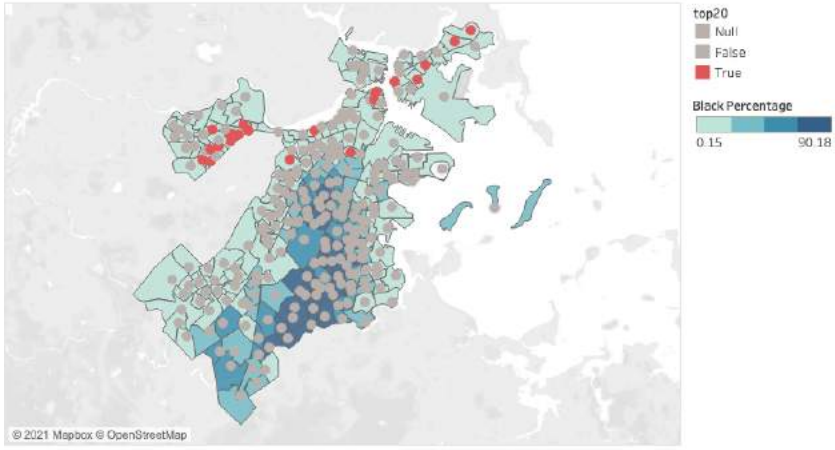
Precincts with the most Black population are the least dramatic on turnout change ratio than the other races.

Visualizing it on an actual map:

Precincts with most dramatic change of voter turnout (top 20) and Asian Percentage

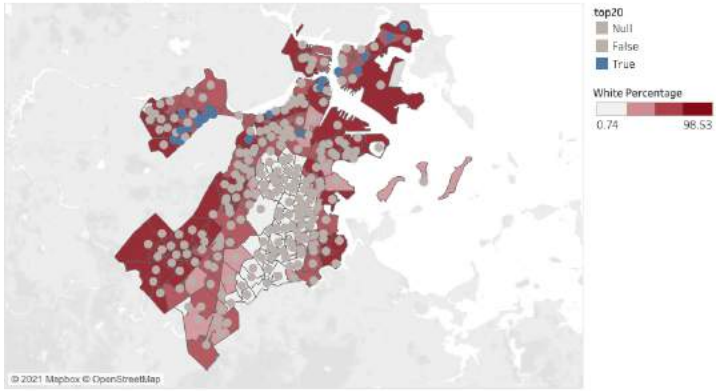
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

Precincts with most dramatic change of voter turnout (top 20) and Black Percentage



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

Precincts with most dramatic change of voter turnout (top 20) and White Percentage



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of White Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

Precincts with most dramatic change of voter turnout (top 20) and Hispanic Percentage

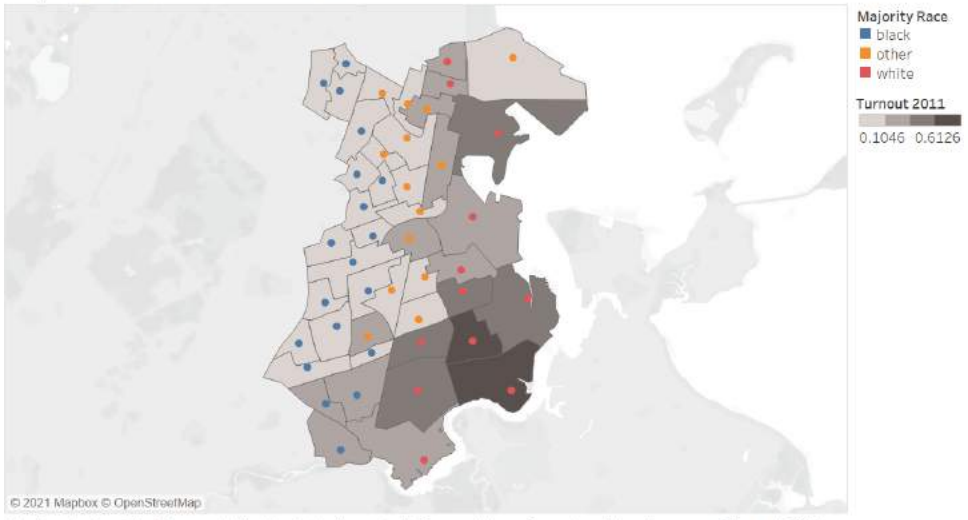
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

Part 6: Changes in District 3 (Wards 13, 15, 16, and 17) Specifically

We break down our findings to focus specifically on District 3, which encompasses Wards 13, 15, 16, and 17.

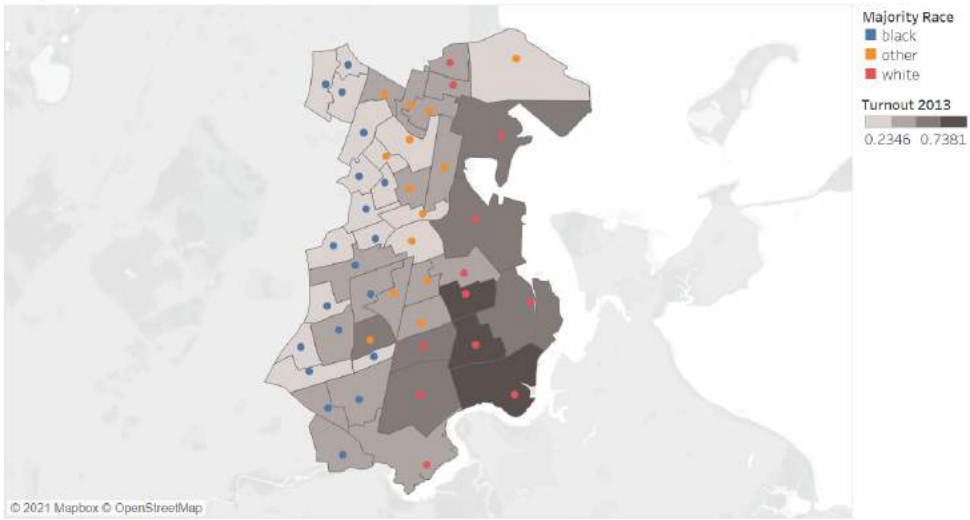
First, we look at all those areas, and compare turnout across the years in the following maps:

City Council 2011 Turnout for District 3



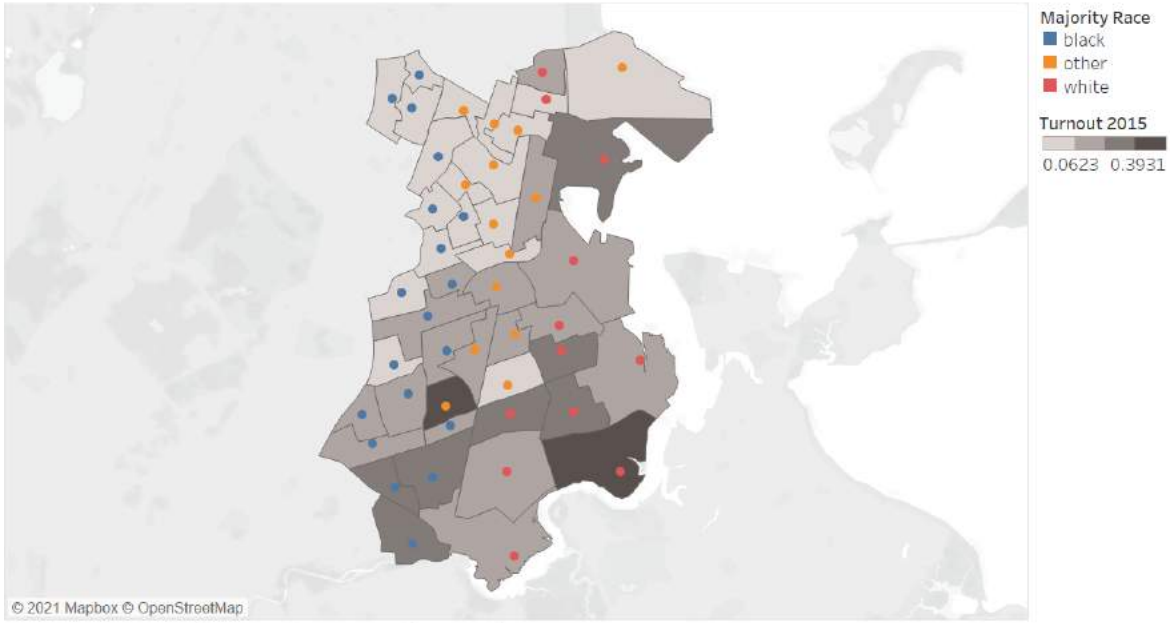
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2011. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

City Council 2013 Turnout for District 3



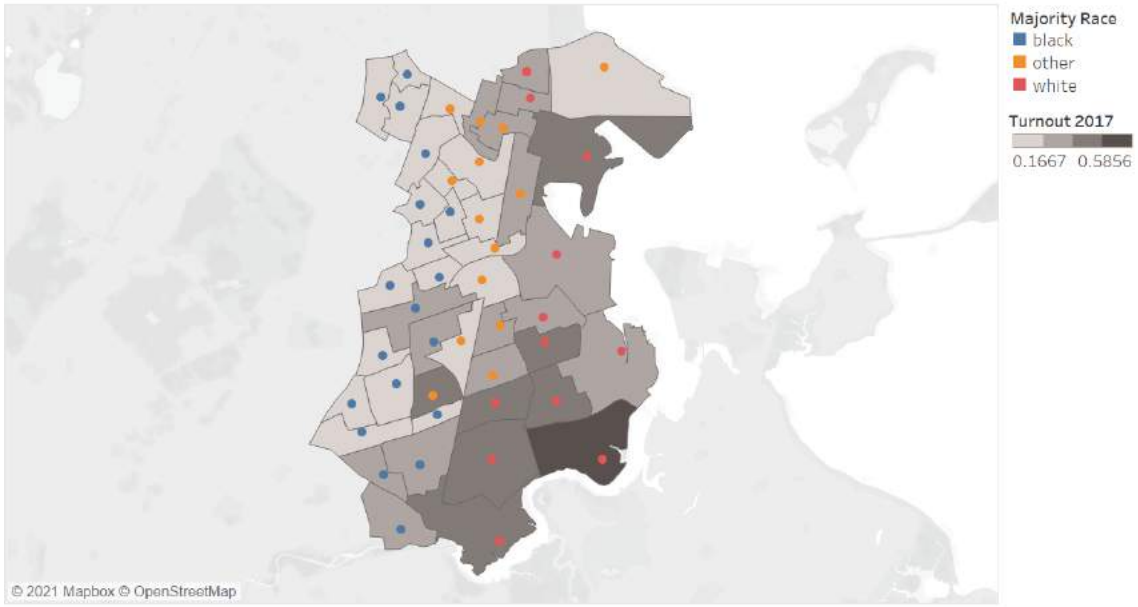
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2013. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

City Council 2015 Turnout for District 3



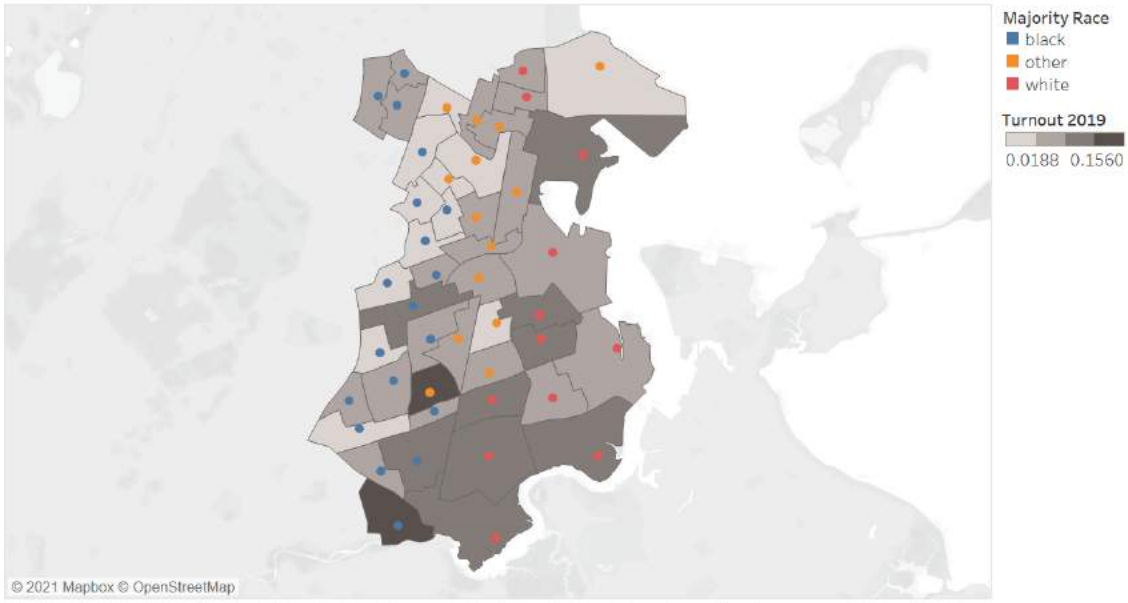
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2015. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

City Council 2017 Turnout for District 3



Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2017. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

City Council 2019 Turnout for District 3



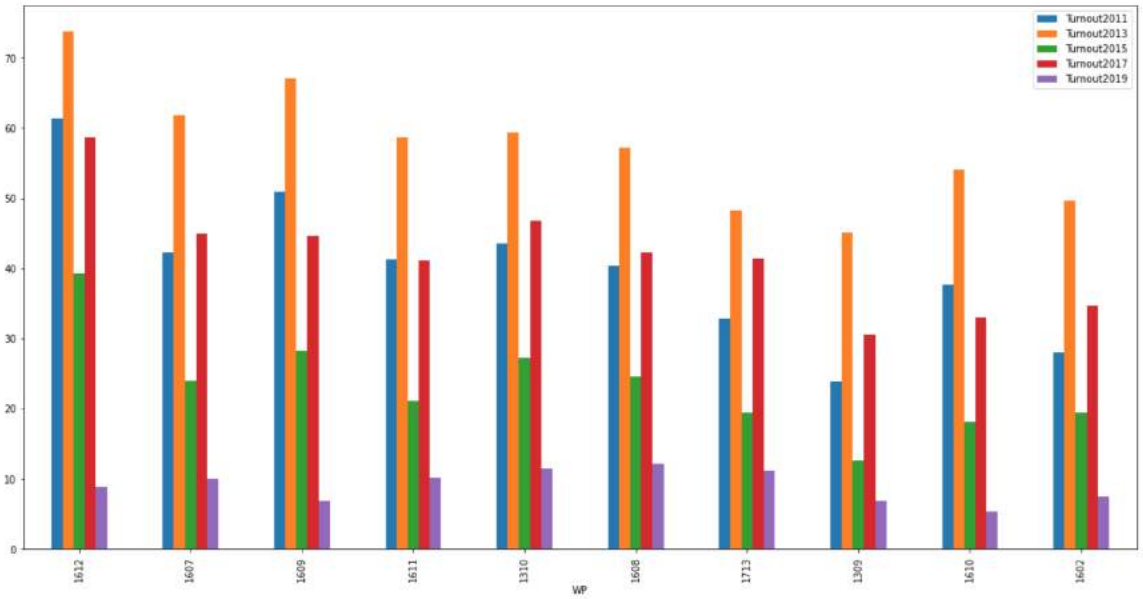
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2019. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

We find that for different years, different precincts have different turnouts, but the constant factor is the southern areas usually have much higher turnouts compared to northern ones on the above maps. On the racial side of things, precincts with majority blacks are continuously improving their turnouts, as you can see on the left side of the maps.

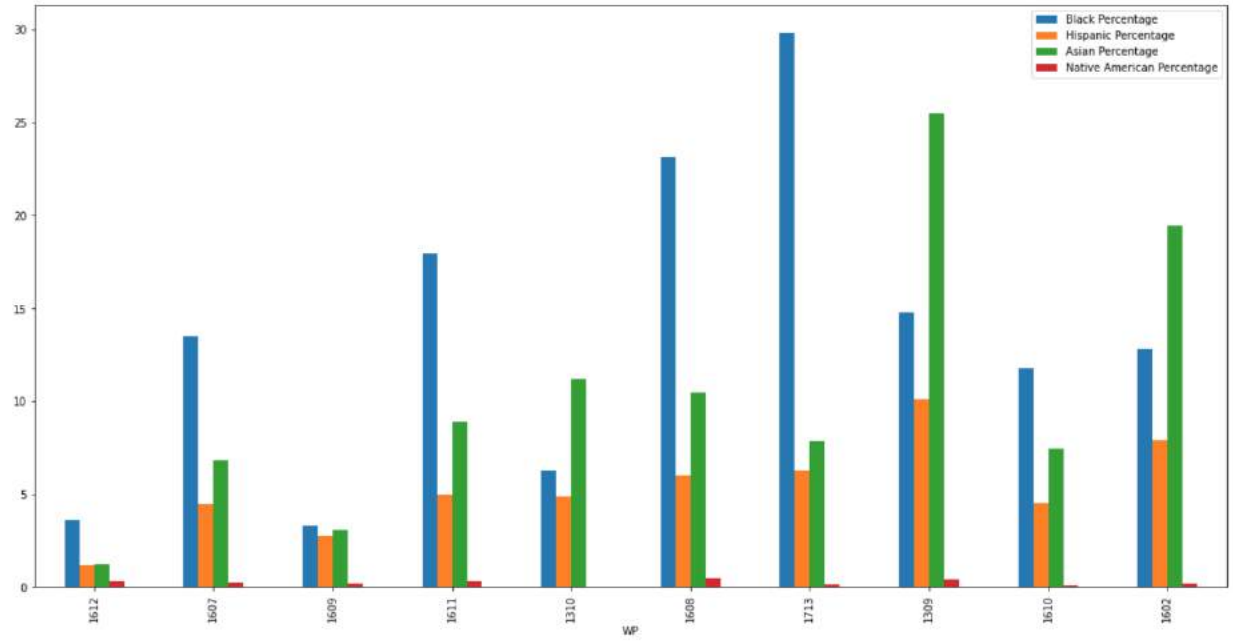
Second, we find the top 10 precincts with the greatest volatility across city council election year in District 3:

WP	Turnout2011	Turnout2013	Turnout2015	Turnout2017	Turnout2019	AvgChange
1612	61.3	73.8	39.3	58.6	8.9	29.0
1607	42.2	61.8	24.0	44.9	10.0	28.3
1609	51.0	67.0	28.2	44.7	6.9	27.3
1611	41.2	58.7	21.1	41.1	10.2	26.5
1310	43.5	59.4	27.3	46.8	11.5	25.7
1608	40.4	57.2	24.6	42.3	12.1	24.3
1713	32.8	48.2	19.5	41.4	11.1	24.1
1309	23.8	45.1	12.6	30.5	6.9	23.8
1610	37.7	54.1	18.2	33.0	5.3	23.7
1602	28.0	49.7	19.4	34.7	7.5	23.6

Visualizing the volatility:



And finally, looking at the demographic breakdown of each of these top precincts:

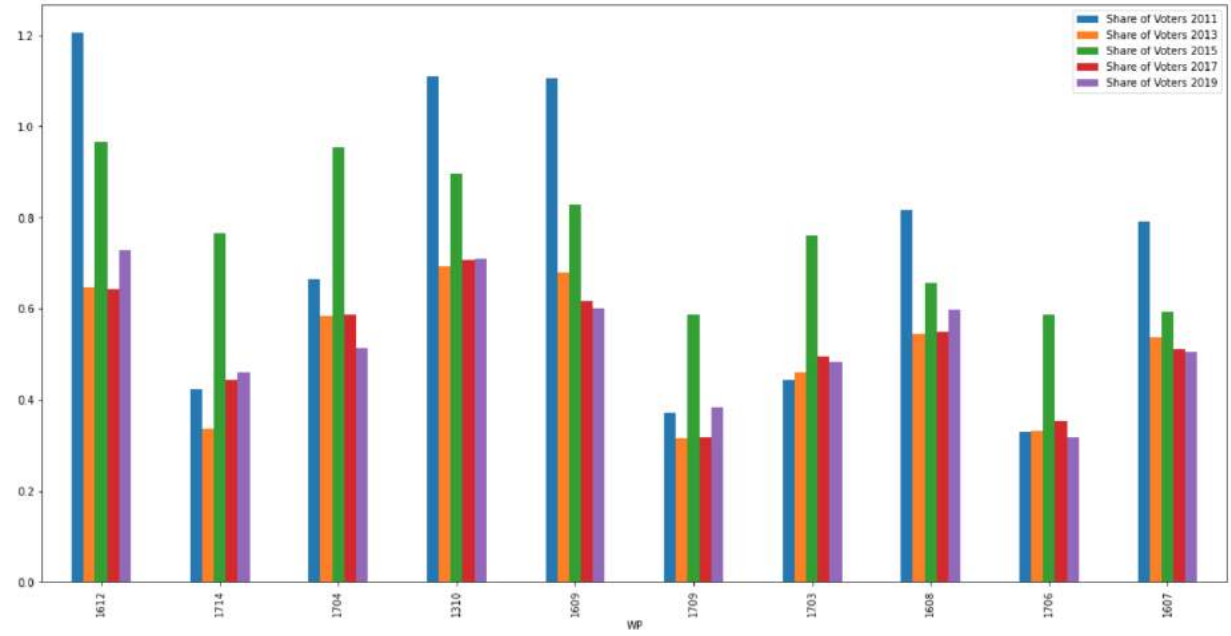


As we can see, about 3 of these precincts have a sizable black population, while two have a sizable Asian population. However, most have a majority white population.

Now, for the same subset of District 3 wards, we determine the top 10 precincts with the greatest change in share of voter turnout from 2011 to 2019:

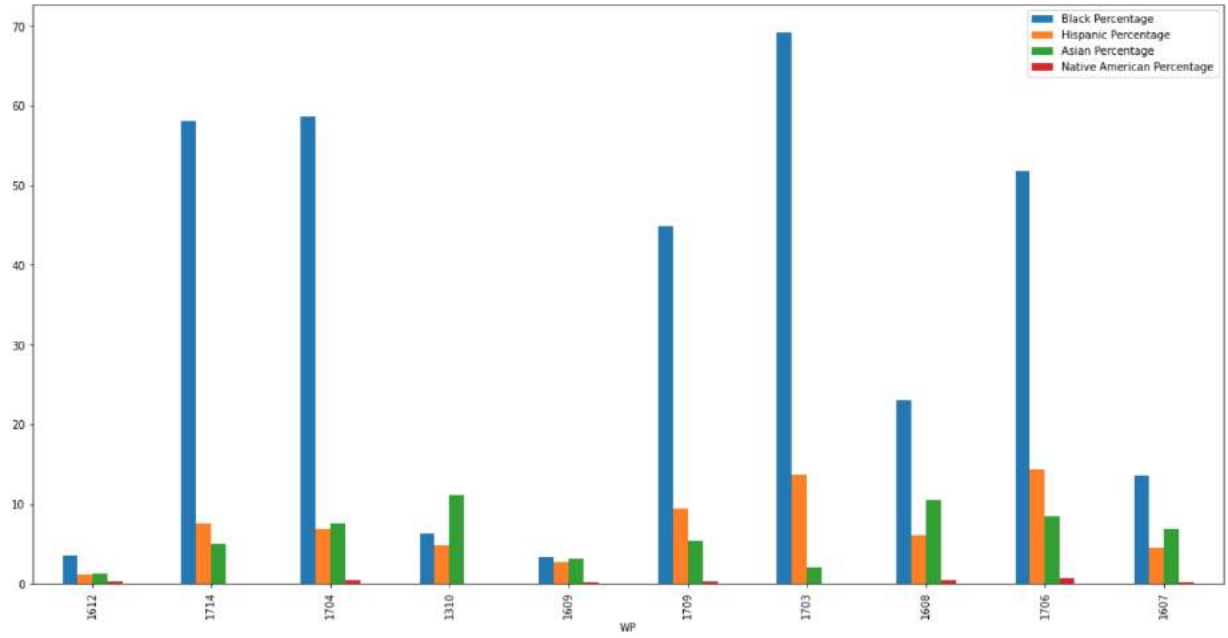
WP	Share of Voters 2011	Share of Voters 2013	Share of Voters 2015	Share of Voters 2017	Share of Voters 2019	AvgChange
1612	1.20712	0.64750	0.96486	0.64263	0.72872	0.29980
1714	0.42305	0.33577	0.76557	0.44468	0.45974	0.20949
1704	0.66479	0.58388	0.95499	0.58646	0.51404	0.20514
1310	1.11010	0.69274	0.89580	0.70799	0.70979	0.20206
1609	1.10533	0.67860	0.82871	0.61685	0.60071	0.19717
1709	0.37216	0.31456	0.58602	0.31763	0.38304	0.14936
1703	0.44372	0.45947	0.75965	0.49532	0.48365	0.14507
1608	0.81747	0.54430	0.65705	0.54872	0.59821	0.12356
1706	0.32921	0.33294	0.58602	0.35354	0.31878	0.12232
1607	0.79202	0.53581	0.59391	0.51189	0.50407	0.09908

Visualizing how this share has changed over each year on a bar chart:



As we can see, the share of voters in Ward-Precinct 16-12 really fluctuates across the City Council election years, while Ward-Precinct 16-09's share of total votes cast has really dropped off since 2011. 17-06, on the other hand, stays steady across most city council elections except 2015.

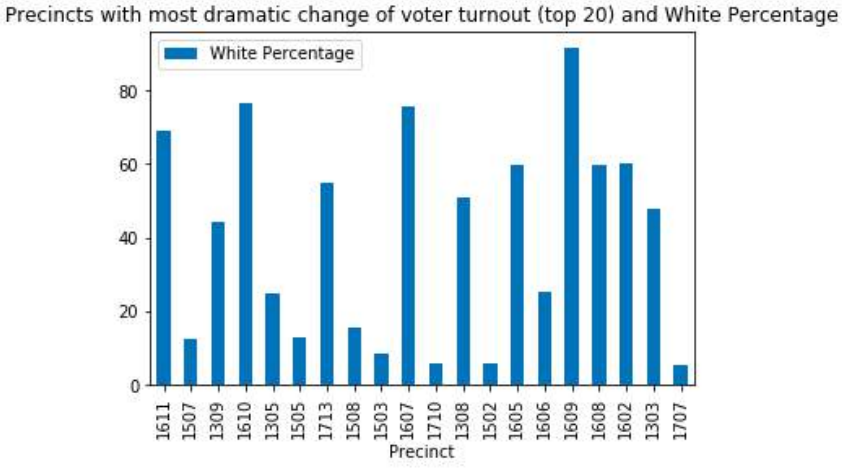
Now, for the demographic breakdown of each of these precincts:



In an interesting contrast to the volatility findings, we find that those precincts in District 3 with the greatest change in share of voter turnout across the City Council election years either have large African american populations or are majority white.

Now, we focus on Michael F. Flaherty's performance changed in district 3 with large white populations.

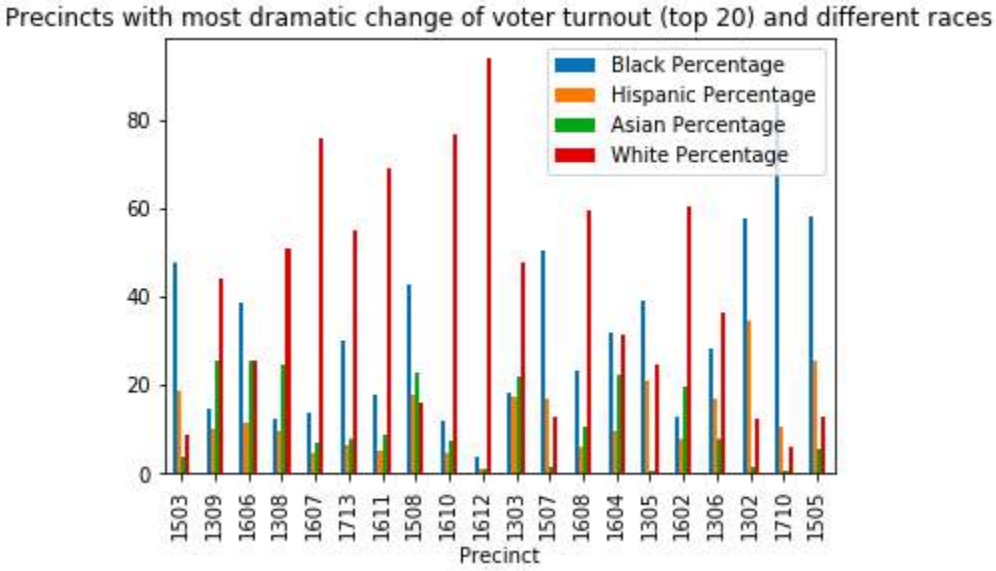
```
Average Turnout Change from 2015 to 2017: 0.573688888888889
Average Turnout Change from 2017 to 2019: -0.3701111111111111
Average Turnout Change from 2015 to 2019: -0.02206666666666667
```



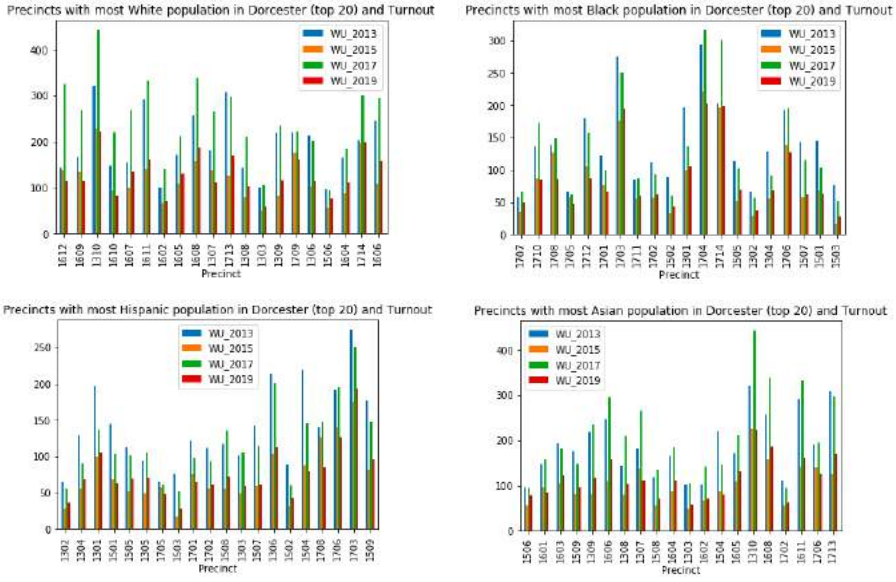
From the graph above, we can see that districts with the greatest average change in *share of voter turnout* over time do not have strong correlation with white percentage. In district 3, he does not have more supporters in 2019 than in 2015.

Lastly, we focus on how Michelle Wu's performance changed in district 3 over time.

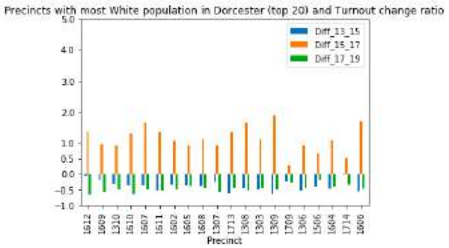
```
Average Turnout Change from 2013 to 2015: -0.4107333333333333
Average Turnout Change from 2015 to 2017: 0.9074222222222221
Average Turnout Change from 2017 to 2019: -0.40373333333333333
Average Turnout Change from 2013 to 2019: -0.3704444444444443
```

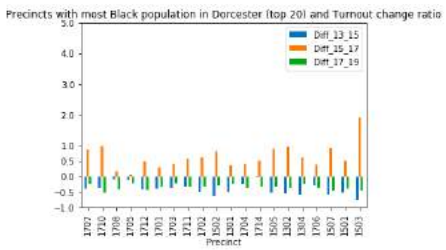


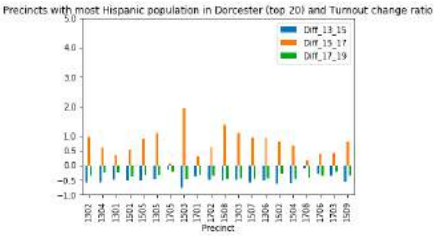
The turnout change trend in District 3 is the same as the overall trend. 11 out of 20 precincts with the most dramatic change of voter turnout are with the most white population. The rest of the precincts with the most dramatic change of voter turnout are with the most black population.

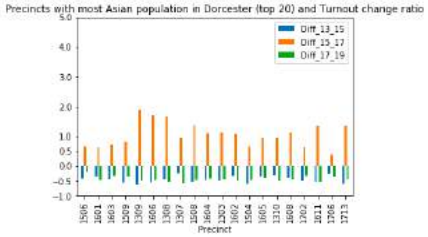


Wu got more votes in precincts in district 3 with most White population or Asian population.









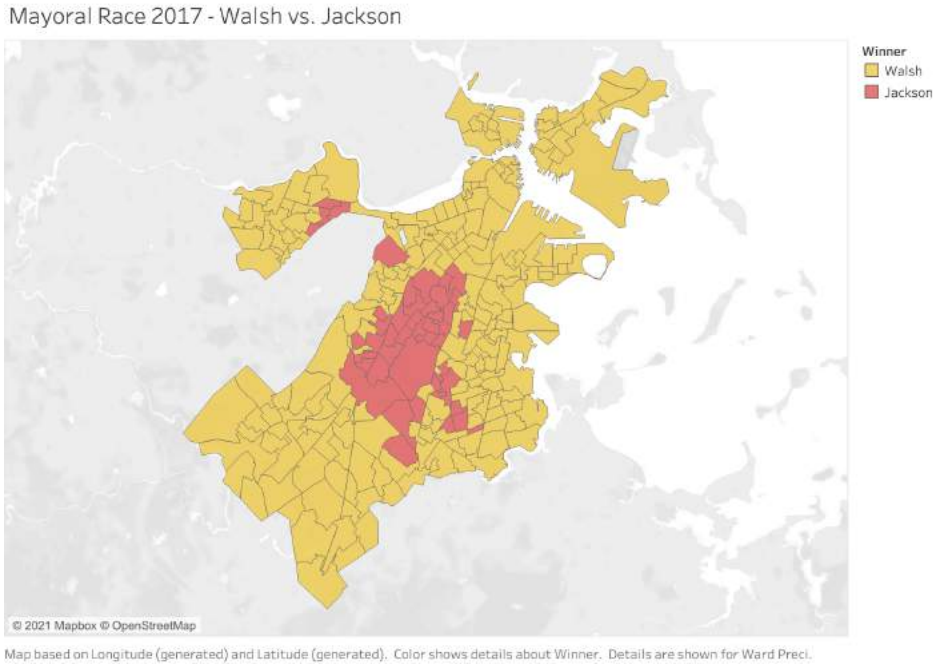
We can see that the gain ratio is larger in precincts with most White/Asian populations than precincts with most Black/Hispanic populations in 2017.

Key Question: What are the key predictors in determining support for Black candidates for Boston?

From our previous analysis, we have found that race plays a key role in determining support for Black candidates. We will now be examining how other factors, such as median income, educational level, and features of neighborhoods may affect support for Black candidates. We will be comparing the outcomes to these maps of three elections with African American frontrunners: 2017 Mayoral Race, 2018 DA Race, and the 2018 US House Democratic Primary.

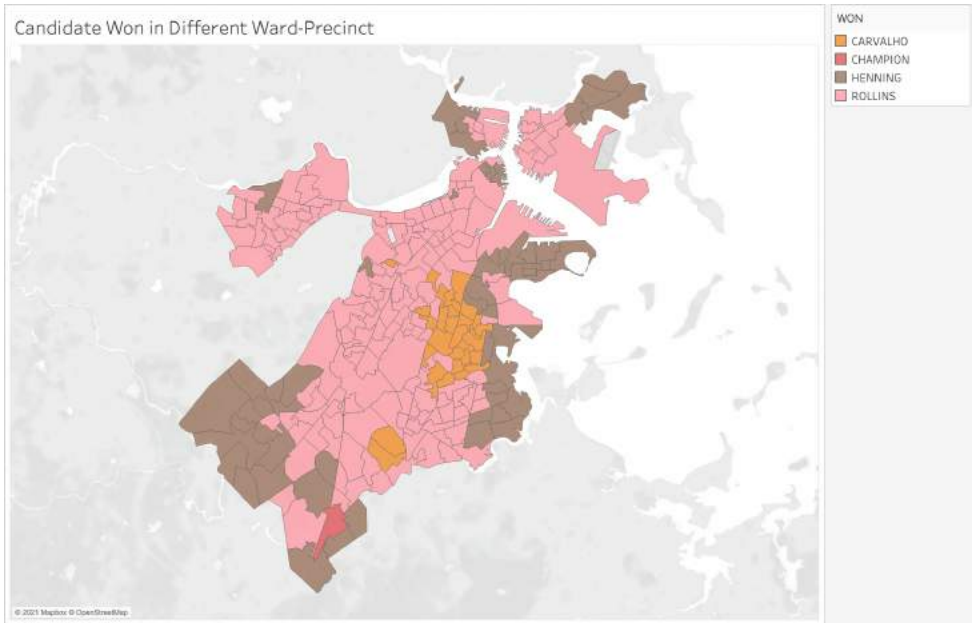
Part 1: Visualization of Key Races

Outcome of the 2017 General Mayoral Race:



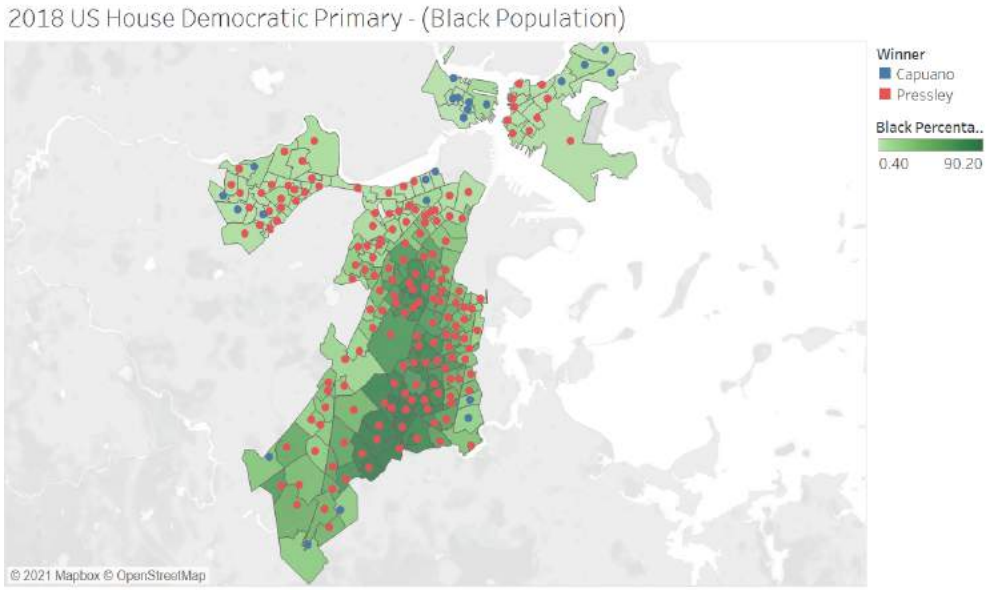
In this race, we will be focusing on Tito Jackson, the Black candidate for mayor in 2017.

Outcome of the 2018 DA Race:



Here, we will be focusing on the performance of the first Black woman DA in Boston, DA Rollins.

Outcome of the 2018 US House Democratic Primary:

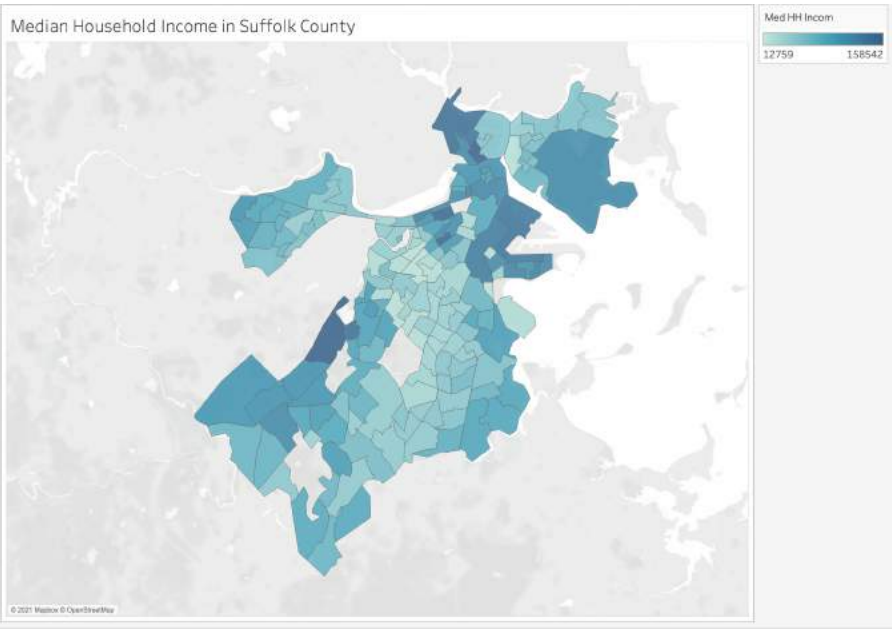


Map based on Longitude (generated) and Latitude (generated). For marks layer Pcnts.shp: Color shows sum of Black Percentage. Details are shown for Ward Prec. For marks layer Pcnts.shp (2): Color shows details about Winner. Details are shown for Ward Prec. The view is filtered on Winner, which keeps Capuano and Pressley.

Here, we will primarily focus on Ayanna Pressley's performance.

Part 2: Median Household Income

We first visualize the median household income across various Boston precincts:



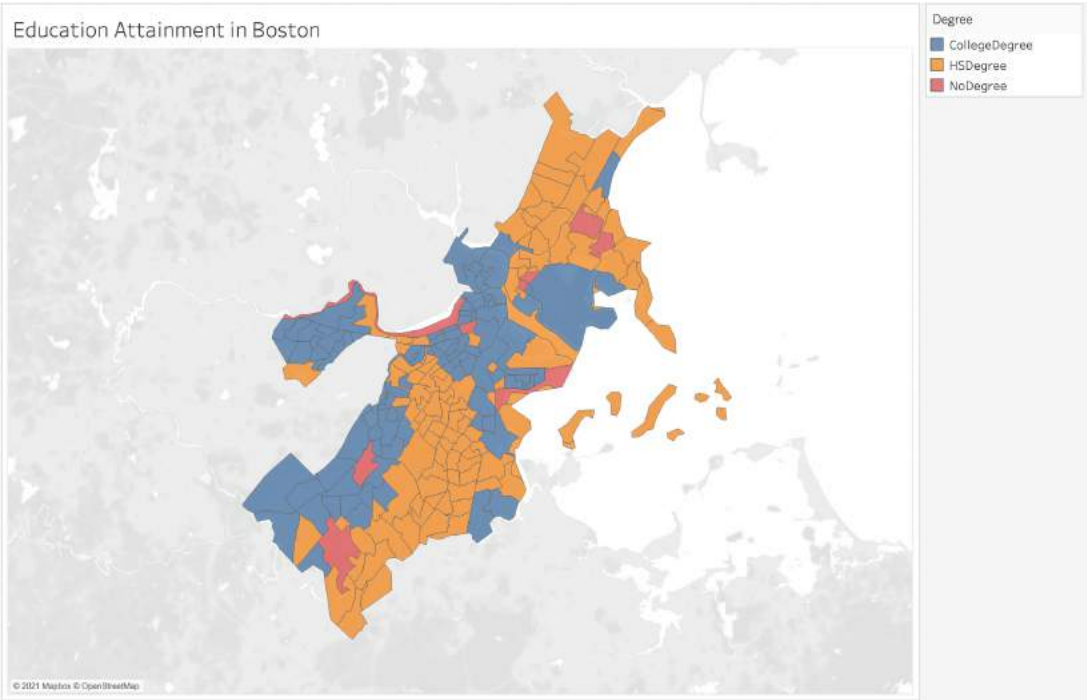
Source: https://data.census.gov/cedsci/table?t=Financial%20Characteristics&g=0500000US25025.140000&tid=ACSST5Y2019.S2503&moe=false&tp=false&hidePreview=true

We compare this median income map with the maps of various elections in which a Black candidate was a frontrunner.

In both the 2017 Mayoral Races and the 2018 DA Race, there seems to be a slight correlation between the median income of a given precinct and a Black candidate winning said precinct. By contrast, however, this does not seem to be the case in the 2018 U.S. House Democratic Primary, as Ayanna Pressley won the majority of precincts regardless of median income.

Part 3: Educational Attainment

2018 Educational Attainment



Source:
https://data.census.gov/cedsci/table?t=Education&g=0500000US25025.140000&tid=ACSST5Y2019.S1501&moe=false&tp=false&hidePreview=false

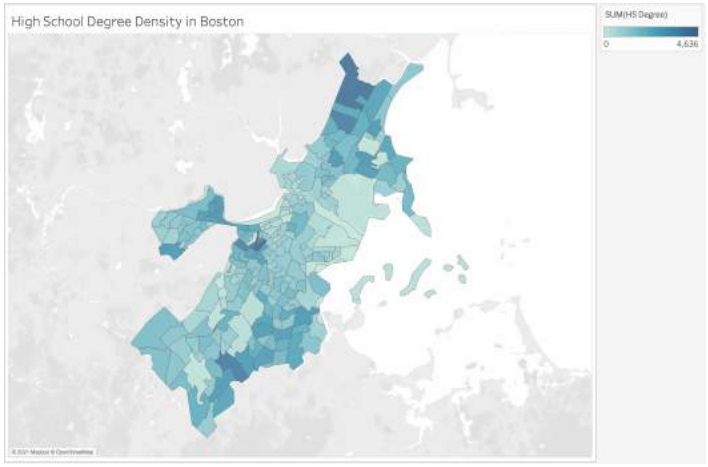
We now analyze any correlation between the average educational attainment of a given precinct and the performance of Black candidates in that precinct:

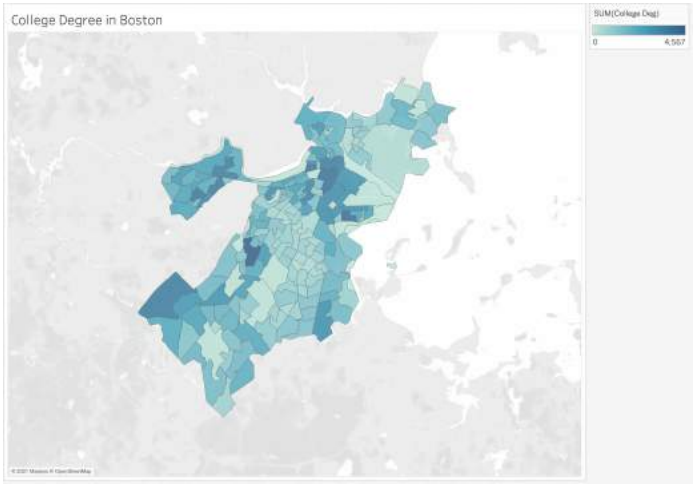
2017 Mayoral Race:
In most precincts where Tito Jackson won, the average educational attainment of the residents was a high school diploma. By contrast, Walsh won almost all districts in which the average educational attainment is a college degree.

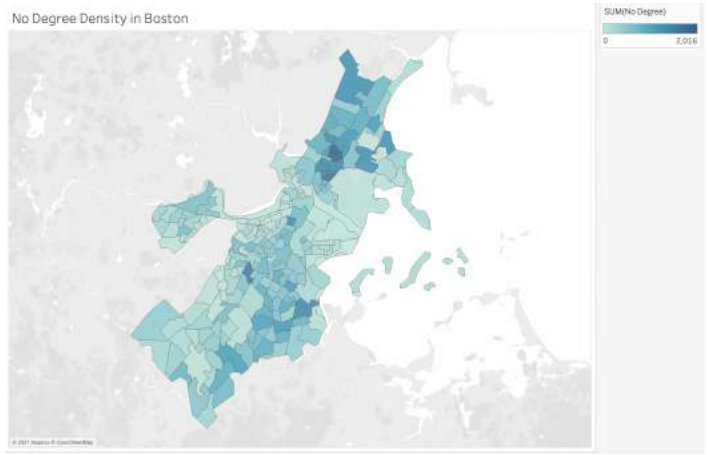
2018 DA Race:
From the data visualization of the educational attainment in Boston compared with the candidate won in each ward-precincts visualization, we could see that most of Henning's precinct that he won over have high density of college degree population; however, Rollin's encompass wide variety of educational attainment population; therefore, it is hard to find correlation between the two variables.

2018 US Senate Democratic Primary:
Again, there is no correlation between the precincts which voted for Pressley and educational attainment, as Pressely won the overwhelming majority of districts regardless of educational attainment.

Lastly we visualize the education levels across all Boston precincts as a gradient:

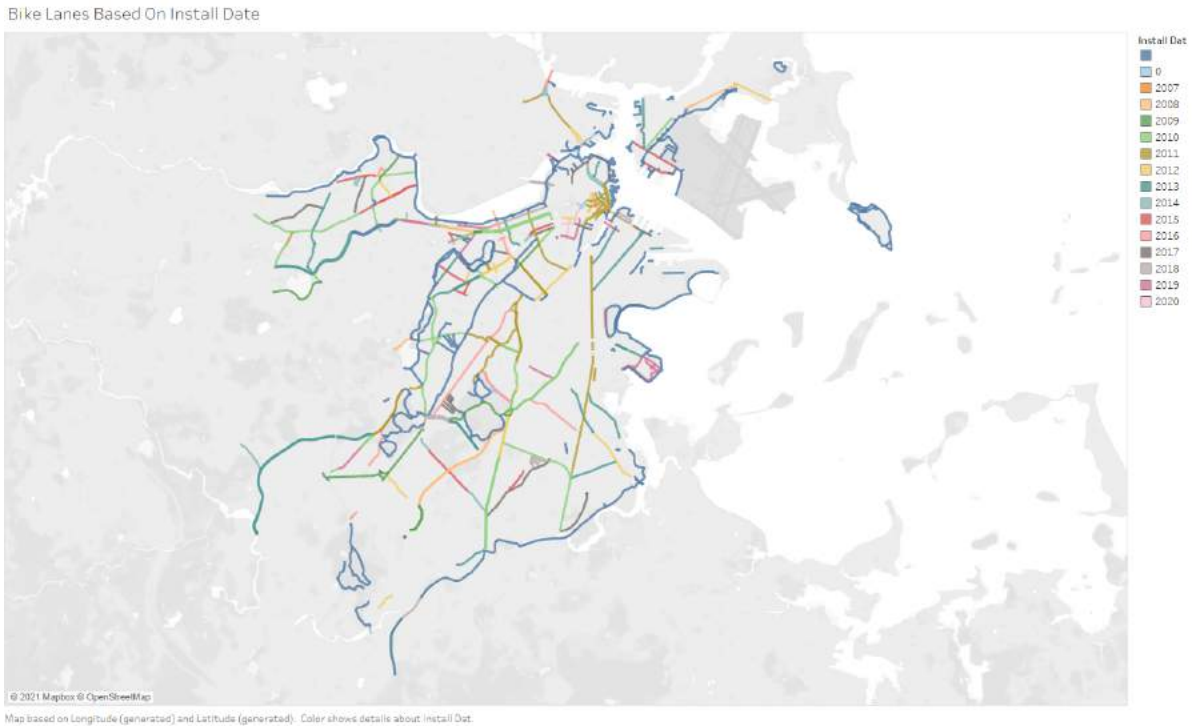




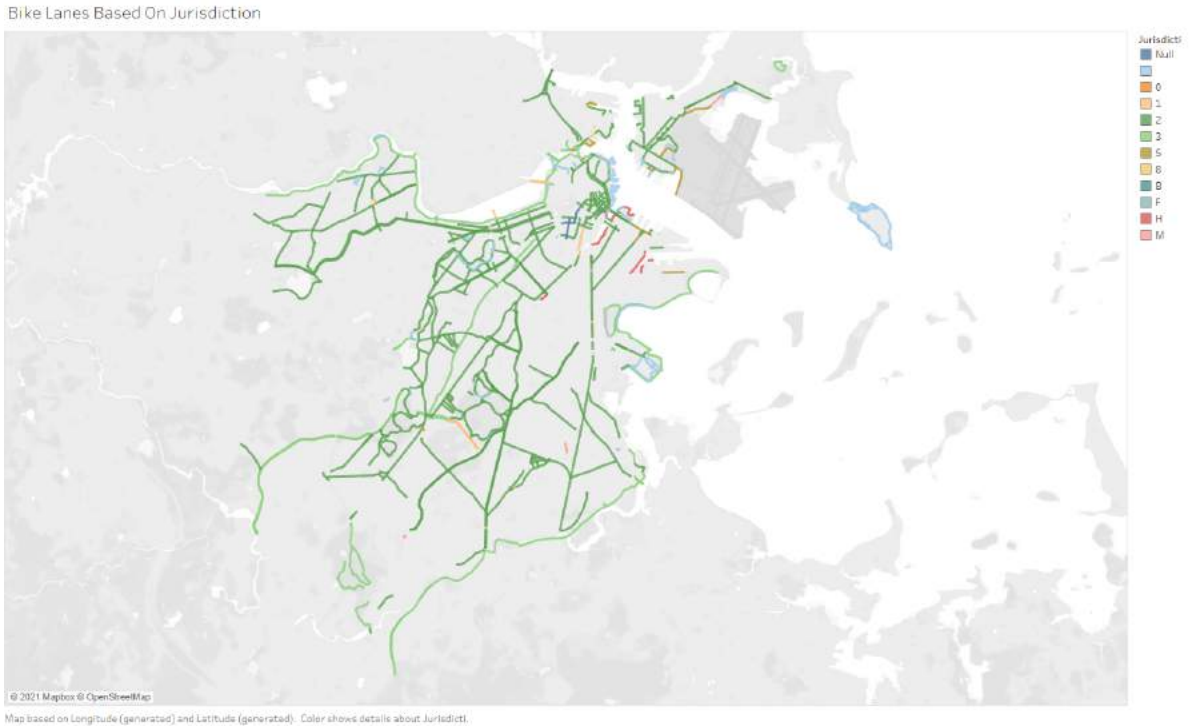


Does more houses affect voting participation for black candidates?

The Bottom of Boston's Building population is around 82% less populated. The Very tip of Boston's Building population is around 56% less populated. This is not a key predictor of black voting participation. There is not a correlation with the amount of houses for both 2017 General mayoral races where Johnson got most votes in the center of the map. And there is no correlation when Pressley received the most votes during the US Democratic party.

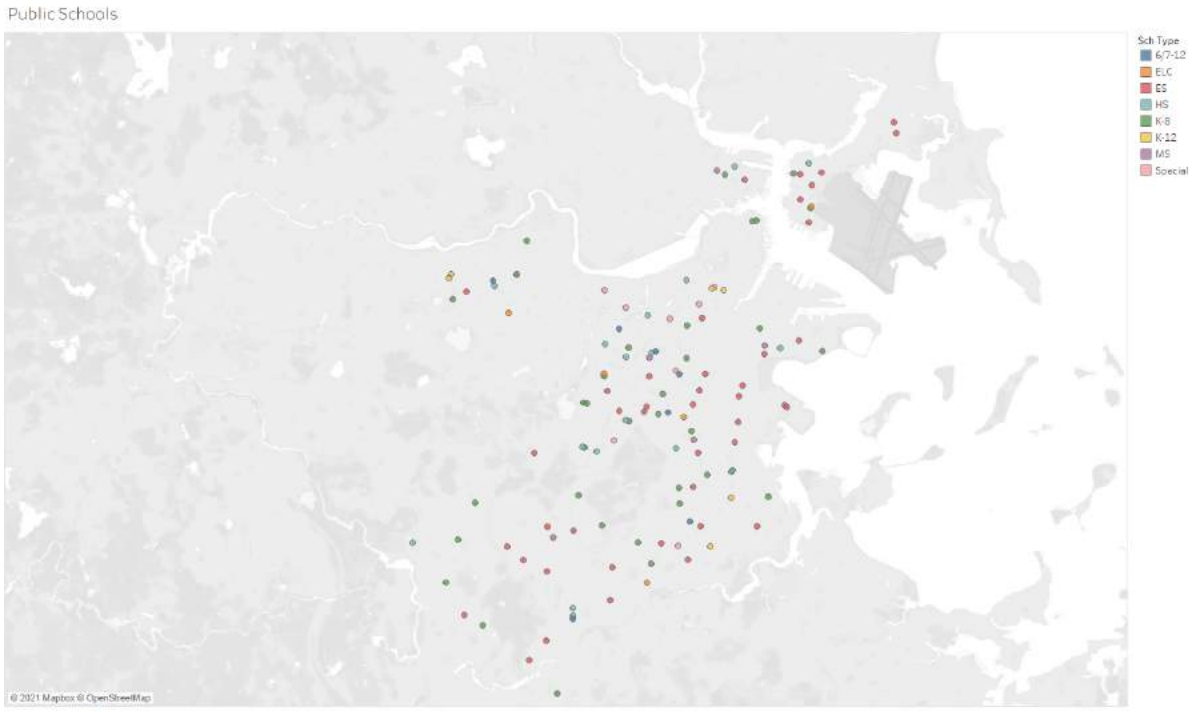


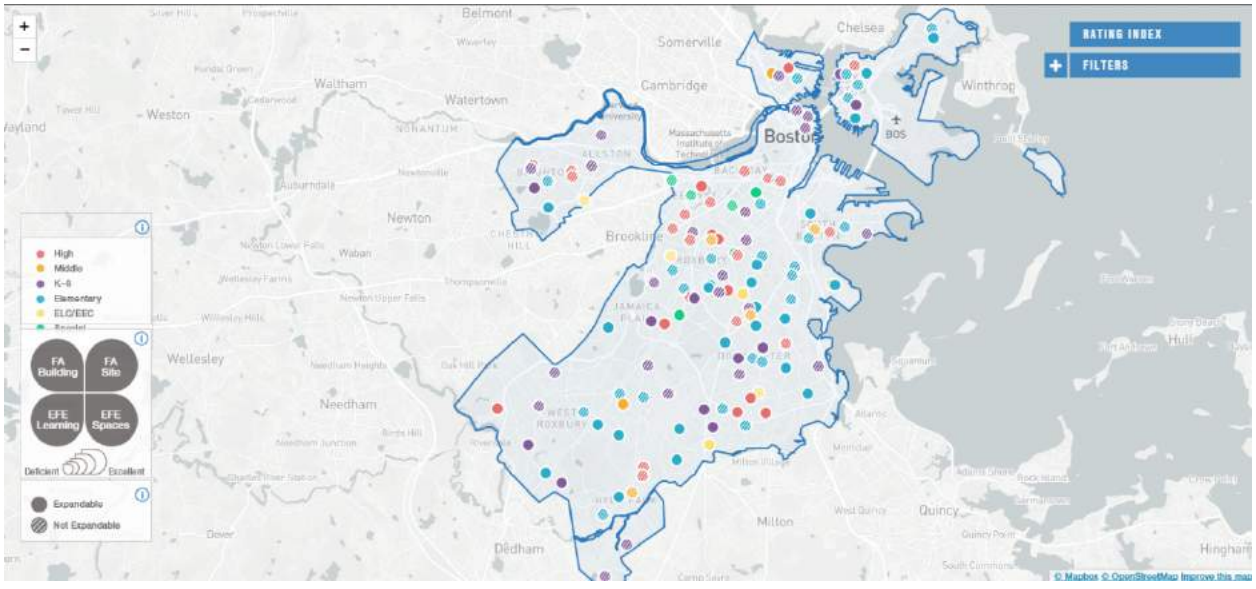
We do not believe bike lanes installation dates affect support for Black candidates. There is no clear correlation for bike lanes and the 2017 General Mayoral Race nor the US House Democratic Party.



We do not believe bike lanes affect support for Black candidates. There is no clear correlation for bike lanes and the 2017 General Mayoral Race nor the US House Democratic Party. This shows that there is more transit on the left side of the map.

Does Public Schools Affect the Support for black candidates?





https://data.boston.gov/showcase/buildbps-dashboard

There is no clear correlation for the number of schools and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race. This shows that there are more schools in the center/top of the map.

Do Park Trees Affect the Support for black candidates?

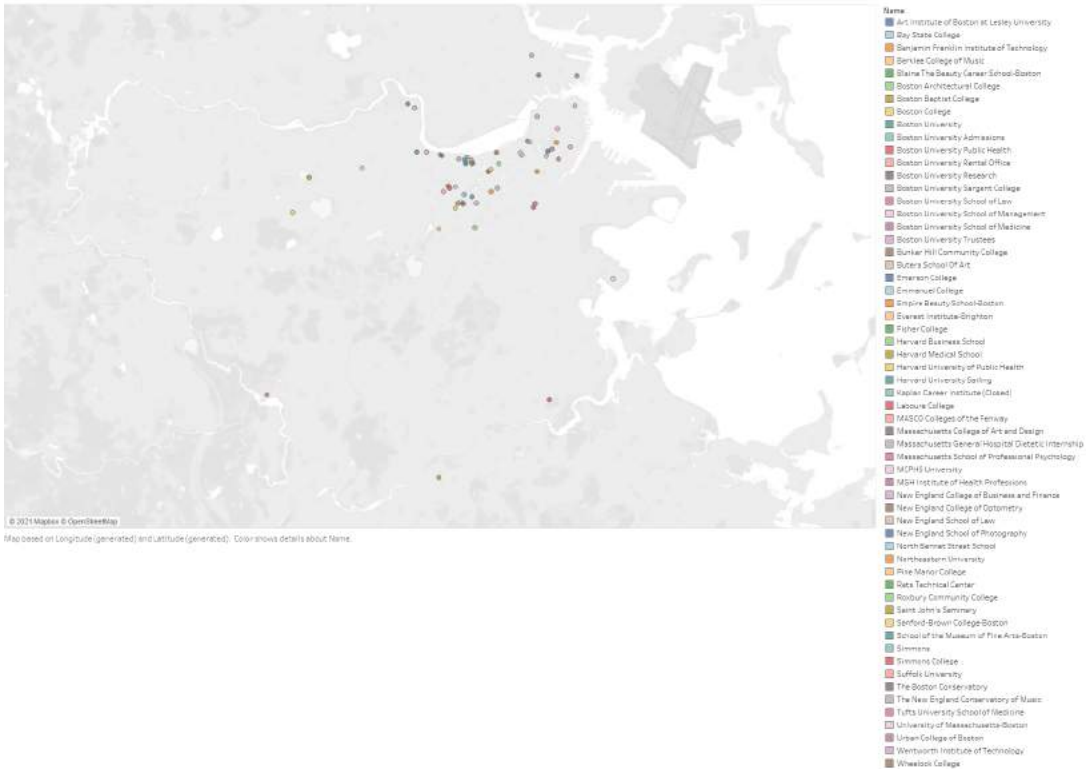
No clear correlation.There is no clear correlation for park trees and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race. This shows that there are a few spots that are empty/void of trees, which does not correlate to voting data.

Street Trees

Map based on Longitude (generated) and Latitude (generated). Color shows details about Type. The view is filtered on Type, which keeps STREET-TREE.

Street trees do not have a correlation. There is no clear correlation for street trees and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race. This shows that there are a few spots that are empty/void of trees, which does not correlate to voting data.

Universities



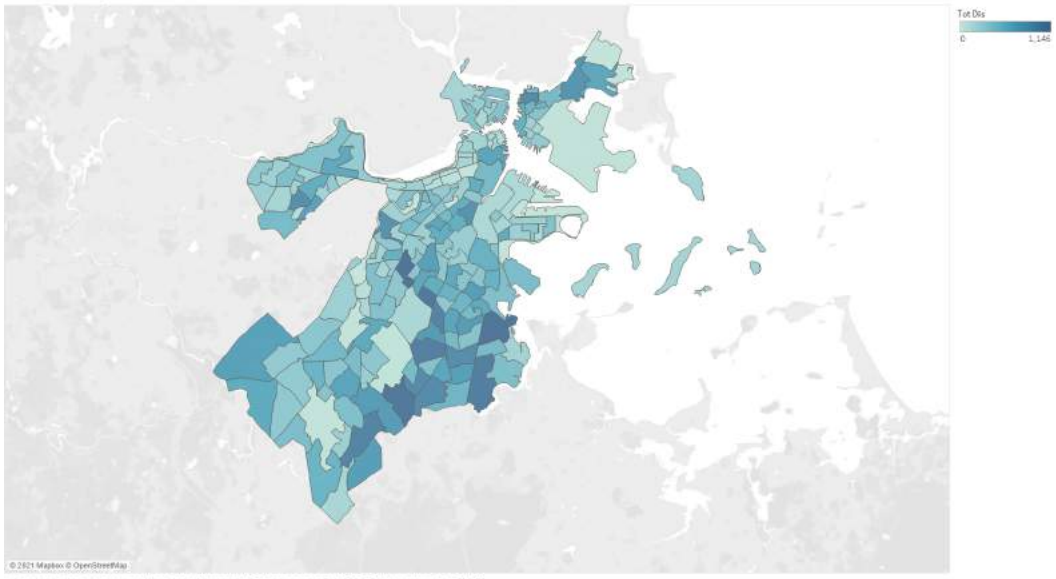
Universities do not affect support for black candidates.

For the following Tableaus Social vulnerability during a climate event:
Population Definitions:
Older Adults:
Older adults (those over age 65) have physical vulnerabilities in a climate event; they suffer from higher rates of medical illness than the rest of the population and can have some functional limitations in an evacuation scenario, as well as when preparing for and recovering from a disaster. Furthermore, older adults are physically more vulnerable to the impacts of extreme heat. Beyond the physical risk, older adults are more likely to be socially isolated. Without an appropriate support network, an initially small risk could be exacerbated if an older adult is not able to get help.
Data source: 2008-2012 American Community Survey 5-year Estimates (ACS) data by census tract for population over 65 years of age.
Children:
Families with children require additional resources in a climate event. When school is cancelled, parents need alternative childcare options, which can mean missing work. Children are especially vulnerable to extreme heat and stress following a natural disaster.
Data source: 2010 American Community Survey 5-year Estimates (ACS) data by census tract for population under 5 years of age.
People of Color:
People of color make up a majority (53 percent) of Boston's population. People of color are more likely to fall into multiple vulnerable groups as
well. People of color statistically have lower levels of income and higher levels of poverty than the population at large. People of color, many of whom also have limited English proficiency, may not have ready access in their primary language to information about the dangers of extreme heat or about cooling center resources. This risk to extreme heat can be compounded by the fact that people of color often live in more densely populated urban areas that are at higher risk for heat exposure due to the urban heat island effect.
Data source: 2008-2012 American Community Survey 5-year Estimates (ACS) data by census tract: Black, Native American, Asian, Island, Other, Multi, Non-white Hispanics.
Limited English Proficiency:
Without adequate English skills, residents can miss crucial information on how to prepare
for hazards. Cultural practices for information sharing, for example, may focus on word-of-mouth communication. In a flood event, residents can also face challenges communicating with emergency response personnel. If residents are more socially
isolated, they may be less likely to hear about upcoming events. Finally, immigrants, especially ones who are undocumented, may be reluctant to use government services out of fear of deportation or general distrust of the government or emergency personnel.
Data Source: 2008-2012 American Community Survey 5-year Estimates (ACS) data by census tract, defined as speaks English only or speaks English "very well".
Low to no Income:
A lack of financial resources impacts a household's ability to prepare for a disaster event and to support friends and neighborhoods. For example, residents without televisions, computers, or data-driven mobile phones may face challenges getting news about hazards or recovery resources. Renters may have trouble finding and paying deposits for replacement housing if their residence is impacted by flooding. Homeowners may be less able to afford insurance that will cover flood damage. Having low or no income can create difficulty evacuating in a disaster event because of a higher reliance on public transportation. If unable to evacuate, residents may be more at risk without supplies to stay in their homes for an extended period of time. Low- and no-income residents can also be more vulnerable to hot weather if running air conditioning or fans puts utility costs out of reach.
Data source: 2008-2012 American Community Survey 5-year Estimates (ACS) data by census tract for low-to- no income populations. The data represents a calculated field that combines people who were 100% below the poverty level and those who were 100–149% of the poverty level.
People with Disabilities:
People with disabilities are among the most vulnerable in an emergency; they sustain disproportionate rates of illness, injury, and death in disaster events.46 People with disabilities can find it difficult to adequately prepare for a disaster event, including moving to a safer place. They are more likely to be left behind or abandoned during evacuations. Rescue and relief resources—like emergency transportation or shelters, for example— may not be universally accessible. Research has revealed a historic pattern of discrimination against people with disabilities in times of resource scarcity, like after a major storm and flood.
Data source: 2008-2012 American Community Survey 5-year Estimates (ACS) data by census tract for total civilian non-institutionalized population, including: hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty.
Medical Illness:

Symptoms of existing medical illnesses are often exacerbated by hot temperatures. For example, heat can trigger asthma attacks or increase already high blood pressure due to the stress of high temperatures put on the body. Climate events can interrupt access to normal sources of healthcare and even life-sustaining medication. Special planning is required for people experiencing medical illness. For example, people dependent on dialysis will have different evacuation and care needs than other Boston residents in a climate event.
Data source: Medical illness is a proxy measure which is based on EASI data accessed through Simply Map. Health data at the local level in Massachusetts is not available beyond zip codes. EASI modeled the health statistics for the U.S. population based upon age, sex, and race probabilities using U.S. Census Bureau data. The probabilities are modeled against the census and current year and five year forecasts. Medical illness is the sum of asthma in children, asthma in adults, heart disease, emphysema, bronchitis, cancer, diabetes, kidney disease, and liver disease. A limitation is that these numbers may be over-counted as the result of people potentially having more than one medical illness. Therefore, the analysis may have greater numbers of people with medical illness within census tracts than actually present. Overall, the analysis was based on the relationship between social factors.

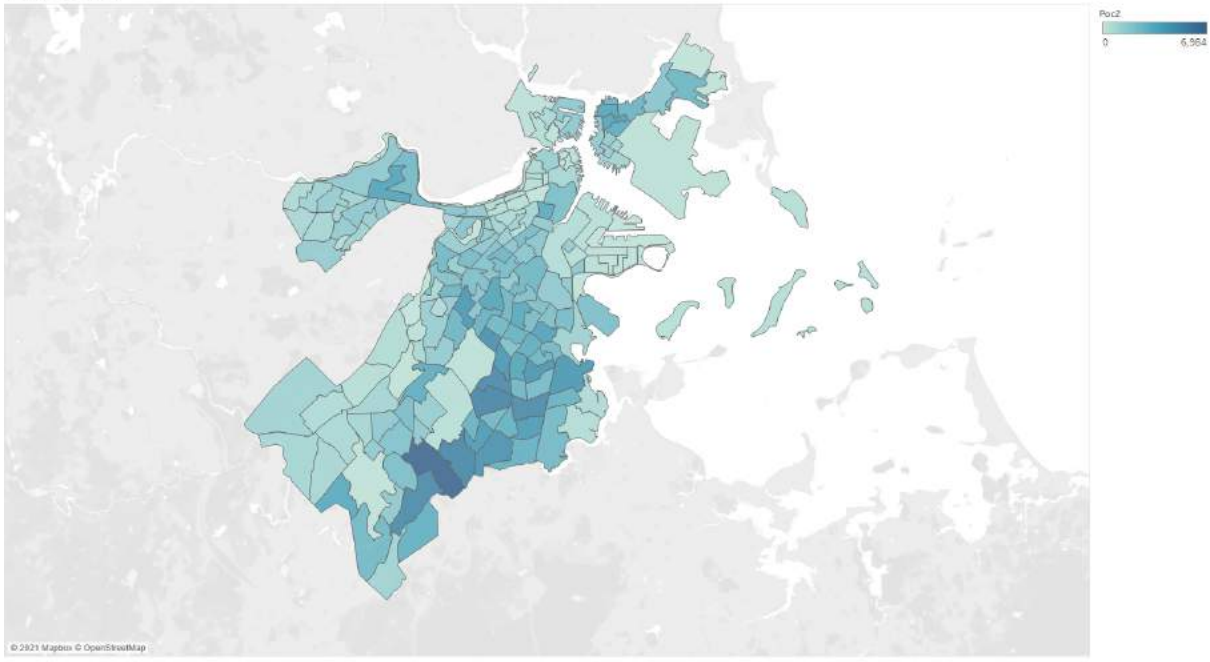
Attribute label: MedIllnes

Total Disability



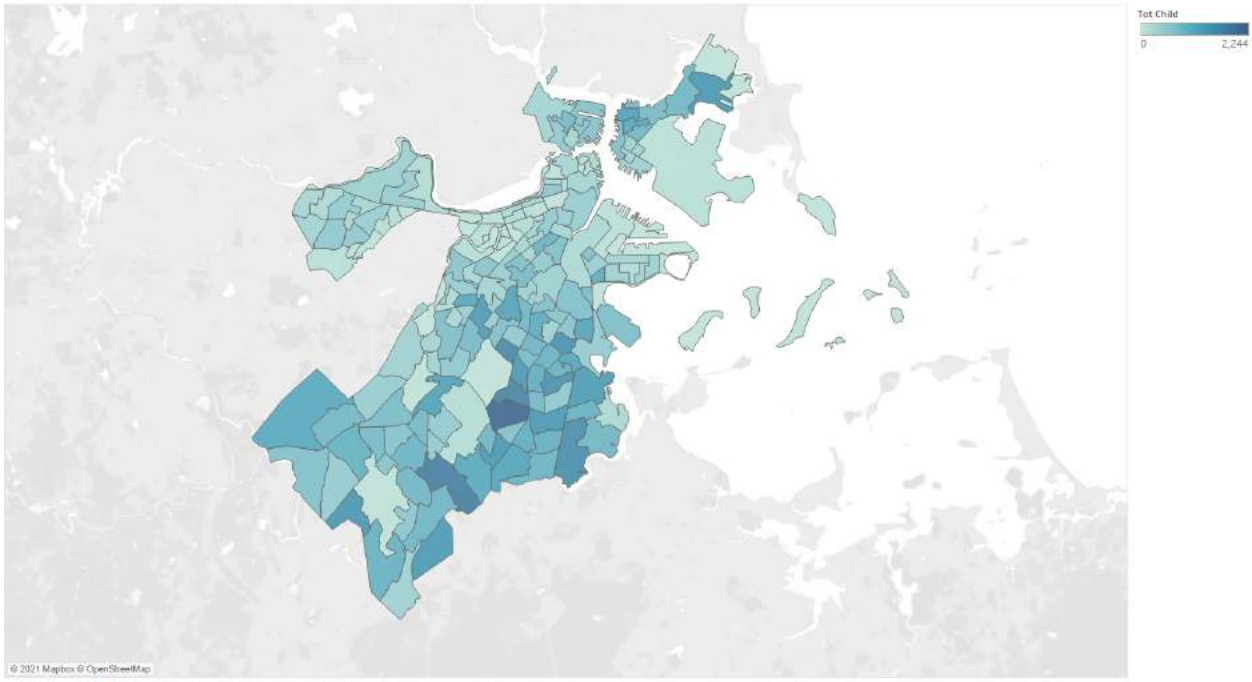
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Tot Dis. Details are shown for Geoid10.

People of Color



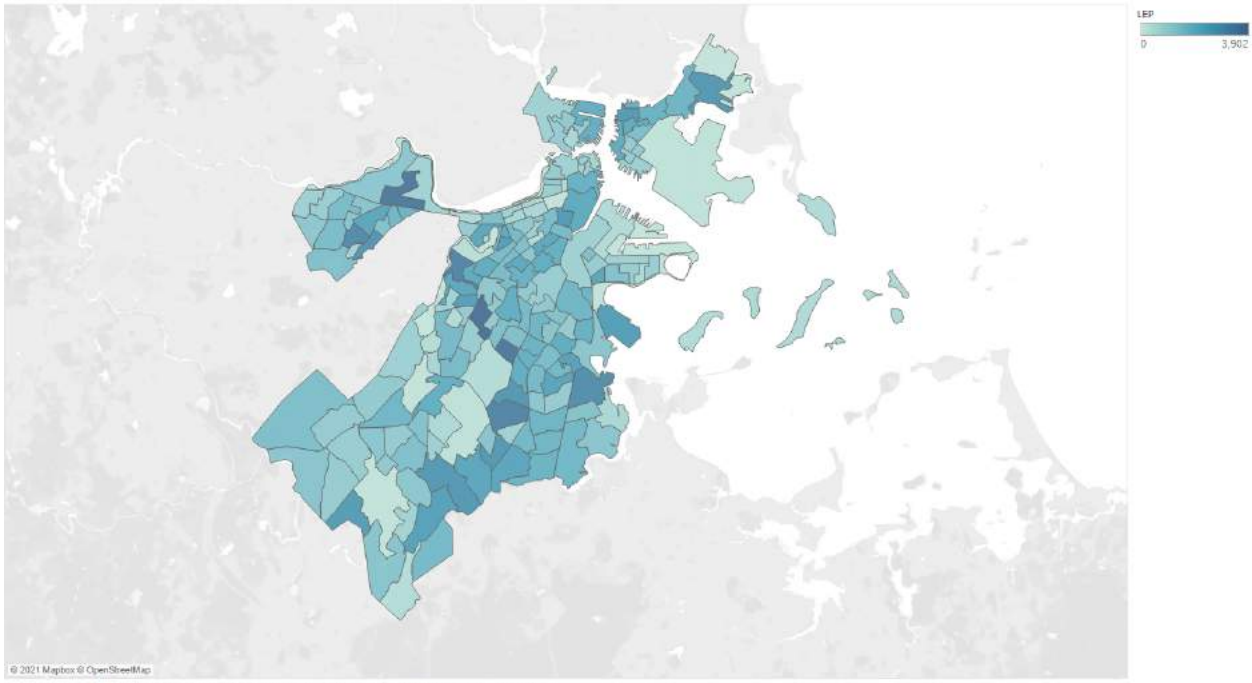
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Poc2. Details are shown for Geoid10.

Children



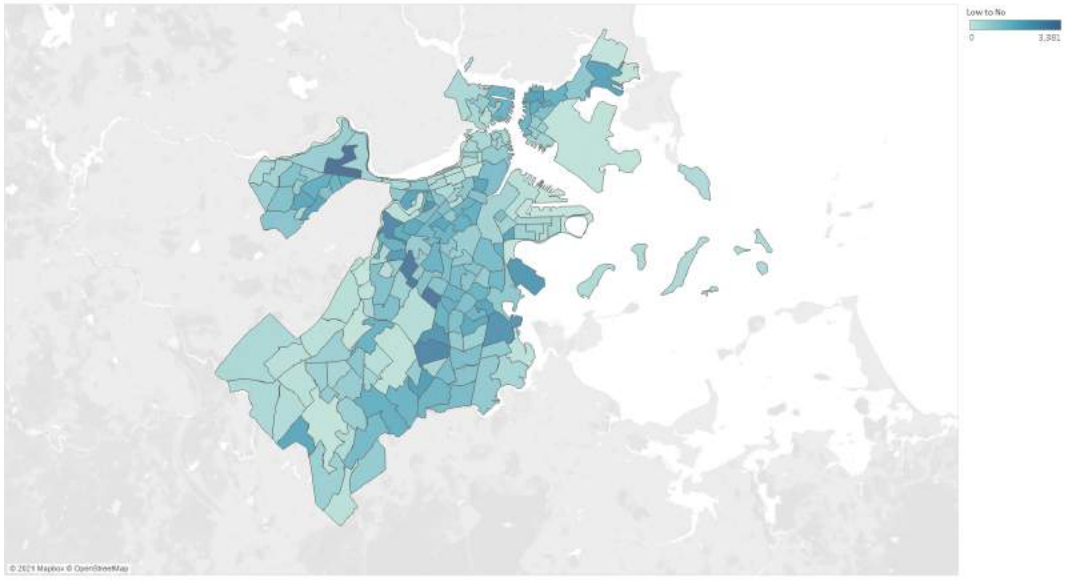
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Tot Child. Details are shown for Geoid10.

Limited English Proficiency



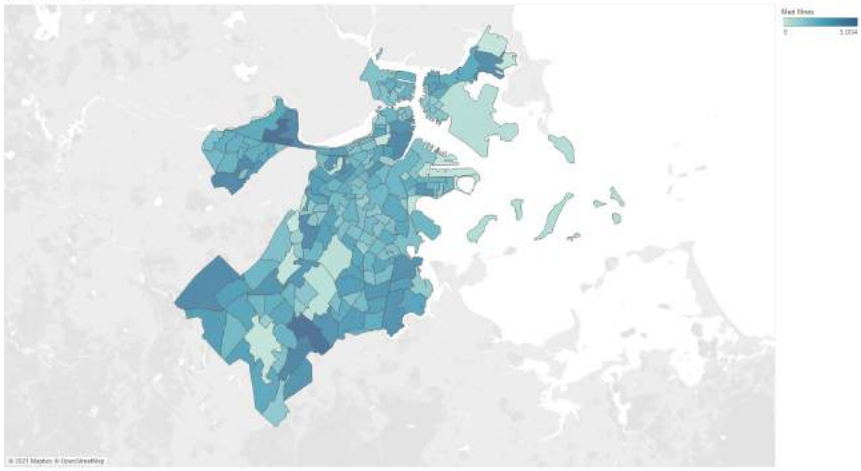
Map based on Longitude (generated) and Latitude (generated). Color shows sum of LEP. Details are shown for Geoid10.

Low to No Income



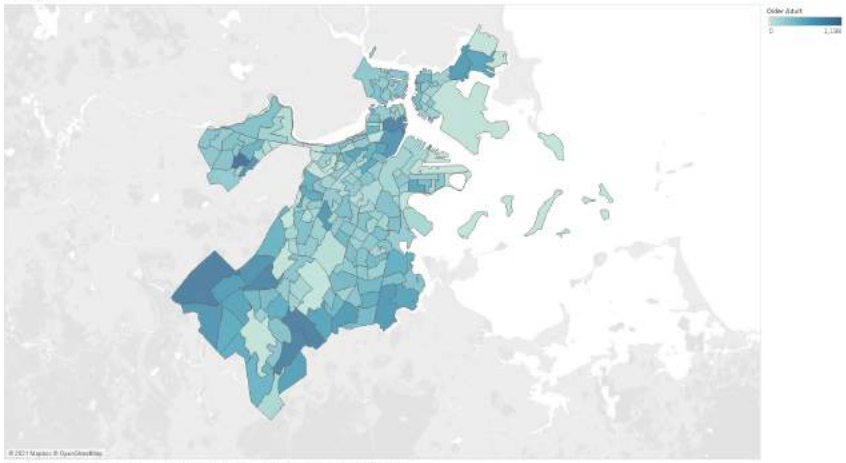
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Low to No. Details are shown for Geoid10.

Medical Illness



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Med Illnes. Details are shown for Geoid10.

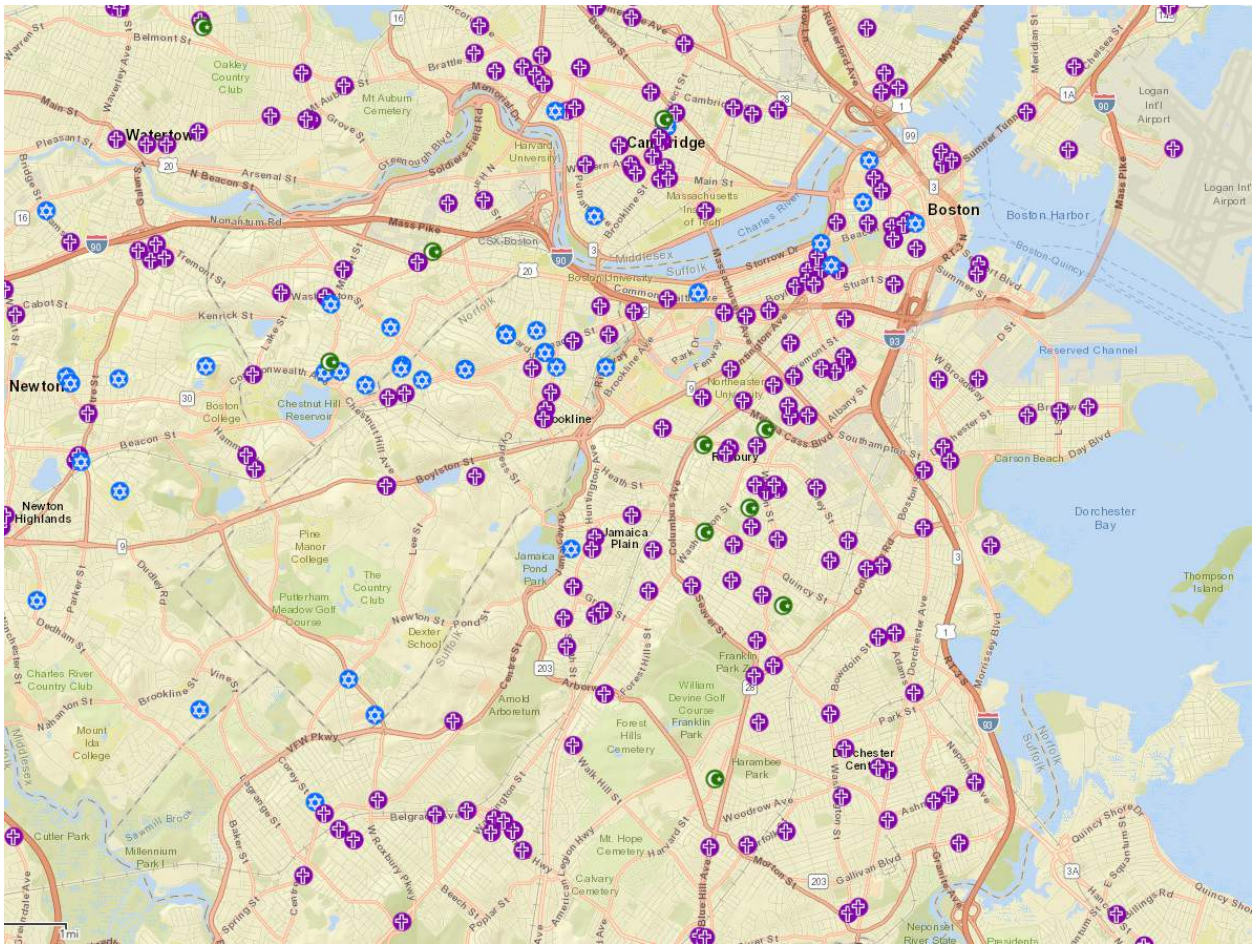
Old People



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Older Adult. Details are shown for Geoid10.

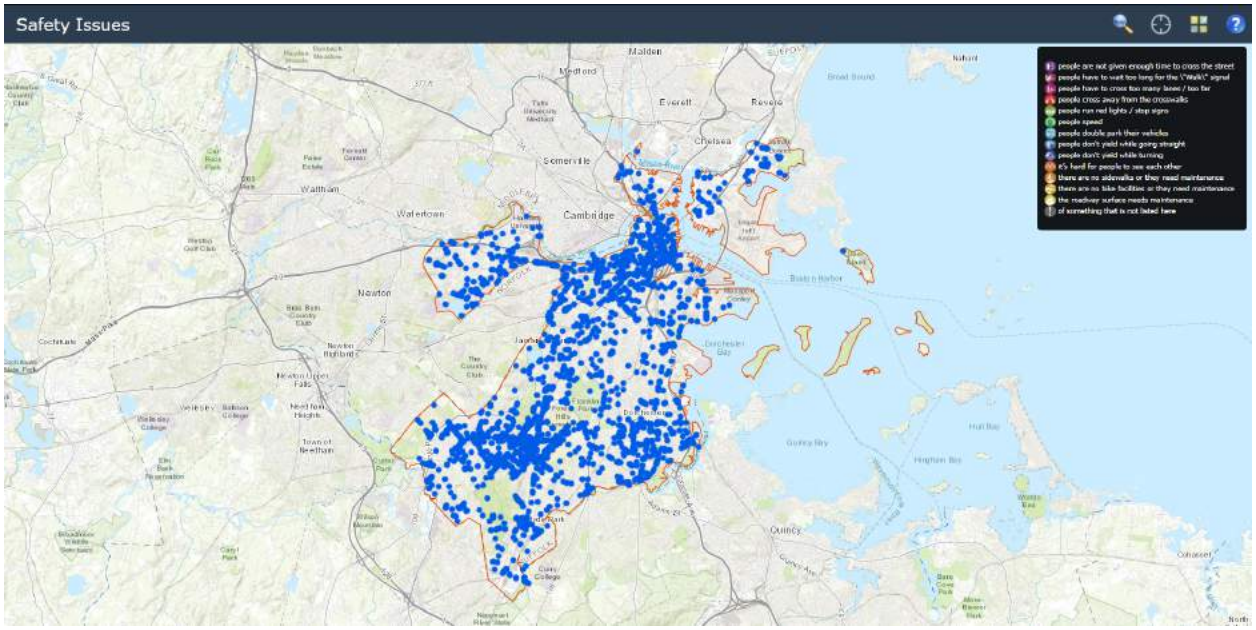
There is no clear correlation for Total disability/People of Color/Old People/ Medical Illness/Low To No Income/ English Proficiency and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race. What this shows is that Disabilities and Medical Illnesses are more apparent and are more prone to climate changes. There might be a slight correlation between people low to no income vulnerable to climate change voting for Jackson in the 2017 General Mayoral Race.
We see that the south end of boston is the most prone to climate, there's no clear correlation.

Boston Churches:



https://massgis.maps.arcgis.com/apps/webappviewer/index.html?id=9fc18ba7901546a1b342393b6486cf31
There is no clear correlation for Number of Churches and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race.
Link to More Geospatial data (Not Correlated):
https://docs.digital.mass.gov/dataset/massgis-data-layers

311 Reports Trash areas in Boston
https://jhaddadin.github.io/trashcity/garbagemap.html
There is no clear correlation for Trash Areas and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race.



http://app01.cityofboston.gov/VZSafety/

There is no clear correlation for Safety Issues and the 2017 General Mayoral Race nor the US House Democratic Party nor the 2018 DA race.