

## 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 2019: 7.6 %

Again, 2013 is the highest.

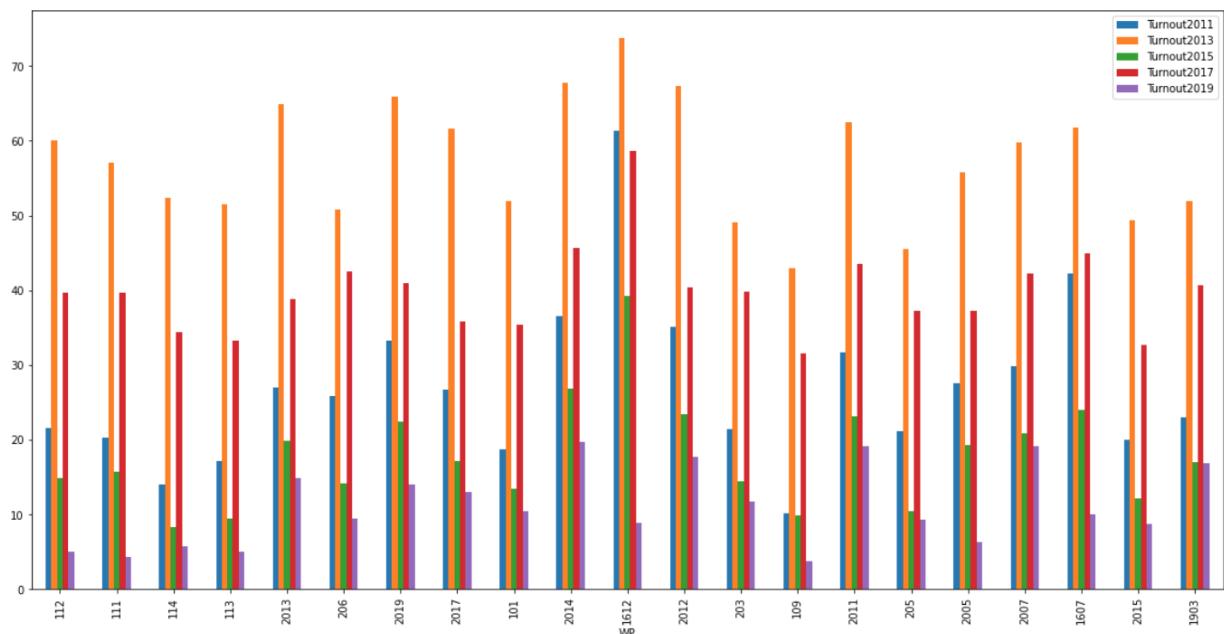
Finding that 2013 and 2017 had the highest voter turnout rates across all precincts due to the fact that they coincided with the Mayoral Elections of those same years.

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:

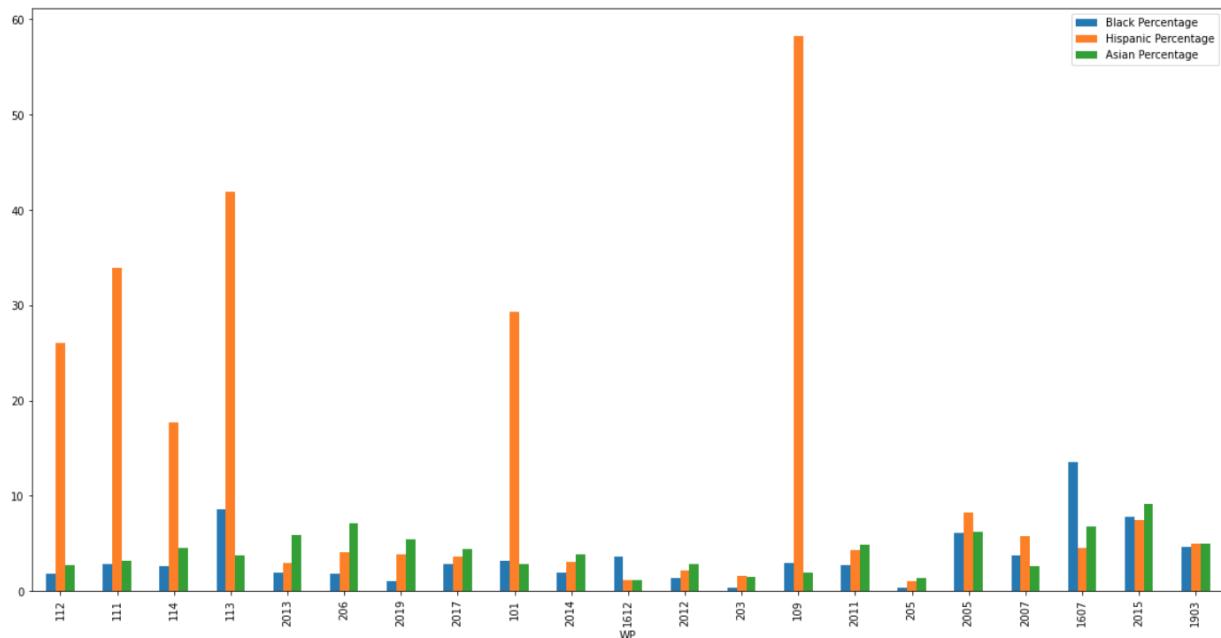


We can clearly see that voter turnout is highly volatile across each of these precincts.

Listing the demographic breakdown of each of these precincts:

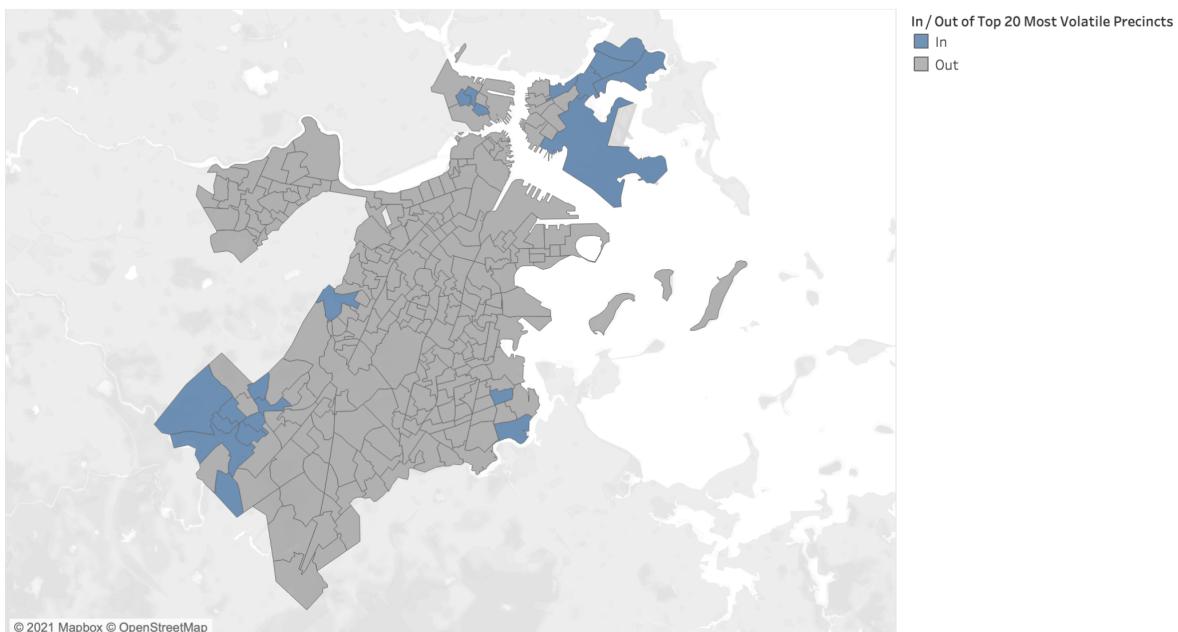
WP	Black Percentage	Hispanic Percentage	Asian Percentage
112	1.8	26.0	2.7
111	2.9	33.9	3.2
114	2.6	17.7	4.5
113	8.6	41.9	3.8
2013	2.0	3.0	5.9
206	1.8	4.1	7.1
2019	1.1	3.9	5.4
2017	2.9	3.6	4.4
101	3.2	29.3	2.9
2014	2.0	3.1	3.9
1612	3.6	1.2	1.2
2012	1.4	2.2	2.9
203	0.4	1.6	1.5
109	3.0	58.3	2.0
2011	2.7	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:



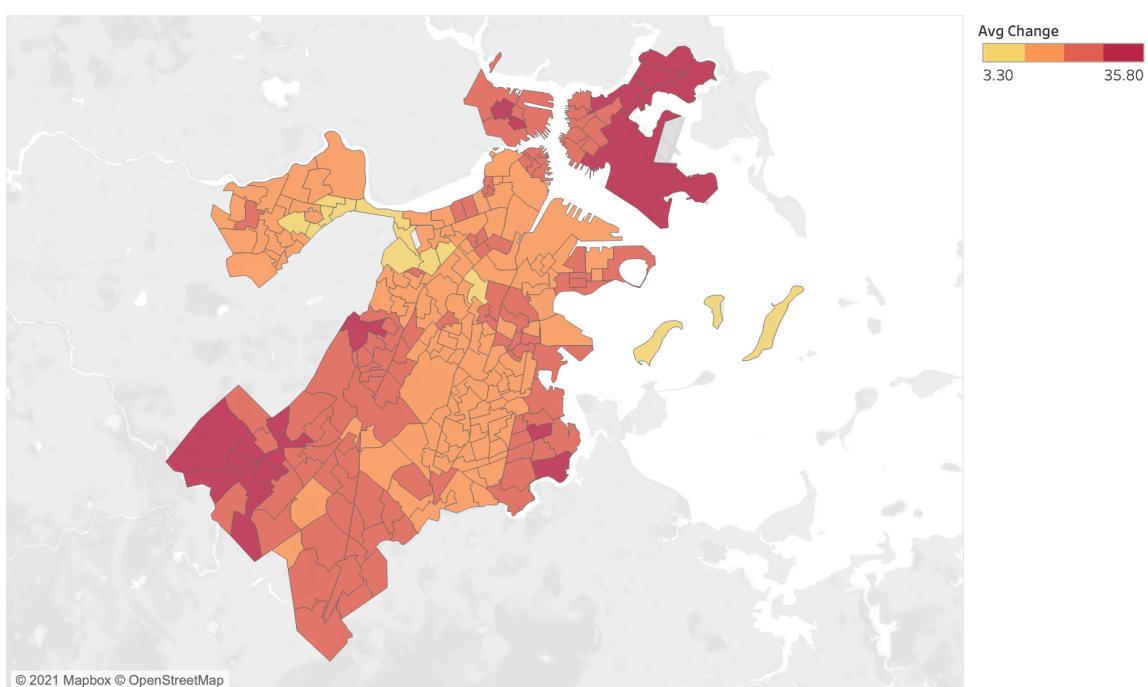
And viewing these precincts on a Boston map, we again see the concentration of precincts in East Boston as well as a concentration in West Roxbury:

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



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.

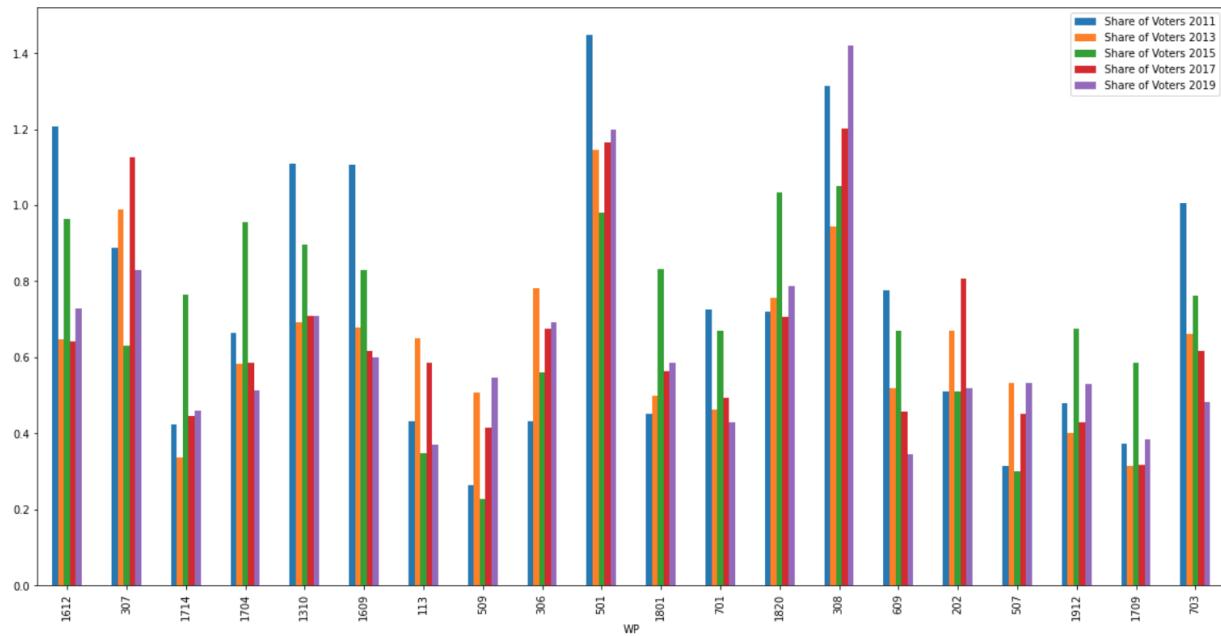
First, we find the top 20 precincts with the greatest average change in share of voters across each election. Note that these top 20 could be experiencing either significant negative or positive change.

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:

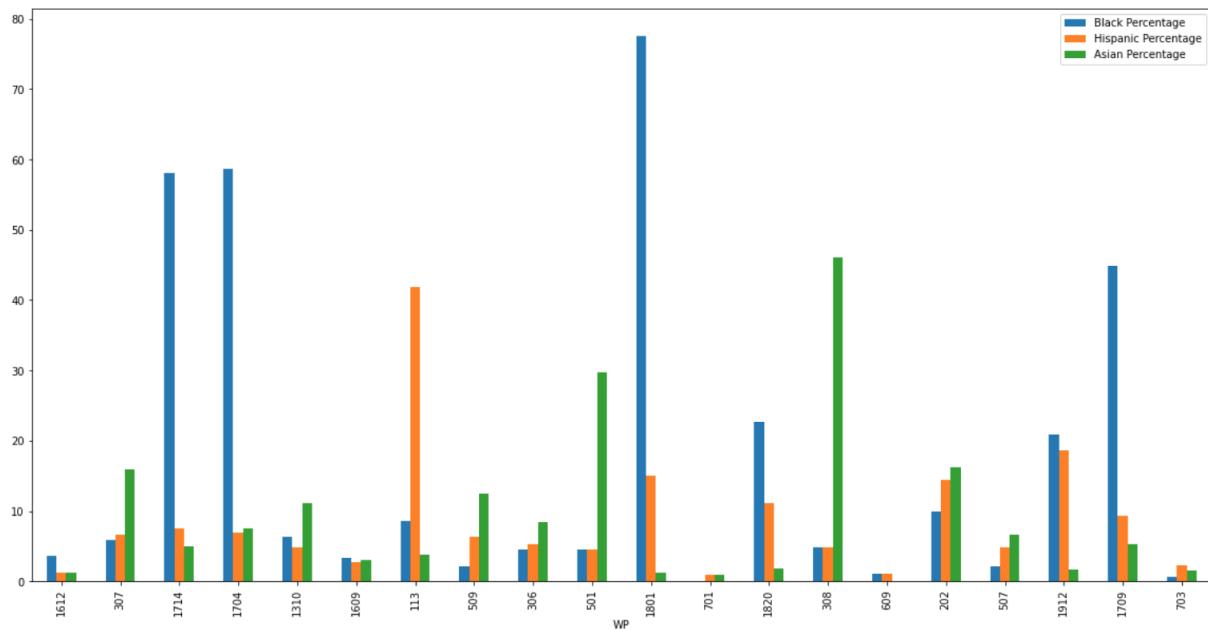


We can clearly see that the voter turnout has changed dramatically across each election in each of these precincts.

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

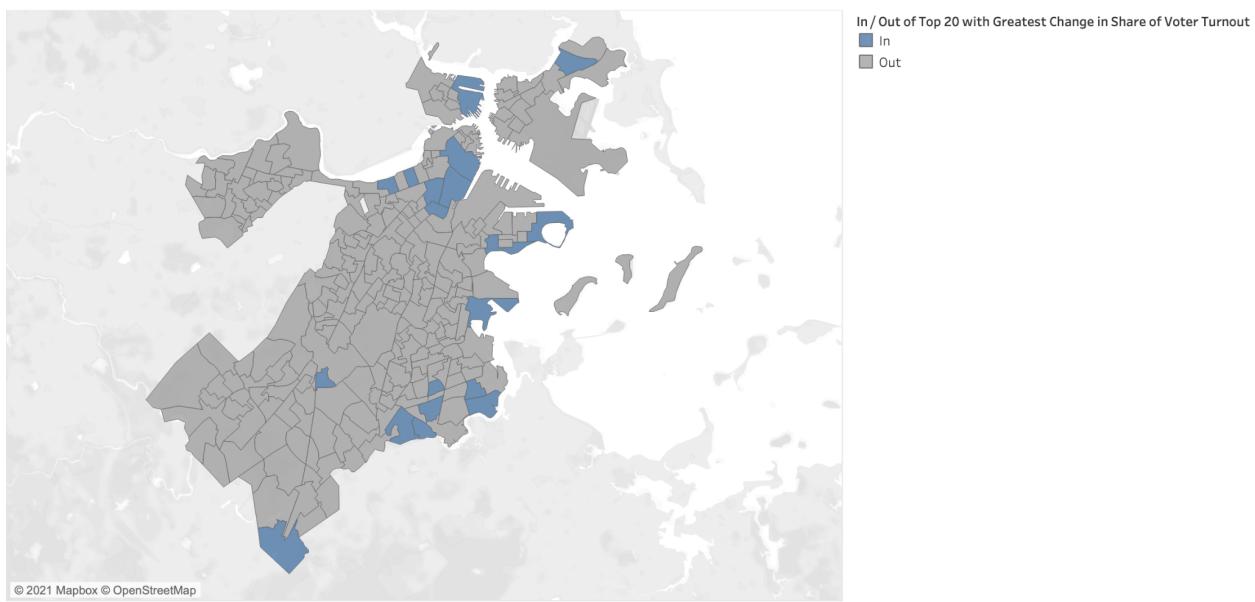
Now, visualizing the demographic breakdown of each of these precincts:



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 precincts with a significant Black population seem to experience a significant average change.

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

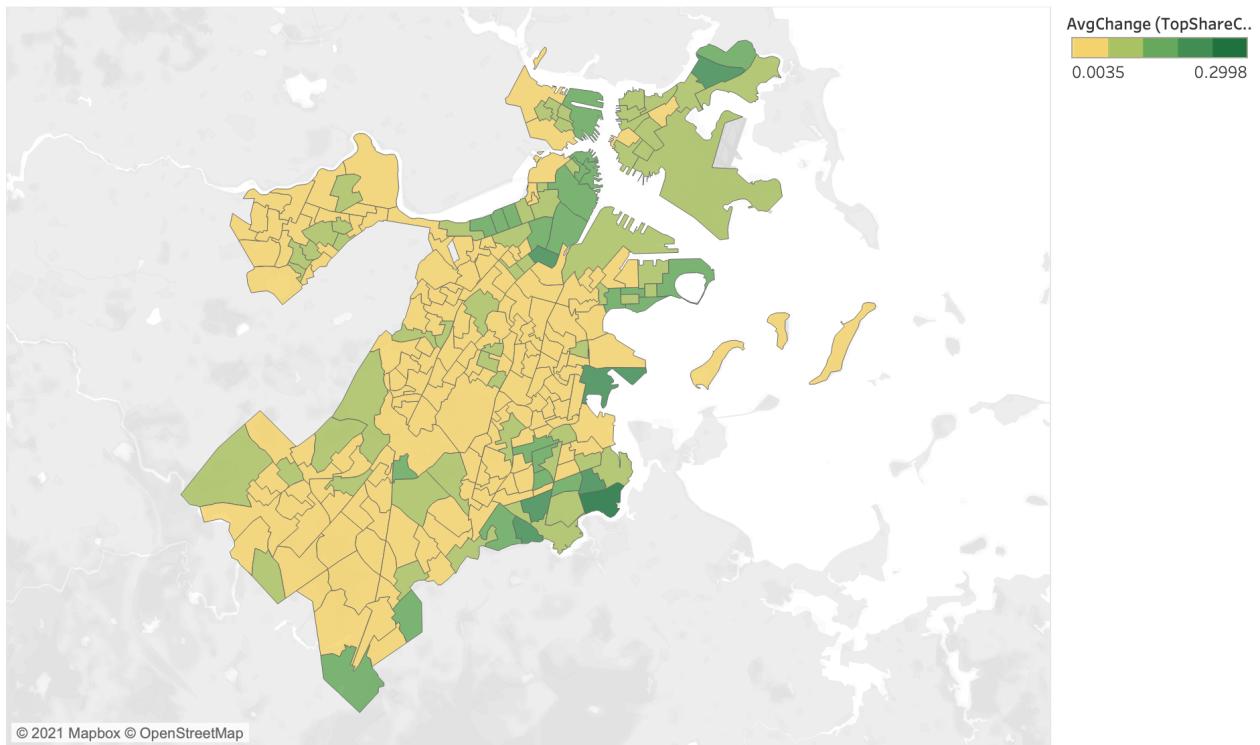
Top 20 Precincts with the Greatest Change in Share of Voter Turnout



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:

Change in Share of Voters Heat Map



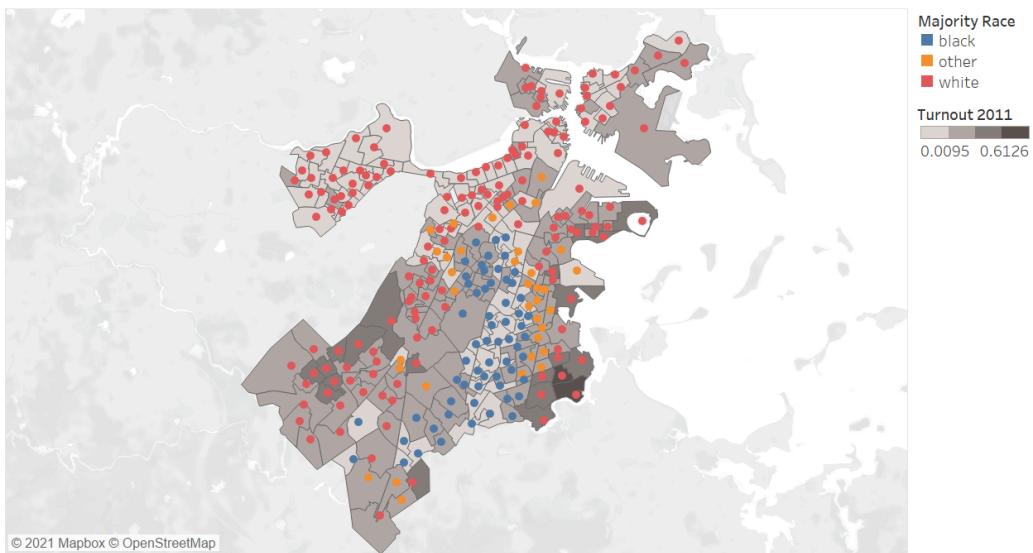
Map based on Longitude (generated) and Latitude (generated). Color shows sum of AvgChange (TopShareChange). Details are shown for Ward Preci.

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:

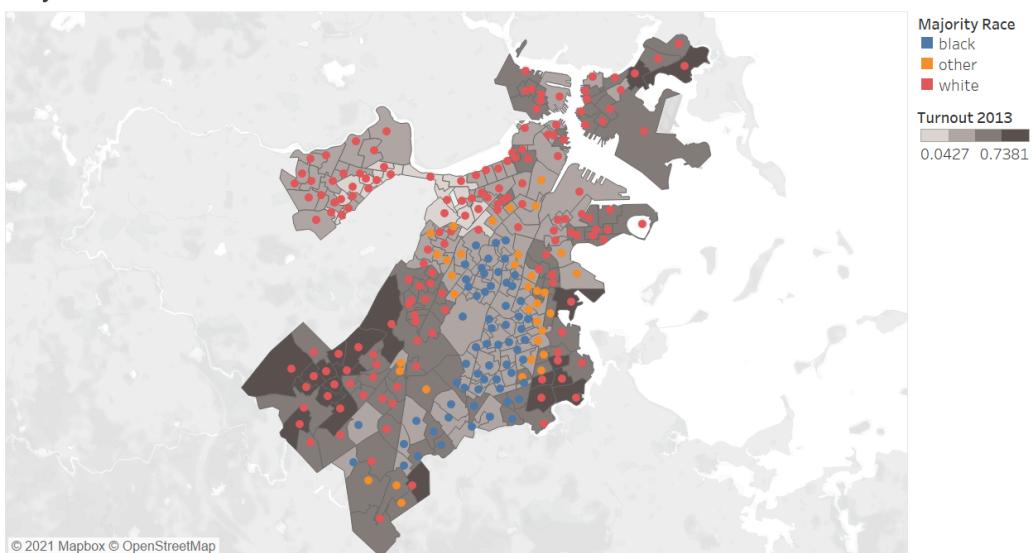
City Council Turnout 2011



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:

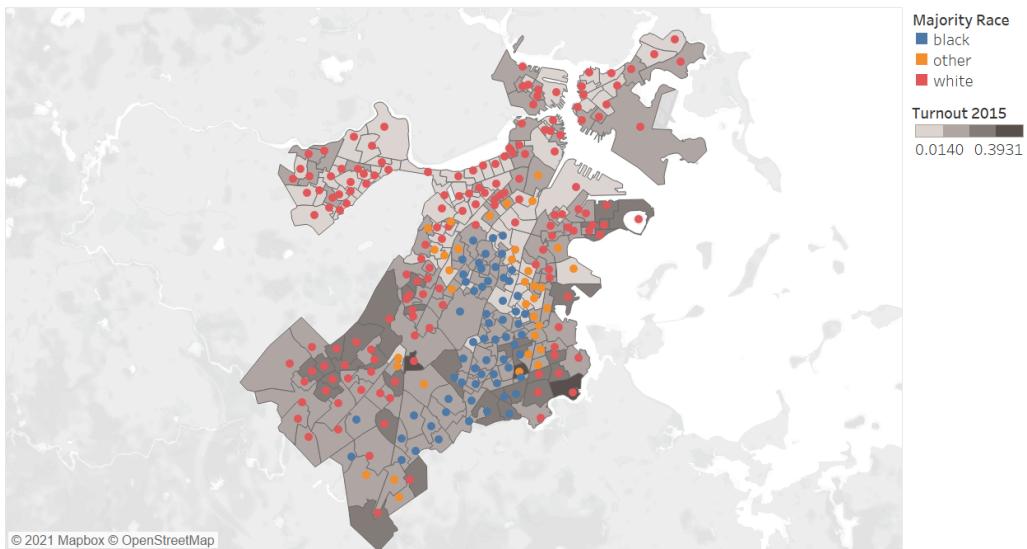
City Council Turnout 2013



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:

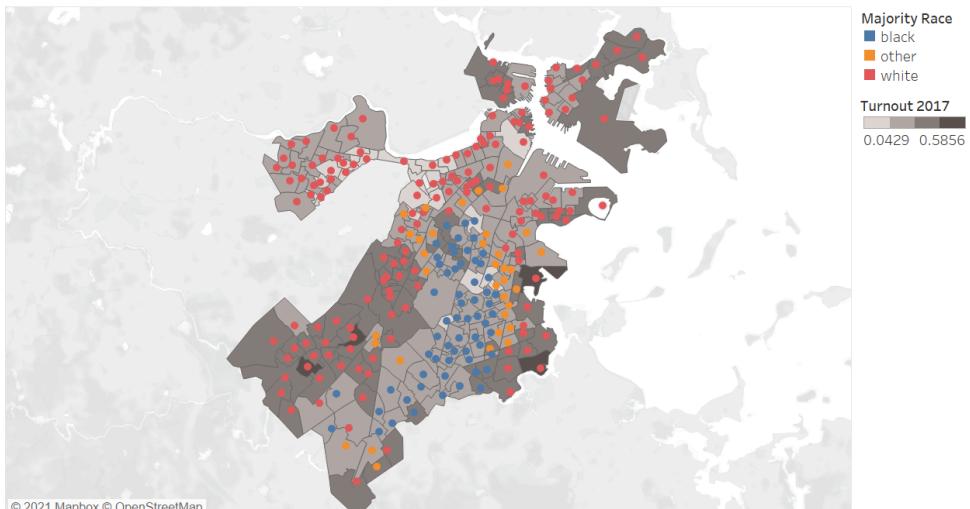
City Council Turnout 2015



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.

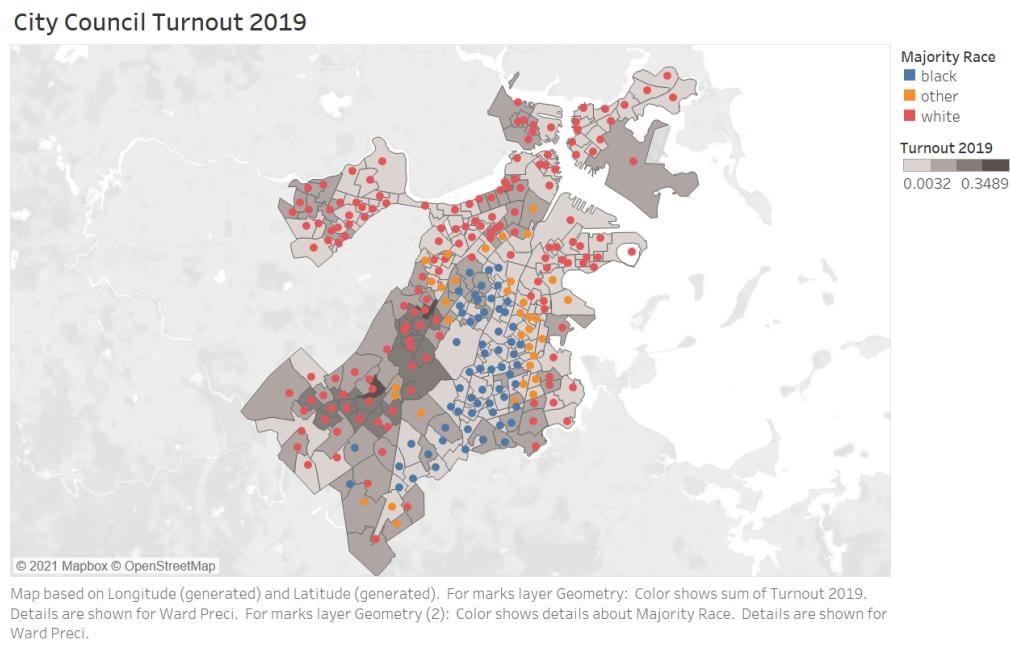
In 2017, we see different majority-black precincts with higher turnouts compared to previous years:

City Council Turnout 2017



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:



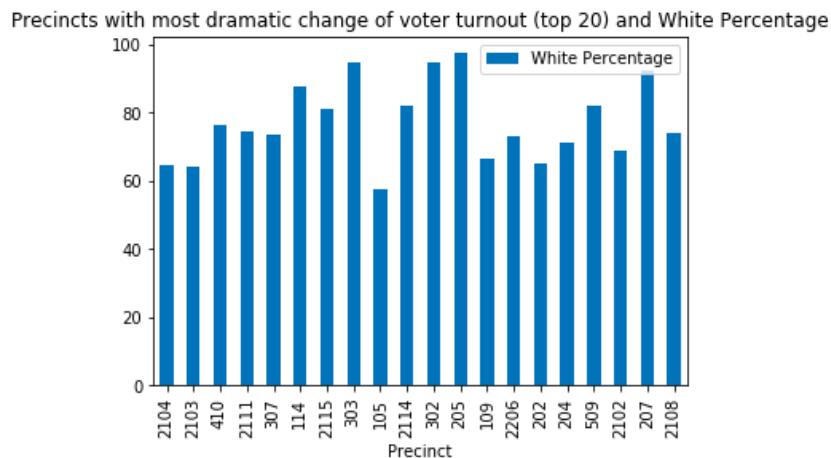
Overall, the turnouts fluctuate from year to year, and as we can see in 2011 the turnout rate ranged from 0.0095-0.612, and in 2013 the range is 0.0427-0.7381, in 2015 the range is 0.014-0.393, in 2017 the range is 0.0429-0.5856, and finally in 2019 the range 0.0032-0.3489. So, clearly there is huge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

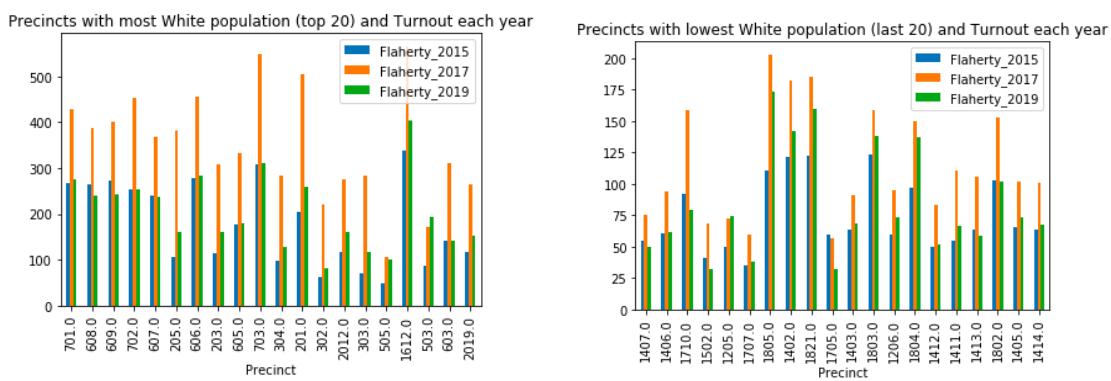
In this section, we are going to find some relations between Michael F. Flaherty's performance and districts with large white populations.

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.)

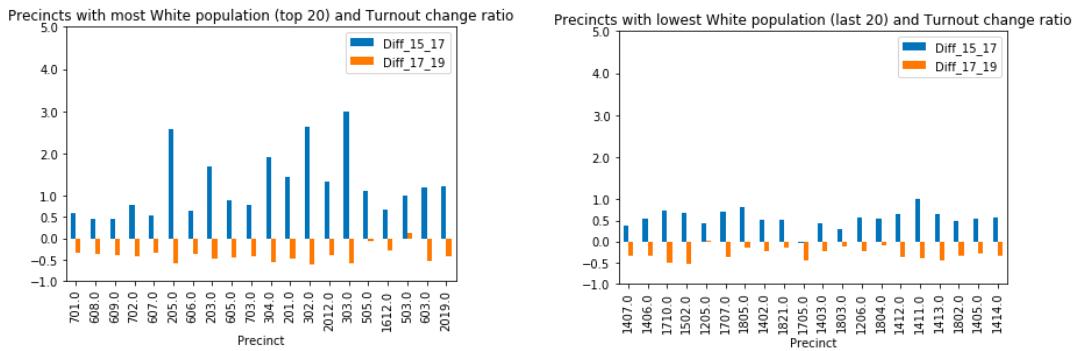


Average Turnout Change from 2015 to 2017: 1.118888888888888  
 Average Turnout Change from 2017 to 2019: -0.3228571428571428  
 Average Turnout Change from 2015 to 2019: 0.3982777777777773

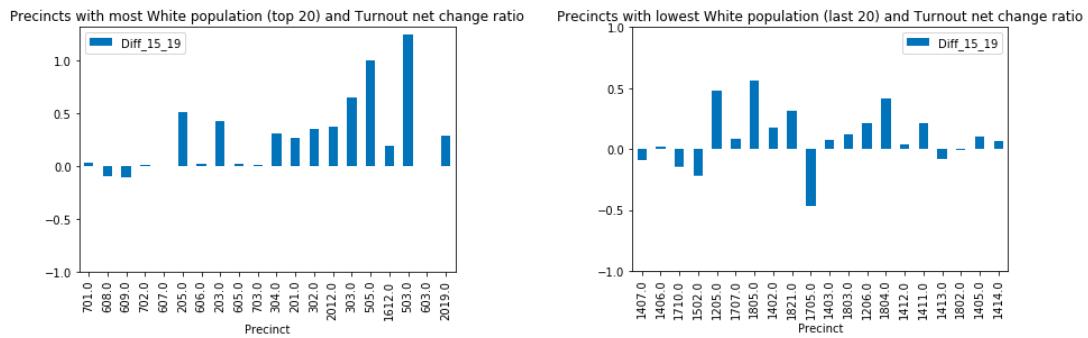
From the graph above, we can see that precincts with the greatest average change in *share of voter turnout* over time have a relatively large white population (all above 50%). Although Flaherty lost some supporters in 2019, in general, he still had more supporters in 2019 than in 2015.



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.

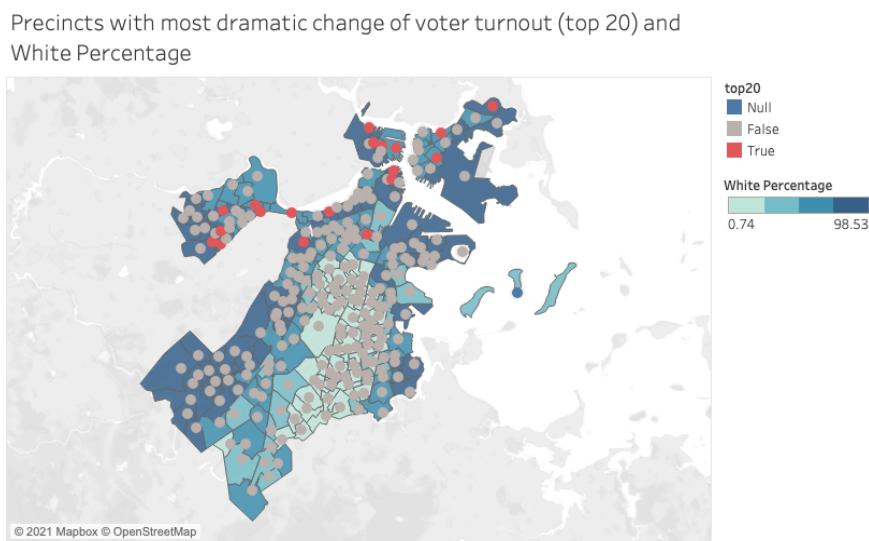


The gain and loss of supporters in precincts with smaller white populations is not as dramatic as that in precincts with larger white populations.



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:

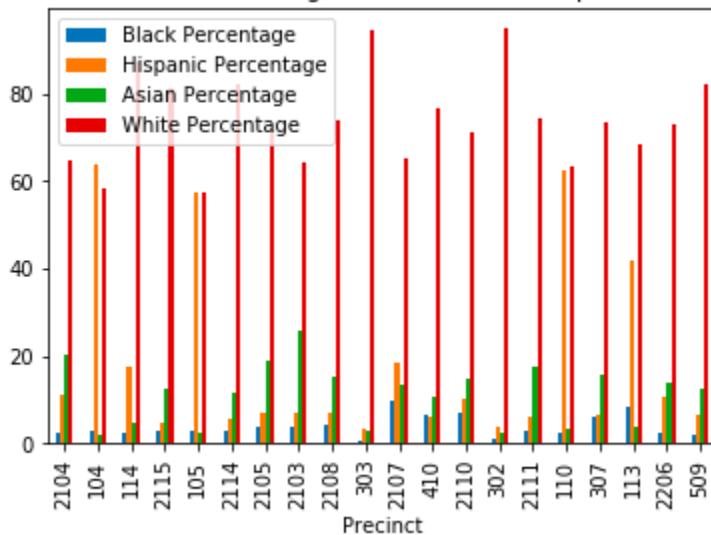


## Part 5: How has Michelle Wu's performance changed over time?

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.)

Precincts with most dramatic change of voter turnout (top 20) and different races



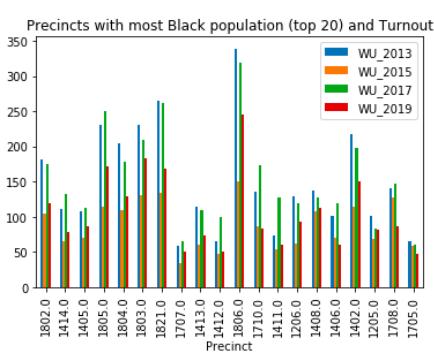
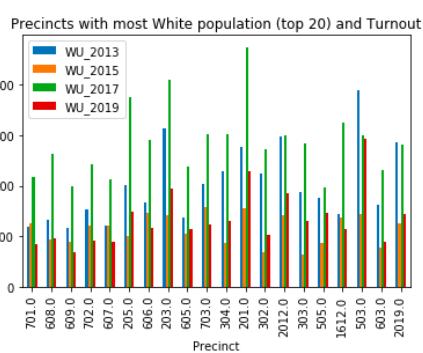
Average Turnout Change from 2013 to 2015: -0.5017588932806326

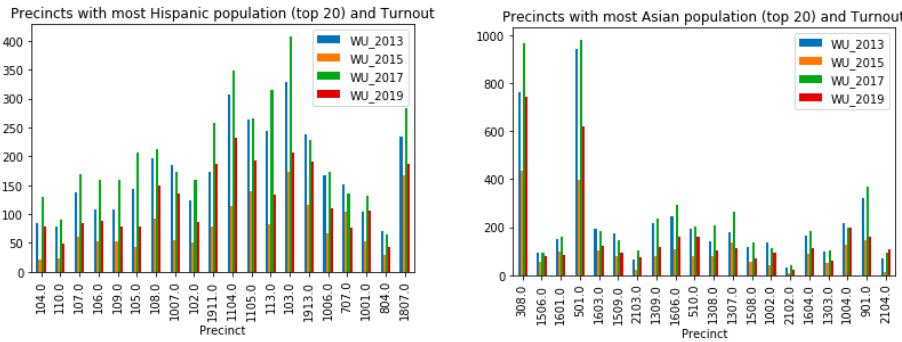
Average Turnout Change from 2015 to 2017: 1.424488095238095

Average Turnout Change from 2017 to 2019: -0.34796031746031747

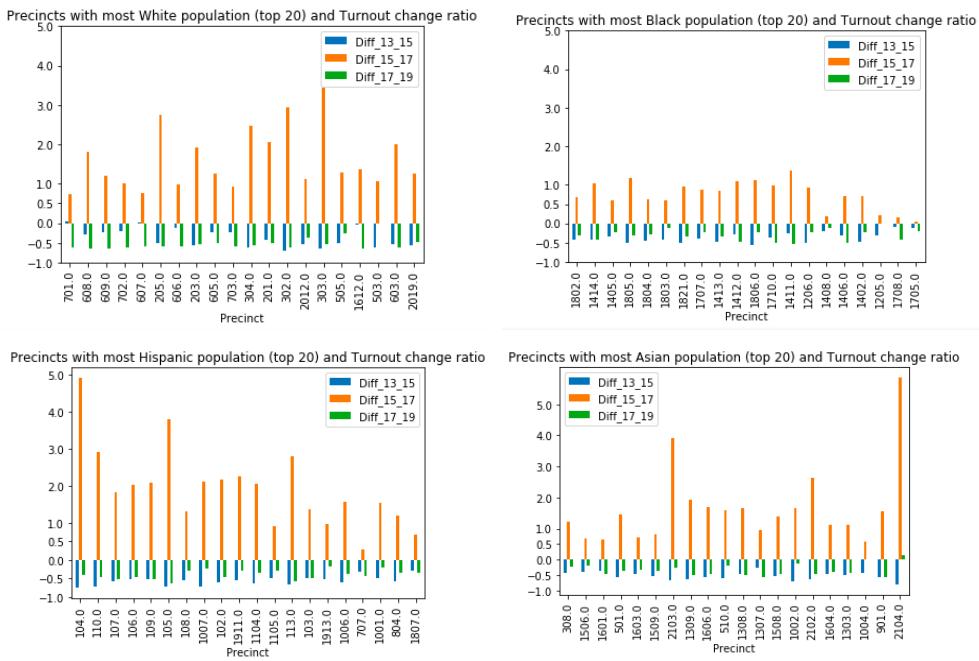
Average Turnout Change from 2013 to 2019: -0.28663241106719384

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.





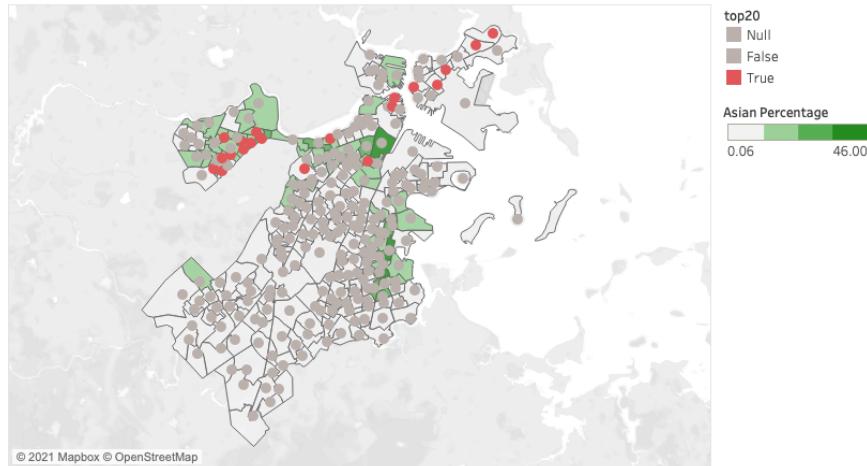
From the graphs, we can see that Wu has more supporters in precincts with more Asian population. Especially in precinct 0308 and 0501, almost 1000 voters voted for her in 2017.



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

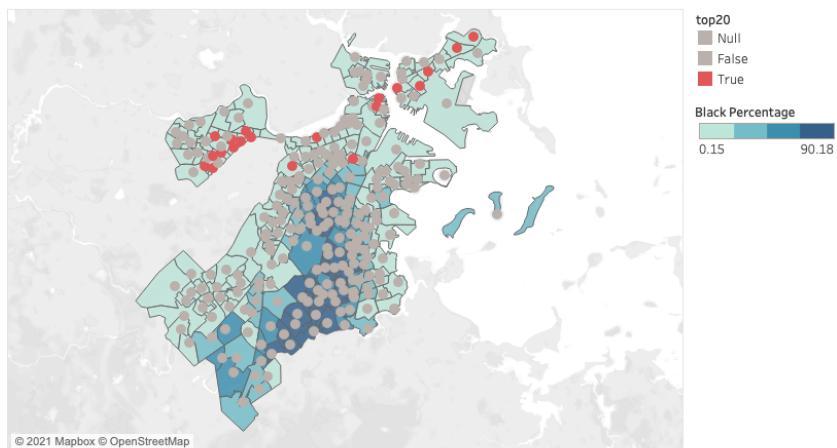
Visualizing it on an actual map:

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



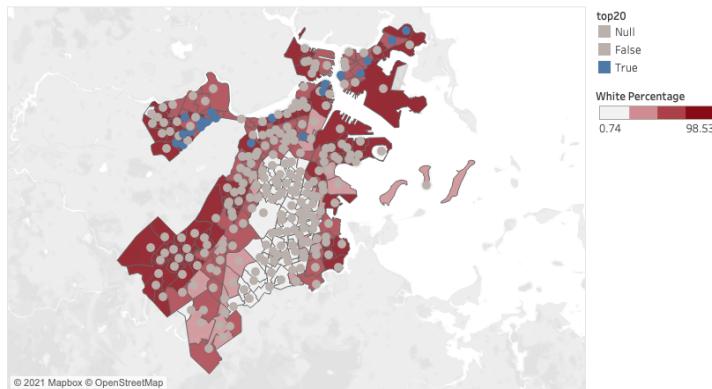
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Asian Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

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



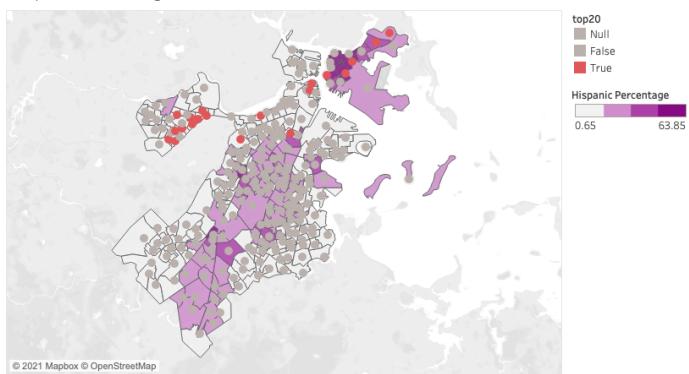
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Black Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

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



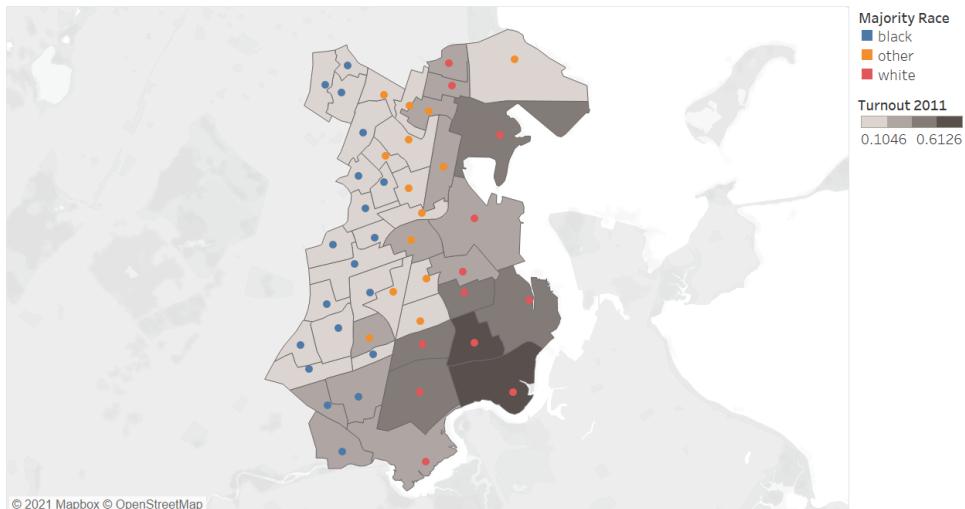
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Hispanic Percentage. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about top20. Details are shown for Ward Preci.

## 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.

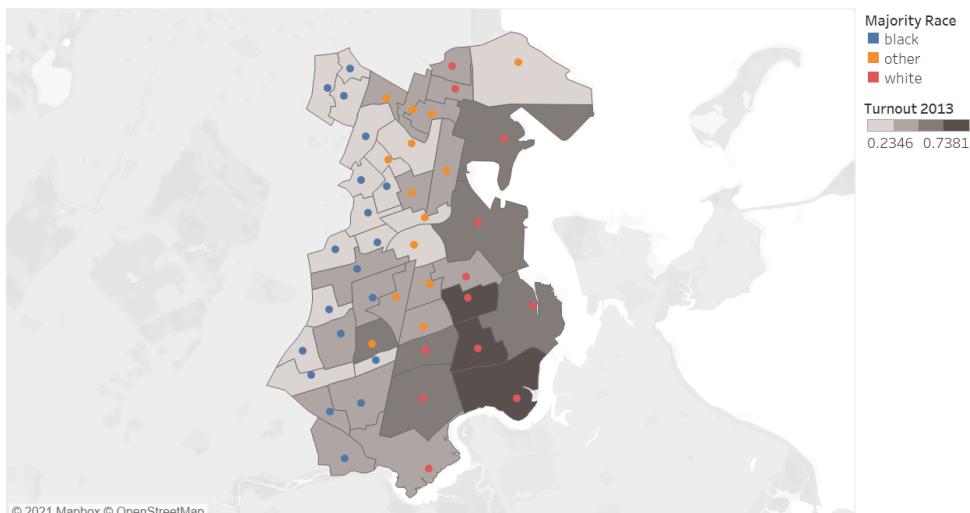
First, we look at all those areas, and compare turnout across the years in the following maps:

City Council 2011 Turnout for District 3



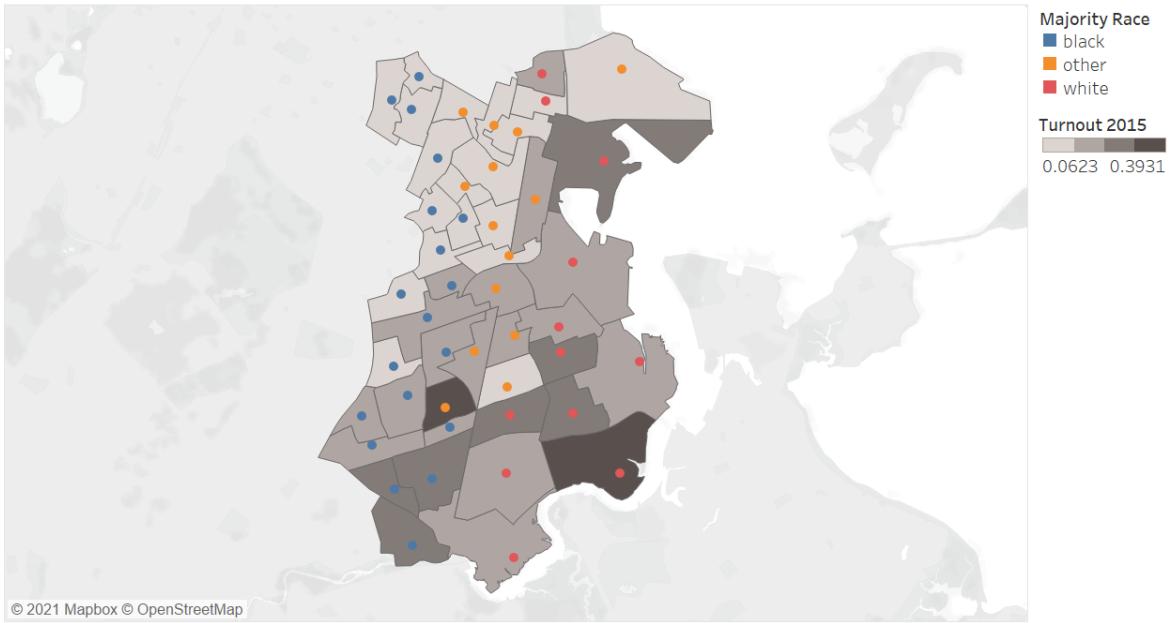
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2011. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

City Council 2013 Turnout for District 3



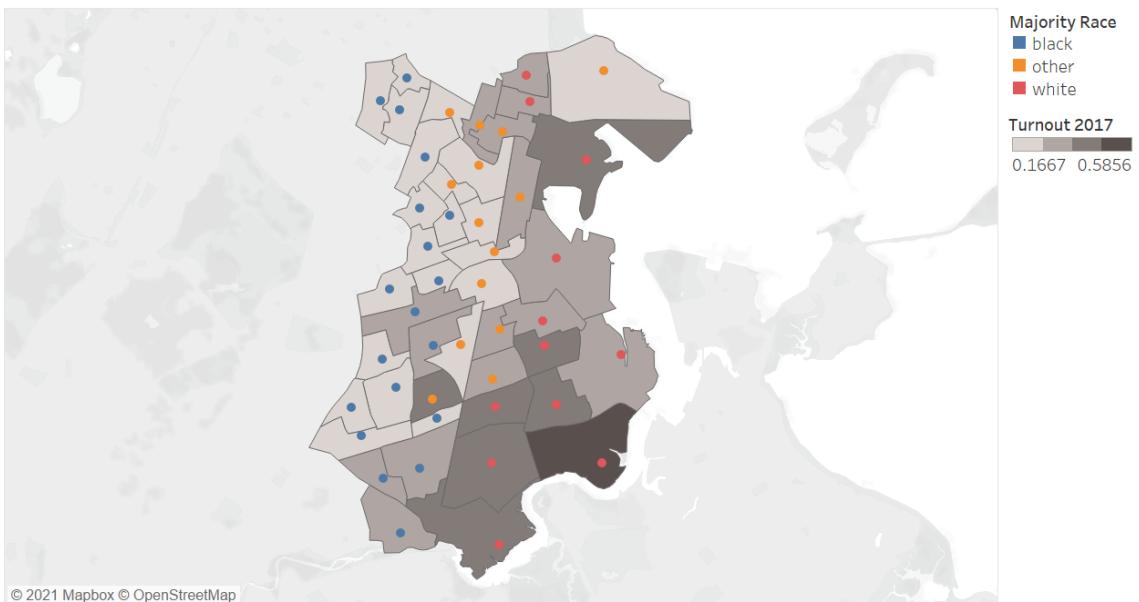
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2013. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

### City Council 2015 Turnout for District 3



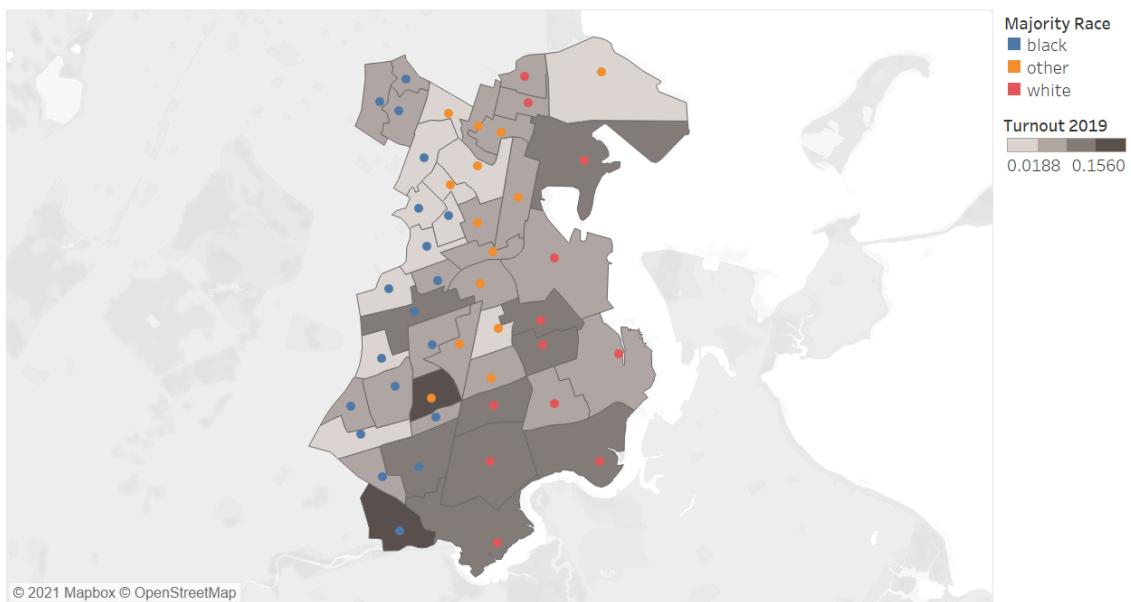
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2015. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

### 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



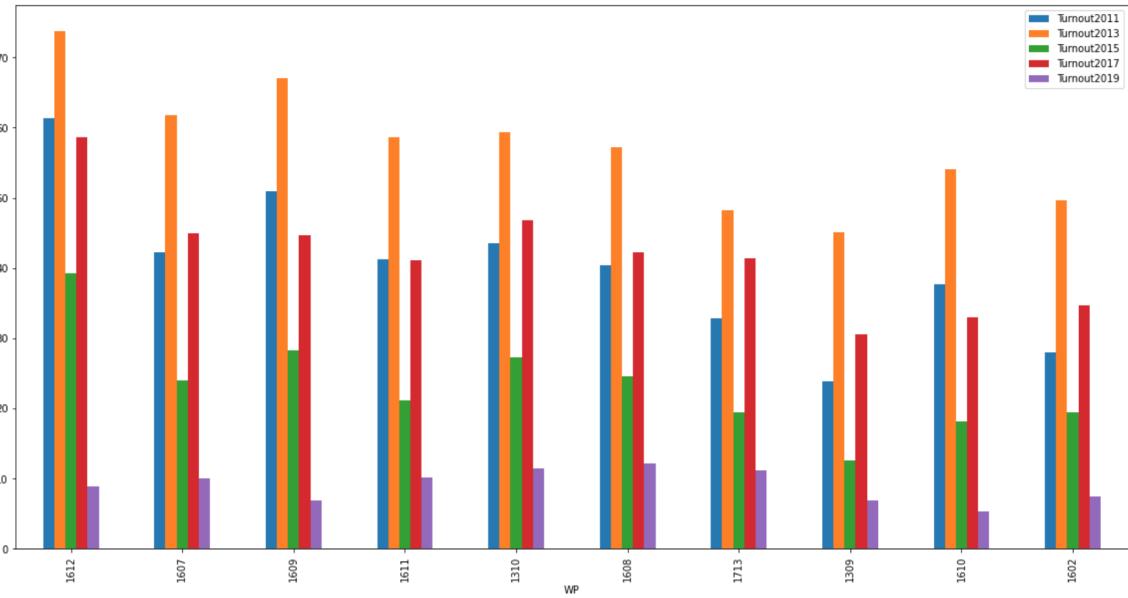
Map based on Longitude (generated) and Latitude (generated). For marks layer Geometry: Color shows sum of Turnout 2019. Details are shown for Ward Preci. For marks layer Geometry (2): Color shows details about Majority Race. Details are shown for Ward Preci.

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.

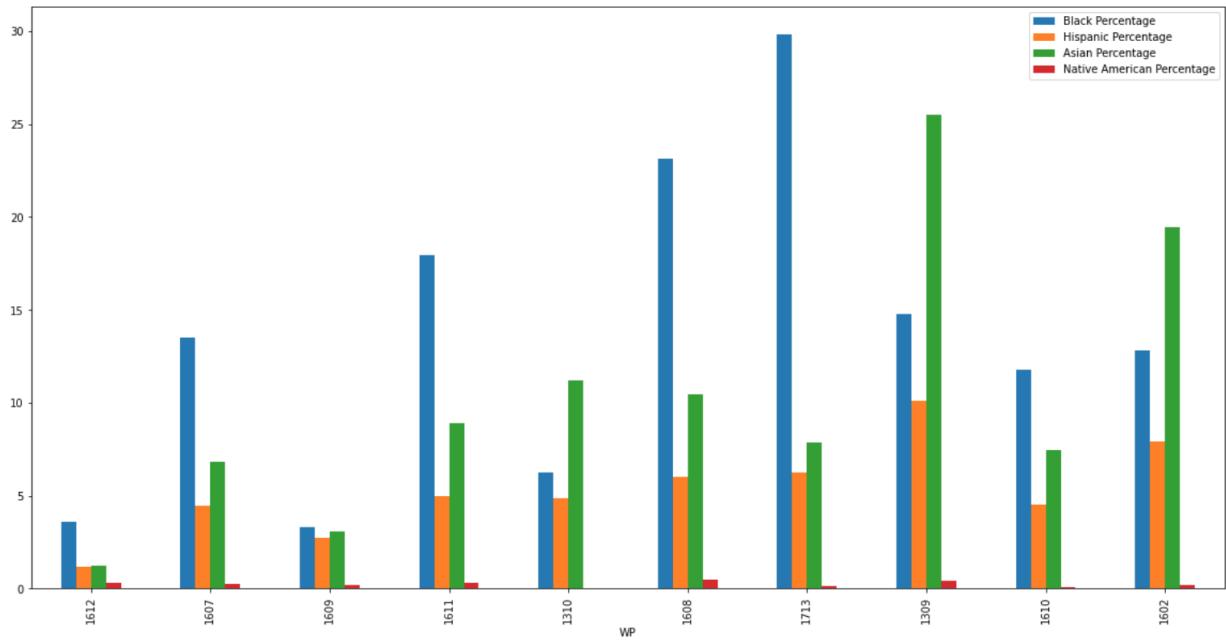
Second, we find the top 10 precincts with the greatest volatility across city council election year in District 3:

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:

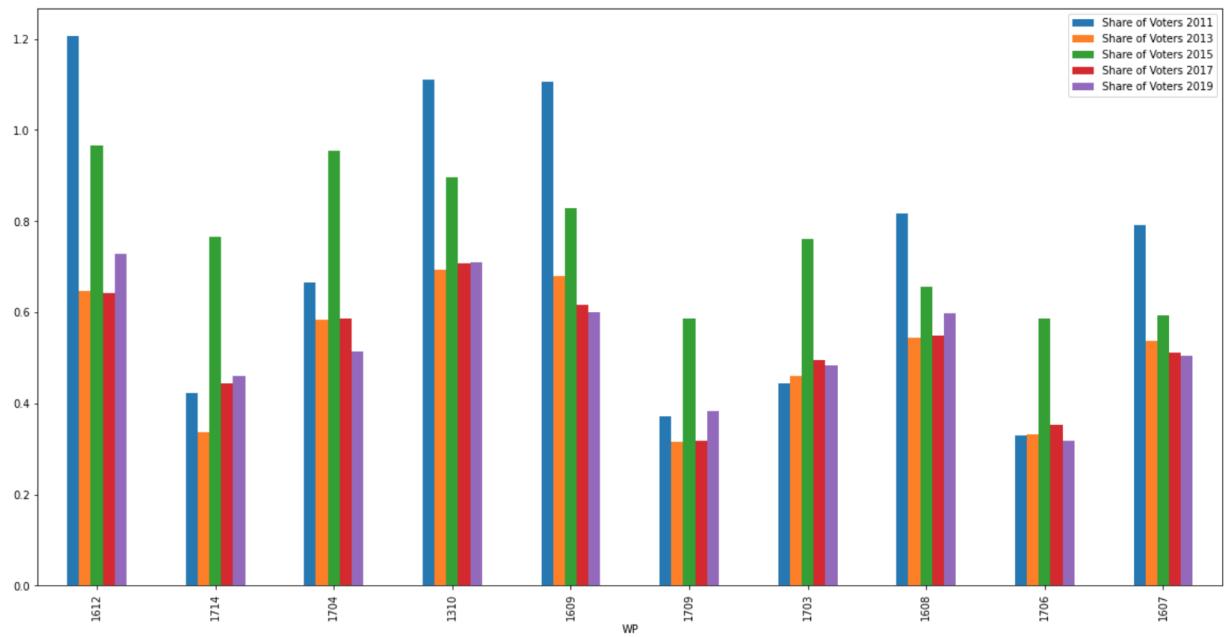


As we can see, about 3 of these precincts have a sizable black population, while two have a sizable Asian population. However, most have a majority white population.

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:

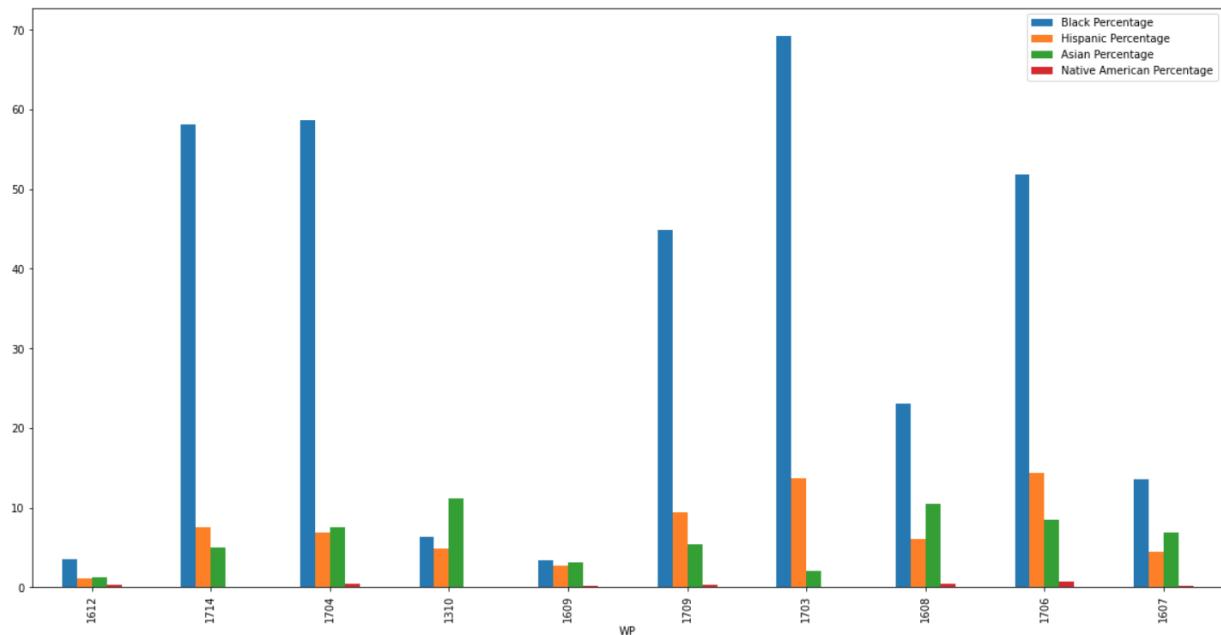
WP	Share of Voters 2011	Share of Voters 2013	Share of Voters 2015	Share of Voters 2017	Share of Voters 2019	AvgChange
1612	1.20712	0.64750	0.96486	0.64263	0.72872	0.29980
1714	0.42305	0.33577	0.76557	0.44468	0.45974	0.20949
1704	0.66479	0.58388	0.95499	0.58646	0.51404	0.20514
1310	1.11010	0.69274	0.89580	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.

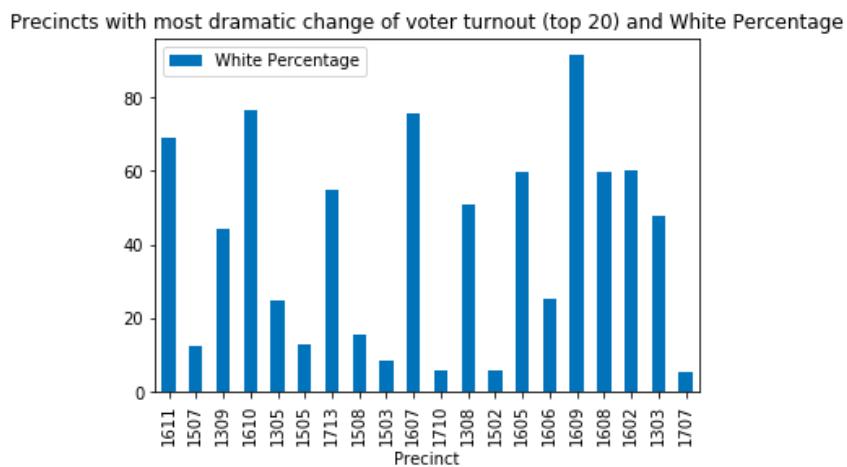
Now, for the demographic breakdown of each of these precincts:



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: 0.57368888888889  
 Average Turnout Change from 2017 to 2019: -0.3701111111111111  
 Average Turnout Change from 2015 to 2019: -0.02206666666666667

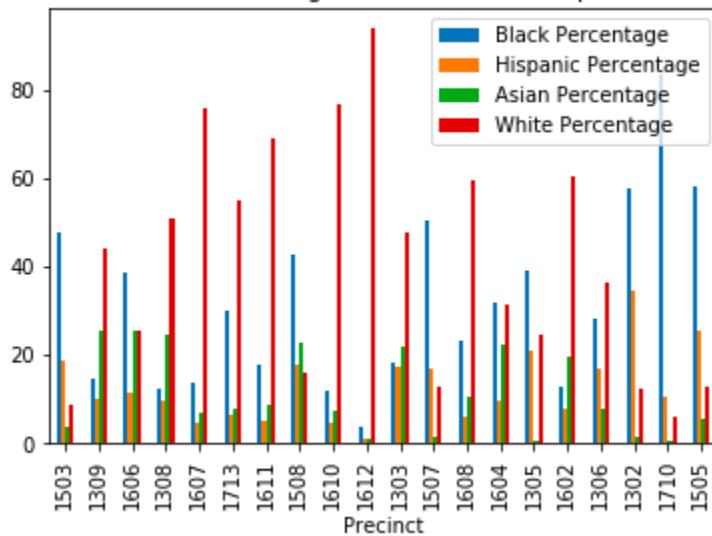


From the graph above, we can see that districts with the greatest average change in *share of voter turnout* over time do not have strong correlation with white percentage. In district 3, he does not have more supporters in 2019 than in 2015.

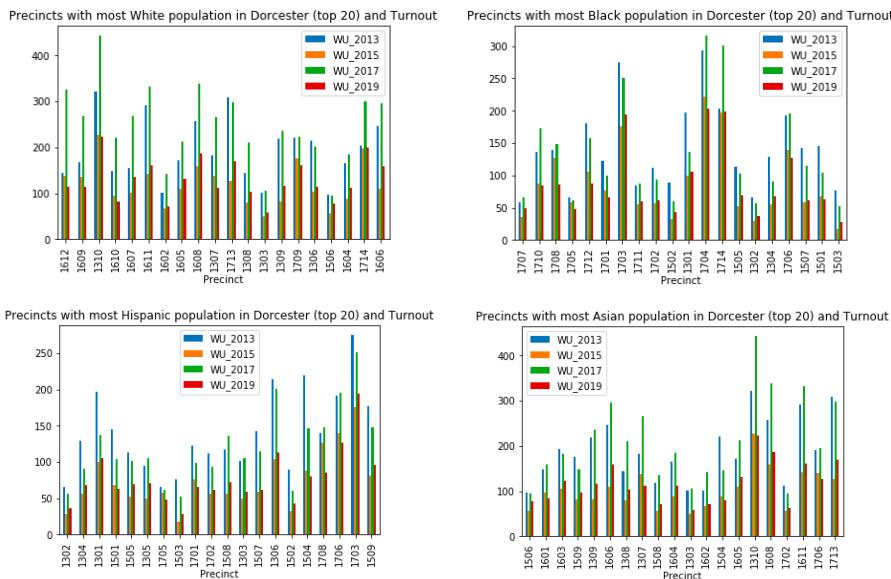
Lastly, we focus on how Michelle Wu's performance changed in district 3 over time.

Average Turnout Change from 2013 to 2015: -0.410733333333333  
 Average Turnout Change from 2015 to 2017: 0.907422222222221  
 Average Turnout Change from 2017 to 2019: -0.403733333333333  
 Average Turnout Change from 2013 to 2019: -0.370444444444444

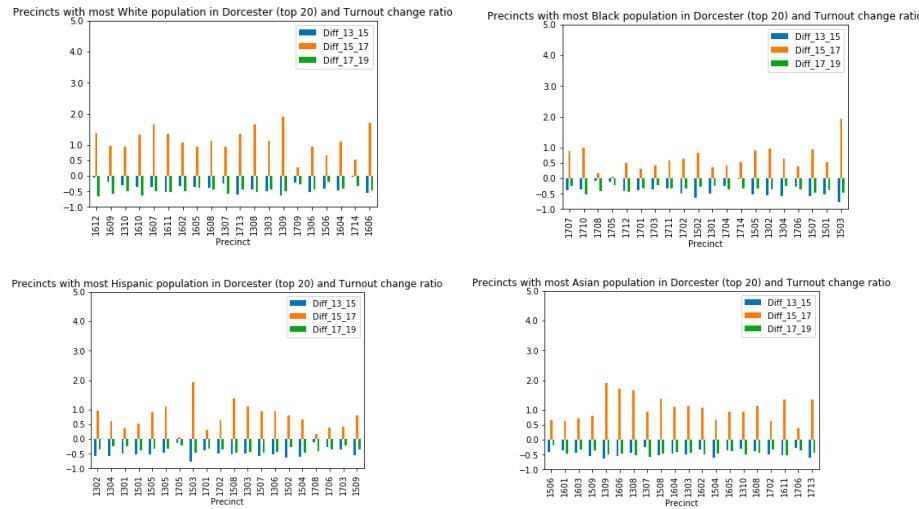
Precincts with most dramatic change of voter turnout (top 20) and different races



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.