# Tableau Homework - Citi Bike Usage Analysis

August 22, 2020

For this study, I chose a couple of time periods separated in time, each covering a span of 4-months: January-April 2019 and January-April 2020. The aim was to be able to analyze monthly trends, as well as yearly trends in New York City with the expectation of seeing the impact of a black swan event like the Covid-19 global pandemic.

- **How many trips have been recorded total during the chosen period?**

Answer: Since two separate time periods were used in this study, the total number of trips recorded was calculated for each period as below. The grand total of the trips over the 4-month period was ~5million in 2019 versus ~4.1 million in 2020. These numbers show that overall ridership fell by nearly a million in 2020. In a regular year like 2019, ridership rose as we moved from the snowy winter into the relatively warmer spring months. However, that trend was reversed by the global pandemic in 2020.
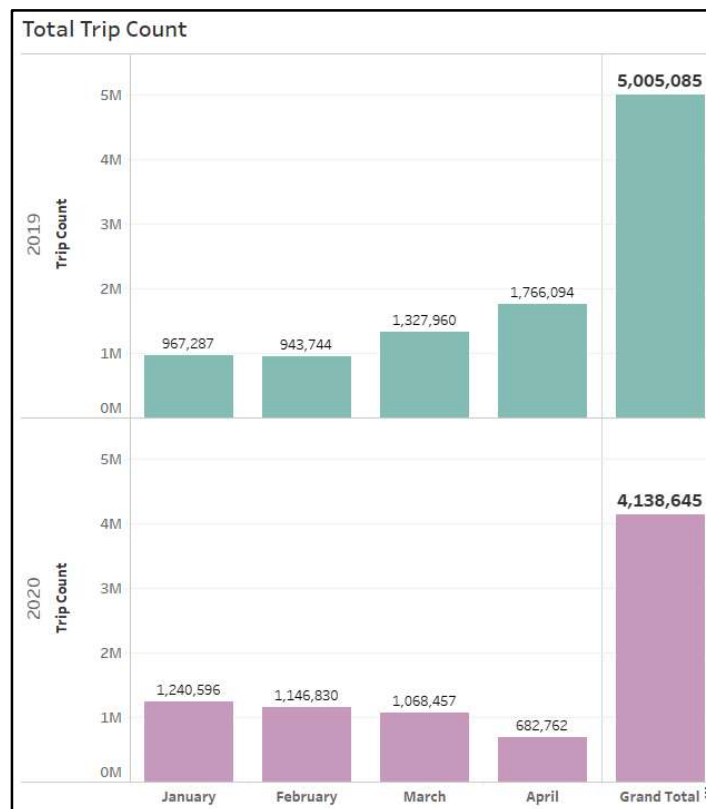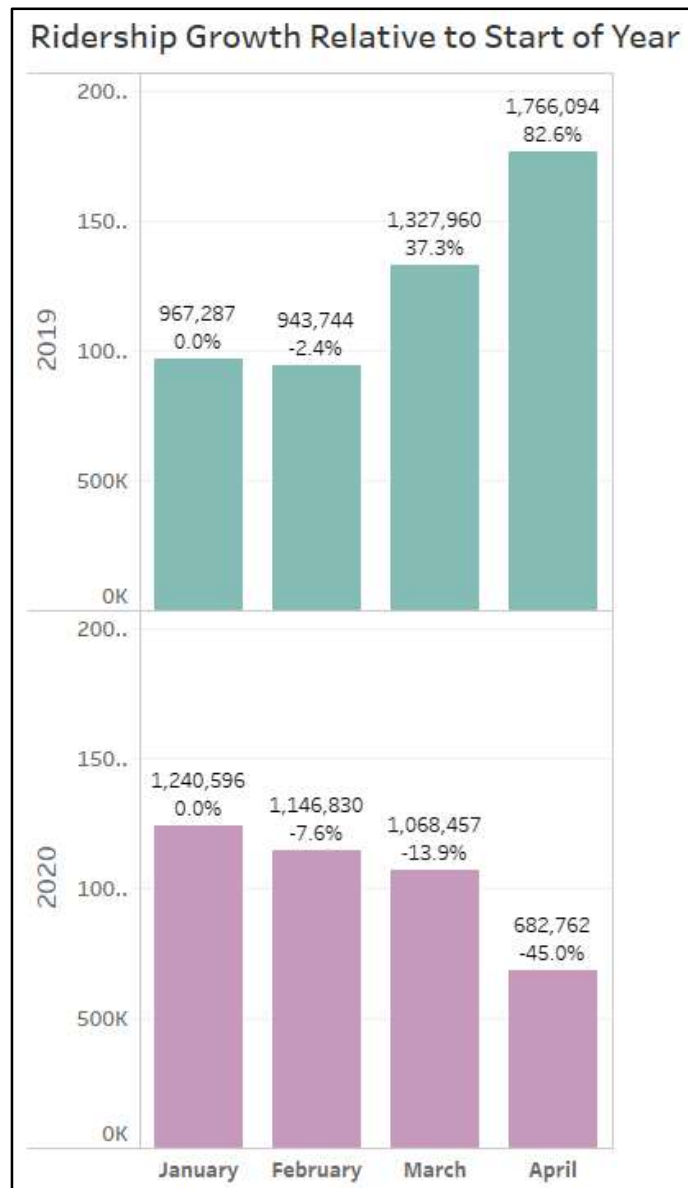
- **By what percentage has total ridership grown?**

Answer: The growth in ridership as compared to the start of the period (January of the respective year) was evaluated for each period separately as below.

For 2019: Growth was as high as 82.6% at the end of April when compared to January.
For 2020: Growth fell to -45% at the end of April when compared to January.

These numbers demonstrate how drastically ridership fell in 2020, compared to a rise in a regular year like 2019.

Ridership Growth Relative to Start of Year

967,287 0.0%	943,744 -2.4%	1,327,960 37.3%	1,766,094 82.6%
1,240,596 0.0%	1,146,830 -7.6%	1,068,457 -13.9%	682,762 -45.0%
January	February	March	April

(2019 shown in top panel; 2020 shown in bottom panel)

- **How has the proportion of short-term customers and annual subscribers changed?**

Answer: The proportion of short-term customers versus annual subscribers has evolved from January to April in both years, and the overall proportion of short-term customers has increased over time in each case. However, a much higher proportion of short-term costumers is clearly seen in 2020, at a time when the uncertainty associated with the global pandemic has likely prevented riders from committing to an annual subscribership.
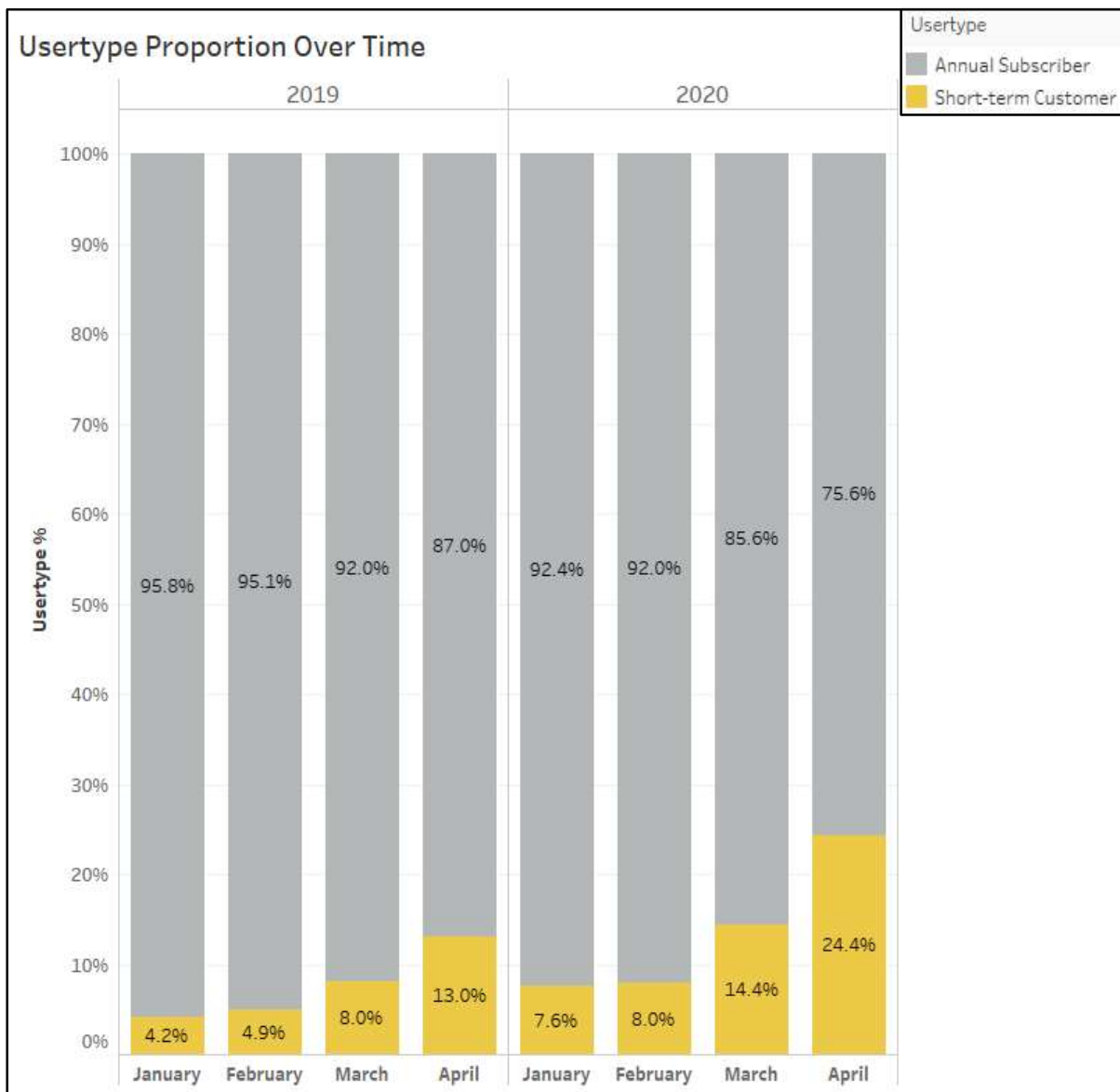
- **What are the peak hours in which bikes are used during winter months?**

Answer: January and February were the only winter months analyzed for both 2019 and 2020. The top 3 busiest hours when bike rides started were 5-6 pm, 8-9 am, and 6-7 pm during both years. The peak hours can be correlated to, and were possibly caused by daily commuters.
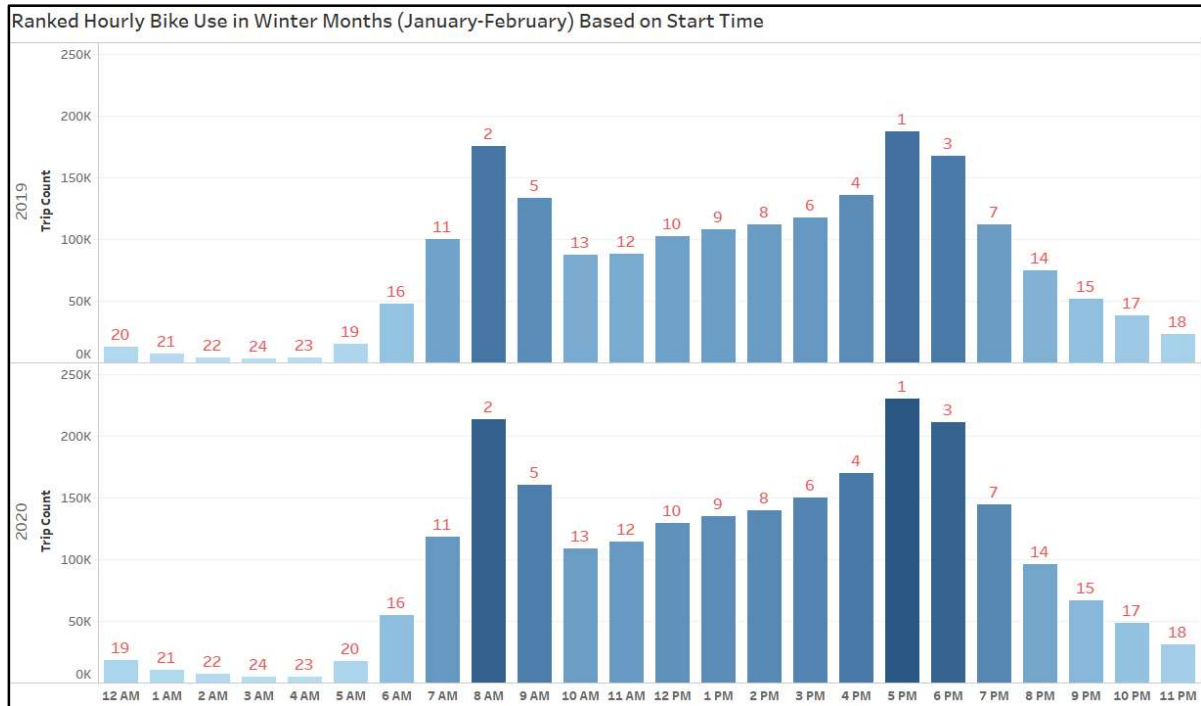
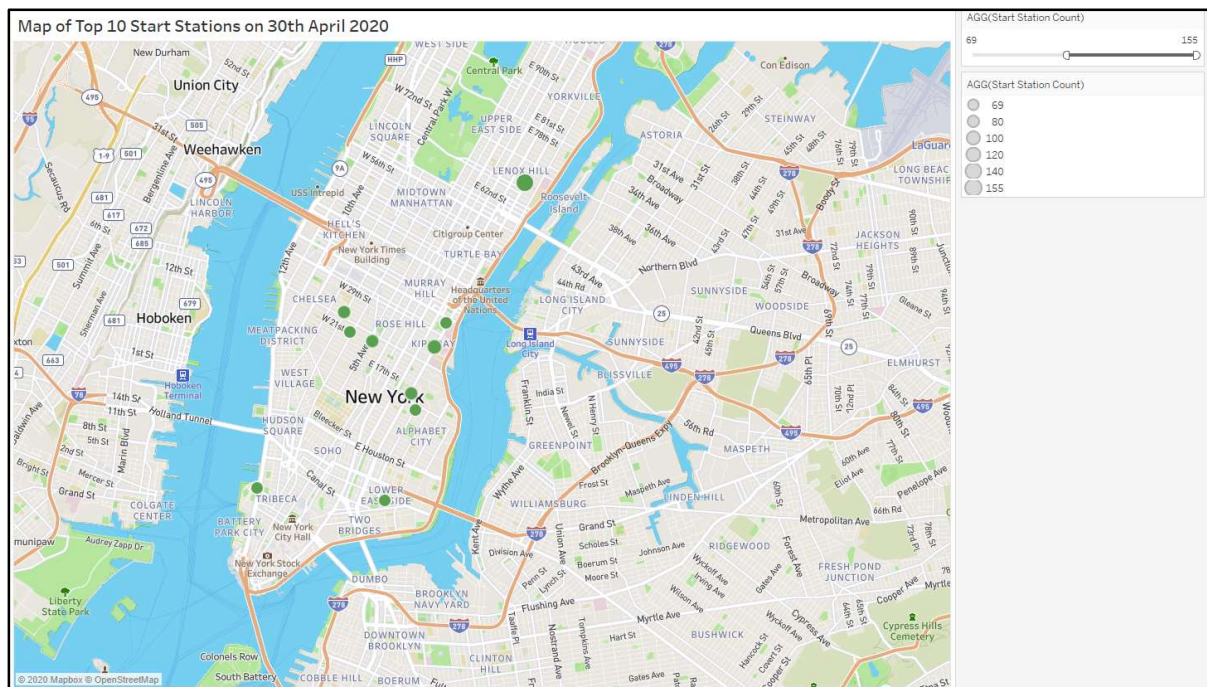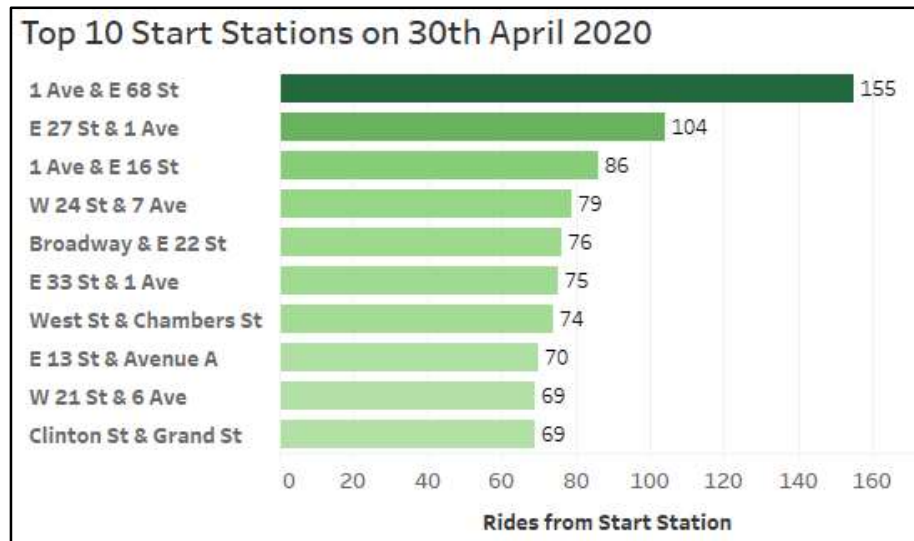- **What are the peak hours in which bikes are used during summer months?**

Answer: I analyzed spring months instead (March and April in both 2019 and 2020), as my dataset did not include summer months. The top 2 busiest hours when bike rides started coincided for both years: 5-6 pm and 6-7 pm. These peaks are possibly caused by evening commuters, although a fall in the trip count is evident in 2020 as compared to 2019.

However, the third highest busiest hour was different between 2019 and 2020. In spring 2019, an 8-9 am peak was likely caused by morning commuter riders, which was not as pronounced in spring 2020 due to the drastic fall in commuter traffic as a result of altered work hours impacted by the pandemic. The third highest peak in spring 2020 was the 4-5 pm hour.
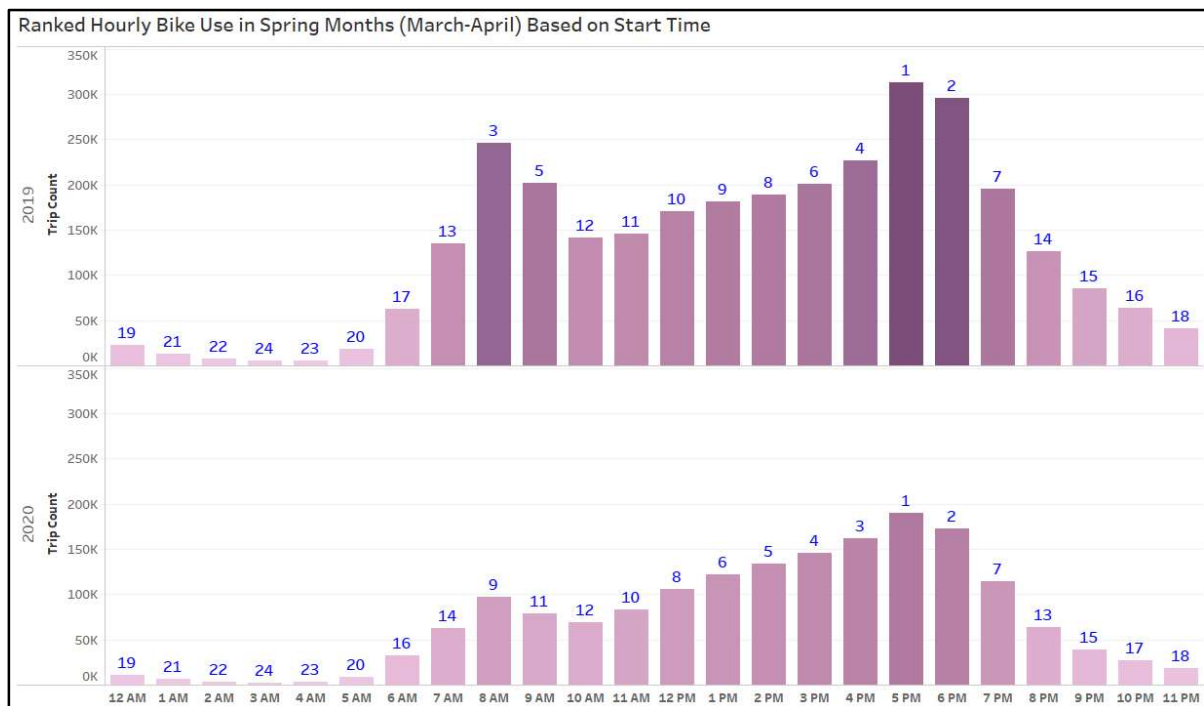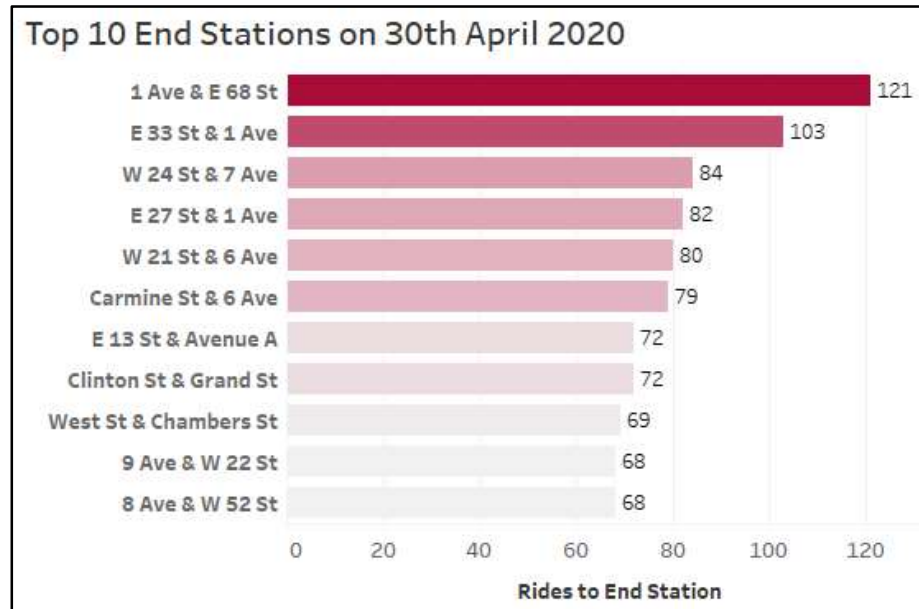
- **Today, what are the top 10 stations in the city for starting a journey? (Based on data, why do you hypothesize these are the top locations?)**

Answer: The last date of the analyzed dataset was 30 April 2020. The top start stations (in GREEN) are all located within Manhattan, and appear to closely correlate with their proximity to prominent business districts, major points of interest, or major transportation hubs (including subway stations and ferry access locations) which are easily accessible by bikes.

Top 10 Start Stations on 30th April 2020

Station	Rides from Start Station
1 Ave & E 68 St	155
E 27 St & 1 Ave	104
1 Ave & E 16 St	86
W 24 St & 7 Ave	79
Broadway & E 22 St	76
E 33 St & 1 Ave	75
West St & Chambers St	74
E 13 St & Avenue A	70
W 21 St & 6 Ave	69
Clinton St & Grand St	69

Map of Top 10 Start Stations on 30th April 2020

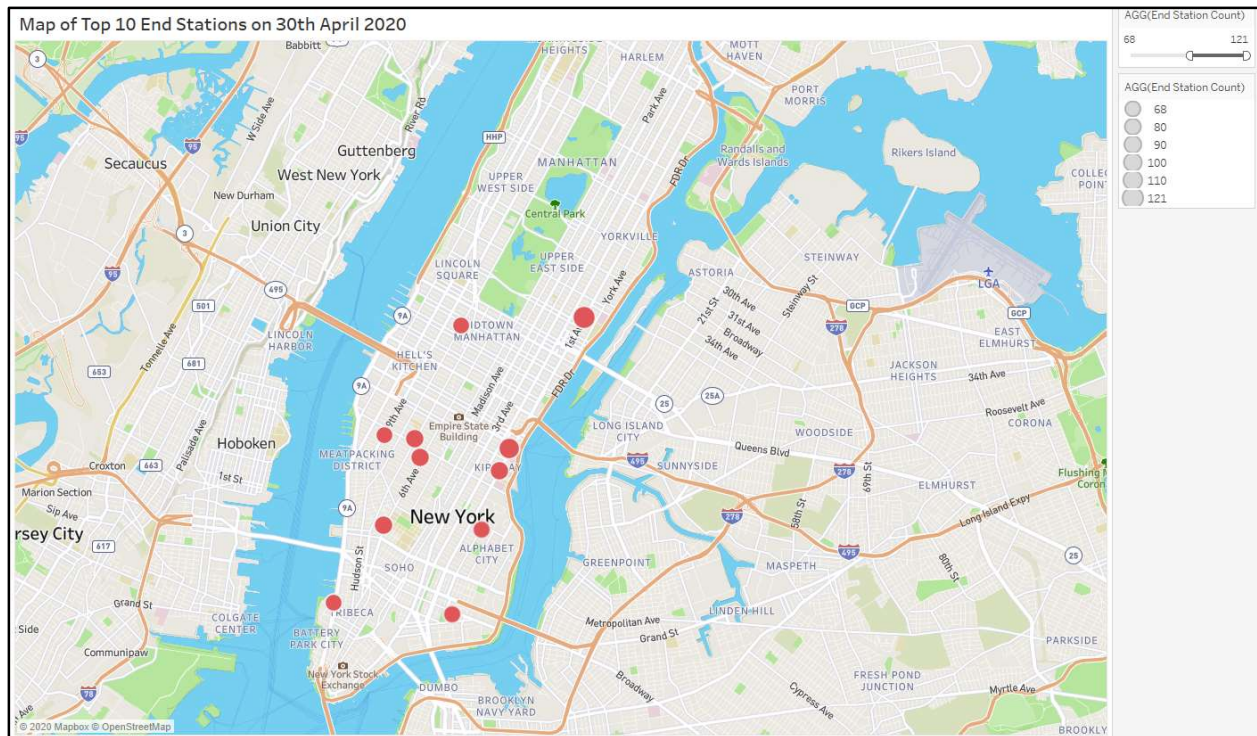- **Today, what are the top 10 stations in the city for ending a journey? (Based on data, why?)**

Answer: The last date of the analyzed dataset was 30 April 2020. The top end stations (in RED) are all located within Manhattan, and appear to closely correlate with their proximity to prominent business districts, major points of interest, or major transportation hubs (including subway stations and ferry access locations) which are easily accessible by bikes.

Top 10 End Stations on 30th April 2020

Station	Rides to End Station
1 Ave & E 68 St	121
E 33 St & 1 Ave	103
W 24 St & 7 Ave	84
E 27 St & 1 Ave	82
W 21 St & 6 Ave	80
Carmine St & 6 Ave	79
E 13 St & Avenue A	72
Clinton St & Grand St	72
West St & Chambers St	69
9 Ave & W 22 St	68
8 Ave & W 52 St	68

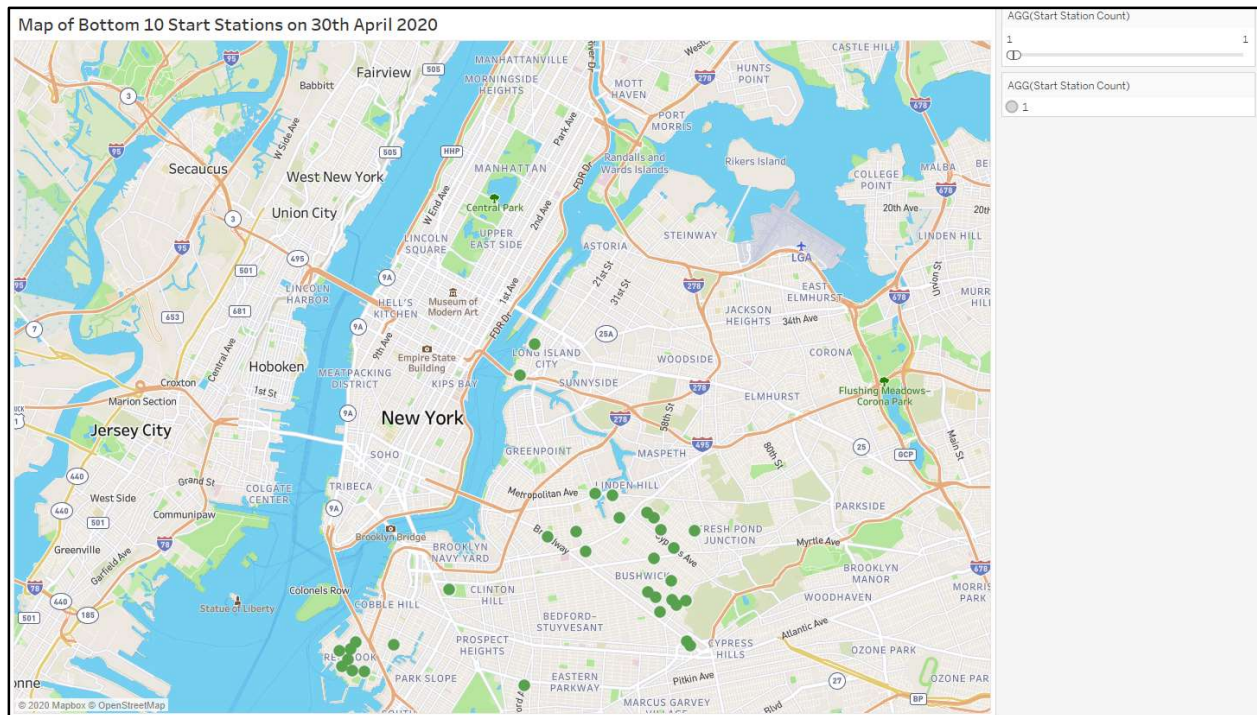Map of Top 10 End Stations on 30th April 2020

- **Today, what are the bottom 10 stations in the city for starting a journey? (Based on data, why?)**

Answer: A total of 33 stations had a rider start count of only 1 on 30th April 2020. All these bottom start station locations are in the Brooklyn area across the river to the east of Manhattan. A possible cause of few bike trips beginning here maybe how far out points of interest and transportation hubs (subways, ferries, etc.) are from these locations, leading to localities being relatively more self-sufficient, or people preferring other modes of transport over biking. Also, people living in this lower cost area are likely not commuting to Manhattan for higher salary jobs. Other possible causes include greater loss of jobs, indifference to health benefits of biking, and overall reduced transportation needs.

Bottom 10 Start Stations on 30th April 2020

Station	Count
5 St & 51 Ave	1
9 St & 44 Rd	1
Bushwick Ave & Forres..	1
Bushwick Ave & McKib..	1
Central Ave & Covert St	1
Central Ave & Decatur St	1
Cypress Ave & Palmett..	1
Dwight St & Van Dyke St	1
Eldert St & Bushwick A..	1
Harman St & Seneca Ave	1
Henry St & Bay St	1
Jefferson Ave & Evergr..	1
Knickerbocker Ave & H..	1
Lorimer St & Broadway	1
Madison St & Evergree..	1

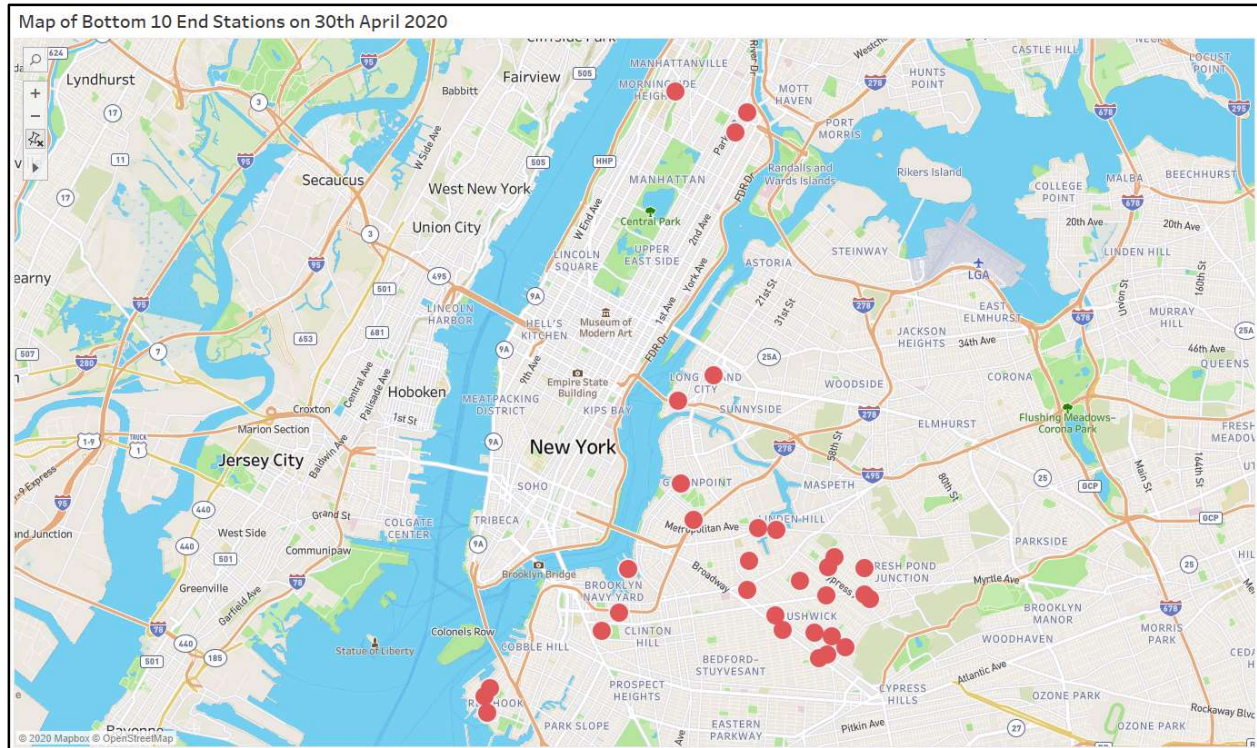Map of Bottom 10 Start Stations on 30th April 2020

- **Today, what are the bottom 10 stations in the city for ending a journey (Based on data, why?)**

Answer: Socioeconomics can play an important role in rider behavior. Economically challenged neighborhoods like Harlem, or even lower cost areas such as Brooklyn showed the least used End Stations amidst the pandemic. A few possible causes include greater loss of jobs, distance from popular points of interest, indifference to health benefits of biking, and overall reduced transportation needs.

Bottom 10 End Stations on 30th April 2020

End Station	End Station Count
44 Dr & 21 St	1
5 St & 51 Ave	1
Bushwick Ave & Dekalb ..	1
Bushwick Ave & Forrest ..	1
Carlton Ave & Park Ave	1
Central Ave & Decatur St	1
Central Ave & Weirfield ..	1
Centre St & Seneca Ave	1
Dwight St & Van Dyke St	1
Eldert St & Bushwick Ave	1
Halsey St & Broadway	1
Harman St & Seneca Ave	1
Irving Ave & DeKalb Ave	1
Lexington Ave & E 120 St	1
Lexington Ave & E 127 St	1
Madison St & Evergreen..	1
Madison St & Forest Ave	1
Metropolitan Ave & Ste..	1
Metropolitan Ave & Van..	1
Morningside Dr & Amst..	1
Myrtle Ave & Linden St	1
N 15 St & Wythe Ave	1
Pioneer St & Van Brunt ..	1
Railroad Ave & Kay Ave	1
Stephen St & Seneca Ave	1
Union Ave & Jackson St	1
Van Brunt St & Wolcott ..	1
Van Buren St & Broadw..	1
White St & Johnson Ave	1
Willoughby St & Ashlan..	1
Woodward Ave & Harm..	1

Axis scale: 0, 20, 40, 60, 80, 100, 120
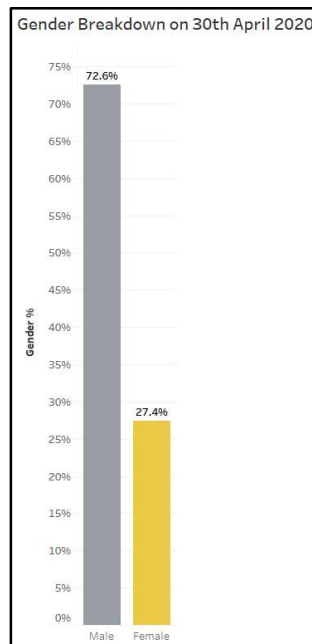
End Station Count

Map of Bottom 10 End Stations on 30th April 2020

- **Today, what is the gender breakdown of active participants (Male v. Female)?**

Answer: As of 30th April 2020, males formed 72.6% while females formed 27.4% of bike riders (excluding riders of unknown/unreported gender).

- **How effective has gender outreach been in increasing female ridership over the timespan?**

Answer: Analysis of female rider proportion over January to April in 2019 and then again over those months in 2020 shows a definite increase in female riders over time, from ~22% in January 2019 rising to ~32% in April 2020 – an indication of the effectiveness of gender outreach.
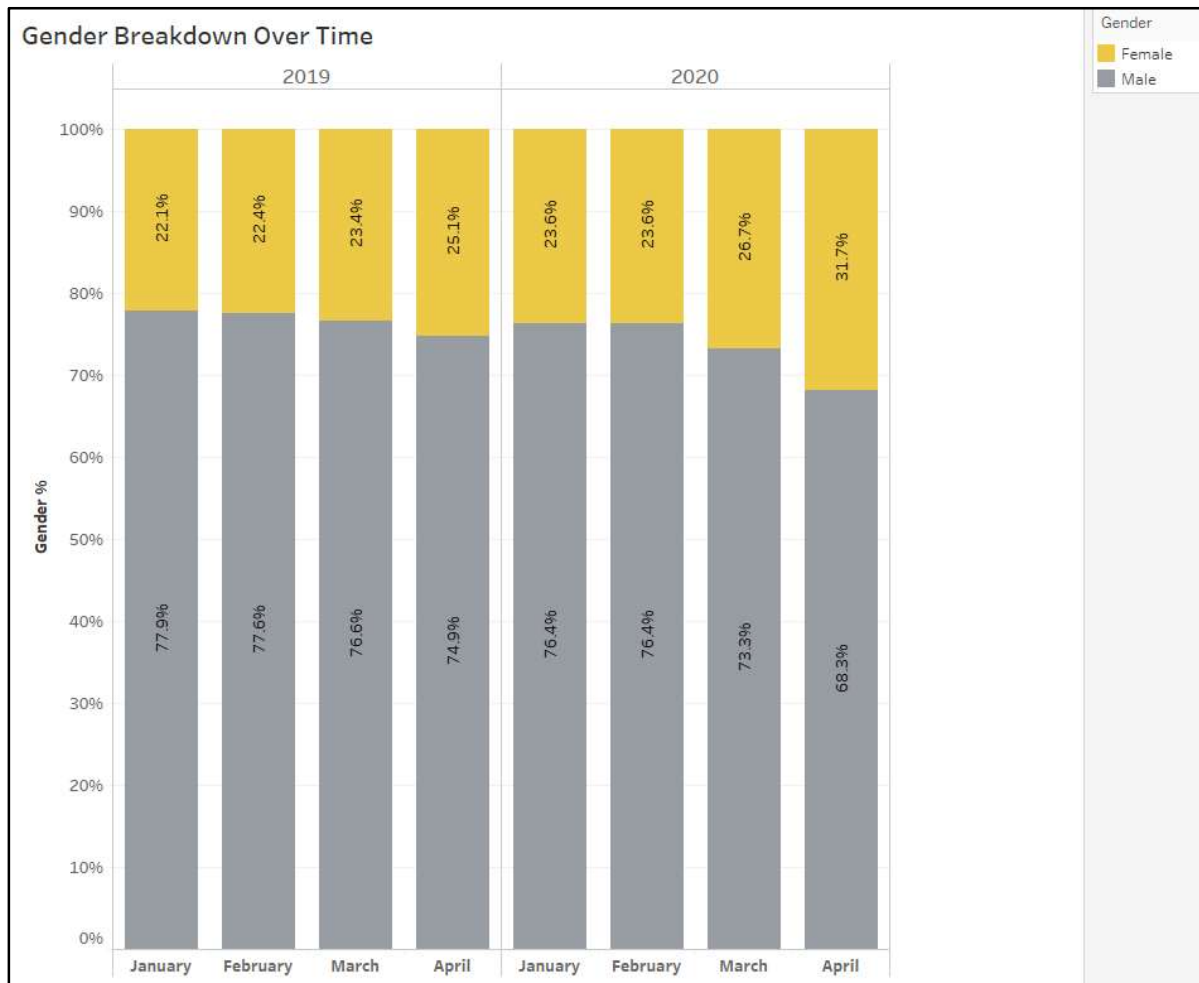
- **How does the average trip duration change by age?**

Answer: Ignoring a few outliers, this analysis shows that average trip duration is inversely proportional to the age of the bike rider. The average trip duration hovers around an average of ~15 minutes till about 65 years age, beyond which, the average duration falls to ~10 minutes. The reduced trip duration with age is expected due to deterioration of health with age.

Trip Length by Age
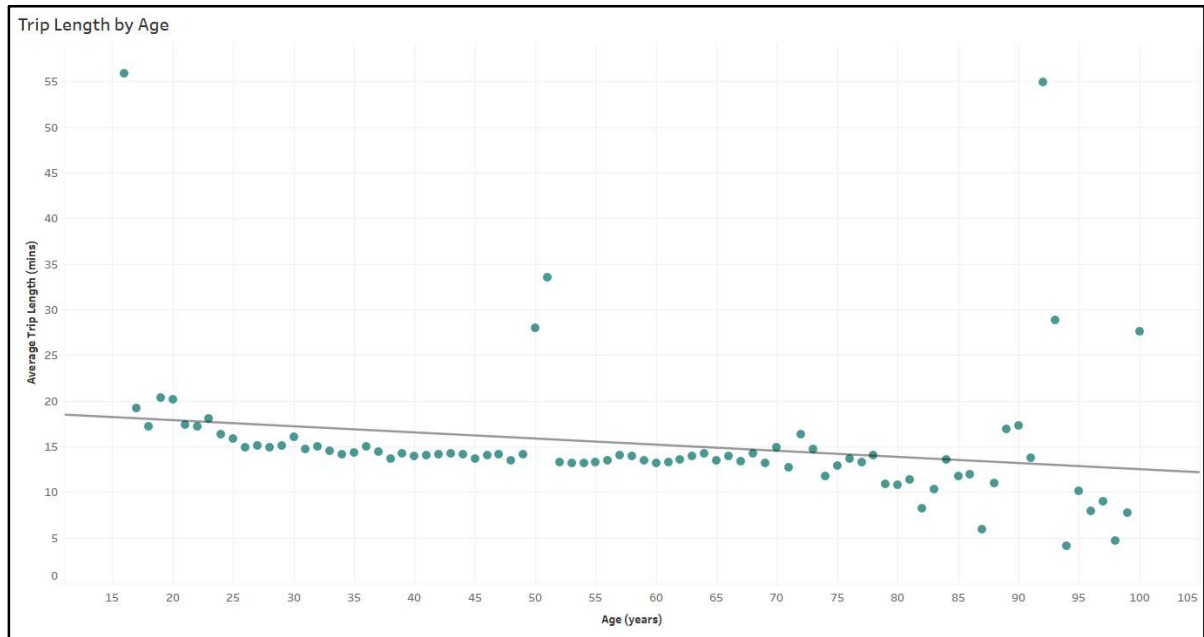
- **What is the average distance in miles that a bike is ridden?**

Answer: 479 miles (obtained using field calculation), which is also in line with the trend on the plot below.
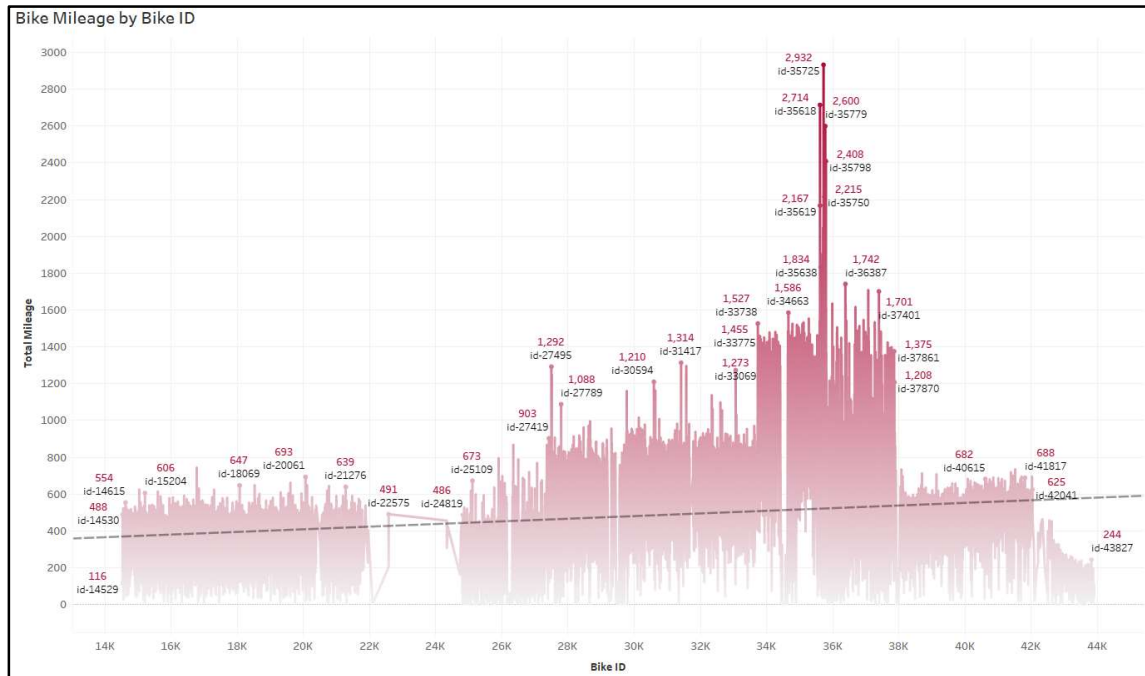
- **Which bikes (by ID) are most likely due for repair or inspection in the timespan?**

Answer: The bikes that have accumulated the most miles are likely due for repair or inspection. Based on the plot above, the bikes with the top 5 highest mileage are:

ID 35725 (~2900 miles)

ID 35618 (~2700 miles)

ID 35779 (~2600 miles)

ID 35739 (~2500 miles)

ID 35798 (~2400 miles)

- **How variable is the utilization by bike ID?**

Answer: As the above total mileage per bike plot shows, the utilization by bike ID is quite variable – from zero miles in a few cases, to ~2900 miles for the most used bike. The bikes can be divided into roughly 5 categories based on their mileages as below:

0-200 miles

200-600 miles

600-1000 miles

1000-1600 miles

> 1600 miles

Popular Start & End Station Maps

It is interesting that both popular start as well as end locations are location in the heart of Manhattan. This does not come as a surprise though, because most businesses and points of interest are concentrated in the area, bringing in thousands of people on a daily basis. Also, the presence of other mass transportation options like the subway or the ferries are more accessible by bikers.