

The Pandemic Commute

An Exploratory Analysis of How Coronavirus Has
Impacted the New York City Transit System

MTA Pre Covid (Jan 2020 to Mar 2021)

Goals:

- 1) Trends between ridership behavior and new covid cases
- 2) How is the pandemic impacting the various station and borough ridership
- 3) How do financial impacts look versus initial estimates

Data:

- 1) MTA Turnstile Data
- 2) MTA Train station to Borough mapping
- 3) NY Department of Health Covid Data

Pre Corona Context:

Average Weekday: 5.5 Million riders

Average Weekend: 5.7 Million riders

Annual : 1.73 Billion riders

2019 MTA Revenues: \$16.7 Billion/year

-38% from Subways ~ \$6.3 Billion

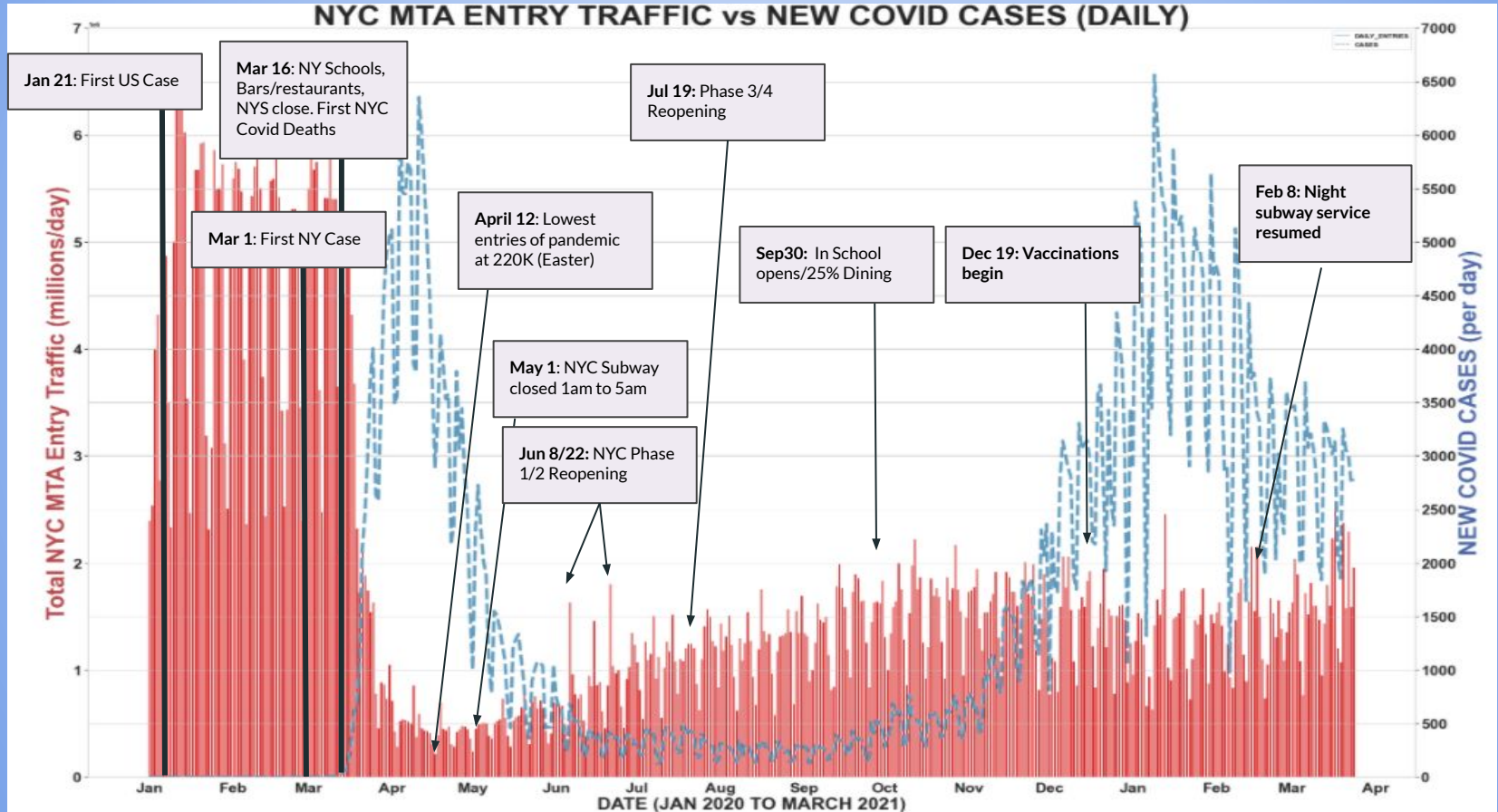
Employees: 75,000

Federal Assistance:

-\$8 billion in 2020 / \$6 Billion 2021

-Projecting \$17 Billion shortfall through 2024

Timeline of Covid and MTA Traffic

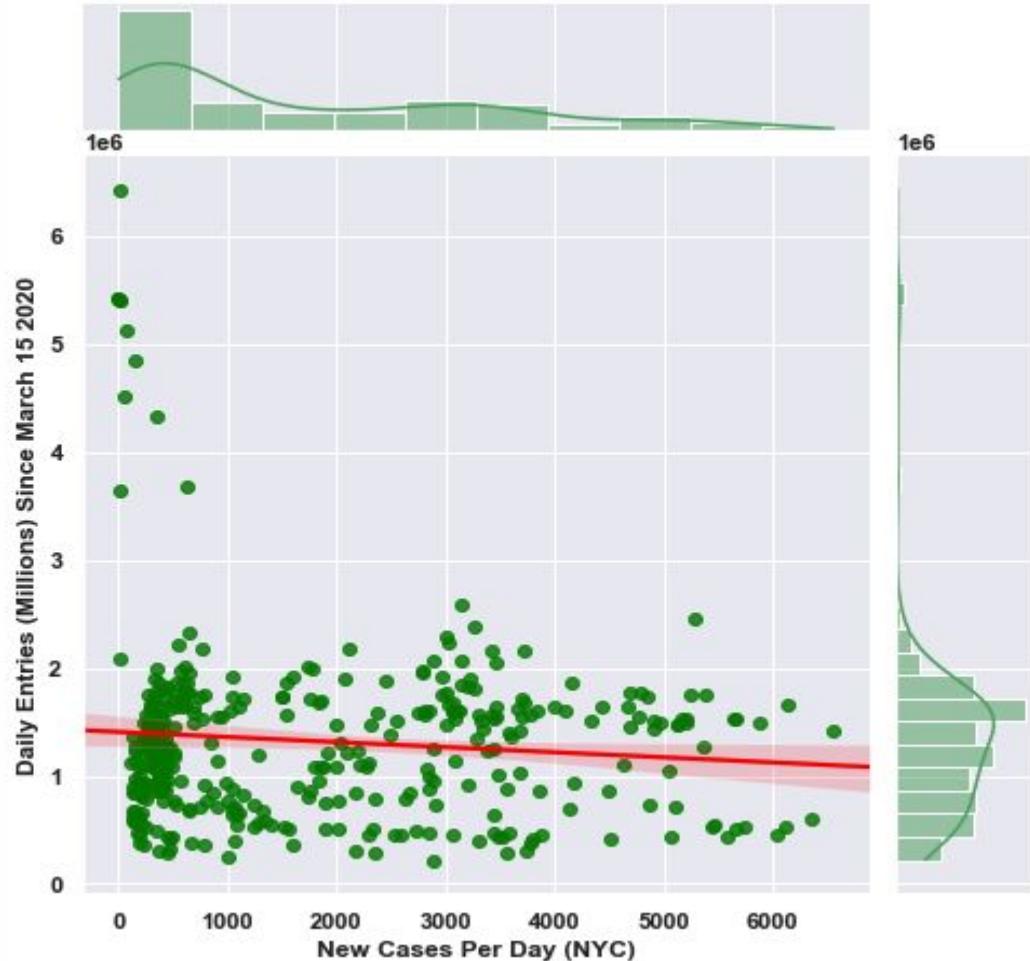


Correlation?

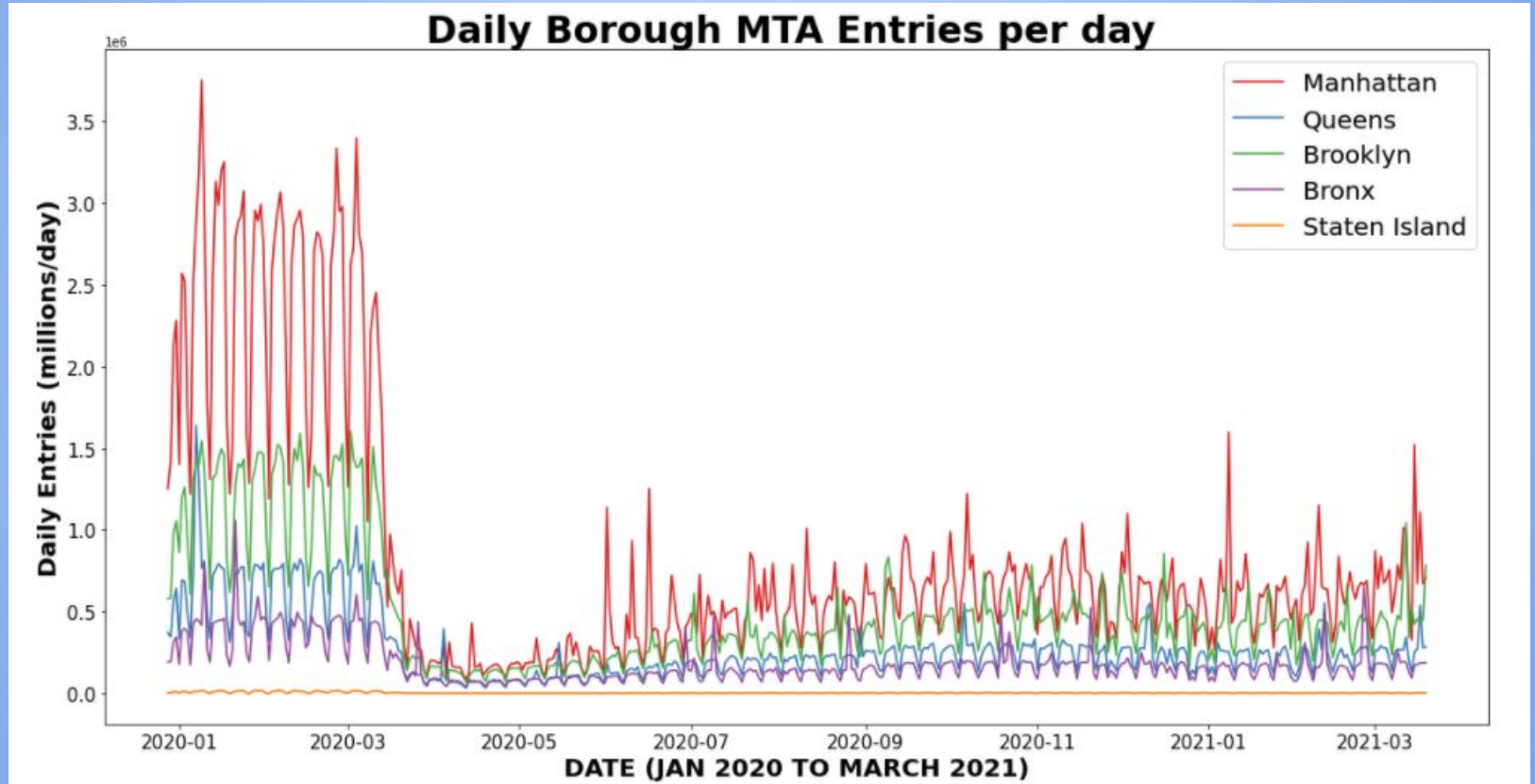
Hard to say there is a correlation looking at the joint plot as used generic regression and not sure appropriate statistically to draw a hard conclusion

Also transmission to symptoms to sickness tend to be delayed days to weeks

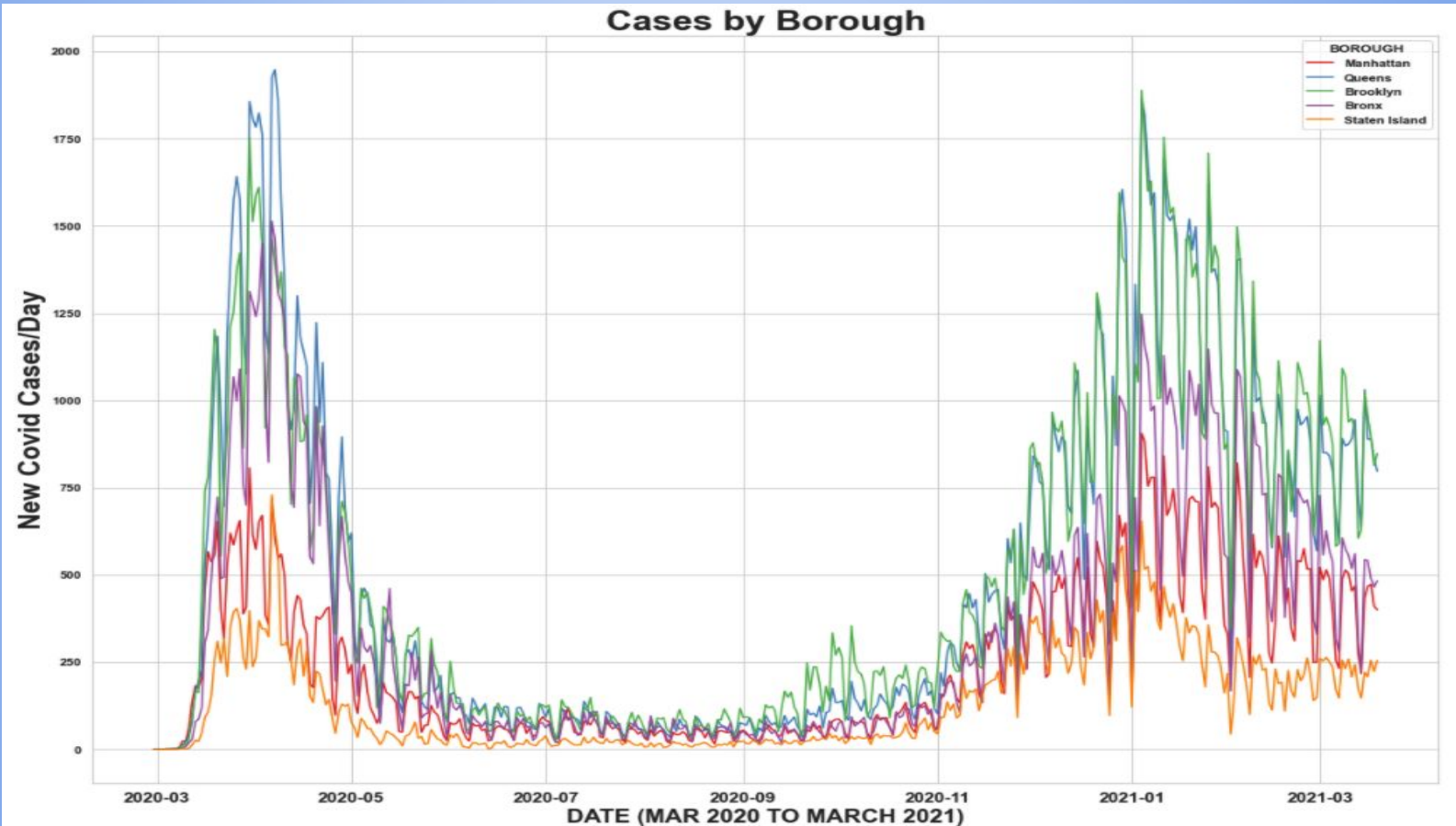
However at first glance this would say weak to no correlation day to day



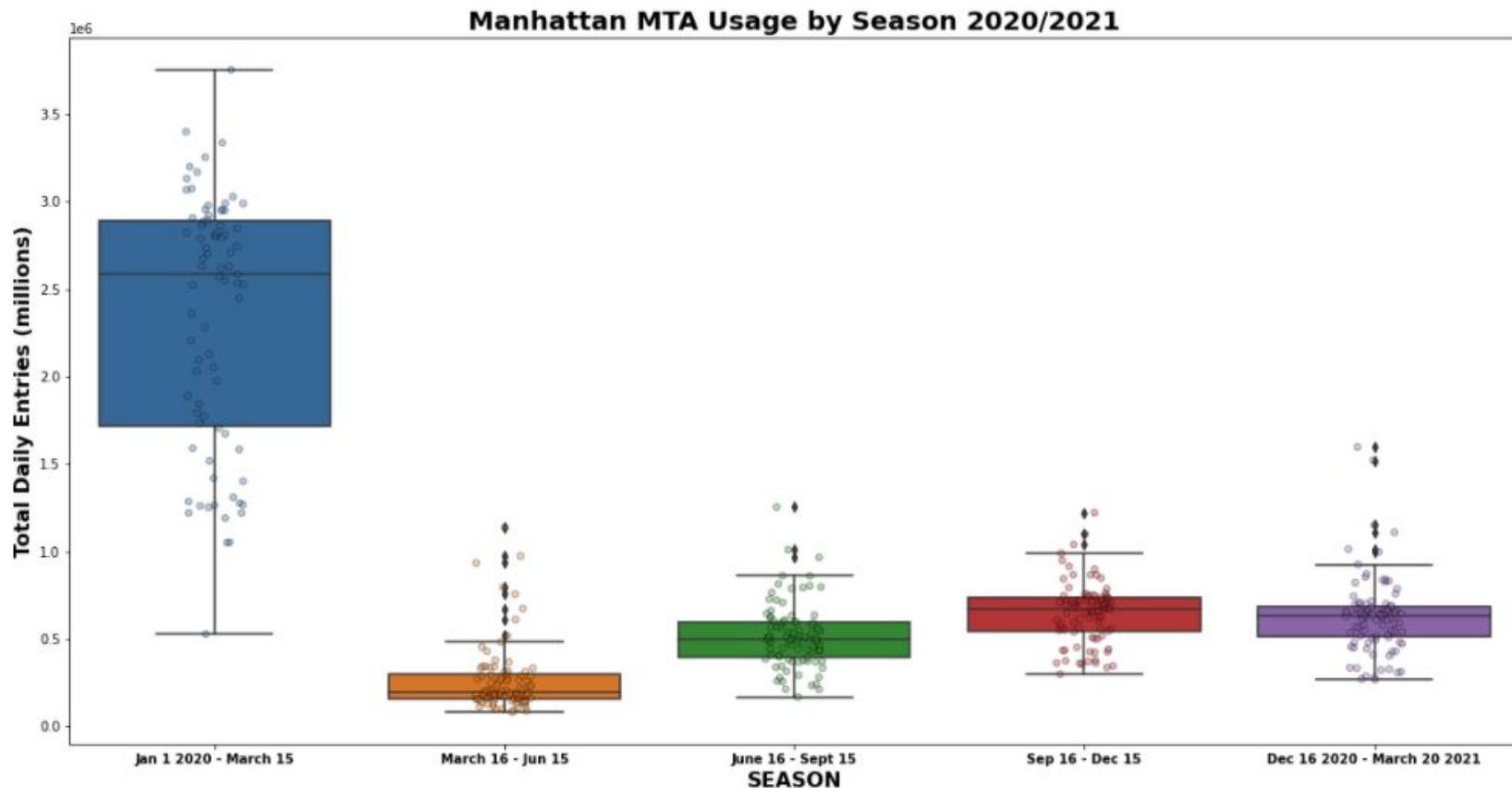
MTA – Borough Breakdown



MTA – Covid Breakdown



Manhattan - Ridership ranges



Financial Findings

Since Mar 15 2020 roughly ~ 450,000,000 riders vs 1.7 Billion annual average from 2014 to 2019

Revenue drop of 70-75% from subway alone is a **loss of ~ \$4 billion/year**

Average fare has **shifted ~15% away from time based passes to single rides** (+\$.09 / ride) which would be a benefit of roughly **~\$50 million/year**

This data doesn't factor in loss of tax revenues and toll deltas (~%15 currently). But the roughly \$4 billion x 4 years gets us in the ballpark of the forecasted \$17 billion shortfall through 2024

City currently evaluating raising fares on all ticket types, monthly/week passes vs single rides, eliminating passes.

Time-based Passes

-> **51% in 2019; 34% in 2020**

-> **Valid for 7 or 30 days, unlimited trips**

-> **7-Day Ticket Fare is \$33**

-> **30-Day Ticket Fare is \$127**

Pay-Per-Ride MetroCard Fares

-> **46% in 2019; 60% in 2020**

-> **\$2.75 for subways**

Source: <https://new.mta.info/document/24141>

Takeaways and Future Work

Takeaways

Covid is still having ~70 to 75% impact on total MTA entries

Data comparing new covid cases and daily use of the subway at first glance don't seem to correlate/trend significantly, but areas with highest infection rates did maintain higher relative ridership

Budgetary forecasted shortfalls used as a means for asking for federal aid currently look to be fairly accurate, though would want to confirm the tax and toll impacts and continue to monitor MTA data as vaccines increase

Future

Investigate times and stations near the lows/zero riders and target cut back operations to save money or schedule maintenance. Can stations be closed for longer than 2-3 hours?

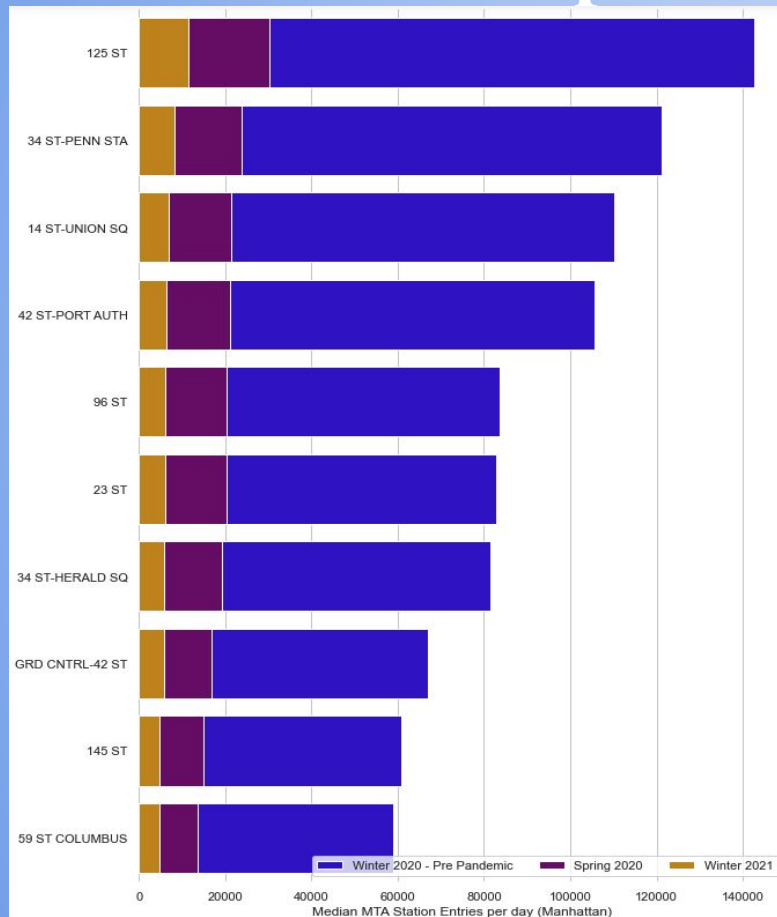
How many people have left the city (census data/occupancy)

Look at ratio of New York companies switching to remote friendly work and using that to proxy how much of corona impact will be sustained beyond the short term (help decide monthly/weekly fare and elimination)

Pull in neighborhood demographics to see how ridership is impacting different populations (i.e. income, race, gender, ect)

Appendix

Manhattan – Top Stations Year on Year



-Top stations by median entries daily for different time periods

-Top station daily volume pre pandemic in the 100K+ for top stations cut down by nearly 10x

-Tourist area Times Square fall out of the top ten (11th) showing impact of tourism

-Harlem and Upper East side (i.e 145/125 and 96 St) saw bumps maintaining more relative ridership

-Looking at ridership of pre pandemic versus the last three months we can see pretty much all the same names again, with Times Square back in the top ten

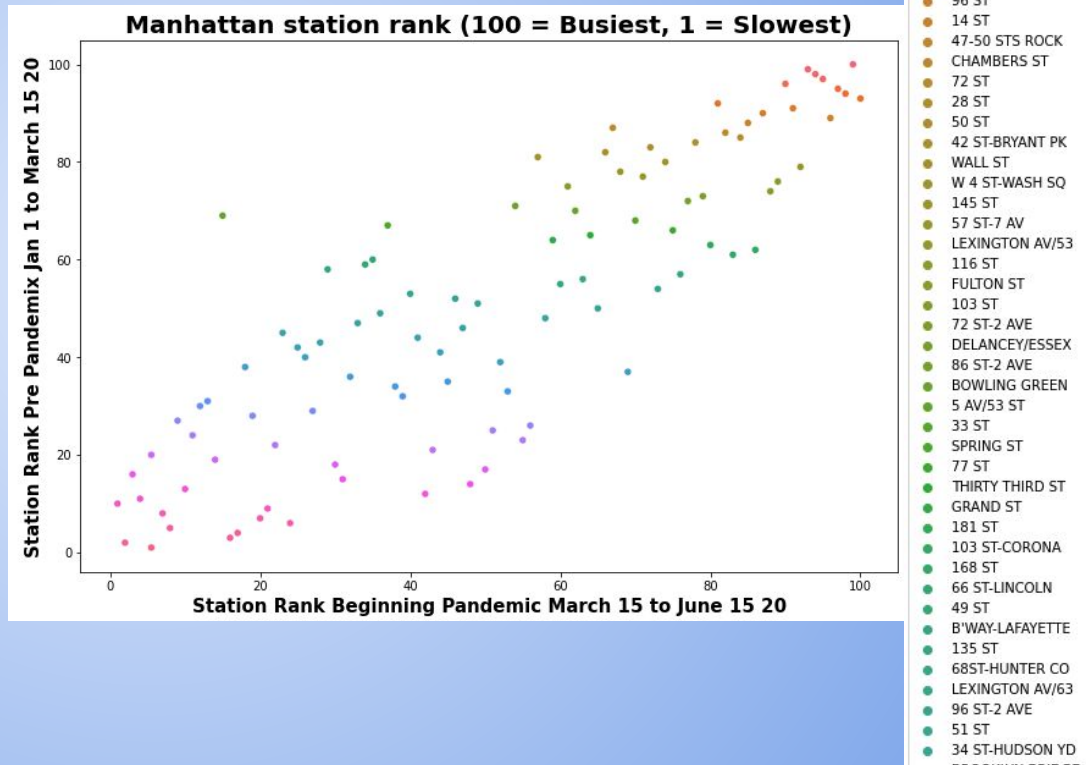
-Winter 2021 Ridership up about 2.5x vs the Pandemic lows at the top ten stations

Manhattan - Station Variability

-Outside of top ten, variability in relative traffic ranked in Manhattan was consistent pre and post pandemic.

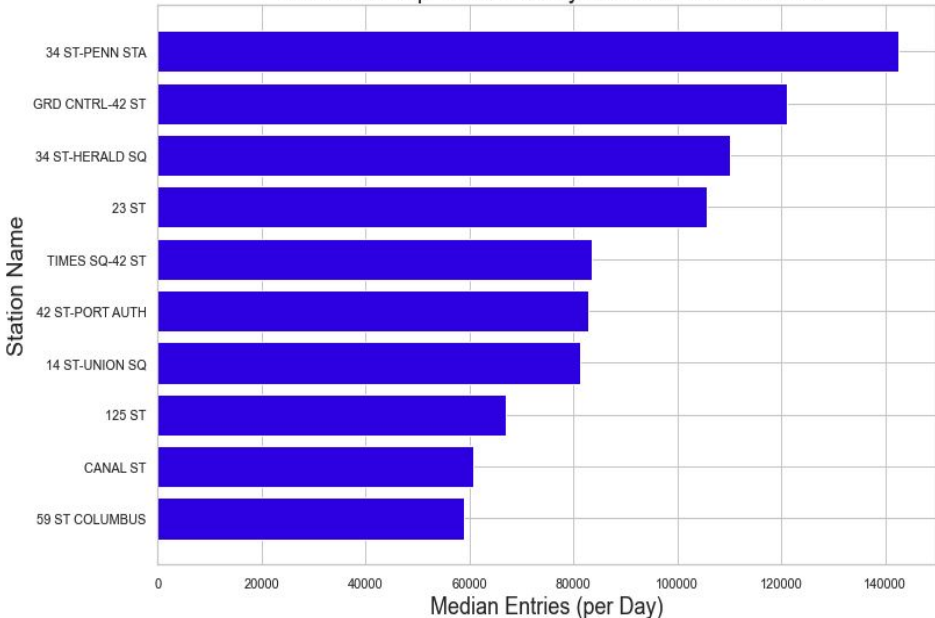
-Top and Lowest ranked stations remained relatively unchanged compared to other stations

-More variability in the middle stations

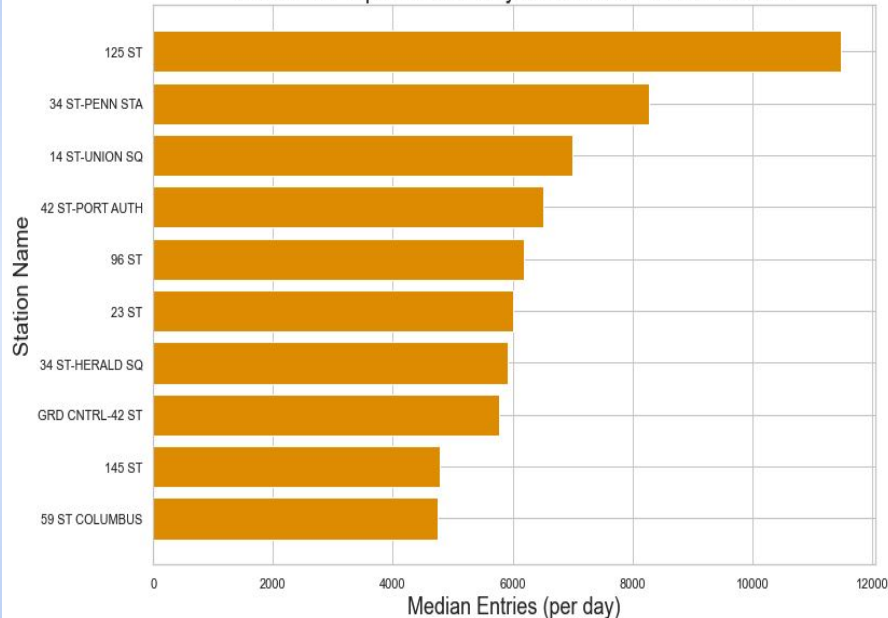


Manhattan – Top Stations Pre and Mid Pandemic

Manhattan Top 10 stations by Volume Pre Pandemic

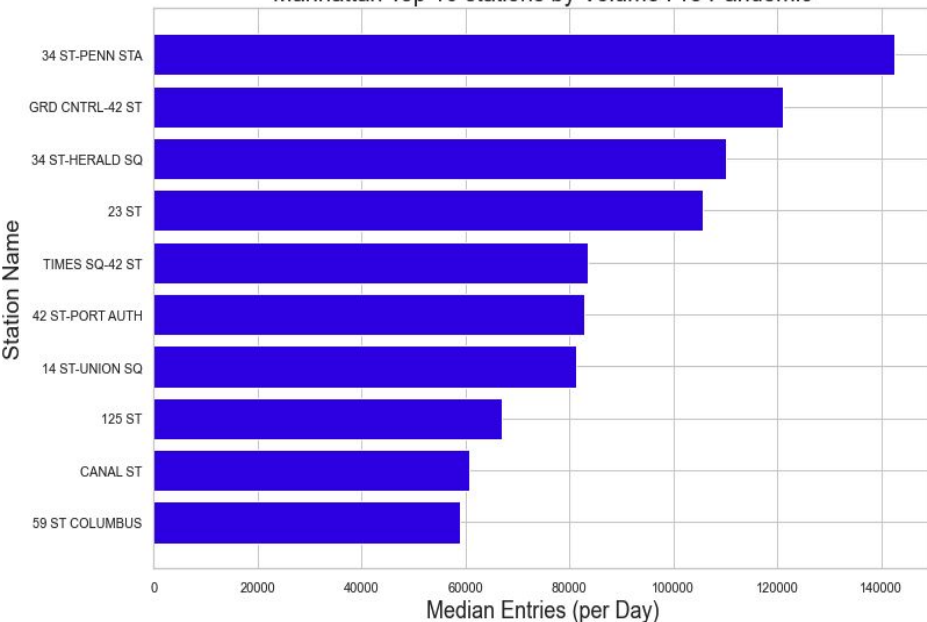


Manhattan Top 10 stations by Volume Mar 15-Jun 15 2020

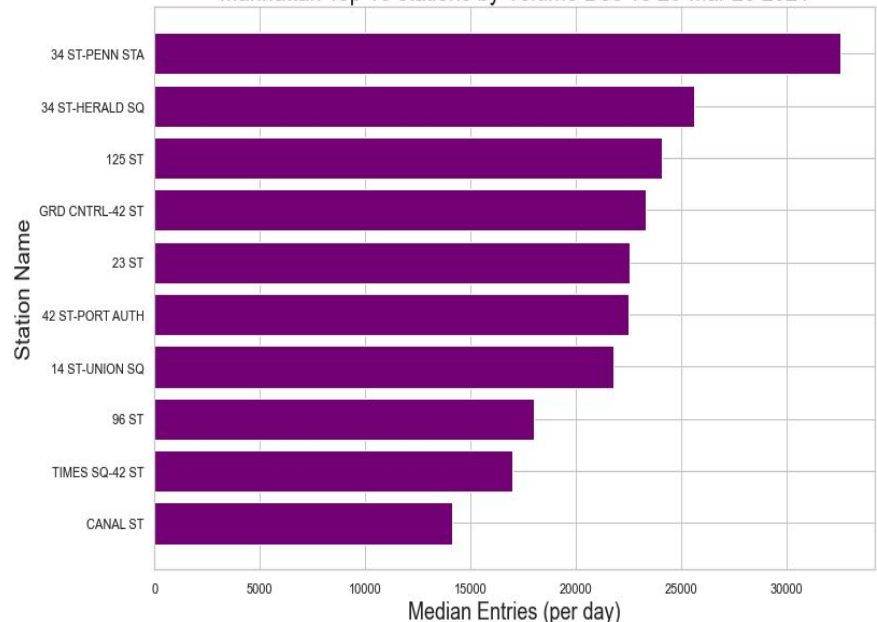


Manhattan – Top Stations Winter 20 vs Winter 21

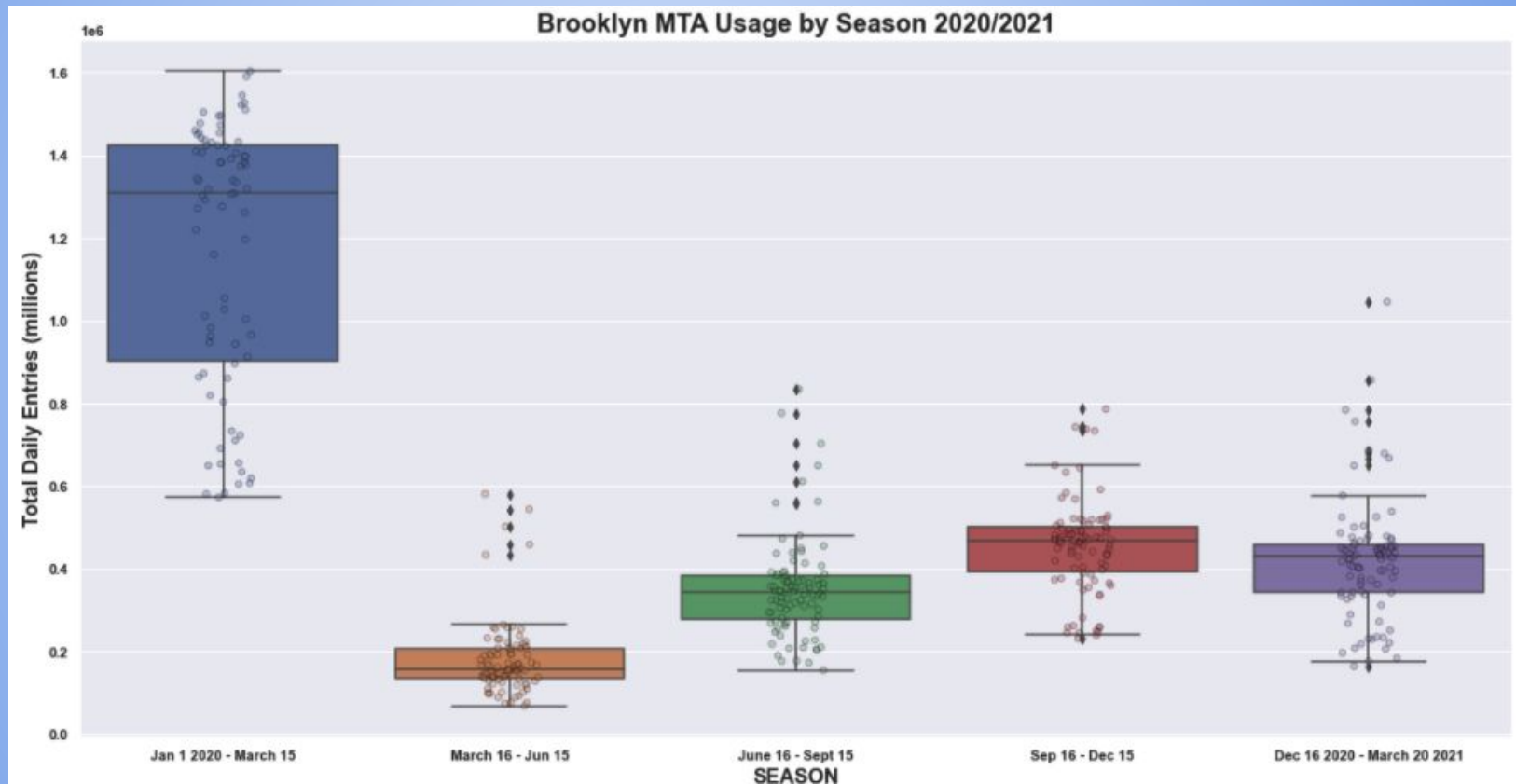
Manhattan Top 10 stations by Volume Pre Pandemic



Manhattan Top 10 stations by Volume Dec 15 20-Mar 2021

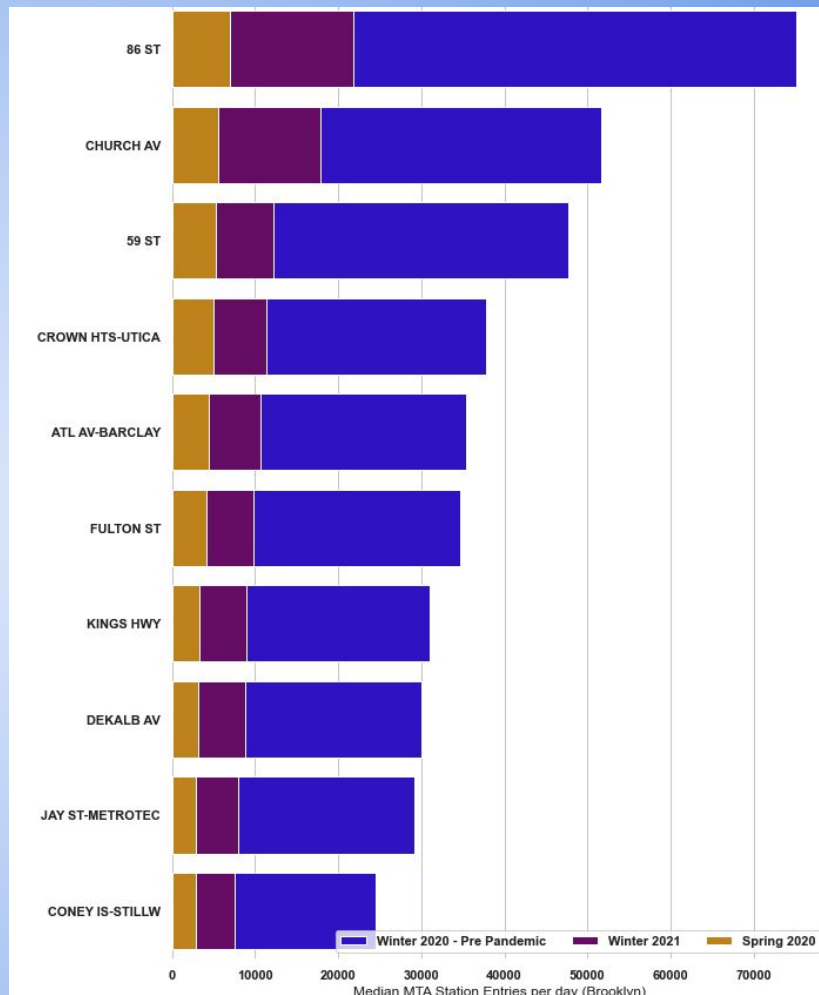


Brooklyn



Brooklyn

While Brooklyn is pretty close to Manhattan at nearly at 10x decrease from pre pandemic to preak beginning pandemic, it is slightly better closer to 9x and it also appears on a percentage basis to be recovering a bit better for their top two stations (purple) compare to the top couple of stations for Manhattan

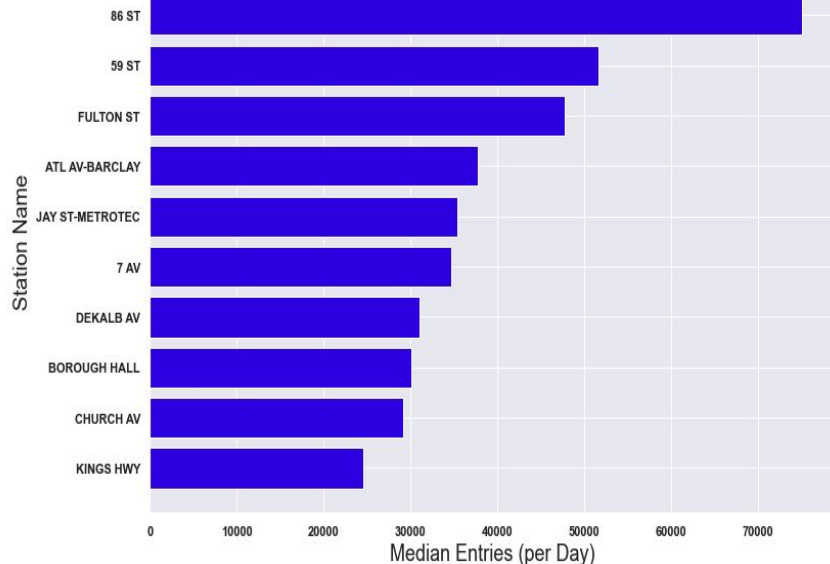


Brooklyn Top Ten Stations Pre and Beginning Pandemic

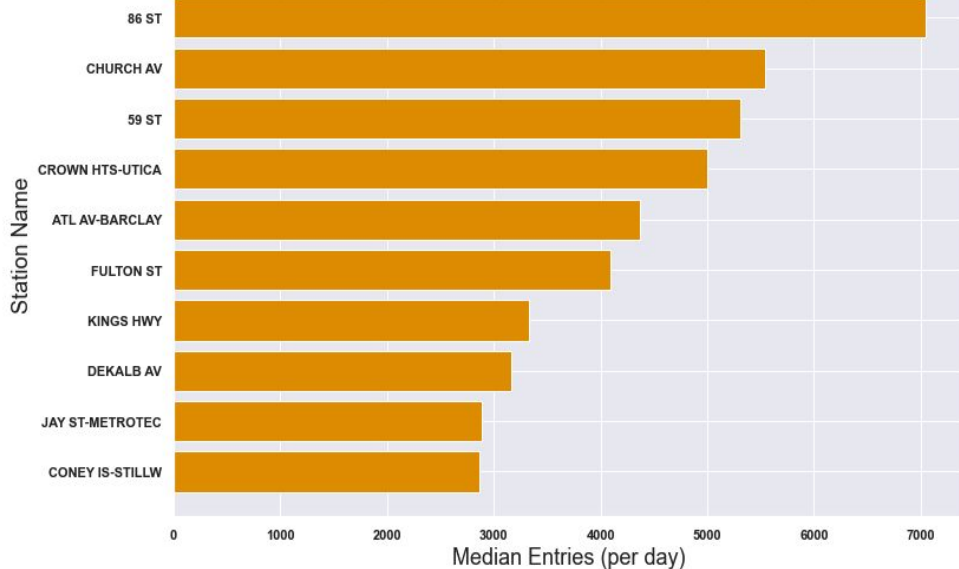
Brooklyn Top 10 stations by Volume Mar 15-Jun 15 2020

86 ST

Brooklyn Top 10 stations by Volume Pre Pandemic Jan 20 to Mar 15 20

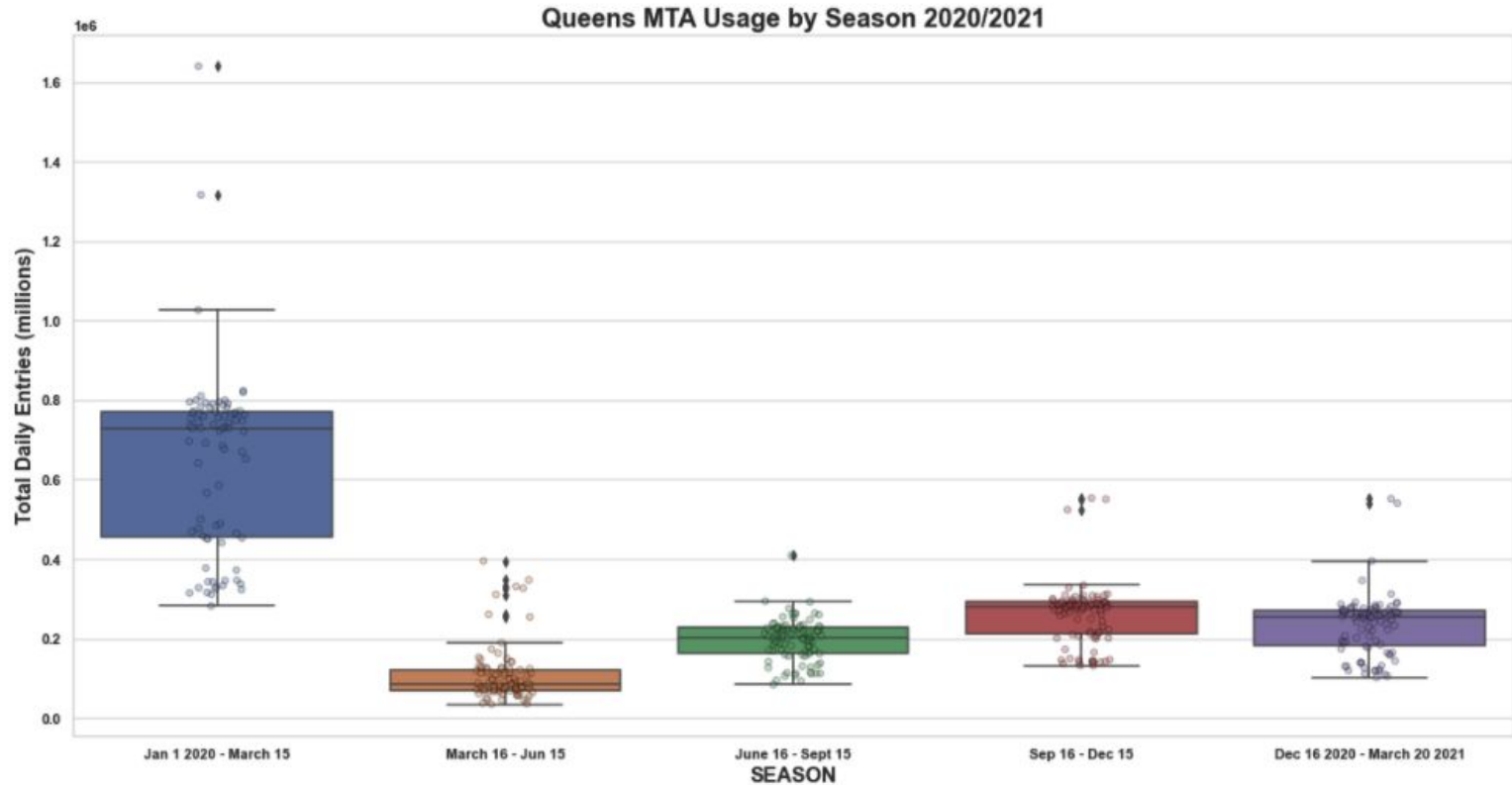


Brooklyn Top 10 stations by Volume Mar 15-Jun 15 2020



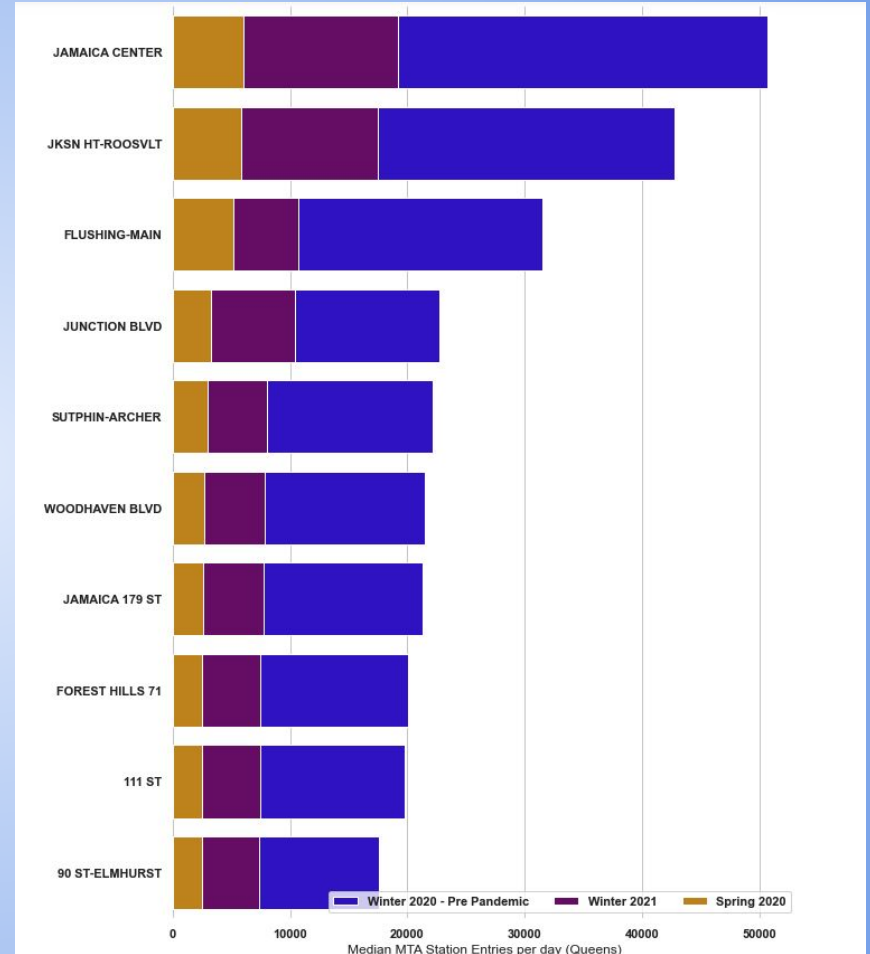
Median Entries (per day)

Queens



Queens

Similar to what we saw with Brooklyn there is a higher retention on a relative basis on stations entries vs the larger drop off from Manhattan particularly this winter vs last

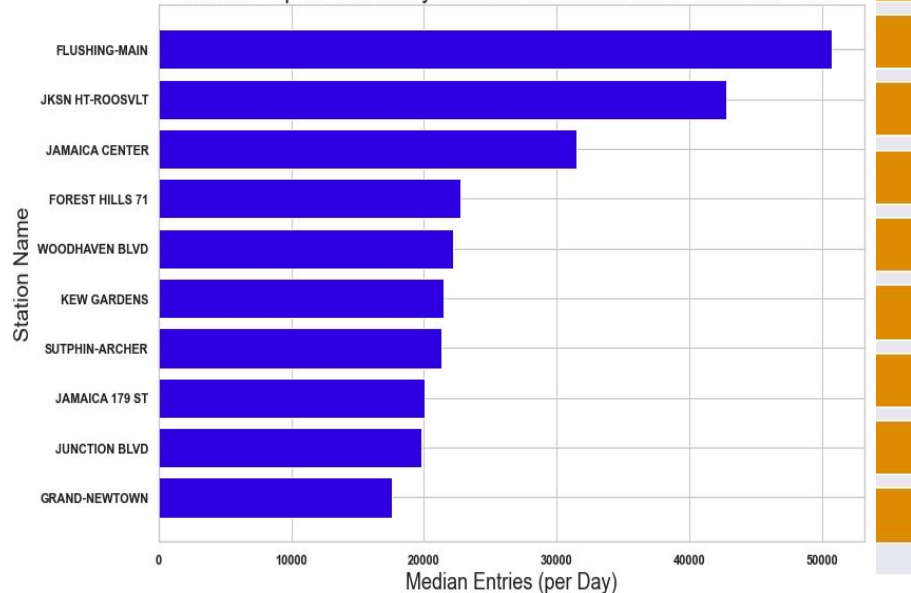


Queens Top Ten Stations Pre and Beginning Pandemic

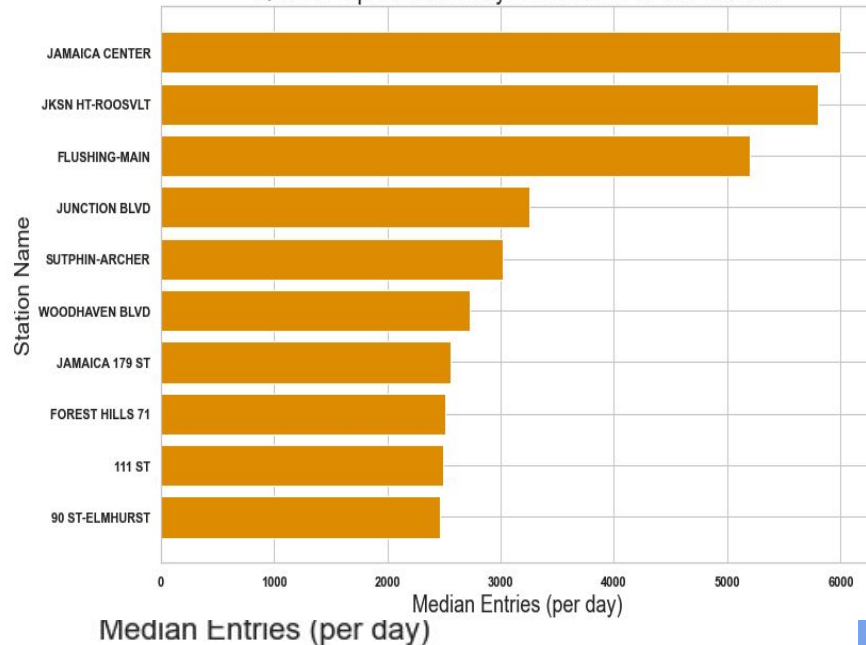
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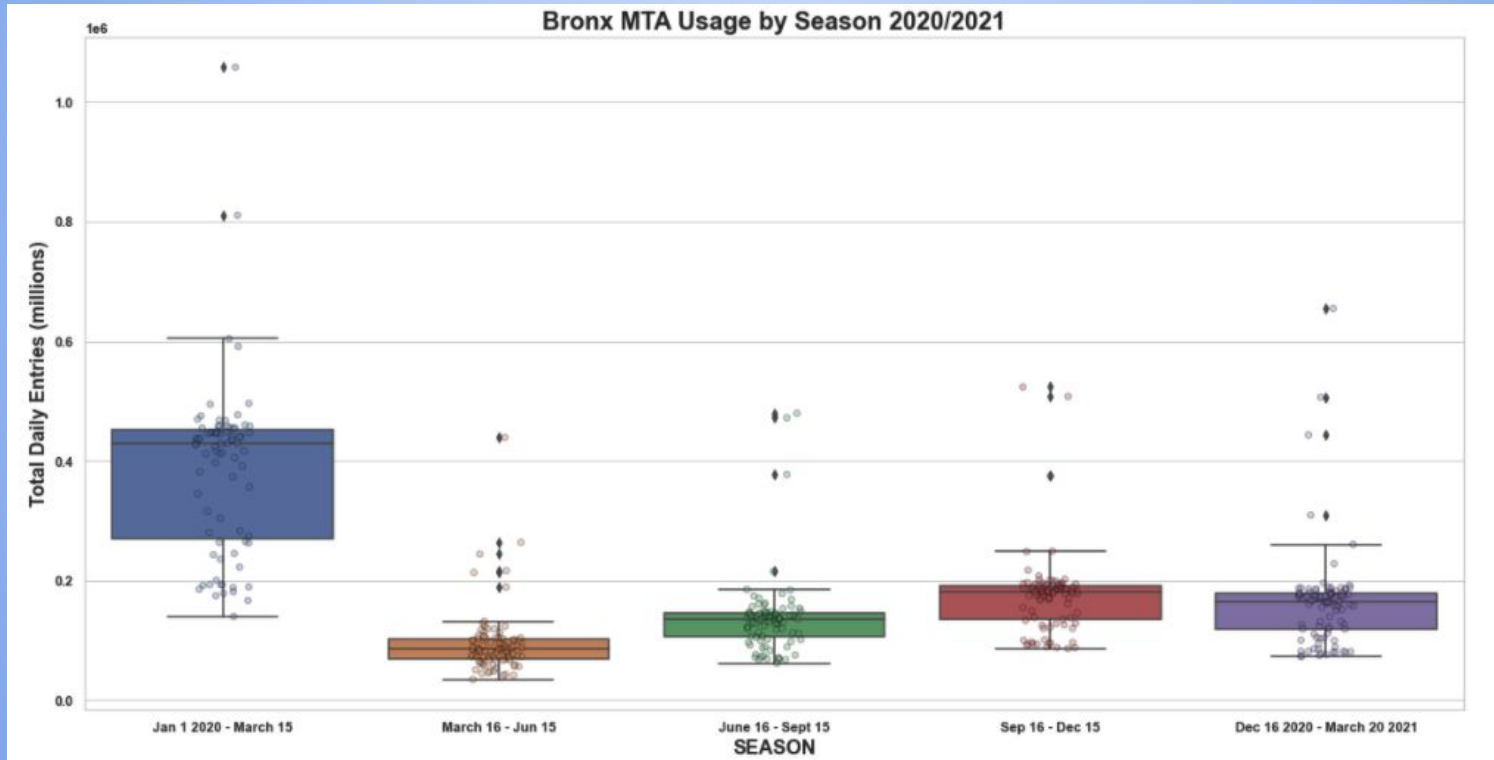
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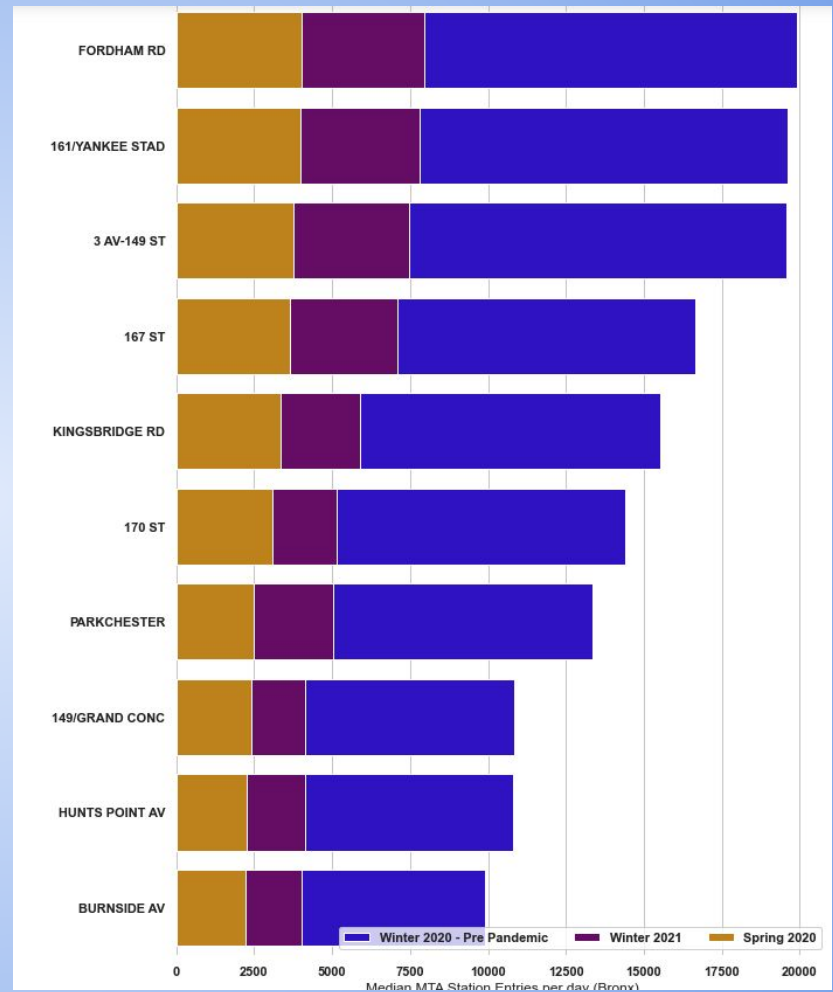
Queens Top 10 stations by Volume Mar 15-Jun 15 2020



Bronx



Bronx



Bronx Top Ten Stations Pre and Beginning

