

NYC SUBWAY AND BIKE-SHARE RIDERSHIP DURING COVID-19

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HOW DID TRANSPORTATION PATTERNS CHANGE DURING COVID-19?

- Subway and bike-share ridership plummeted during the COVID-19 lockdowns in the spring of 2020 enacted to stop the spread of the virus. Since then, and particularly since the wide distribution of vaccines in 2021, New York City has reopened and activity has picked up in the city.
- Citi Bike, the bike-share company for NYC, wants to know how their ridership has changed throughout the pandemic and how it compares to subway ridership. Is it possible that New Yorkers are trading the subway for bikes?
- This analysis shows that bike-share ridership in NYC has indeed recovered from its Spring 2020 lows. Ridership is even higher in 2021 than in 2019. Subway ridership on the other hand is still consistently 60-70% below 2019 levels, though this is an overestimate.

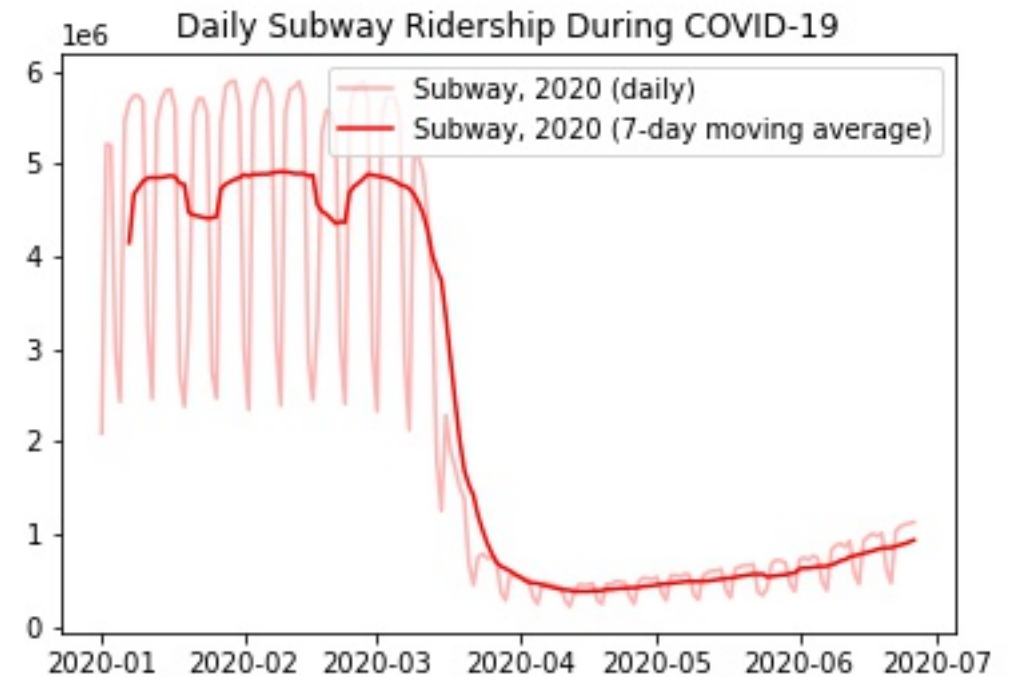
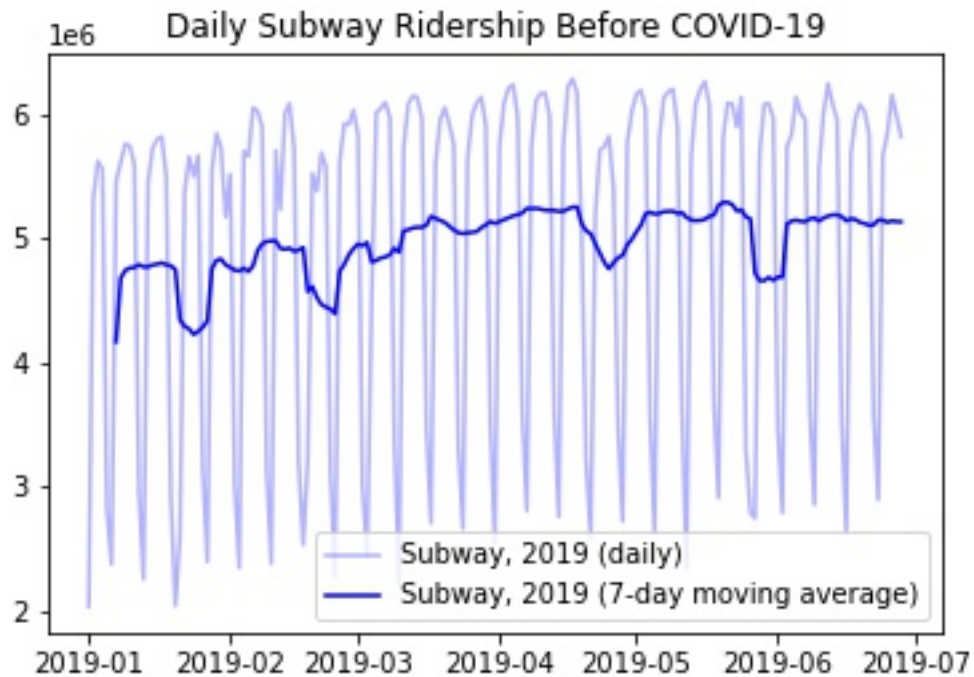
MTA SUBWAY DATA

- Source: <http://web.mta.info/developers/turnstile.html>
- Started with over 16 million rows of data, where each observation is a single turnstile at a subway station at 4 hour intervals, covering the 6-month period between January and June for years 2019, 2020, and 2021.
- Converted the variable for cumulative entries per turnstile to a daily count per turnstile and aggregated daily counts from the turnstile level to the day level. This new measure represents daily ridership.
- Used daily aggregations to compute a 7-day moving average.
- Plotted a time-series over 6 months of daily subway ridership with the 7-day moving average for each year.

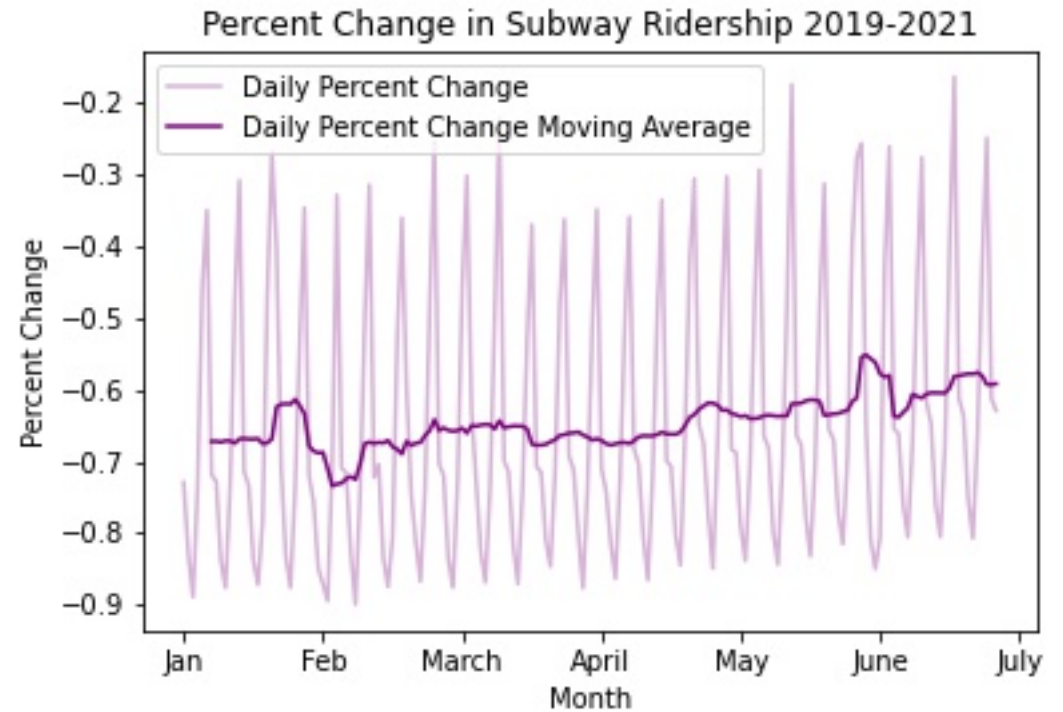
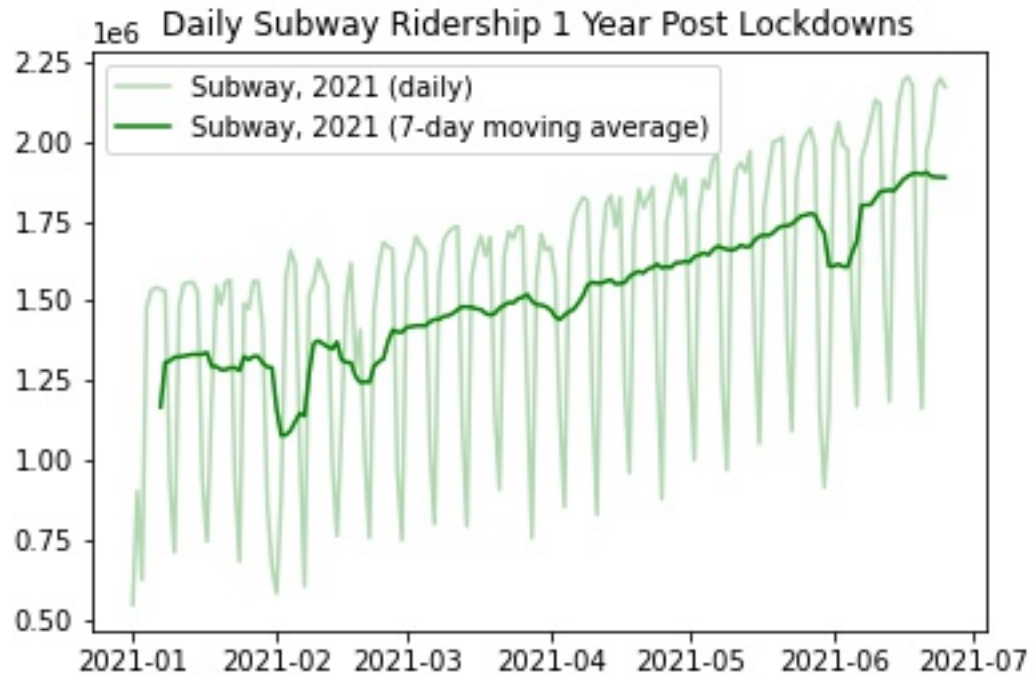
CITI BIKE DATA

- Source: <https://s3.amazonaws.com/tripdata/index.html>
- Started with nearly 28 million rows of data, where each observation is a single bike ride, covering the 6-month period between January and June for years 2019, 2020, and 2021.
- Created a daily ridership measure by aggregating rides per day.
- Used daily aggregations to compute a 7-day moving average.
- Plotted a time-series over 6 months of daily bike-share ridership with the 7-day moving average for each year.

SUBWAY RIDERSHIP IN NYC PLUMMETED IN 2020...



... AND HAS NOT RECOVERED

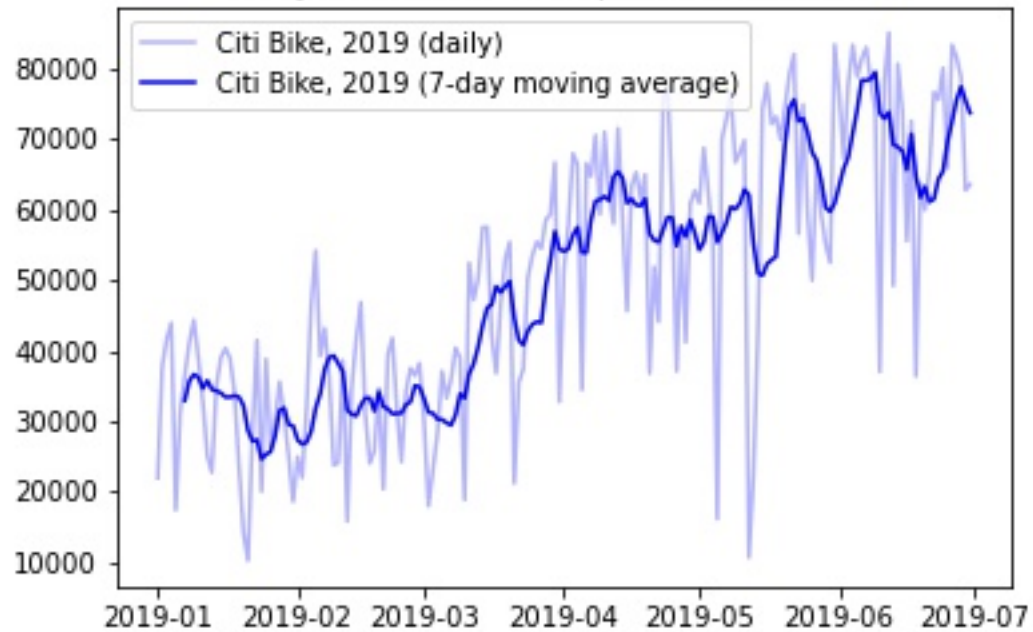


BUT...

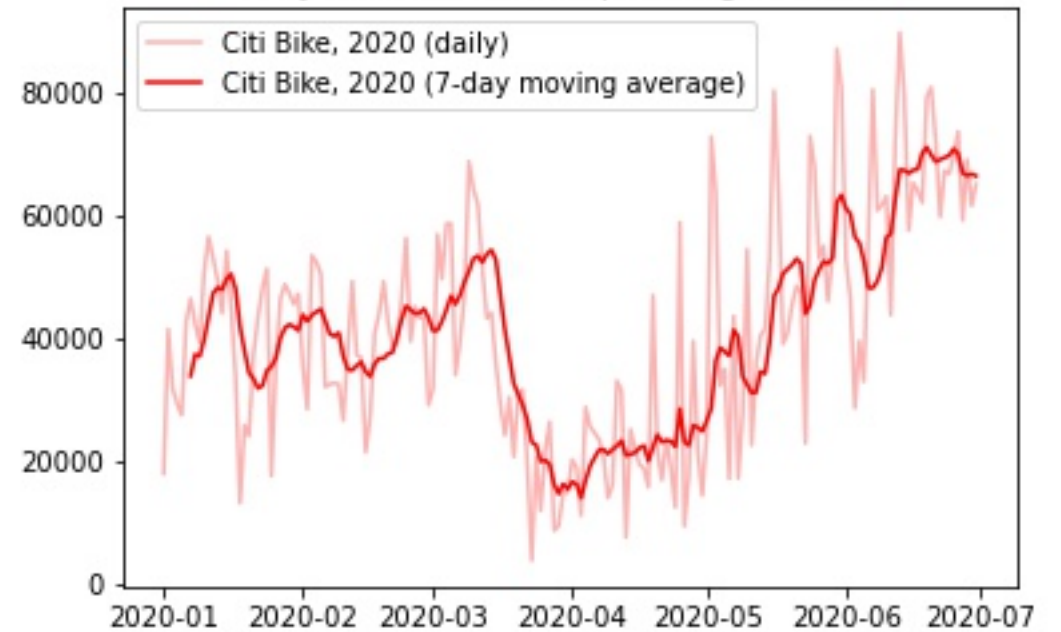
- While this analysis shows the 7-day moving average percent change from 2019 to 2021 is consistently negative 60-70%, this is an overestimate.
- Percent change was calculated between each day in the 6 month period in 2019 and the same date in 2021. However, the corresponding date in 2021 is not always a comparable day of the week. For example, 3/6/2019 was a Wednesday whereas 3/6/2021 was a Saturday. As weekend ridership is typically below weekday ridership, the difference between these two days overstates the lower overall ridership occurring in 2021 compared to 2019.
- Still, the 7-day moving average daily ridership remains below 2 million in 2021, while it was around 5 million in 2019.

CITI BIKE RIDERSHIP ALSO DROPPED IN 2020...

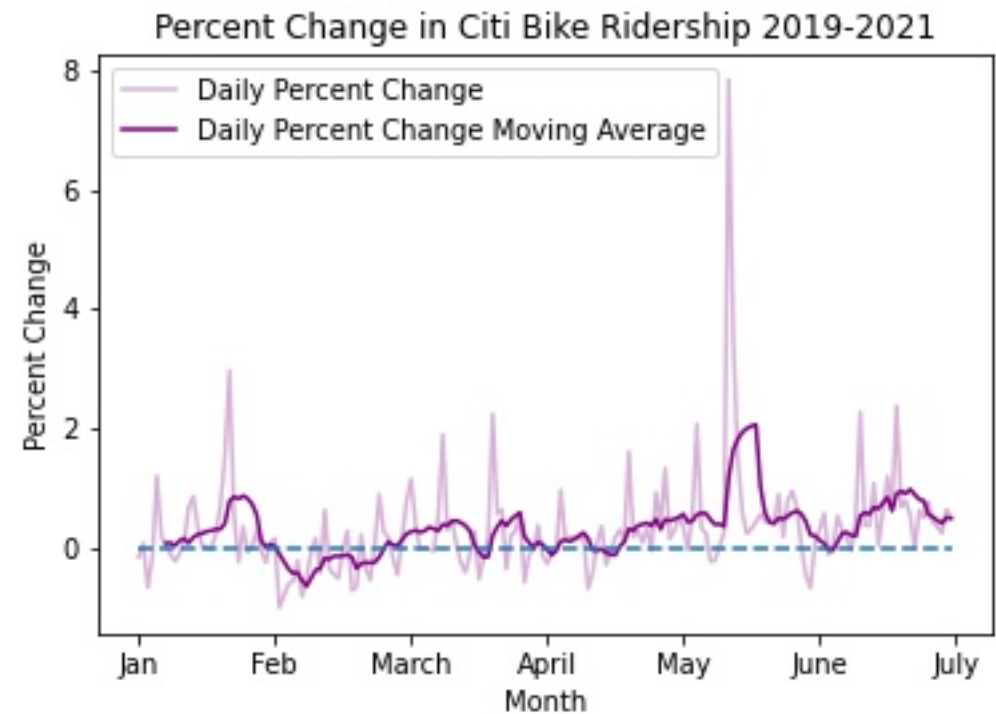
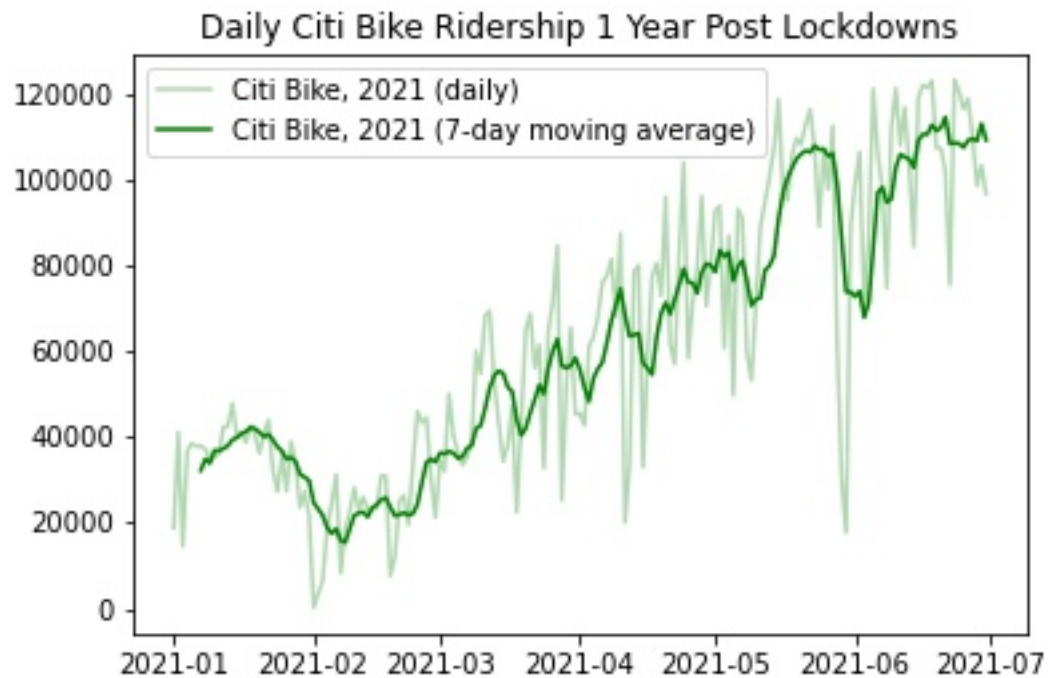
Daily Citi Bike Ridership Before COVID-19



Daily Citi Bike Ridership During COVID-19



...AND HAS MORE THAN RECOVERED



THE SAME COMPARABILITY ISSUE REMAINS

- Given that weekday-to-weekend fluctuations also occur with Citi Bike ridership, though less severely, the percent change measure is likely slightly off-base.
- Like subway ridership, Citi Bike ridership percent change was calculated between each day in the 6 month period in 2019 and the same date in 2021. As the corresponding day between the two years is not always the correct day of the week, the percent-change measure likely overstates the improvement from 2019 to 2021.
- However, Citi Bike ridership is undeniably higher in 2021 than 2019 based on the daily ridership time-series chart.
- Bike-share use is naturally higher in summer months when the warm weather keeps people outside longer. In June and July of 2019, Citi Bike ridership was approximately between 60K and 80K, while it was between 80K and 120K in 2021.

CONCLUSIONS

- Subway ridership has not recovered to pre-pandemic levels, while Citi Bike ridership has surpassed pre-pandemic levels.
- This could be an indication that some New Yorkers have traded the subway for bikes on their daily commutes, but a conclusive answer to this question is beyond the scope of this analysis.
- The rise in Citi Bike ridership could also be due to more people spending time outside during the pandemic and could also be impacted by the addition of new bike dock stations.

FUTURE WORK

- Using this analysis as a starting point, future work could look at percent changes in ridership by station. This could answer the following two questions:
 - 1) What is the distribution of percent changes in ridership across subway stations?
 - The locations of stations with less severe changes could inform how different people changed their travel patterns by location.
 - 2) Which stations are busiest in 2021 vs. 2019?
 - If the list of busiest stations in 2021 differs from those in 2019, Citi Bike could use this information to decide where new bike dock stations should go.
- Finding the busiest hours for subway ridership and Citi Bike ridership can also help answer if New Yorkers are trading the subway for bikes on their commutes, as well as how the distribution of bike user types (membership vs. single use) has changed.