

Title:

Impacts of school closures and reopenings on NYC MTA ridership (March 2020-April 2021)

Upshot – *school closures and reopenings do not have an observable impact on MTA ridership, whether the event is unexpected or planned..*

Abstract:

Using data from the 12 months of the pandemic, I do a preliminary examination of the impact of sudden school closures and planned reopenings on MTA ridership. Shown below are three graphs: all stations, an mid-Manhattan station, and a Brooklyn station. The initial school closing on March 16, 2020 was a week after the order to avoid public transit. After this, it is clear that school reopenings did not have any sudden impact on MTA ridership. Neither did the sudden closures (e.g. Nov 19, 2020). There are sudden dips in the time series throughout this time period, even one close to the sudden closure of schools on Nov 19, 2020. Upon closer inspection (see below, Figure 2), this specific one turns out to be low ridership due to Thanksgiving Day, (Nov 26, 2020).

Typically, the increases in MTA ridership are gradual, but there are some step changes towards the end of the time series. Investigation into sudden dips, and other step changes

Design:

I analyze 4-hourly MTA turnstile data to understand the potential impact of sudden school closures and reopenings on MTA ridership. Turnstile are composited by weekday, weekend, and station. I curate a timeline of school closures for the first year of the pandemic, including the Phased reopening of NYC.

Data:

The data used here are:

MTA turnstile data – <http://web.mta.info/developers/turnstile.html> (all April 2015-2019)

NOTE: these data were downloaded using get_mta.py provided by Metis.

A timeline of NYS/NYC declarations and events during the pandemic -

<https://www.investopedia.com/historical-timeline-of-covid-19-in-new-york-city-5071986>

Algorithm:

The MTA data shown below were composited into 4-hourly bins, further composited by weekday and weekend. Turnstile data are filtered for erroneous turnstile counting (an uncommon event). The sum of -hourly exits and entries are plotted for all stations, and for each station (contact me for access for all station data).

Tools:

The tools used in this analysis were:

Ubuntu 20.04 – operating system

DB Browser for SQLite3 – used for initial data scans and process development

Python – numpy, pandas, matplotlib were used for all compositing, counting, and visualizations

Communication:

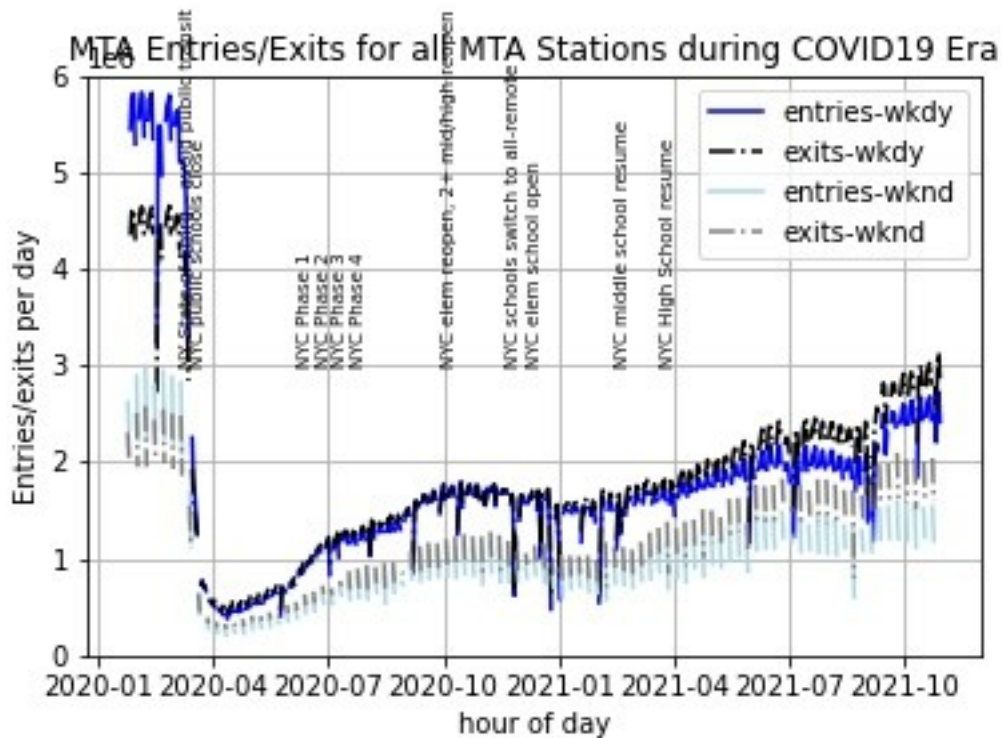


Figure 1. All 4-hourly entry and exits in the MTA system during the pandemic (Feb 2020-Oct 2021). The phased reopening and school closures and reopenings are identified. See Table 1 below for more detail on these events. The dark blue line represents weekday entries, the black line represents weekday exits. The light blue line represents weekend entries, while the gray line represents weekend exits. March 7-8, 2020 is when the a state of emergency was declared, and New Yorkers were warned off of public transit. March 16, 2020 is when all NYC public schools were first ordered closed.

MTA Entries/Exits for all stations during COVID19 (focus time pd)

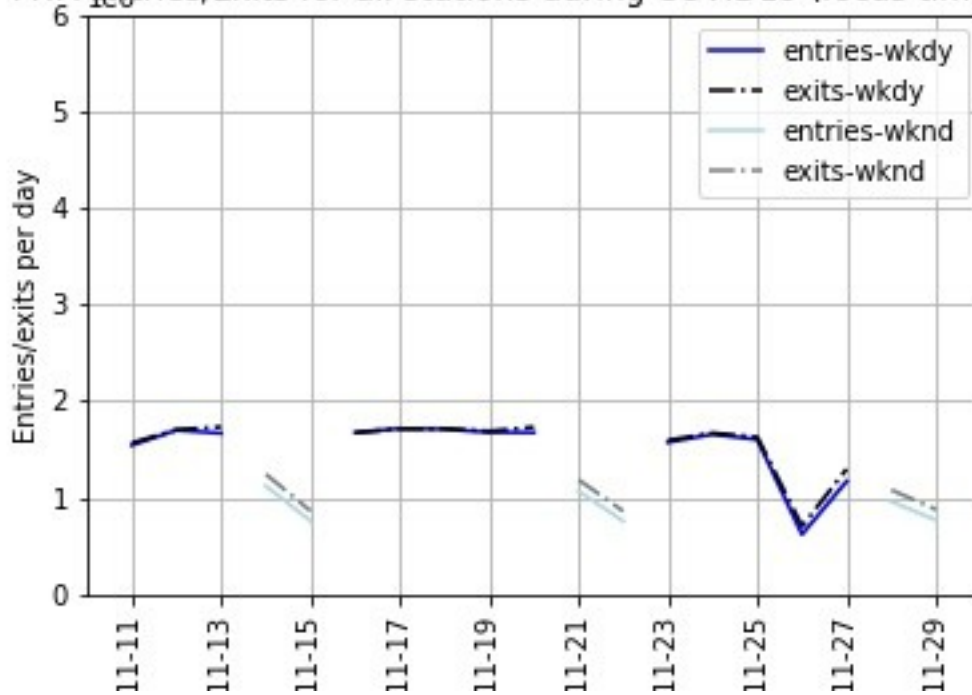


Figure 2. All 4-hourly entry and exits in the MTA system for Nov 10 – Nov 30, 2020. The sudden school closure this month was Nov 19, 2020. The dip in entries on Nov 26, 2020 is due to the Thanksgiving holiday. The dark blue line represents weekday entries, the black line represents weekday exits. The light blue line represents weekend entries, while the gray line represents weekend exits.

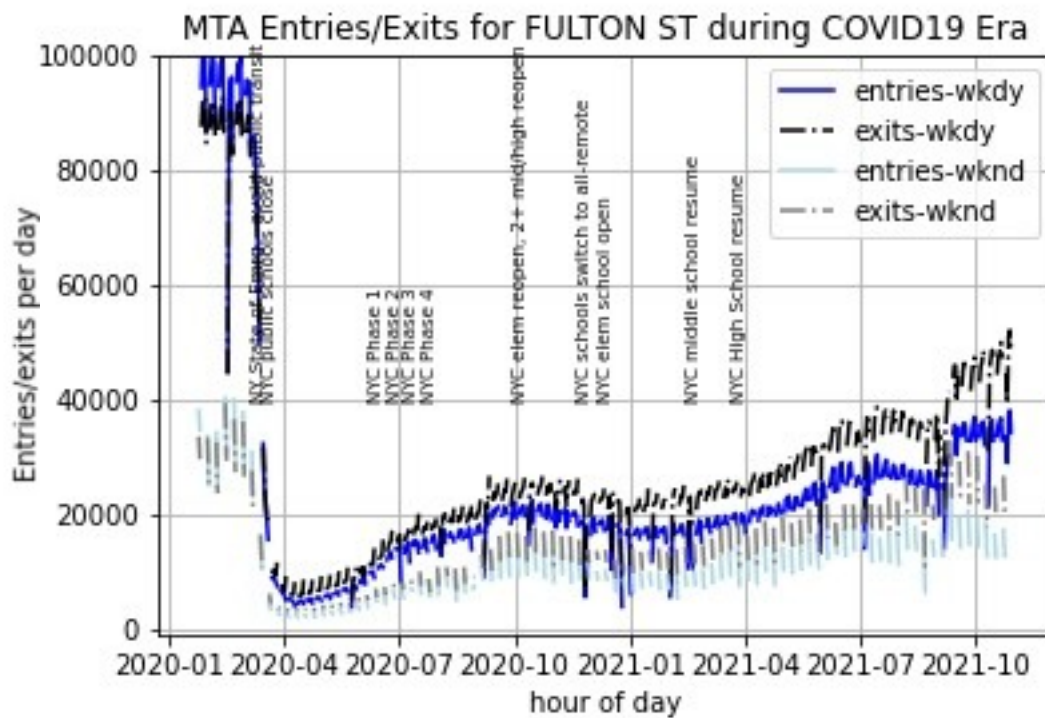


Figure 3. 4-hourly entry and exits on the MTA subway system for Fulton Station (in Brooklyn, NYC) during the pandemic (Feb 2020-Oct 2021). The dark blue line represents weekday entries, the black line represents weekday exits. The light blue line represents weekend entries, while the gray line represents weekend exits. March 7-8, 2020 is when the a state of emergency was declared, and New Yorkers were warned off of public transit. March 16, 2020 is when all NYC public schools were first ordered closed.

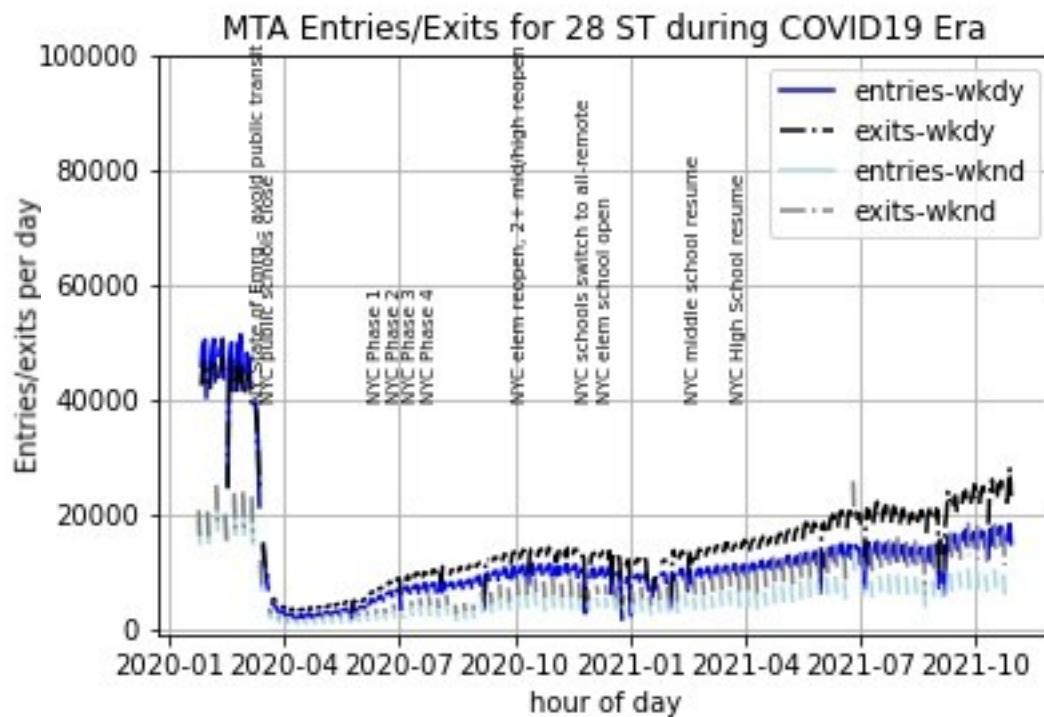


Figure 4. 4-hourly entry and exits on the MTA subway system for 28th St Station (mid-town Manhattan, NYC) during the pandemic (Feb 2020-Oct 2021). The dark blue line represents weekday entries, the black line represents weekday exits. The light blue line represents weekend entries, while the gray line represents weekend exits. March 7-8, 2020 is when the a state of emergency was declared, and New Yorkers were warned off of public transit. March 16, 2020 is when all NYC public schools were first ordered closed.

Table 1. A timeline of important events related to school closures and reopenings from the first year of the pandemic.

Date	Event	Event shortened (plotted)
March 7, 2020	NY Governor Andrew Cuomo declares a state of emergency	NY State of Emrg – avoid public transit
March 16, 2020	NYC public schools close	NYC public schools close
June 8, 2020	NYC begins Phase 1 reopening	NYC Phase 1
June 22, 2020	NYC begins phase 2 of reopening	NYC Phase 2
July 6, 2020	NYC begins Phase 3 of reopening, without indoor dining	NYC Phase 3
July 19, 2020	NYC begins Phase 4 reopening, excluding malls, museums and indoor dining/bars	NYC Phase 4
September 29, 2020	Elementary students return to public school classrooms across NYC	NYC elem reopen, 2+ mid/high reopen
November 19, 2020	NYC schools switch to all-remote	NYC schools switch to all-remote
December 7, 2020	NYC elementary schools reopen for in-person learning	NYC elem school open
February 15, 2021	NYC middle schools resume in-person learning	NYC middle school resume
March 22, 2021	NYC high schools reopen for in-person learning	NYC High School resume