NEUBERGER BERMAN

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Preparing for the Recovery

Where do we stand and how do we reopen?

On Tuesday, April 7, the death toll from COVID-19 was zero in China; on Wednesday, April 8, Wuhan was reopened. Italy has passed the peak of daily deaths. California, Austria and Denmark are easing restrictions, and Belgium, France and Spain are examining when to release lockdowns. With the end of the first wave of the coronavirus nearly in sight in Europe and the United States, the discussion has turned to the process of reopening.

Robert Margolis, Scott Gottlieb (both prior FDA Commissioners) and their colleagues at the Duke Margolis Center just published a detailed roadmap for the way forward ("A National COVID-19 Surveillance System: Achieving Containment"). Gottlieb, in the paper and in other channels, has made clear his view that, after this first wave of the COVID-19 epidemic, a small single-digit percentage of the susceptible population will have been exposed to the virus. The susceptible percentage is still debated, and may only be resolved after large-scale antibody testing of people who have never tested positive.

The Duke Margolis Center report identifies four key plan components:

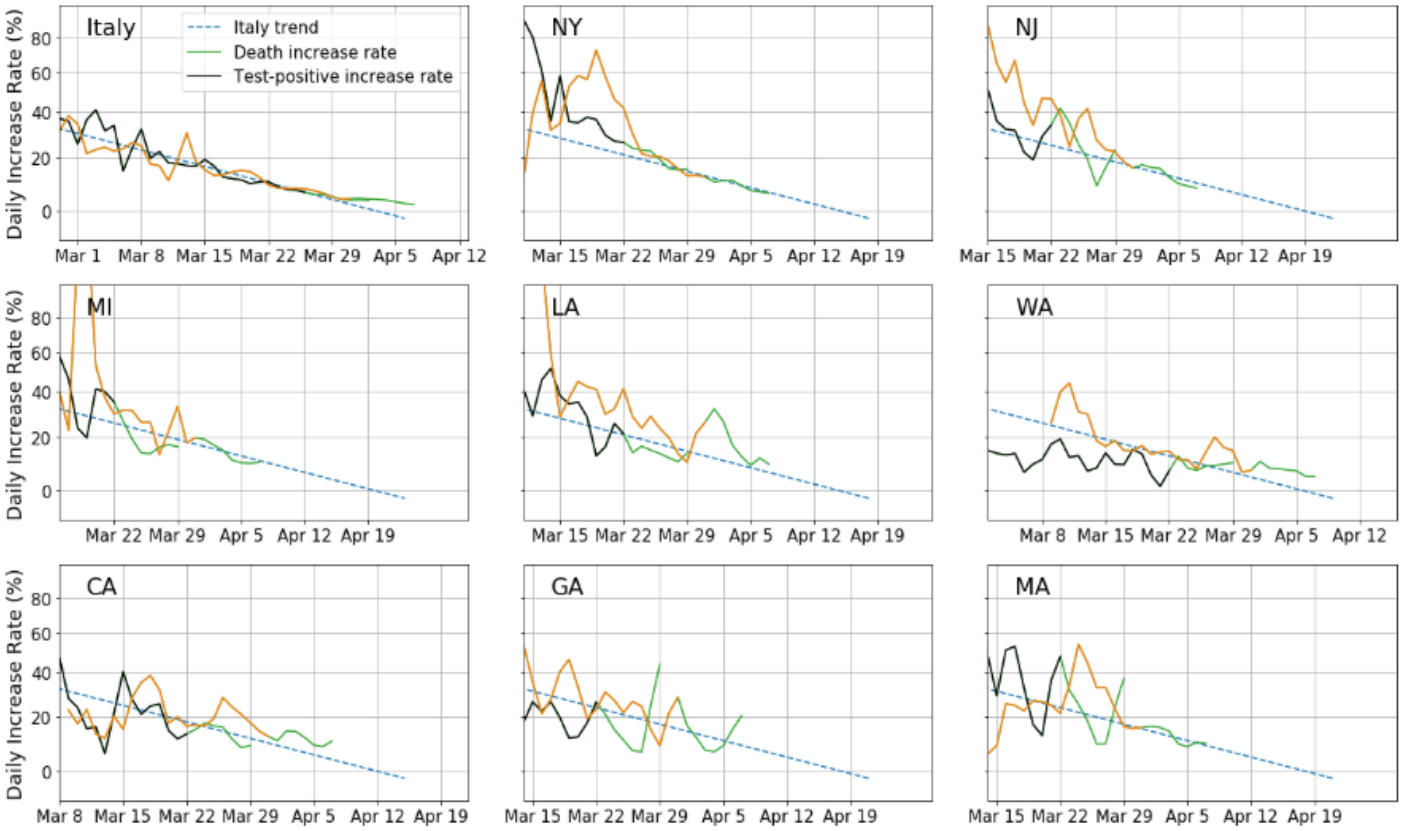
1. **New test and trace infrastructure** (tests, training and 50,000 new staff) to test all symptomatic, contacts, and a random sampling of the population with a national capacity of at least 750,000 tests per week.
2. **Integration of the test and trace data into a national surveillance program** managed by the Office of National Coordination, managing flow of information across testing sites.
3. **Serologic testing** to identify reliable markers of immunity in the population, and therefore know who is no longer at risk from COVID-19 or from being a carrier. There are trials underway.
4. **A new rapid response process** with a capacity for isolation, contact tracing and quarantines. The proposal suggests facilities to provide isolation for those who are not able to quarantine themselves at home. The report describes technology and data-based monitoring to evaluate potential outbreak sites.

We see this as a viable path, but also one that will likely require time to put in place.

State of the Epidemic in the United States

Since our previous report, the epidemics in New York, New Jersey, Michigan and Massachusetts have continued to follow the decreasing trend set by Italy (see figure below). In contrast, the data supports that the epidemics in Washington, California and Georgia have been different: These states have had rates of increase that are persisting at constant values.

COVID-19 Models: Italy and Selected States

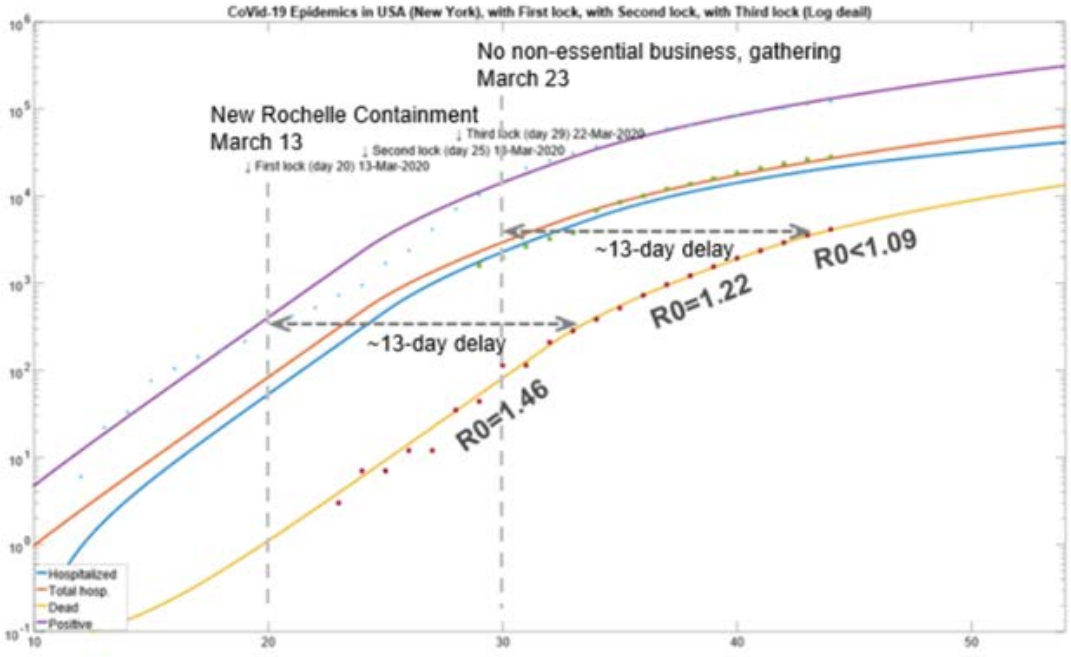


Source: Neuberger Berman, data from Johns Hopkins (as of April 8, 2020)

Also of note, recent Italian death rates have deviated from their long-term trends: Rates of increase didn't reach zero but remained roughly constant for the week of April 6. This is consistent with the observation that new deaths and new cases in Italy did not decrease as rapidly as had they increased at the start of the epidemic (it is not a bell curve). In the 10 days after March 30, 2020 when Italy reached its peak in deaths, new deaths decreased by only a third, while in the 10 days before the peak in deaths, new deaths increased by three times. A slow decline of daily deaths keeps pressure on an already strained health care system and delays the recovery of the economy. We will watch this trend carefully in Italy, and in several key countries and U.S. states.

Based on our model, the replication rate (R0) of New York gradually reduced to 1.09 after the March 22-23 stay-at-home order, which was reflected in daily new death numbers with about a 10 day delay. This is consistent with our previous predictions. Given our current R0 estimate, we expect daily new deaths to peak in New York on April 13 when cumulative deaths reach 10,000.

COVID-19 Model in New York: Trend and Outlook

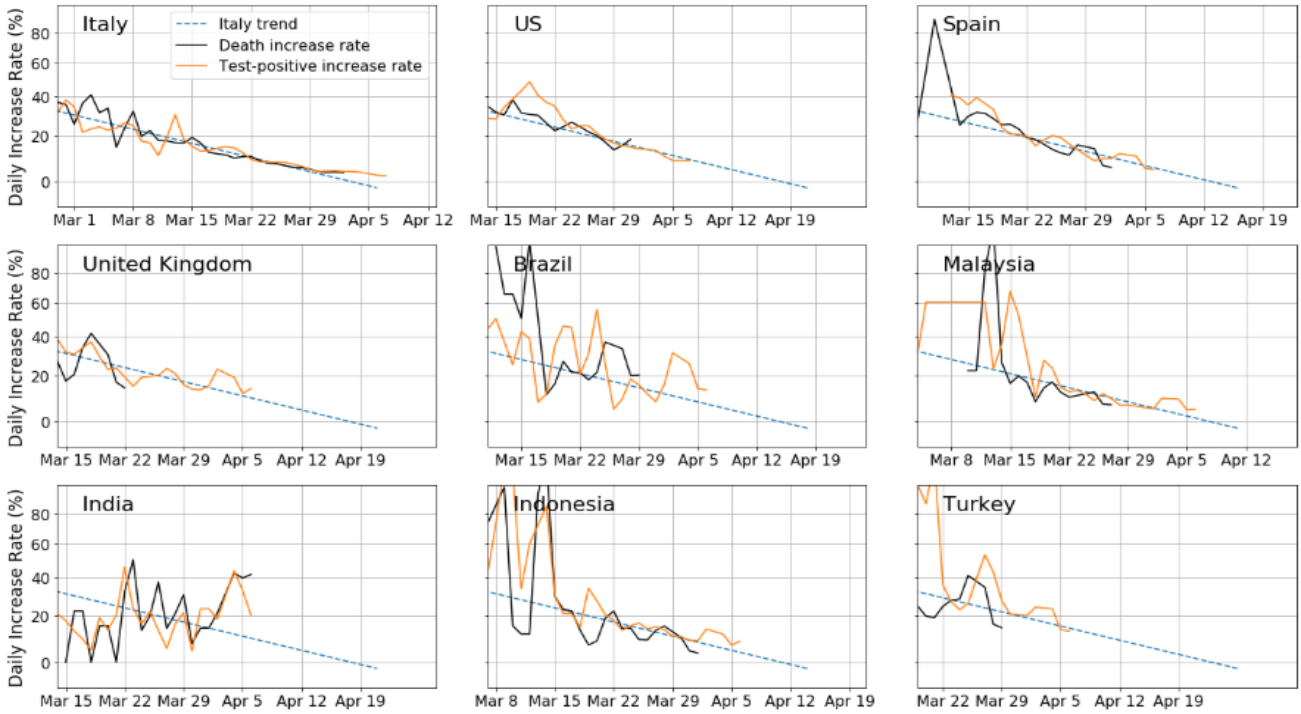


Source: Neuberger Berman, data from Johns Hopkins (as of April 8, 2020).

On the U.S. national level, we expect cumulative deaths to reach 33,000 to 53,000 the week of April 20, in ten days, an increase of 20,000 to 40,000 from the current level. This is consistent with our prediction in our previous commentary, and new deaths are expected to peak on April 14.

Looking internationally, the epidemics in Spain, Indonesia and Malaysia have followed the path of daily increase rates set by Italy. While India and Brazil have not followed this trend. The rates in India are particularly concerning if they remain at the current level (doubling every three days).

COVID-19 Models: Within Countries



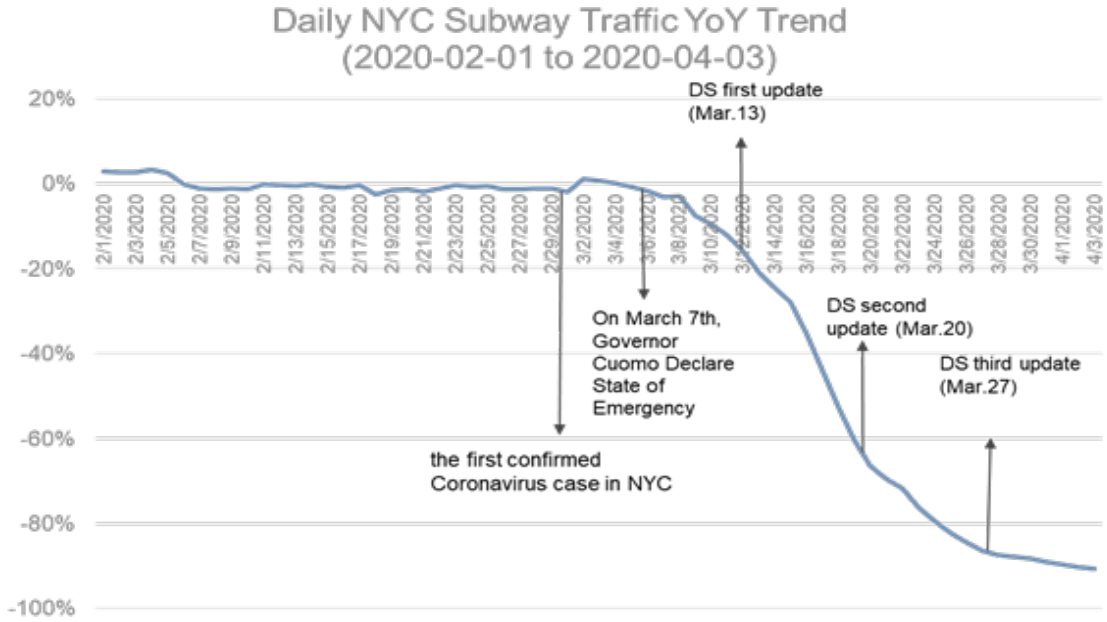
Source: Neuberger Berman, data from Johns Hopkins (as of April 8, 2020)

Trends in U.S. Cities and Asia

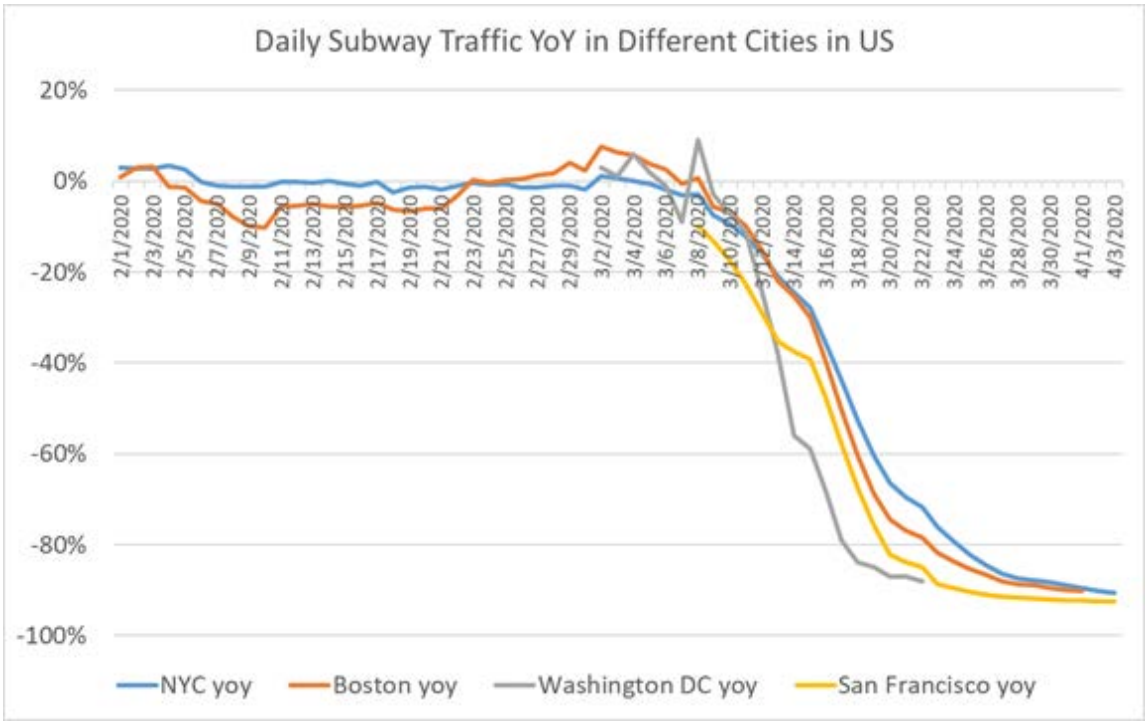
The R0 is of the virus is higher in densely populated areas. In previous reports, we have shown a correlation between subway traffic and cases in New York boroughs.

NYC subway traffic tracker: Subway traffic in New York City has decreased about 90% year-over-year in the week ended April 3.

The subway tracker for other large cities in the U.S.: The data shows a similar year-over-year subway traffic decrease for other large cities in U.S.

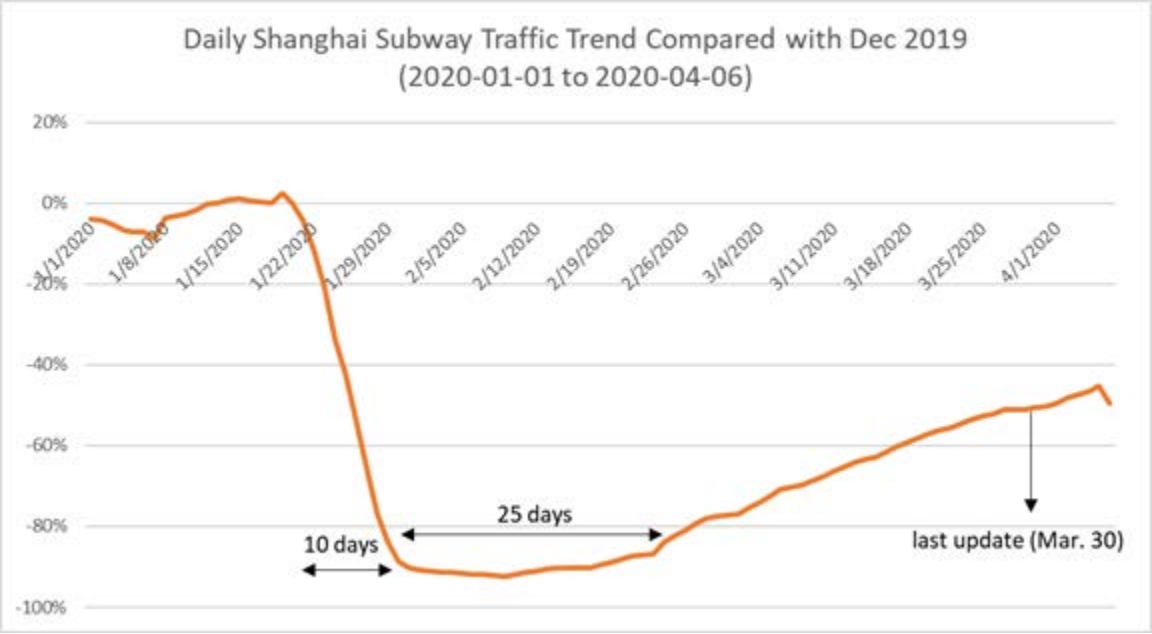


Source: Neuberger Berman, data from ny.gov.



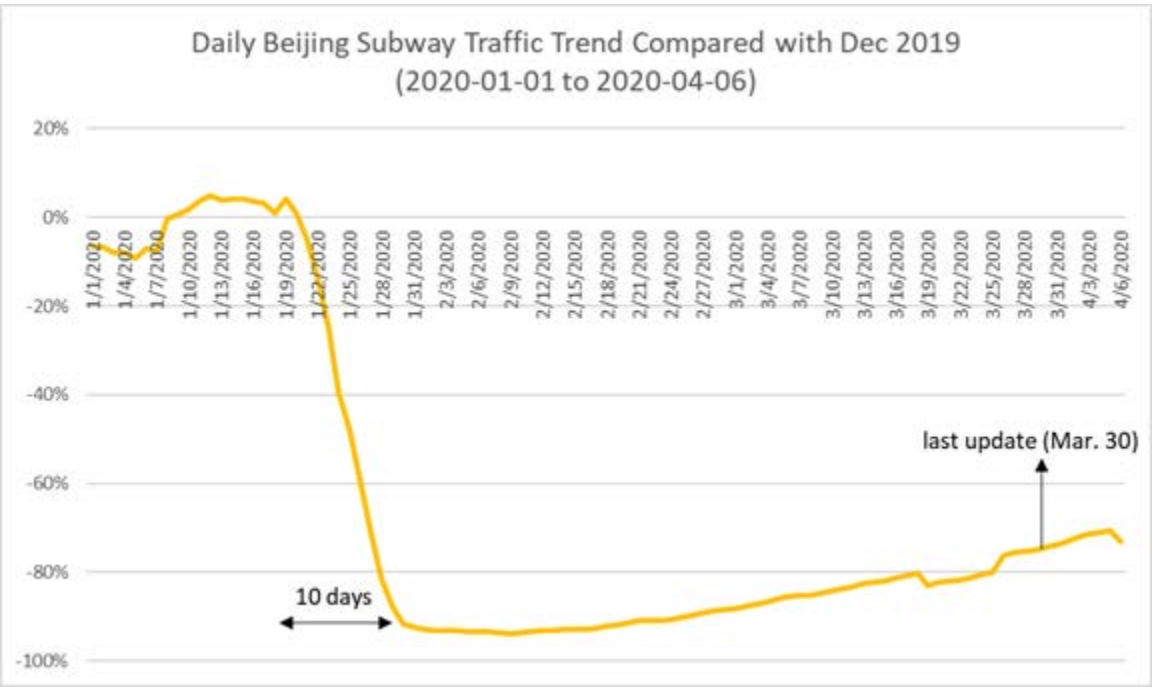
Source: Neuberger Berman, data from ny.gov, https://www.mbtabackontrack.com/blog/112, https://www.wmata.com/initiatives/ridership-portal/#main-content, "SFBART" Twitter Account

By comparison, **subway traffic in Shanghai** continued to recover gradually, but still only returned to about half of the level seen at the same time last year.



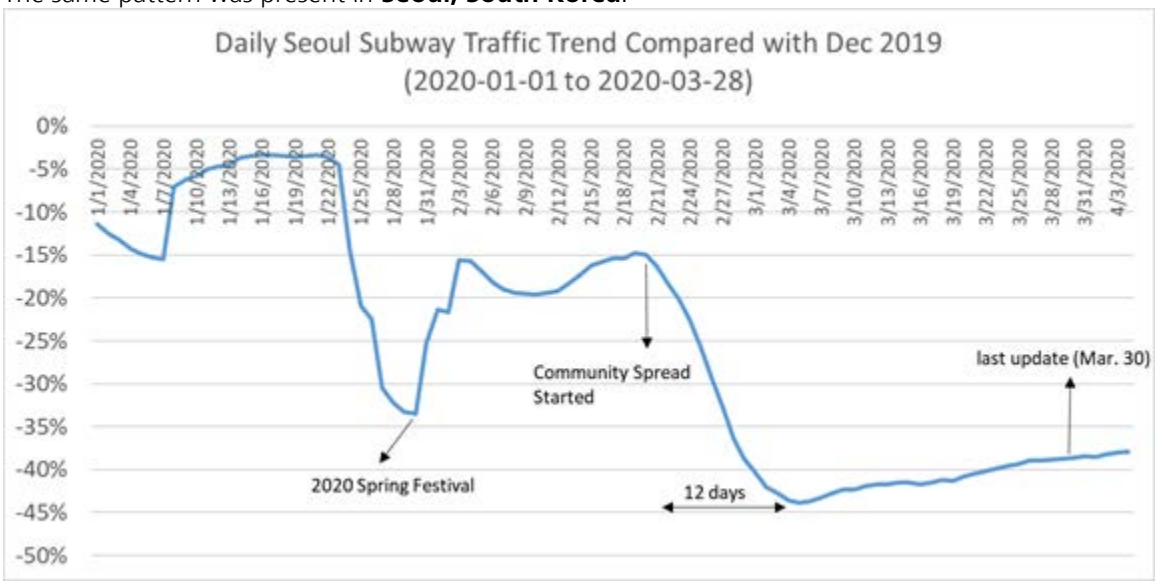
Source: Neuberger Berman, Weibo

Similarly, **subway traffic in Beijing** continued to recover, but has not recovered to the same extent as Shanghai.



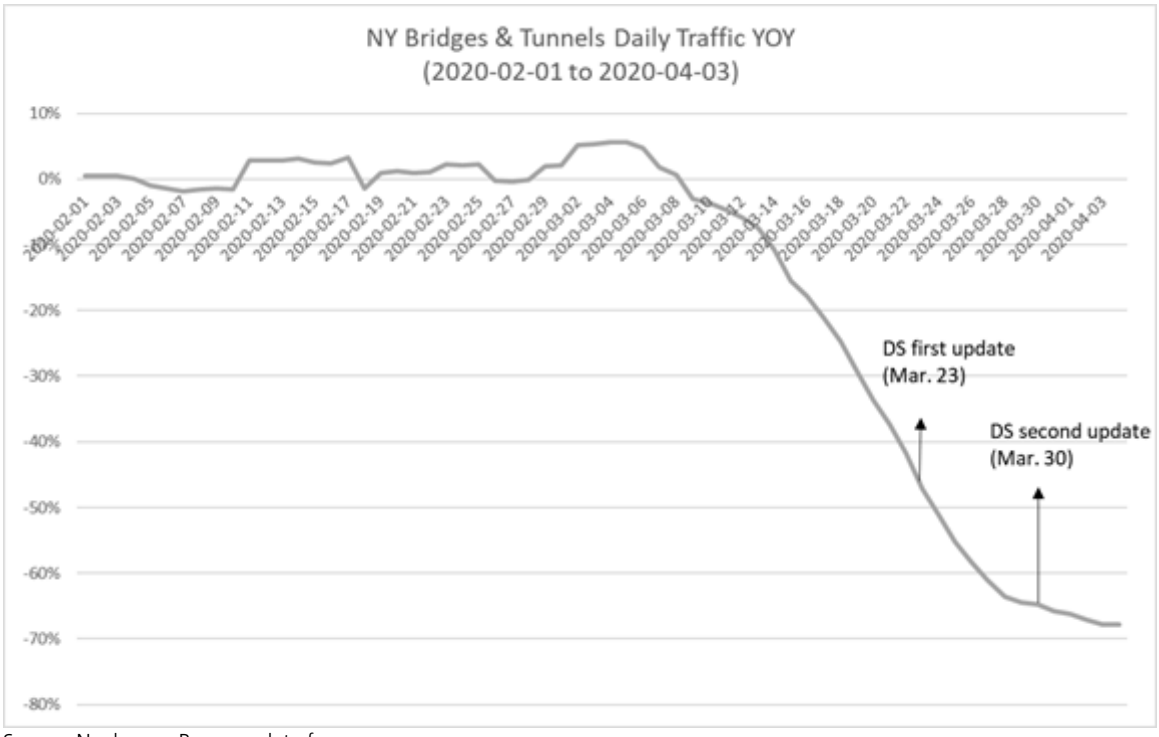
Source: Neuberger Berman, Weibo.

The same pattern was present in **Seoul, South Korea**.



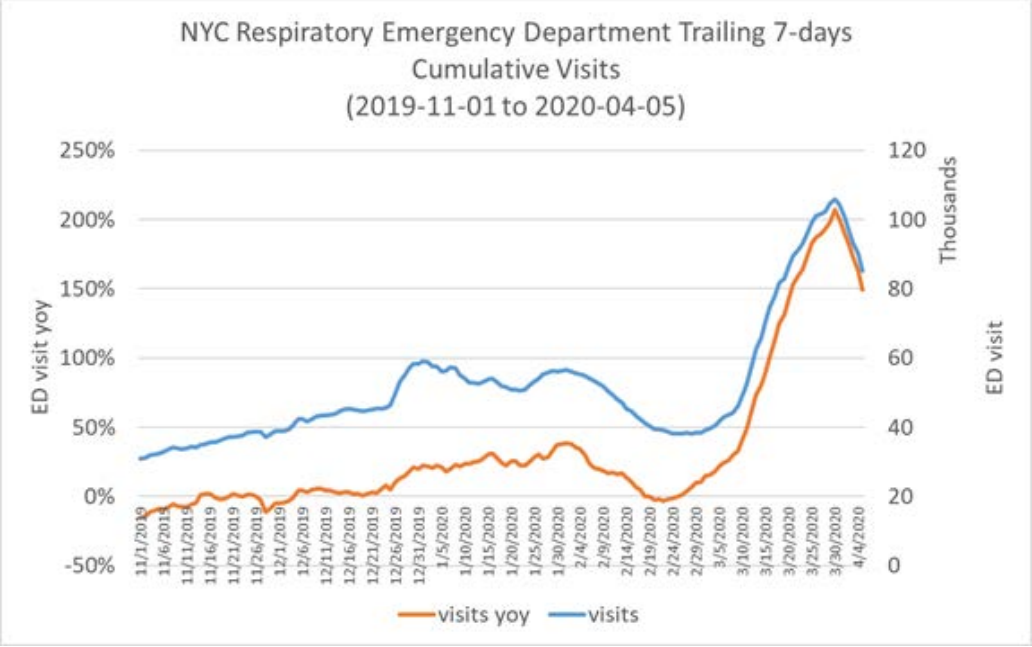
Source: Neuberger Berman, data from http://data.seoul.go.kr/dataList

Bridge and tunnel traffic in the New York City has decreased consistent with the subway trend, falling about 70% year-over-year compared to roughly 65% as of the week of March 30.



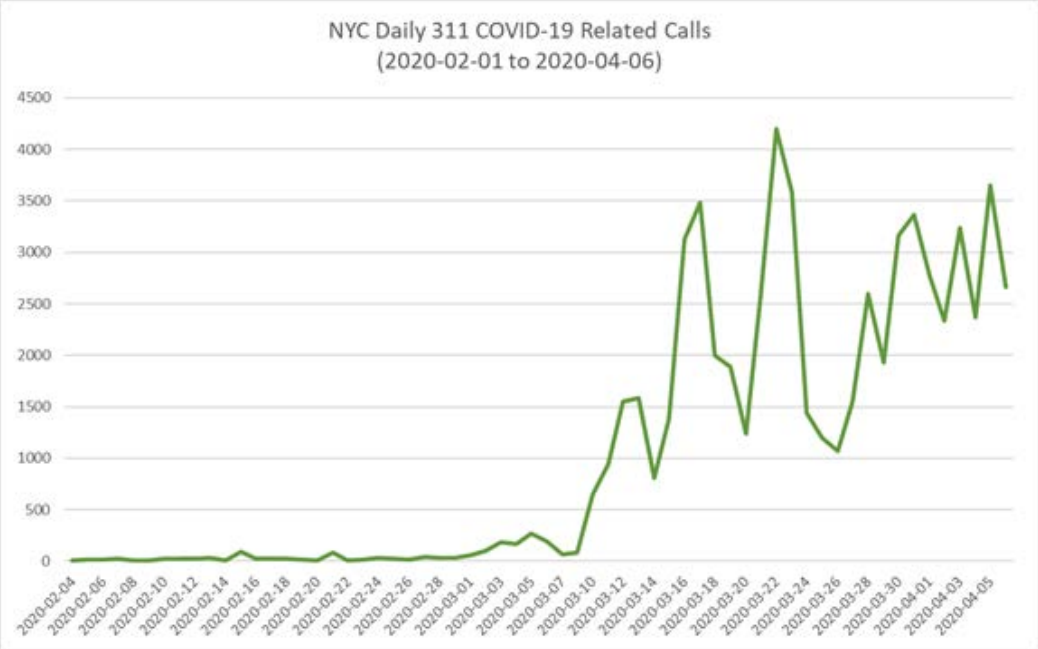
Source: Neuberger Berman, data from ny.gov.

Respiratory emergency visits in New York City have decreased since the week of April 6, but are still 150% above YOY levels.



Source: Neuberger Berman, data from ny.gov.

However, **calls to 311** in New York City that are COVID-19 related continued to increase.



Source: Neuberger Berman, data from ny.gov.