



Public Transit and COVID-19 Pandemic:

Global Research and Best Practices



SEPTEMBER 2020

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Disclaimer: The global COVID-19 pandemic is an evolving situation. **Many scientific studies available about the virus are pre-prints and not yet peer reviewed.** As new evidence emerges, it may affect the following information. *This report was prepared in September 2020.*

Sam Schwartz is a transportation planning and engineering firm. Any medical/epidemiological information contained in the report are drawn from research and/or consultation with public health professionals.

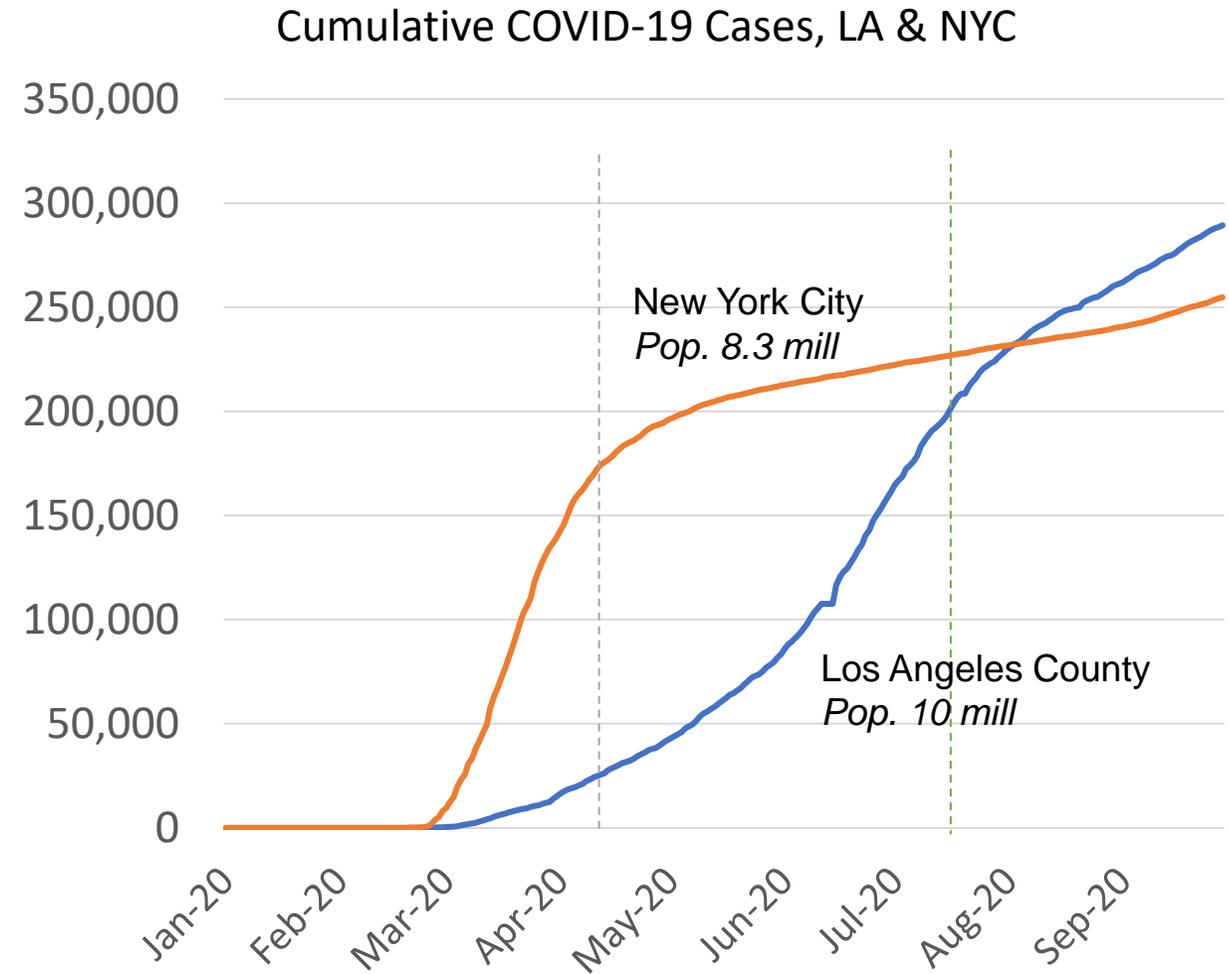
Sam Schwartz/APTA report, September 2020. [Public Transit and COVID-19 Pandemic: Global Research and Best Practices.](#)

Principal Findings:

Researchers and media, **without much evidence**, were quick to point to transit as a major cause of the virus's spread.

Why? Irresponsible Research and Reporting

- ***"The Subways Seeded the Massive Coronavirus Epidemic in New York City"*** -MIT (April 2020)
- ***"Are Cars Protecting Los Angeles?"*** - NYTimes (May 2020)
- ***"Is the Subway Risky? It May Be Safer than You Think"*** - NYTimes (August 2020)

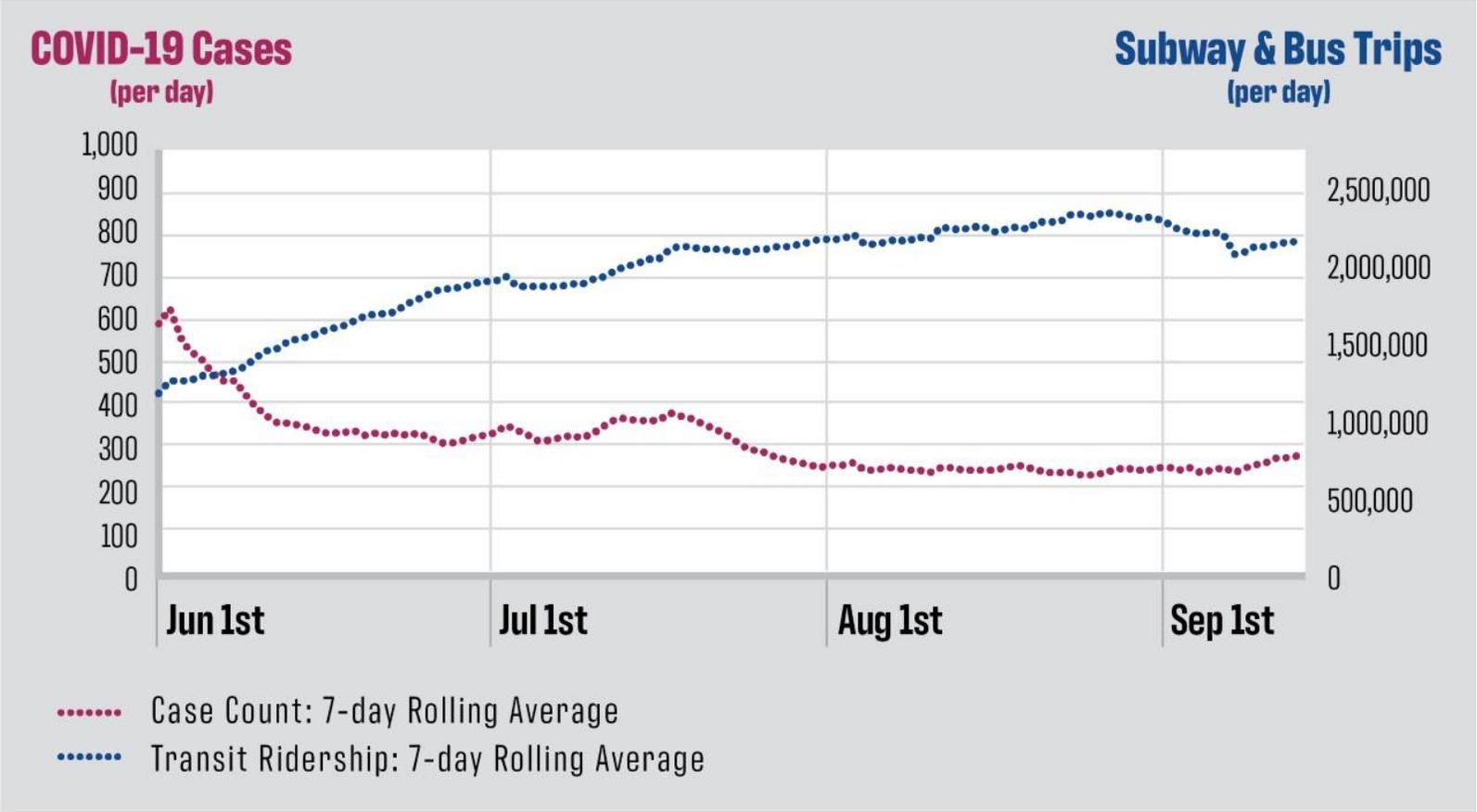


Data: USAFacts

Health experts and gov't officials have looked at transit as a potential major source of infection, have **found no clear links to date.**

Paris	0 of 150 case clusters in May/June originated on city transit; to date no cases linked to city transit
Vienna	0 of 2,407 case clusters in April-September traceable to transit
Tokyo	None of the infection clusters traced to the country's famously crowded rail systems; ridership remains high
Hong Kong	Despite >12mm transit riders, known cases citywide remained low (until recently – and current outbreak not connected to transit); ridership remains 70%+
Seoul	Able to maintain low case rates despite never severely restricting mobility; despite pop. of 10 mil. daily new cases topped near 1,000 before declining. Ridership has only declined slightly (~30%)
Singapore	Even with rigorous contact tracing, no cases traced to public transportation; new case increases linked to dense living conditions of migrant workers
Milan	No increase in case rates once restrictions were lifted in Italy's most impacted area

Analysis shows no correlation with the rise or fall of local COVID-19 cases.

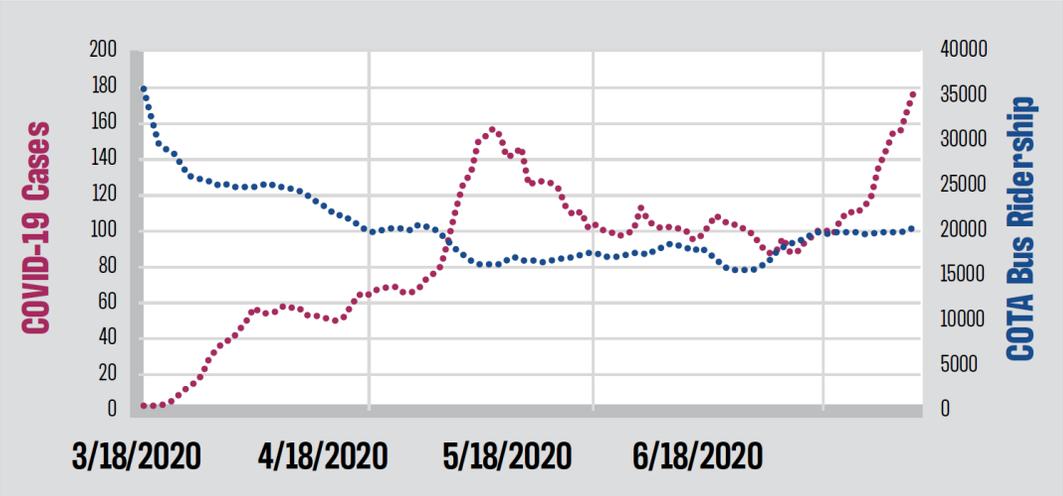


New York City: June 1st – September 12th, more than 212 million rides were taken on subways and buses; avg. case counts dropped from 623 per day to 281 per day (-55%)

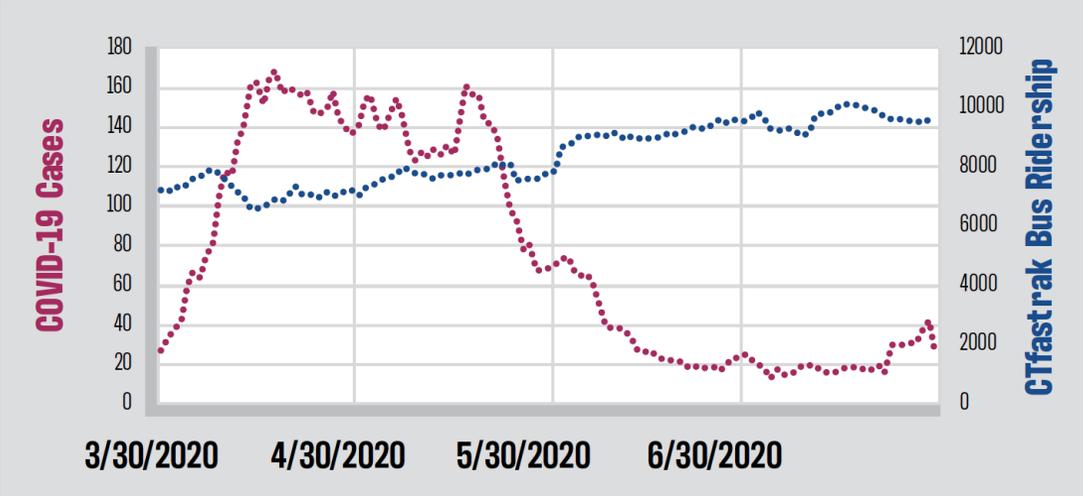
Positivity rates from 3.3% to 1.5%

DATA SOURCES: Case Counts, NYC Department of Health (shown for NYC residents only). Transit Ridership, MTA.

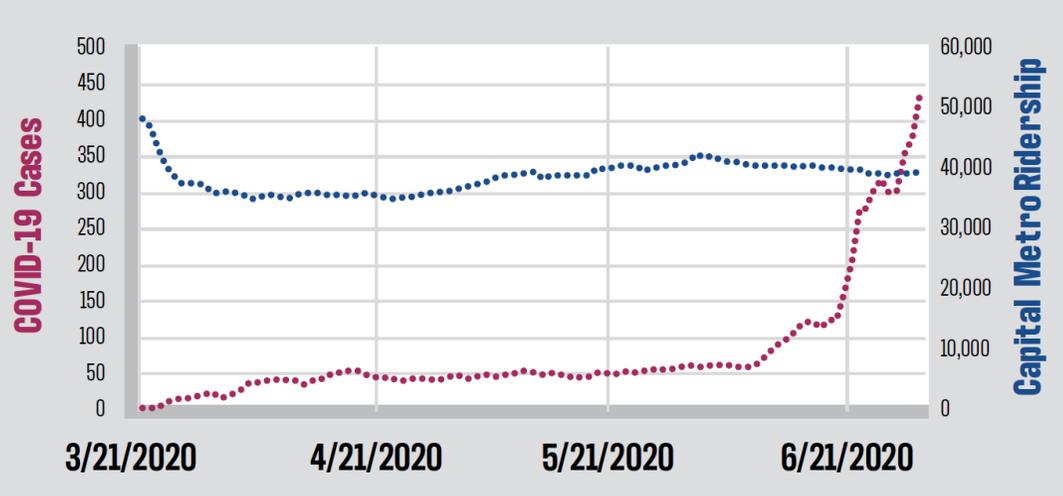
Case studies underscore that case rates are tied primarily to local community spread, rather than correlated to transit ridership rates.



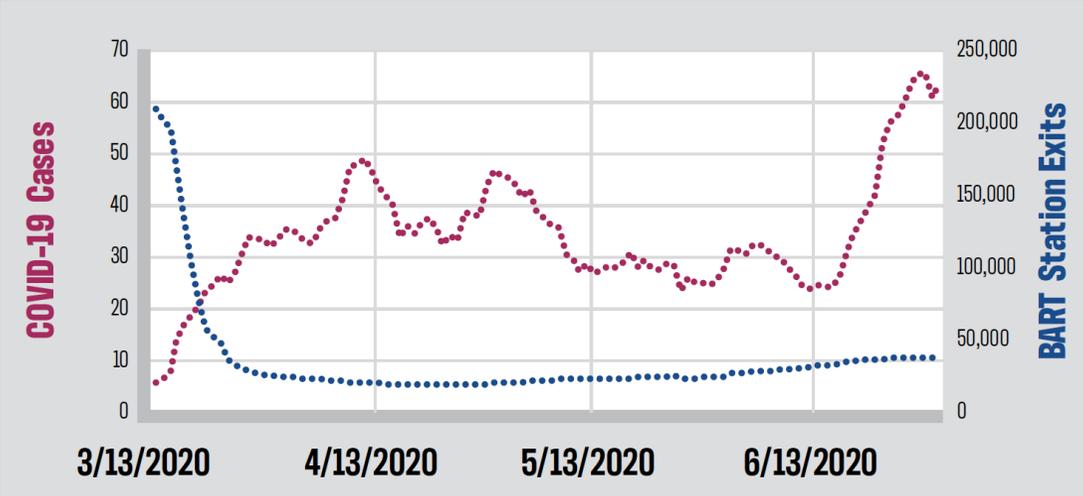
Columbus, OH



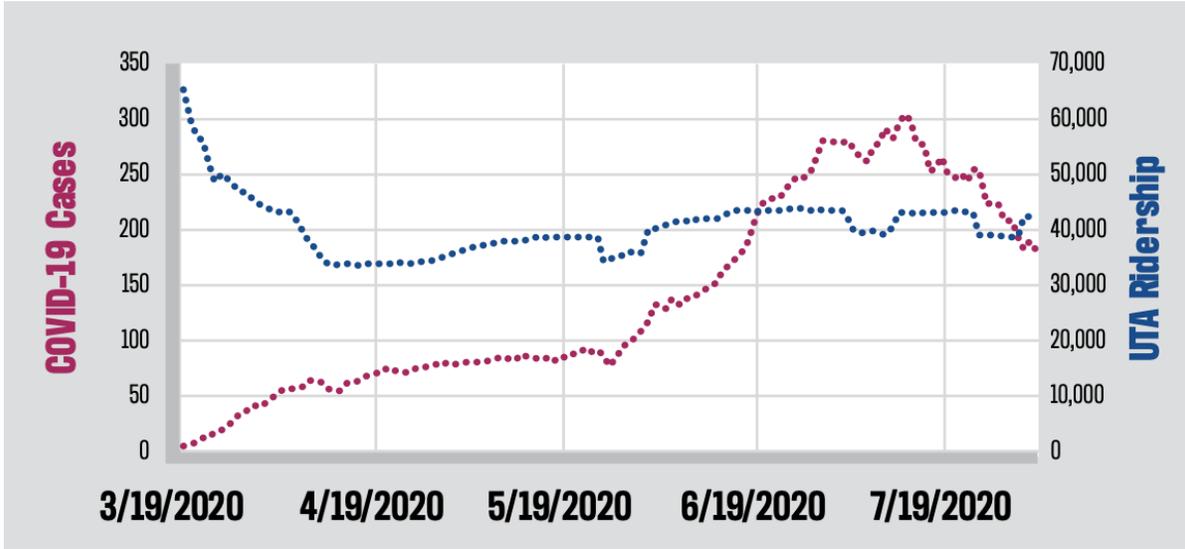
Hartford, CT



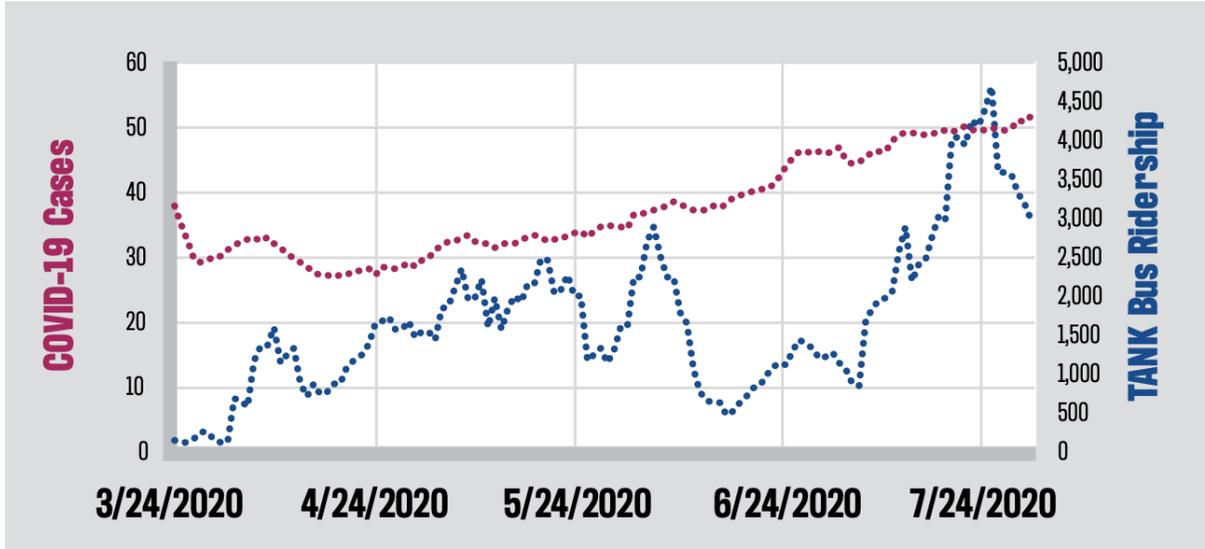
Austin, TX



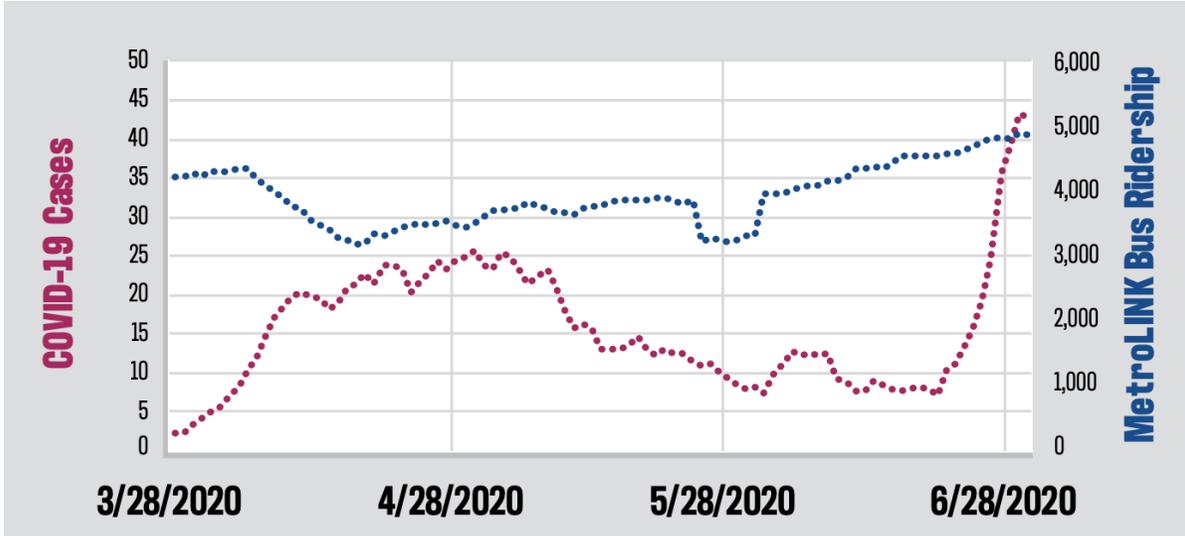
San Francisco, CA



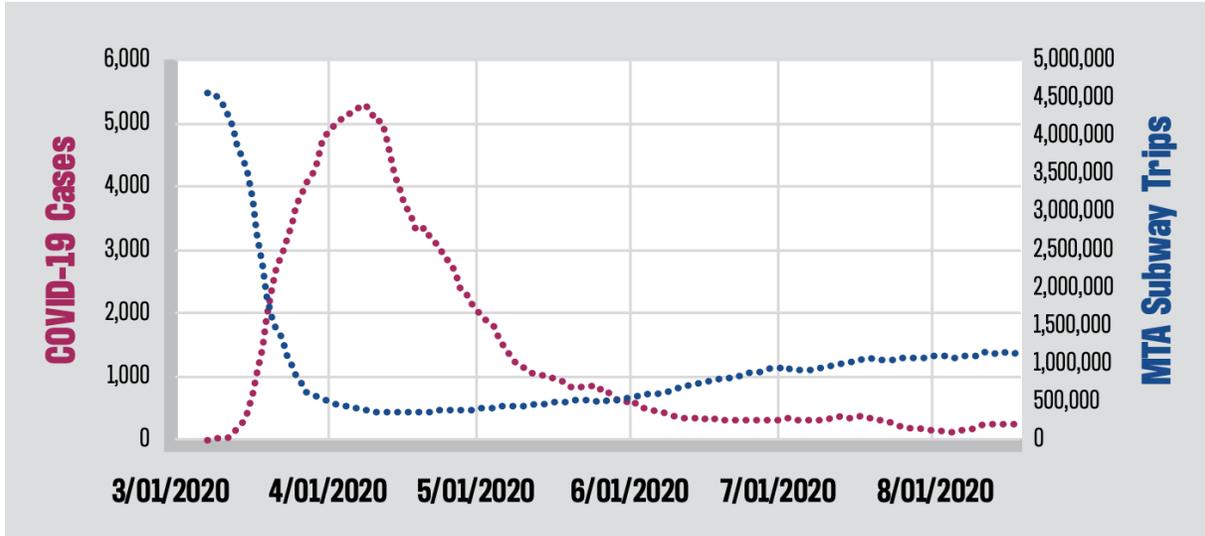
Salt Lake, UT



Northern Kentucky



Quad Cities, IL



New York City

There are **several possible explanations for the lack of correlation:**

- Little talking
- Enhanced airflow
- Short duration
- Early mask mandates

Successful Infection = Exposure to Virus x Time

Evidence Points to Concentrated Environments with a Strong Social Element

I.e. bars, clubs, indoor restaurants, houses of worship

Dr. Hitoshi Oshitani, virologist at Tohoku University: **clusters of the disease originated in gyms, pubs, live music venues ... places where people gather to eat and drink and chat.**

Did not trace any clusters to Japan's heavily packed commuter trains. **Riders are usually alone, not talking** to other passengers, and **wearing masks.** *"An infected individual can infect others in such an environment [on trains], but it must be rare."*

Source: <https://www.sciencemag.org/news/2020/05/japan-ends-its-covid-19-state-emergency>

Good Ventilation Can Further Reduce Risk

- CDC, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) recommend minimum air change/hour (ACH) of **12x for infectious airborne disease isolation rooms**, and 2 complete replacements with outdoor air.
- **ACH** = measure of the air volume added to or removed from a space / volume of a space.

Ventilation is Above the Recommended Amount on Many Rail Cars

- Air changes per hour (ACH) on NYC subway cars = **18-times an hour, 50 percent more frequently than the 12-times recommended rate for air quality for medical isolation rooms.**

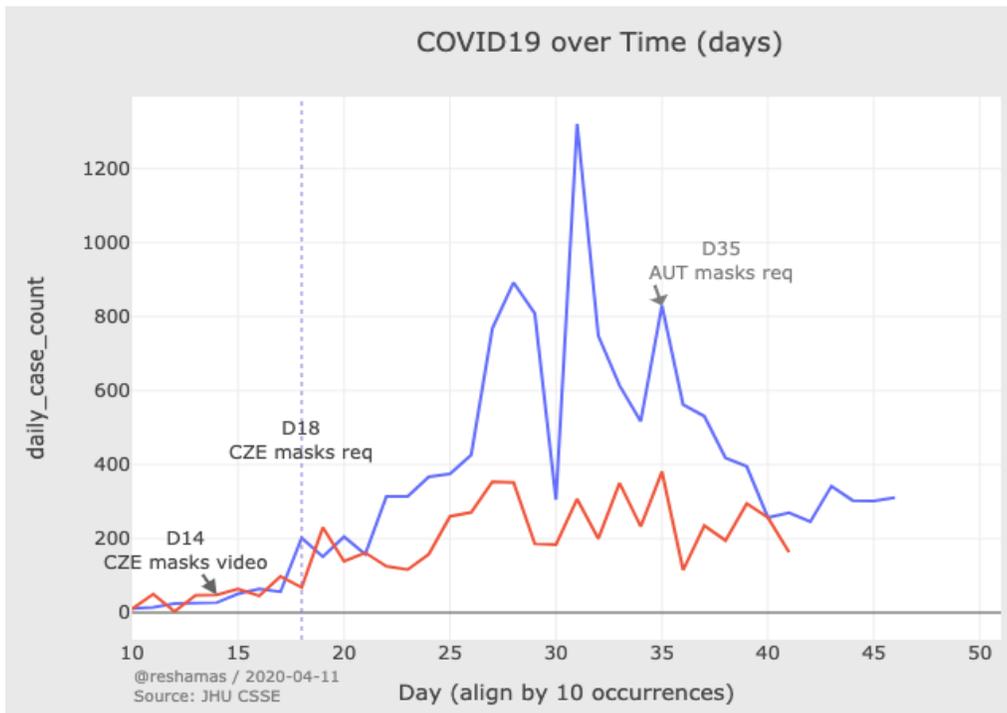
Note: for offices recommended ACH rate = 6-8x/hr, classrooms recommended ACH = 3-4x/hr



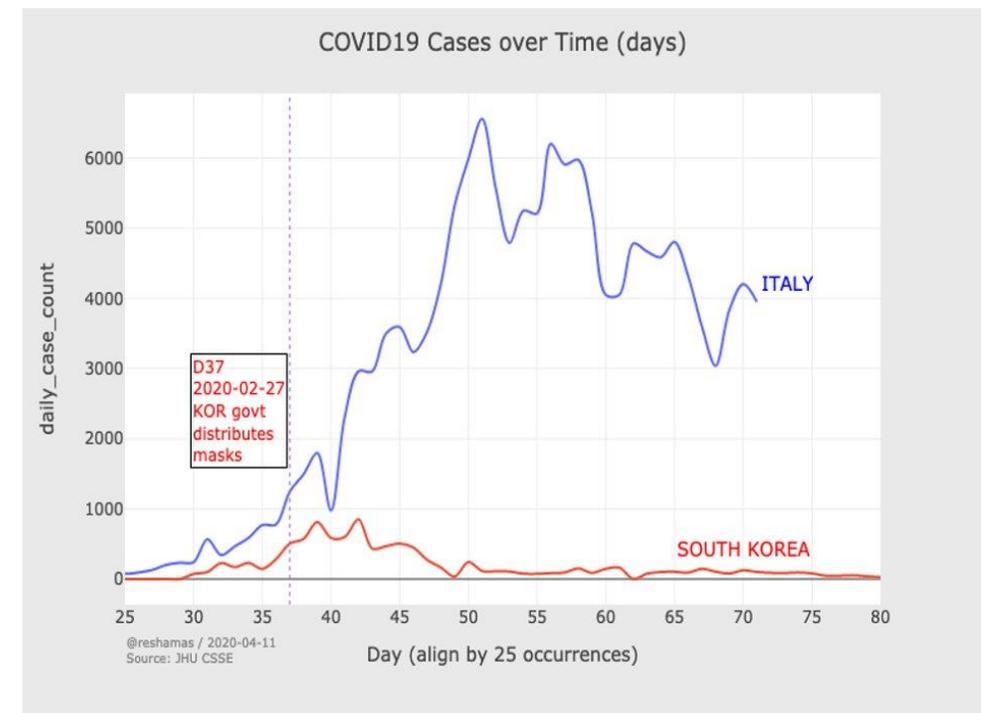
<https://www.nytimes.com/interactive/2020/08/10/nyregion/nyc-subway-coronavirus.html>

Masks are effective in reducing transmission

[Masks are] *“the most important, powerful public health tool we have. I might even go so far as to say that **this face mask is more guaranteed to protect me against Covid than when I take a Covid vaccine,**”* Dr. Robert Redfield CDC Director, before U.S. Senate committee



Both Austria and Cechzia instituted physical distancing on the same day, but only CZE required masks (March 18); Austria mask mandate April 6



S. Korea distributed masks in Feb, w/ mask mandate May 13; Italy mask mandate August 16

Source: <https://www.fast.ai/2020/04/13/masks-summary/>

<u>PERSON WITH COVID-19</u>	<u>HEALTHY PERSON</u>	<u>LIKELIHOOD OF TRANSMISSION</u>	<u>PERSON WITH COVID-19</u>	<u>HEALTHY PERSON</u>	<u>LIKELIHOOD OF TRANSMISSION</u>
<p>Neither person wearing face mask, less than 6 feet apart</p>		Very High	<p>Both wearing face mask, less than 6 feet apart</p>		Low
<p>Only healthy person wearing face mask, less than 6 feet apart</p>		High	<p>Both wearing face mask, and at least 6 feet apart</p>		Very Low
<p>Only person with COVID-19 wearing face mask, less than 6 feet apart</p>		Medium	<p>Staying Home</p>		Virtually None

Source: Based on infographic prepared by Washington State Department of Health

The communities with the highest per capita case rates in the U.S. **rely mostly on cars.**

RANK	METRO OR MICRO AREA	METRO AREA POPULATION	TOTAL CASES	CASES PER 1,000 (AS OF 8/24/20)	METRO AREA TRANSIT SHARE
1	Gallup, NM	71,367	4,157	58.2	0.8%
2	El Centro, CA	181,215	10,393	57.4	0.8%
3	Yuma, AZ	213,787	12,072	56.5	1.9%
4	Eagle Pass, TX	58,722	3,117	53.1	0.0%
5	Show Low, AZ	110,924	5,496	49.5	0.9%
6	Rio Grande City, TX	64,633	2,973	46.0	0.4%
7	Marion, OH	65,093	2,978	45.7	0.8%
8	Yakima, WA	250,873	11,476	45.7	0.5%
9	Brownsville-Harlingen, TX	423,163	19,225	45.4	0.6%
10	Lake City, FL	71,686	3,226	45.0	0.0%

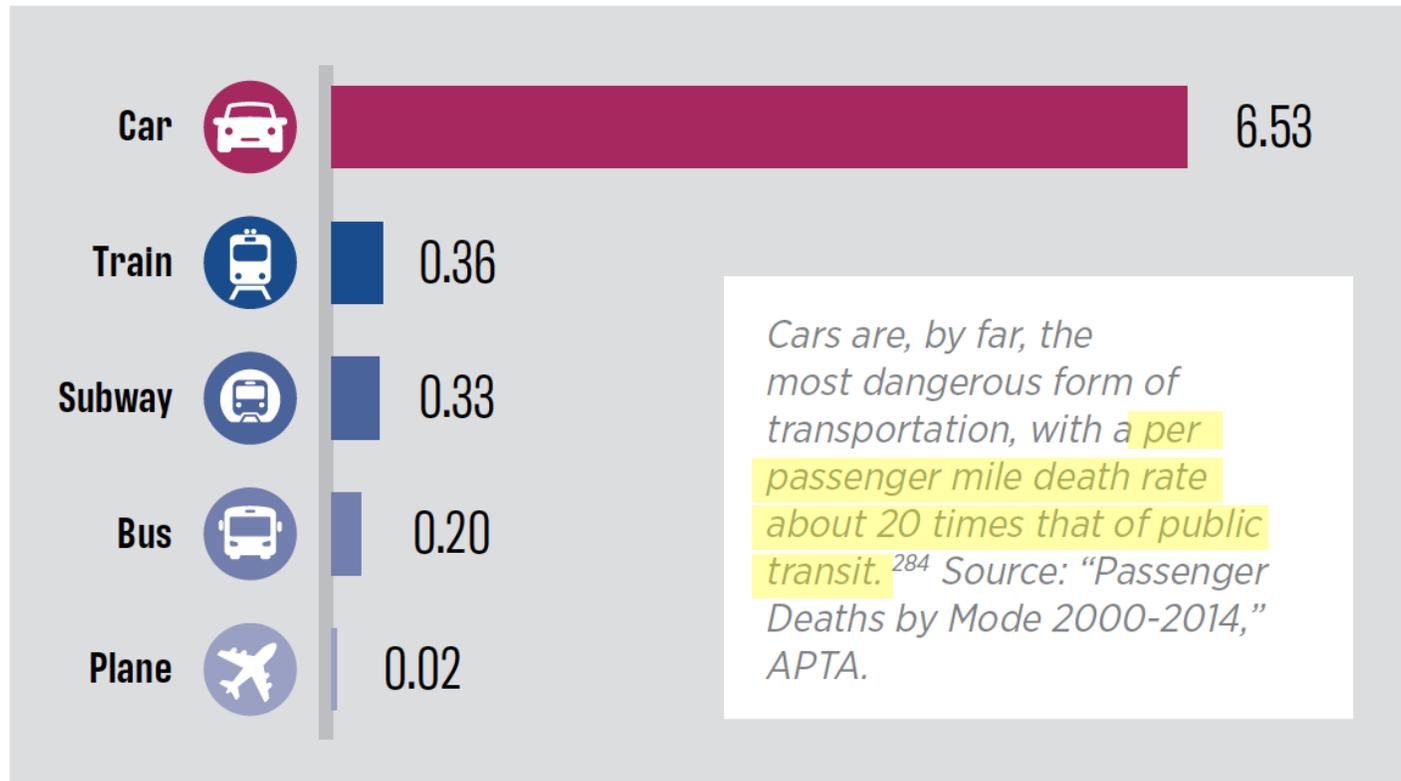
Source: <https://www.nytimes.com/interactive/2020/04/23/upshot/five-ways-to-monitor-coronavirus-outbreak-us.html>;
 US Census Bureau, ACS 5-Year Estimate 2012-2018: Table B0141. Means of Transportation to Work.

A conclusion: what you do at a trip end, not necessarily the mode, affects probability of contracting the virus.

Those who traveled by any means had higher case rates regardless of commute mode. Where they went, often to essential front-line jobs, had more associated risk than how they got there.

And safety and health consequences if people in large numbers switch from transit to private cars.

DEATHS PER 1 BILLION PASSENGER MILES



+ more pollution, inactivity diseases and climate change

Instances Where Transportation Mode Was Significant

- 24 out of 67 passengers on Buddhist tour bus infected; 50 minutes each way, air conditioning system in re-circulating mode, and no masks. No passengers sitting adjacent to an open window contracted the virus.*
- 12 of 313 infected on 5-hour commercial flight; no passengers wore masks, but no cases were reported among the crew members, who wore face masks.**
- *Diamond Princess* cruise ship one infected passenger infected 712 people -- 20% of the ship's population of 3,711.***

* https://www.researchgate.net/publication/340418430_Airborne_transmission_of_COVID-19_epidemiologic_evidence_from_two_outbreak_investigations

** <https://www.medrxiv.org/content/10.1101/2020.03.28.20040097v1.full.pdf>

*** <https://www.medrxiv.org/content/10.1101/2020.07.13.20153049v1>

Maintaining essential mass transit in cities during COVID-19: A public health framework

Vital Strategies, Resolve, Partnership for Healthy Cities (September 2020)

- All public settings have risks; mass transit may have moved individuals leading to community clusters but spread **within vehicles infrequent**
- Not much study has occurred for COVID-19; can look to influenza/respiratory virus transmission as a proxy
 - SARS: Beijing study found spread in taxis, not in subways and buses
 - Flu:
 - UK study found regular public transport users less likely to have acute respiratory illness
 - NYC study found only 4% of transmission on subway
 - European study found only 3% of transmission in public transport
- Similarly concluded that while possible, transmission in transit must be infrequent; more likely to occur in other indoor settings

Assessment of Risks of SARS-CoV-2 Transmission during Air Travel and Non-Pharmaceutical Interventions to Reduce Risk

Harvard T.H. Chan School of Public Health (October 2020)

- With proper precautions, **flying can be safer than grocery shopping**
- Behavior: masks, hand sanitation; Environment: sanitized, good ventilation



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New York + Jersey City + Chicago + Washington, DC + Tampa + Los Angeles + White Plains + Oakland