



Resiliencia y transporte: ¿Qué tan arriesgado es usar el transporte público desde una perspectiva epidemiológica?

Alejandro Tirachini Hernández
Seminario GIZ – TUMI – NUMO, 5 de agosto de 2020



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COVID-19 and Public Transportation: Current Assessment, Prospects, and Research Needs

[Alejandro Tirachini](#), *Universidad de Chile*
[Oded Cats](#), *Delft University of Technology*

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Abstract

The COVID-19 pandemic poses a great challenge for contemporary public transportation worldwide, resulting from an unprecedented decline in demand and revenue. In this paper, we synthesize the state-of-the-art, up to early June 2020, on key developments regarding public transportation and the COVID-19 pandemic, including the different responses adopted by governments and public transportation agencies around the world, and the research needs pertaining to critical issues that minimize contagion risk in public transportation in the so-called post-lockdown phase. While attempts at adherence to physical distancing (which challenges the very concept of mass public transportation) are looming in several countries, the latest research shows that for closed environments such as public transportation vehicles, the proper use of face masks has significantly reduced the probability of contagion. The economic and social effects of the COVID-19 outbreak in public transportation extend beyond service performance and health risks to financial viability, social equity, and sustainable mobility. There is a risk that if the public transportation sector is perceived as poorly transitioning to post-pandemic conditions, that viewing public transportation as unhealthy will gain ground and might be sustained. To this end, this paper identifies the research needs and outlines a research agenda for

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Do not use public transport if you can avoid it. Stay at home to do your bit, protecting the NHS and saving lives.

If you are unsure about your travel plans visit [gov.uk/guidance/coron...](https://www.gov.uk/guidance/coronavirus)

#StayHomeSaveLives

 HM Government



AVOID PUBLIC TRANSPORT
Avoid travelling at rush hour

Pandemia
COVID-19
presenta **desafío**
sin precedentes
para el transporte
público
contemporáneo

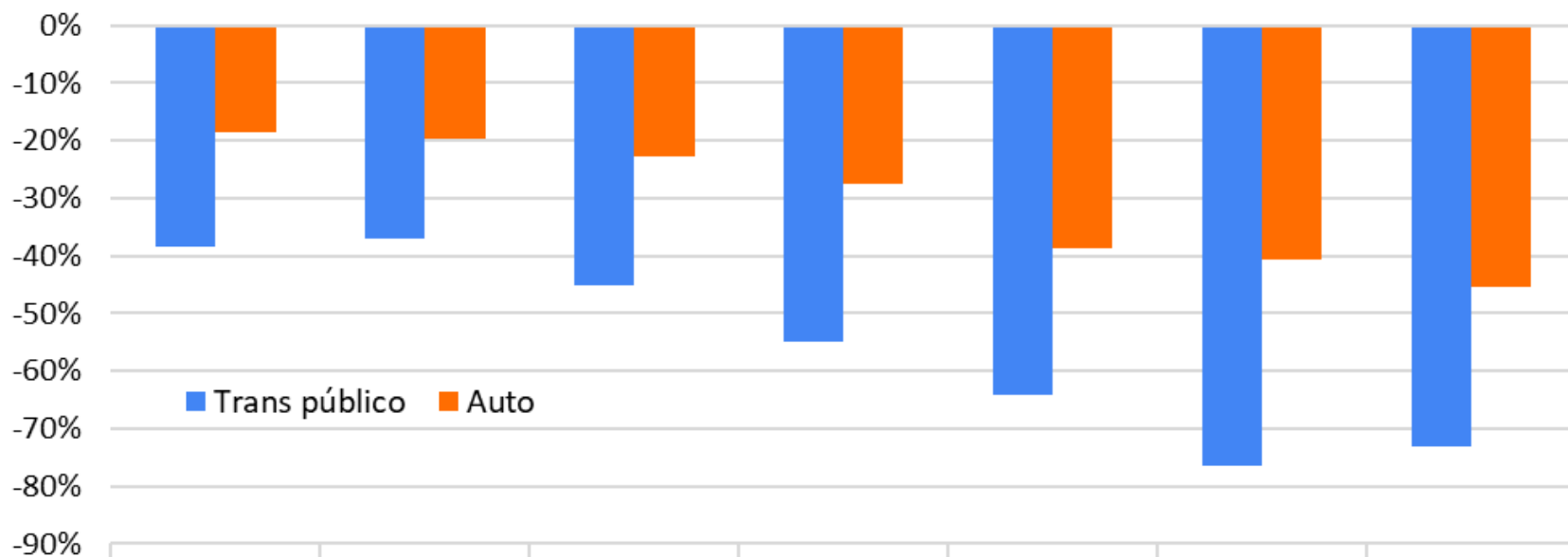
**¿Por qué es importante no dejar caer
el transporte público?**

**¿Por qué es importante no dejar caer
el transporte público?**

1. Equidad social

¿Quién reduce más viajes? Chile

Coronavirus: disminución porcentual viajes Semana 16-22 Marzo 2020



	Menos de \$300.000	Entre \$300.001 y \$600.000	Entre \$600.001 y \$1.000.000	Entre \$1.000.001 y \$1.500.000	Entre \$1.500.001 y \$2.000.000	Entre \$2.000.001 y \$3.000.000	Más de \$3.000.000
■ Trans público	-39%	-37%	-45%	-55%	-64%	-76%	-73%
■ Auto	-19%	-20%	-23%	-27%	-39%	-41%	-45%

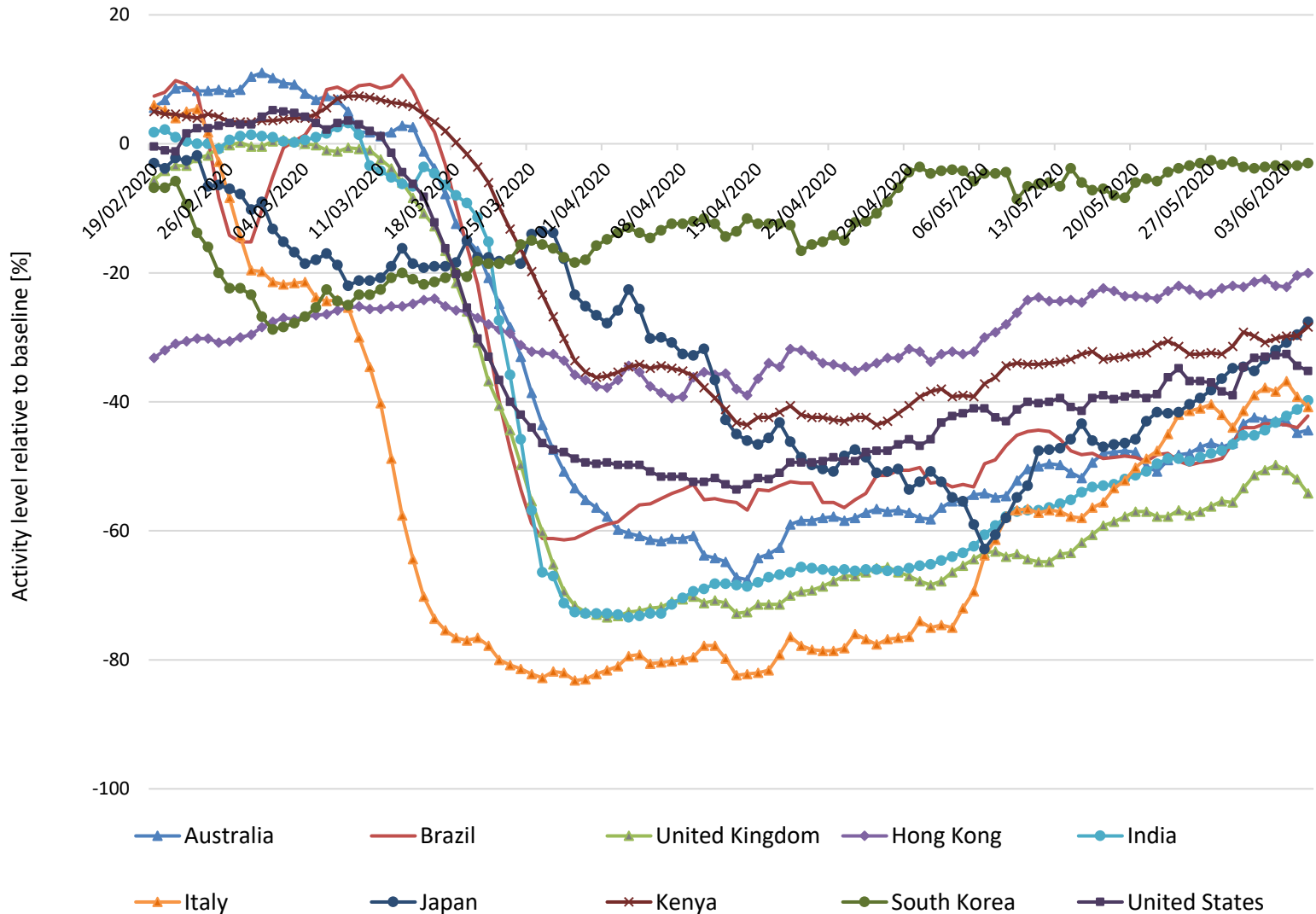
Reducción de viajes en pandemia, por grupo de ingreso familiar

¿Por qué es importante no dejar caer el transporte público?

2. Desastre financiero

Uso transporte público

15 febrero-5 junio 2020



(Elaboración en base a Google Community Mobility Reports, media móvil 5 días)

COVID-19 Has Been 'Apocalyptic' for Public Transit. Will Congress Offer More Help?



N.Y. Subway, Facing a \$16 Billion Deficit, Plans for Deep Cuts

The transit agency will announce budget cuts on Wednesday. Officials are hoping federal assistance will help ease the crisis that the pandemic has created.



Disminución del 86% de pasajeros transporte público en Santiago, Mayo 2020



¿Por qué es importante no dejar caer el transporte público?

3. Exacerbación de externalidades negativas del tráfico en reapertura



MOVILIDAD / ESTUDIO SOBRE LA EVOLUCIÓN DE LA MOVILIDAD ESPAÑOLA DE INVERTIA (V)

La recuperación del uso del coche ya llega al 80% y duplica la del transporte público

El vehículo particular vuelve a imponerse en la quinta entrega del Estudio sobre la evolución de la Movilidad Española durante la Desescalada.

13 junio, 2020 - 03:39

EN: ESTUDIO DE LA EVOLUCIÓN DE LA MOVILIDAD EN ESPAÑA IMPACTO CORONAVIRUS MOVILIDAD

Miguel Elizondo

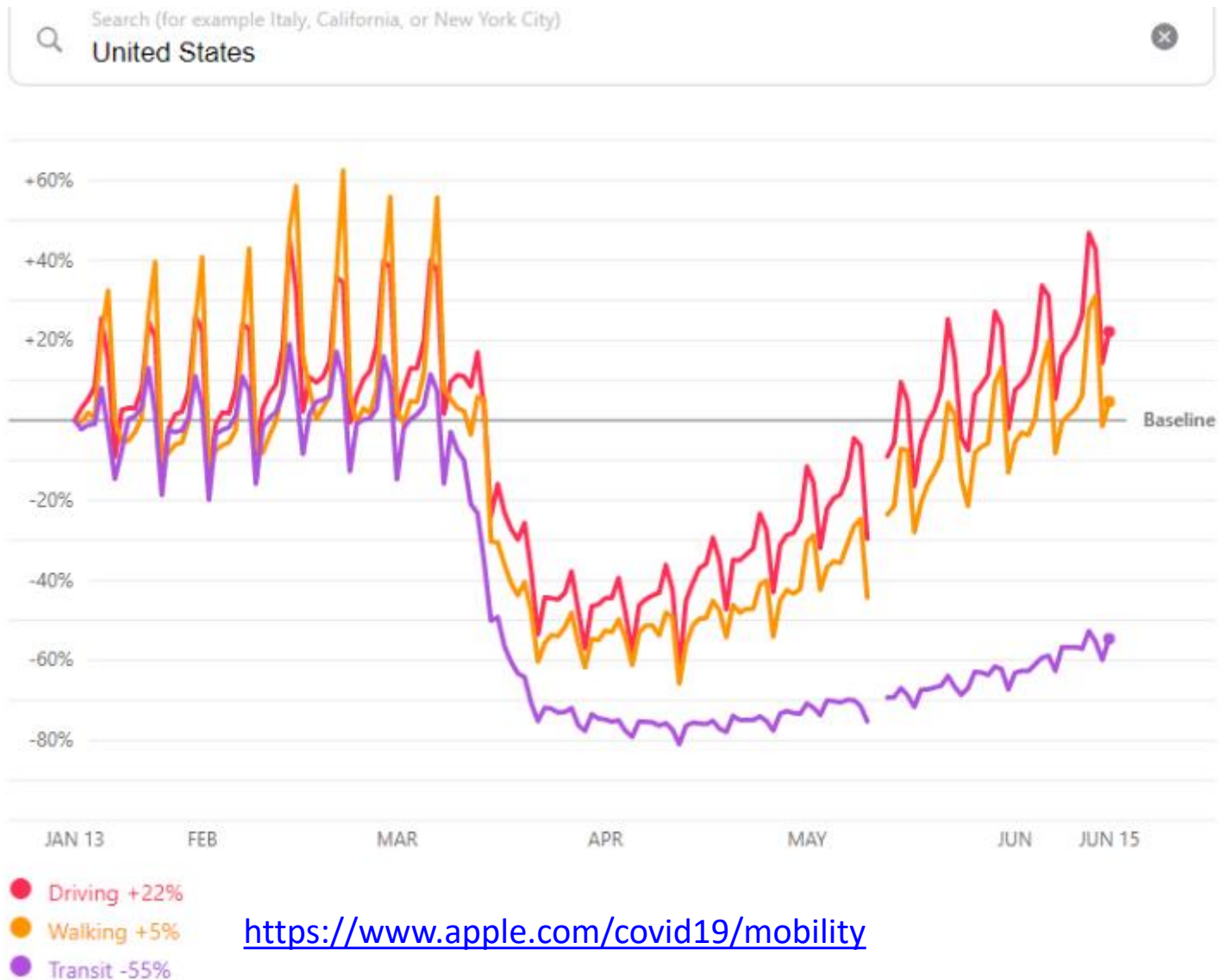
El uso del coche vuelve a pisar el acelerador. Si la semana pasada el uso del transporte público consiguió cambiar la tendencia

Noticias relacionadas

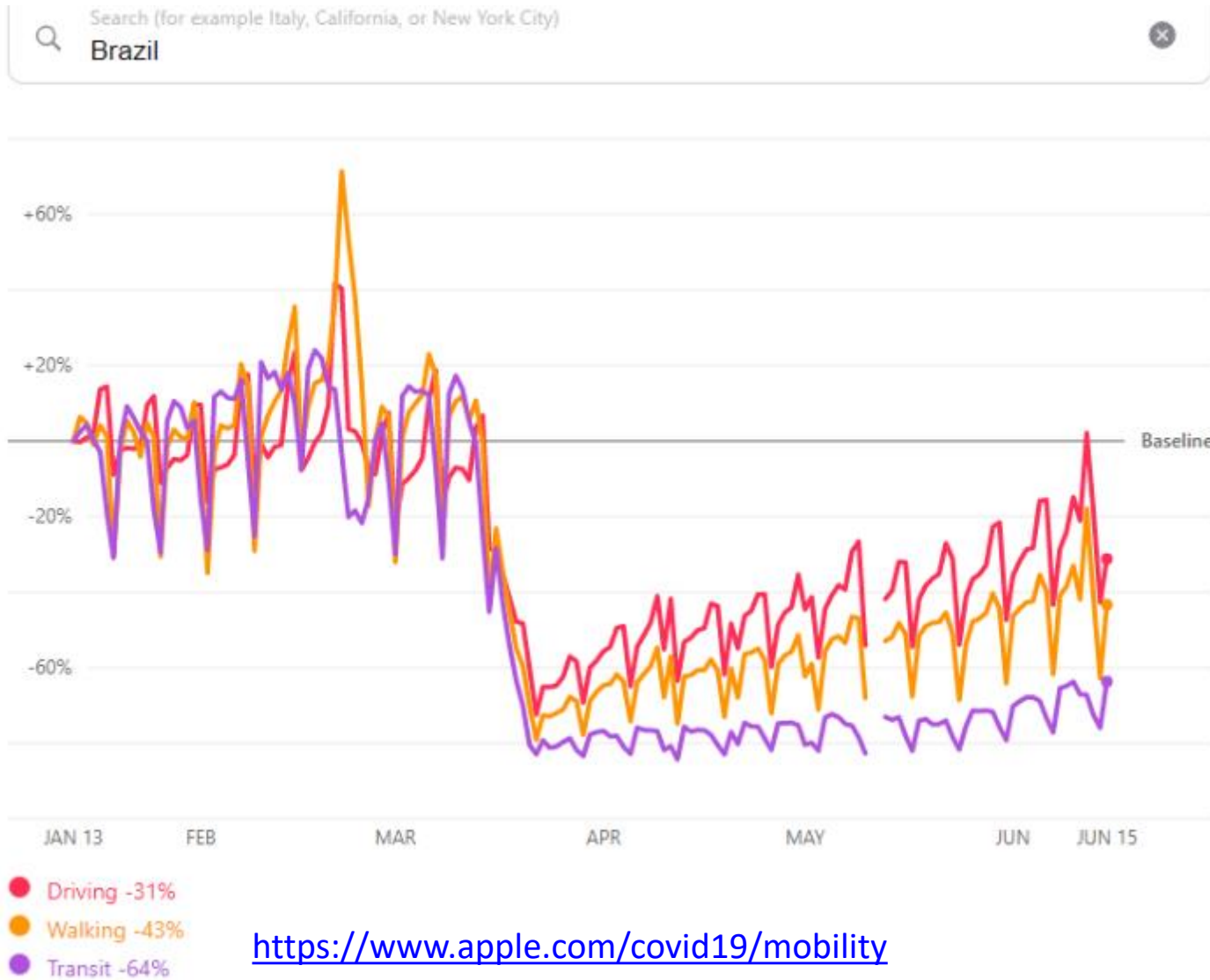
- Madrid no solicitará

La recuperación del uso del coche ya llega al 80% y duplica la del transpor

Solicitudes de ruta Apple Maps 2020



Solicitudes de ruta Apple Maps 2020



Escenarios en reapertura

1. Veredas más anchas, más ciclovías etc.
 - Pro transporte sustentable
2. Aumento tráfico vehicular, **por evitar uso transporte público**
 - Más contaminación, congestión, siniestros (accidentes)
3. ¿Medidas pro transporte público?
 - **Pistas o carriles solo bus si hay tráfico congestionado.**
4. Gestión de demanda fuera del sector transporte
 - Teletrabajo parcial
 - Horarios diferenciados entrada trabajo


The Subways Seeded the Massive Coronavirus Epidemic in New York City

NBER Working Paper No. w27021

21 Pages • Posted: 20 Apr 2020

Jeffrey E. Harris

Massachusetts Institute of Technology (MIT) - Department of Economics; National Bureau of Economic Research (NBER)

 [There are 2 versions of this paper](#)

Date Written: April 2020

Abstract

New York City's multitentacled subway system was a major disseminator – if not the principal transmission vehicle – of coronavirus infection during the initial takeoff of the massive epidemic that became evident throughout the city during March 2020. The near shutoff of subway ridership in Manhattan – down by over 90 percent at the end of March – correlates strongly with the substantial increase in the doubling time of new cases in this borough. Maps of subway station turnstile entries, superimposed upon zip code-level maps of reported coronavirus incidence, are strongly consistent with subway-facilitated disease propagation. Local train lines appear to have a higher propensity to transmit infection than express lines. Reciprocal seeding of infection appears to be the best explanation for the emergence of a single hotspot in Midtown West in Manhattan. Bus hubs may have served as secondary transmission routes out to the periphery of the city.

Institutional subscribers to the NBER working paper series, and residents of developing countries may download this paper without additional charge at www.nber.org.

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3580579

Informe sobre el transporte público: ¿por qué se creó que es el principal diseminador de coronavirus?



METRO

MIT study: Subways a 'major disseminator' of coronavirus in NYC

By David Meyer

April 15, 2020 | 2:09pm | Updated

CORONAVIRUS

El subway pudo haber sido la causa de que Nueva York se convirtiera en el epicentro del coronavirus

Un estudio de la prestigiosa universidad MIT sostiene que el subway ha sido la principal fuente de contagio del coronavirus en Nueva York. Sin embargo, esta teoría va en contra de lo que dicen las autoridades de la ciudad.

UNIVISION

CORONAVIRUS

Coronavirus| El metro fue el foco de contagio en Nueva York, dice un estudio

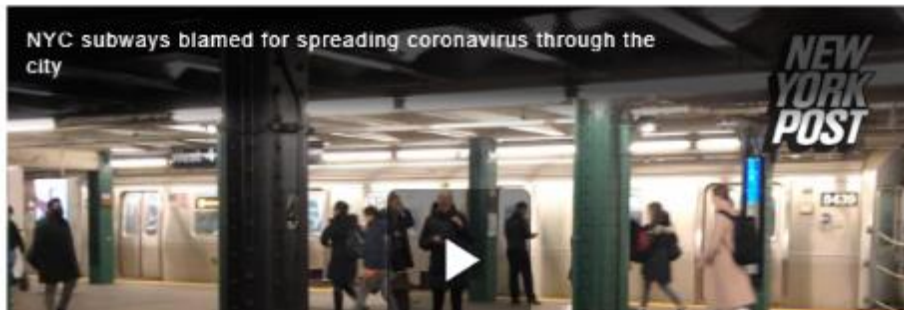
Lluís Bou

Foto: Flickr Pom

Barcelona. Domingo, 19 de abril de 2020. 21:37

Actualizado Domingo, 19 de abril de 2020. 21:37

Tiempo de lectura: 1 minuto



It's Easy, But Wrong, to Blame the Subway for the Coronavirus Pandemic

A draft paper by an MIT economist claims the New York City subway was the "major disseminator" of coronavirus. If only it were that simple.



By [Aaron Gordon](#)

STREETSBLOG NYC

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That MIT Study About the Subway Causing COVID Spread is Crap

By Alon Levy | Apr 17, 2020 | 103 COMMENTS



CITYLAB

The New York Subway Got Caught in the Coronavirus Culture War

A paper claims that the nation's largest transit system made NYC a Covid-19 hot spot. But experts say there are too many unknowns to link ridership to infection rates.

The determinants of the differential exposure to COVID-19 in New York City and their evolution over time*

Milena Almagro[†] Angelo Orane-Hutchinson[‡]

June 25, 2020

[Updated frequently. Click here for most updated version.](#)

Abstract

We argue that occupations are a key explanatory variable for understanding the early transmission of COVID-19 in New York City, finding that they play a larger role than other key demographics such as race or income. Moreover, we find no evidence that commuting patterns are significant after controlling for occupations. On the other hand, racial disparities still persist for Blacks and Hispanics compared to Whites, although their magnitudes are economically small. We perform a daily analysis over a range of one month to evaluate how different channels interact with the progression of the pandemic and the stay-at-home order. While the coefficient magnitudes of many occupations and demographics decrease, we find evidence consistent with higher intra-household contagion over time. Finally, our results also suggest that crowded spaces play a more important role than population density in the spread of COVID-19.

https://m-almagro.github.io/Covid_and_Within_City_Inequality.pdf

The determinants of the differential exposure to COVID-19 in New York City and their evolution over time*

Milena Almagro[†] Angelo Orane-Hutchinson[‡]

June 25, 2020

[Updated frequently. Click here for most updated version.](#)

Our results show that occupations are a key component in explaining the observed differences across NYC areas at early stages of the pandemic. For example, in our preferred specification, we find that a one-percentage-point increase in the number of workers employed in transportation, an occupation that has been declared essential and has a high degree of exposure to human interaction, increases the share of positive tests by 1% by April 20, six weeks into the pandemic. Moreover, we show that length of commute and the use of public transport are not significant after controlling for occupations.⁶ In terms of neighborhood characteristics, we also find that the magnitude of the coefficient for household size is roughly six times larger than the coefficient for neighborhood density for our preferred specification for April 20. This result suggests that crowding of shared spaces plays a more important role than the density of locations.

https://m-almagro.github.io/Covid_and_Within_City_Inequality.pdf

Table 1: Dependent variable - share of positive tests (cumulative, up to specified date)

	April 1			April 20			April 30				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		
	Controls Neighborhood Controls	+ Occup.	Borough FE + Dem. & Borough FE	Controls Neighborhood Controls	+ Occup.	Borough FE + Dem. & Borough FE	Controls Neighborhood Controls	+ Occup.	Borough FE + Dem. & Borough FE		
Tests per capita	9.017***	11.186***	12.050***	0.667	0.262	2.553***	0.723**	0.291	1.437***		
Log Density	0.015	0.022*	0.032***	0.024**	0.015*	0.016***	0.013*	0.005	0.010*		
% Public Transport	-0.015	0.013	-0.059	0.010	-0.001	-0.017	0.006	0.019	0.023		
Log Commuting Time	0.237***	-0.016	-0.054	0.232***	0.001	-0.008	0.196***	0.014	-0.012		
% Uninsured	1.002***	0.662***	0.150	0.924***	0.417**	0.351***	0.831***	0.424***	0.302***		
% Essential - Professional		0.156	0.766***		-0.210	0.235		-0.153	0.039		
% Non ess. - Professional		0.669***	0.544**		0.329**	0.224*		0.192*	-0.008		
% Science fields		-4.703***	-2.965***		-1.931*	-1.609**		-1.000	-1.148*		
% Law and related		-0.410	-1.427**		-0.492	-0.898**		-0.364	-0.876**		
% Health practitioners		-0.432	-0.167		-0.155	-0.206		0.065	-0.130		
% Other health		0.947***	0.346		0.815***	0.365		0.703***	0.307		
% Firefighting		2.743**	1.629*		0.379	-0.156		-0.223	-0.953		
% Law enforcement		-0.301	-0.223		-1.970*	-1.344**		-1.017	-0.729		
% Essential - Service		-0.100	0.245		0.312	0.082		0.236	-0.075		
% Non ess. - Service		0.769	1.154**		-0.046	0.578*		-0.042	0.281		
% Ind. and Construction		1.091**	0.839**		0.271	-0.079		0.254	-0.007		
% Essential - Technical		-2.025*	-0.319		-0.785	-0.908*		-0.159	-0.917**		
% Transportation		1.752***	1.102**		1.253***	0.541*		1.028***	0.229		
Log Income			-0.010			-0.022			0.015		
Share $\geq 20, \leq 40$			-0.357**			-0.208**			-0.028		
Share $\geq 40, \leq 60$			-0.611**			-0.198			-0.067		
Share ≥ 60			-0.347*			0.002			0.276***		
Share Male			-0.146			0.318**			0.218		
Log Household Size			0.037			0.099***			0.090***		
% Black			0.175***			0.081***			0.083***		
% Hispanic			0.194***			0.125***			0.135***		
% Asian			0.141***			0.012			0.019		
Bronx			-0.014			-0.062***			-0.036***		
Brooklyn			0.086***			0.034**			0.036***		
Queens			0.084***			0.023			0.034***		
Staten Island			0.083***			-0.064***			-0.029		
Constant	-0.671**	-0.149	0.196	-0.682***	0.201	0.111	-0.513***	0.190	-0.024		
Observations	174	174	174	174	174	174	174	174	174		
R ²	0.514	0.694	0.839	0.673	0.800	0.920	0.718	0.807	0.911	.763	0.821 0.896

Weighted OLS by population size. Robust standard errors.

**¿Significa esto que el transporte público
tiene cero riesgo?**

**Además, recordar la naturaleza y limitaciones
de un estudio correlacional**

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12K



1K



Concerns that crowded commuter trains in Japan would help spread COVID-19 have, so far, not been realized. EDGARD GARRIDO/REUTERS/NEWSCOM

Japan ends its COVID-19 state of emergency

By Dennis Normile | May. 26, 2020 , 12:45 PM

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

Japón

Not surprisingly, they found that most clusters originated in gyms, pubs, live music venues, karaoke rooms, and similar establishments where people gather, eat and drink, chat, sing, and work out or dance, rubbing shoulders for relatively extended periods of time. They also concluded that most of the primary cases that touched off large clusters were either asymptomatic or had very mild symptoms. “It is impossible to stop the emergence of clusters just by testing many people,” Oshitani says. This led them to urge people to avoid what they dubbed the “three Cs”—closed spaces, crowds, and close-contact settings in which people are talking face-to-face. It sounds simple. But, “This has been the most important component of the strategy,” Oshitani says.

(Reassuringly, they did not trace any clusters to Japan’s notoriously packed commuter trains. Oshitani says riders are usually alone and not talking to other passengers. And lately, they are all wearing masks. “An infected individual can infect others in such an environment, but it must be rare,” he says. He says Japan would have seen large outbreaks traced to trains if airborne transmission of the virus was possible.)

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

- **Estudio trazabilidad de contactos.**
- **No clusters de contagio asociados al transporte público.**
- **Mismo resultado ha sido reportado en Francia y Austria.**
- **Medidas adoptadas para minimizar riesgos.**



Important notice for preventing COVID-19 outbreaks.

Avoid the “Three Cs”!

- 1. Closed spaces** with poor ventilation.
- 2. Crowded places** with many people nearby.
- 3. Close-contact settings** such as close-range conversations.



One of the key measures against COVID-19 is to prevent occurrence of clusters.

Keep these “Three Cs” from overlapping in daily life.



In addition to the “Three Cs,” **items used by multiple people** should be cleaned with disinfectant.



Important notice for preventing COVID-19 outbreaks.

Avoid the “Three Cs”!

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One of the key measures against COVID-19 is to prevent occurrence of clusters.

Keep these “Three Cs” from overlapping in daily life.



The risk of occurrence of clusters is particularly high when the “Three Cs” overlap!

In addition to the “Three Cs,” items used by multiple people should be cleaned with disinfectant.




Transporte público

Transporte público y COVID-19

- Premisa: riesgo de contagio depende de la prevalencia del virus en la población.
- De todas las medidas para reducir contagio, **la que causa más problemas al transporte público es el distanciamiento físico.**
- Uso universal de mascarillas: **funciona.**
 - Hoy ya hay evidencia científica.
- Sanitización frecuente (¿qué tan frecuente?)
- Viajes largos vs cortos.

Brief Communication | Published: 03 April 2020

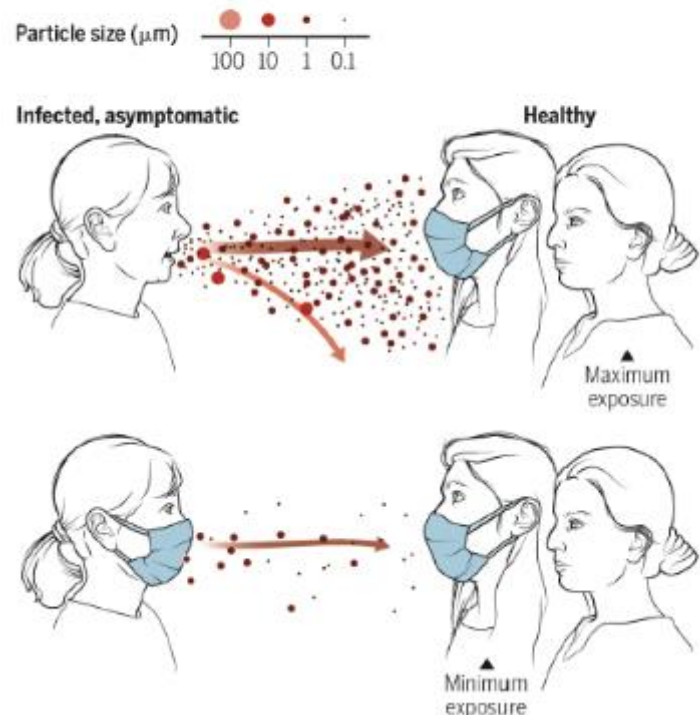
Respiratory virus shedding in exhaled breath and efficacy of face masks

Nancy H. L. Leung, Daniel K. W. Chu, Eunice Y. C. Shiu, Kwok-Hung Chan, James J. McDevitt, Benien J. P. Hau, Hui-Ling Yen, Yuguo Li, Dennis K. M. Ip, J. S. Malik Peiris, Wing-Hong Seto, Gabriel M. Leung, Donald K. Milton & Benjamin J. Cowling 

respiratory droplets, but not in aerosols¹². Both the previous and current study used a bioaerosol collecting device, the Gesundheit-II (G-II)^{12,15,19}, to capture exhaled breath particles and differentiated them into two size fractions, where exhaled breath coarse particles $>5\mu\text{m}$ (respiratory droplets) were collected by impaction with a $5\text{-}\mu\text{m}$ slit inertial Teflon impactor and the remaining fine particles $\leq 5\mu\text{m}$ (aerosols) were collected by condensation in buffer. We also demonstrated the efficacy of surgical masks to reduce coronavirus detection and viral copies in large respiratory droplets and in aerosols (Table 1b). This has important implications for control of COVID-19, suggesting that surgical face masks could be used by ill people to reduce onward transmission.

Masks reduce airborne transmission


Infectious aerosol particles can be released during breathing and speaking by asymptomatic infected individuals. No masking maximizes exposure, whereas universal masking results in the least exposure.



Transporte público: caso en Chongqing, China

LETTER TO THE EDITOR |  Open Access |  

COVID-19: Face masks and human-to-human transmission

Xiaopeng Liu, Sisen Zhang 

First published: 29 March 2020 | <https://doi.org/10.1111/irv.12740> | Citations: 8

The peer review history for this article is available at <https://publons.com/publon/10.1111/irv.12740>

- Infectado COVID-19 se sube a un bus sin mascarilla por 2 horas 10 minutos: **contagió a 5 personas (de 39)**.
- Luego compra mascarilla, la usa y se sube a minibus por 50 min para terminar su viaje: **había 14 personas y no contagió a nadie**.

<https://doi.org/10.1111/irv.12740>

Why you can board a crowded MRT train but cannot meet your friends: Lawrence Wong explains

If you were wondering.

Mandy How | Sumita Thiagarajan | ⌚ June 08, 2020, 06:56 PM



Acknowledging that it will be difficult to maintain physical distance on a train or bus, Wong said that the government has therefore taken other precautions.

This includes wearing a masks and requiring commuters not to talk.

Cleaning has also been stepped up.

Furthermore, Wong said, public transport journeys are not long — they are qualified as "transient risks" that the above measures will minimise even further.

"But social interactions are of a different magnitude of risk all together," the minister elaborated.

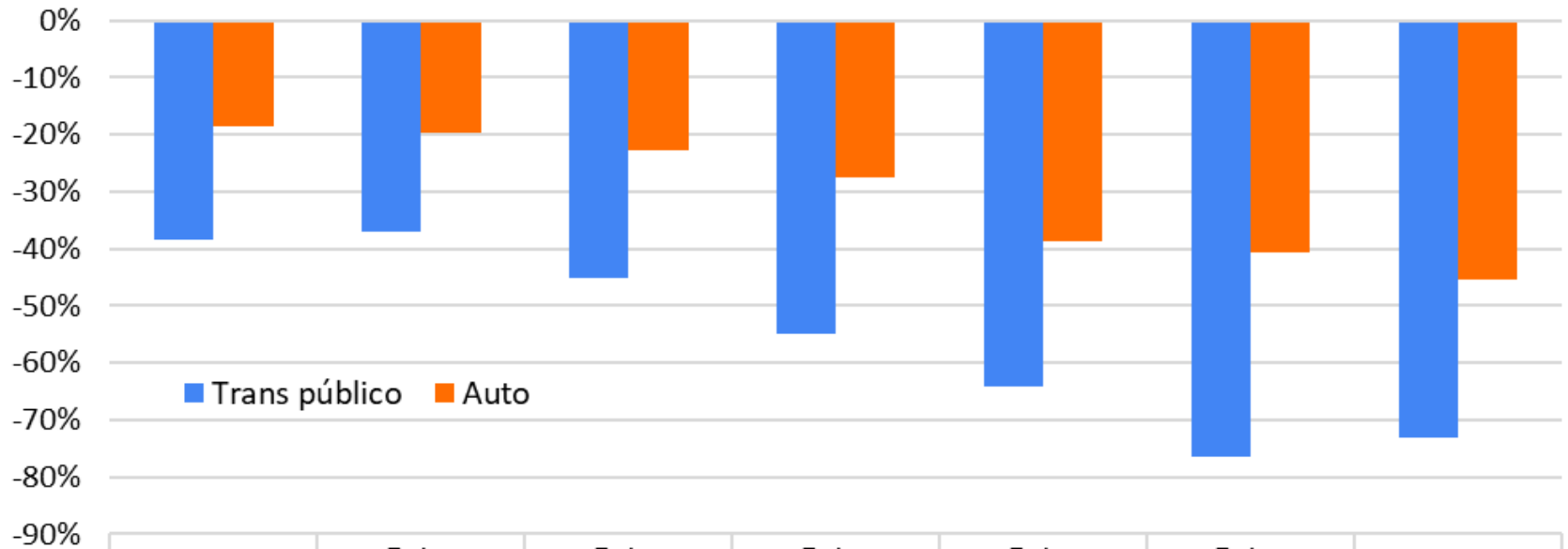
Transporte público y COVID-19

- Enfoque Singapur (primera etapa descofinamiento Junio 2020):
 - Mantener distanciamiento físico en transporte público es a veces imposible.
 - Todos con mascarilla y prohibición de hablar entre pasajeros ni por teléfono.
 - ¿Funcionará en el contexto latinoamericano?

**¿Por qué es importante hacerlo bien
con el transporte público?**

¿Quién reduce más viajes?

Coronavirus: disminución porcentual viajes Semana 16-22 Marzo 2020



	Menos de \$300.000	Entre \$300.001 y \$600.000	Entre \$600.001 y \$1.000.000	Entre \$1.000.001 y \$1.500.000	Entre \$1.500.001 y \$2.000.000	Entre \$2.000.001 y \$3.000.000	Más de \$3.000.000
Trans público	-39%	-37%	-45%	-55%	-64%	-76%	-73%
Auto	-19%	-20%	-23%	-27%	-39%	-41%	-45%

El problema del transporte público en COVID-19 es hoy más que nunca un problema de equidad social

Muchas gracias por vuestra atención

Alejandro.tirachini@ing.uchile.cl