

# **Supporting Information**

## Supplementary methods, table and figures

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

Appendix to: Adams L, Adams RJ, Bastiampillai T. Australia can use population level mobility data to fight COVID-19. *Med J Aust* 2020; doi: 10.5694/mja2.50773.

## **Supplementary methods**

#### **Data sources**

The Apple Mobility Data reports the relative volume of directions requests per region, sub-region, or city compared to a baseline volume on 13 January 2020, divided by movement type, driving, transit, walking. The definition of day is midnight-to-midnight, US Pacific time. Cities are defined as the greater metropolitan area and their geographic boundaries remain constant across the data set. Eight of the cities (Santiago de Chile, Johannesburg, Casablanca, Mumbai, Riyadh, Tel Aviv, Buenos Aires, and Hong Kong) had driving and walking data available only. Data is anonymous and not traceable to an individual user.

We extracted data from the 13 January to 10 May 2020. We did not extract data beyond 10 May 2020 as data for 11 and 12 May 2020 was unavailable.

## **Region selection**

The world was divided into nine regions: Nordic, Western Europe, Mediterranean, North America, South America, Oceania, Asia, Africa, and Middle East.

It was then analysed what cities had Apple mobility data available. Notably, Africa, South America and the Middle East had limited options. Once this was done a number of cities were excluded to lack of public health data. Then the top global cities<sup>8</sup> from each region were selected. Additionally, cities diverse in culture, population-size, climate, governmental structure, and economy were selected.

These cities were:

Nordic cities: Stockholm, Helsinki

Western European cities: London, Paris

Southern European cities: Rome, Barcelona

North American cities: New York City, New Orleans, Atlanta, Toronto

South American cities: Rio de Janeiro, Buenos Aires, Santiago

Oceania cities: Auckland, Sydney

Asian cities: Hong Kong, Singapore, Mumbai

African cities: Johannesburg, Casablanca

Middle Eastern cities: Riyadh, Tel Aviv

#### Public health data

Information regarding governmental interventions was extracted from the governmental websites of each region, these were one or a combination of the public health department website, general government department website, or governor's website. The date listed in the images is the date the intervention came into place, not when announcement date.

A stay-at-home order was defined as widespread regional restriction of movement, or strong governmental advice to stay-home. Days before stay-at-home advisory was defined as number of consistent days prior to order being put into place where all movement measures were below baseline.

If no stay-at-home order was in place, then it was the first of five days where all movement measures were below baseline, this was used to record when movement dropped below baseline. These cities were not included in the movement decrease prior to stay-at-home advisory analysis.

All data used in this report is publicly available.

## Statistical analysis

The data for the fourteen cities was extracted from the global Apple mobility file. On extraction, it was listed as whole number of 100, subtracted 100 from every data point to present as a percentage.

Continuous variables are presented as a mean (standard deviation), median (interquartile range) as appropriate.

Statistical analysis was completed using Microsoft Excel for Mac (Version 16.37).

## **Data visualisation**

The data from each city was tabulated individually and *Tableu Desktop – Professional Edition* (*Version 2020.2.0*) was used to generate and annotate graphs.

Data was only graphed from 1 February 2020 to better represent data.

# **Supplementary Tables**

Table 1: Date of movement below baseline

City	Date movement was below baseline	Number of days prior to stay-at-home order
Atlanta	15/3/20	8
Auckland	14/3/20	11
Barcelona	14/3/20	1
Buenos Aires	14/3/20	6
Casablanca	15/3/20	5
Helsinki	9/3/20	7
Hong Kong	23/1/20	N/A*
Johannesburg	15/3/20	11
London	15/3/20	8
Mumbai	8/3/20	15
NOLA	12/3/20	10
New York City	14/3/20	8
Paris	8/3/20	9
Rio de Janeiro	14/3/20	N/A*
Riyadh	13/3/20	24
Rome	1/3/20	7
Santiago	15/3/20	11
Singapore	24/1/20	74
Stockholm	11/3/20	N/A*
Sydney	14/3/20	8
Tel Aviv	11/3/20	14
Toronto	7/3/20	11
Mean	12/3/20	13.1 (15.5)
Median	13/3/20	9.0 (7.5-12.0)

dates.

<sup>\*</sup>No stay-at-home advisory issued in that region

Table 2: Mean reduction in movement below baseline prior to stay-at-home order by movement type

City	driving	transit	walking
Atlanta	-28.3	-45.9	-32.1
Auckland	-29.0	-45.3	-35.3
Barcelona*	-64.2	-40.4	-63.3
Buenos Aires*	-34.2		-52.1
Casablanca*	-50.5		-54.1
Helsinki	-17.6	-19.8	-22.0
Johannesburg	-30.8		-31.9
London	-37.6	-57.6	-54.3
Mumbai*	-33.3		-37.6
New Orleans	-50.2	-46.7	-77.2
NYC	-37.1	-67.4	-55.1
Paris	-38.2	-24.3	-45.3
Riyadh*	-48.0		-40.4
Rome	-17.8	-30.9	-26.2
Santiago*	-57.1		-69.32
Singapore	-22.1	-34.6	-31.9
Sydney	-19.9	-39.4	-35.6
Tel Aviv*	-53.4		-55.2
Toronto	-37.10	-55.71	-39.2
		-42.33	
Mean	-37.2 (13.6)	(13.9)	-45.2 (15.1)
	25 4 ( 42 4	10.0	-40.4 (21.0
	-37.1 (-49.1	`	(-55.0
Median	28.7)	49.033.6)	33.7)
Data are n (%), median (IQR), or mean (SD).			

<sup>\*</sup>Transit data not available for these cities

Table 3: Mean reductions in movement by month and movement type

	Mean		
	movemen		
	t	Mean	Mean
	reduction in	movement reduction	movement reduction
	February 111	in March	in April
City	(%)	(%)	(%)
Atlanta			
Driving	13.6 (17.4)	-12.6 (28.7)	-37.8 (10.8)
Transit	-5.3 (10.7)	-31.6 (23.3)	-57.7 (3.9)
Walking	15.2 (32.4)	-15.4 (31.8)	-39.3 (9.7)
Auckland			
Driving	8.6 (16.7)	-27.0 (37.3)	-80.3 (11.2)
Transit	15.9 (9.5)	-34.4 (39.6)	-88.8 (3.7)
Walking	16.4 (13.6)	-25.0 (33.8)	-71.9 (7.1)
Barcelona			
Driving	18.2 (12.8)	-44.9 (50.7)	-85.0 (4.2)
Transit	63.8 (58.3)	4.9 (113.7)	-88.1 (2.2)
Walking	27.7 (22.2)	-43.2 (62.0)	-92.9 (2.5)
Buenos Aires			
Driving	17.2 (20.8)	-28.7 (55.4)	-80.0 (6.23)
Walking	10.4 (20.6)	-35.4 (56.7)	-89.1 (2.6)
Casablanca			
Driving	15.0 (10.2)	-37.2 (42.8)	-79.9 (3.2)
Walking	20.2 (13.4)	-37.1 (44.5)	-79.3 (2.8)
Helsinki			
Driving	2.3 (6.8)	-23.4 (18.8)	-26.8 (9.1)
Transit	8.2 (7.6)	-34.0 (30.8)	-61.3 (4.6)
Walking	5.1 (14.0)	-27.0 (21.0)	-31.0 (11.3)
Hong Kong			
Driving	-31.4 (5.9)	-37.0 (8.2)	-45.5 (4.7)
Walking	-49.5 (5.4)	-47.7 (7.8)	-53.2 (5.2)
Johannesburg			
Driving	11.9 (13.6)	-21.2 (37.0)	-81.2 (4.2)
Walking	5.4 (12.1)	-26.6 (31.0)	-75.9 (5.0)
London			
Driving	14.6 (7.0)	-26.7 (33.2)	-67.2 (4.0)
Transit	17.8 (10.4)	-38.0 (40.4)	-86.3 (1.0)
Walking	28.0 (22.5)	-30.3 (43.4)	-74.3 (3.2)

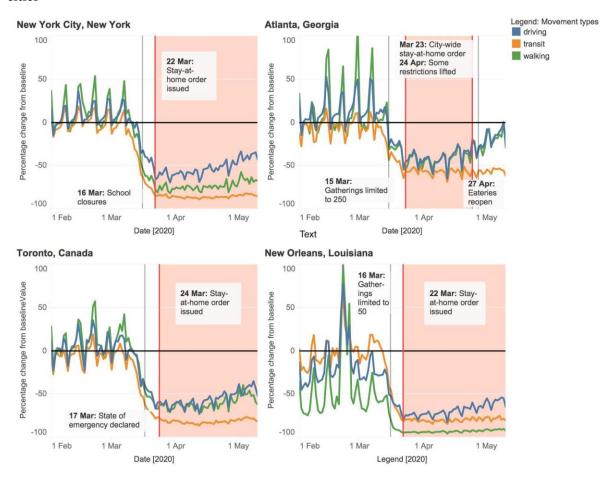
Mumbai			
Driving	11.1 (10.0)	-39.8 (36.5)	-87.5 (1.2)
Walking	5.1 (9.4)	-43.0 (33.4)	-85.3 (1.2)
New Orleans			, ,
	-12.2	40.0 (0.4.0)	(0.4 (5.4)
Driving	(29.4)	-49.0 (24.2)	-69.4 (5.2)
Transit	1.2 (20.0) -36.9	-39.7 (38.7)	-80.3 (2.1)
Walking	(43.9)	-74.9 (20.3)	-93.2 (1.0)
New York City			
Driving	8.5 (12.1)	-26.8 (31.0)	-54.9 (6.1)
Transit	1.3 (10.4)	-48.7 (36.1)	-86.4 (1.1)
Walking	14.0 (18.6)	-35.9 (40.4)	-74.6 (3.3)
Paris			
Driving	-15.3 (7.5)	-57.5 (30.0)	-83.0 (3.2)
Transit	11.3 (9.7)	-49.3 (44.4)	-89.6 (1.6)
Walking	-17.5	62 2 (20 5)	00.4 (1.0)
Walking Rio de Janeiro	(13.9)	-63.3 (30.5)	-90.4 (1.0)
	21.0 (25.4)	22.5 (24.4)	62.0 (2.0)
Driving Transit	21.9 (25.4)	-32.5 (34.4)	-62.9 (3.9)
	10.1 (18.7)	-41.3 (42.6)	-84.0 (2.6)
Walking Riyadh	40.8 (66.4)	-36.0 (41.1)	-75.7 (3.0)
Driving	2.4.(12.2)	27.2 (28.1)	61.0 (5.2)
Walking	3.4 (12.2) 1.0 (10.4)	-27.2 (28.1)	-61.0 (5.2) -49.1 (5.1)
Rome	1.0 (10.4)	-23.6 (22.9)	<del>-4</del> 5.1 (5.1)
Driving	146 (12.2)	66 7 (30 7)	841(20)
Transit	14.6 (13.2) 16.9 (14.8)	-66.7 (30.7)	-84.1 (2.9)
Walking	33.4 (26.3)	-76.4 (28.5)	-93.9 (0.9)
Santiago de	33.4 (20.3)	-73.6 (29.4)	-91.8 (1.5)
Chile			
Driving	-10.1 (14.6)	-30.7 (38.9)	-61.8 (10.3)
Walking	-19.2 (20.9)	-38.4 (44.8)	-79.0 (5.7)
Singapore			
Driving	-17.1 (6.1)	-25.5 (8.8)	-57.4 (10.7)
Transit	-28.9 (6.3)	-38.1 (11.1)	-80.9 (10.9)
Walking	-25.0 (9.6)	-39.6 (10.6)	-67.3 (8.5)
Stockholm			
Driving	8.9 (8.4)	-13.9 (15.0)	-12.8 (8.8)

Transit	12.1 (6.9)	-28.3 (25.1)	-46.7 (4.7)	
Walking	16.9 (16.8)	-20.9 (26.1)	-32.1 (8.9)	
Sydney				
Driving	12.6 (11.3)	-15.6 (23.1)	-44.7 (11.0)	
Transit	9.0 (11.9)	-33.0 (33.7)	-78.1 (2.9)	
Walking	10.5 (18.4)	-28.0 (29.1)	-60.2 (4.8)	
Tel Aviv				
Driving	3.8 (10.3)	-38.9 (32.7)	-62.1 (11.8)	
Walking	7.8 (16.7)	-33.8 (44.0)	-66.6 (10.7)	
Toronto				
Driving	5.6 (14.0)	-29.5 (30.8)	-57.8 (6.8)	
Transit	-5.1 (10.3)	-45.2 (33.8)	-82.7 (1.6)	
Walking	10.6 (18.7)	-27.6 (36.6)	-62.4 (5.2)	
Data are n (%), or mean (SD).				

<sup>\*</sup>Transit data not available for these cities

## **Supplementary Figures**

Figure 1: population-level mobility data mapped against government action in North American cities



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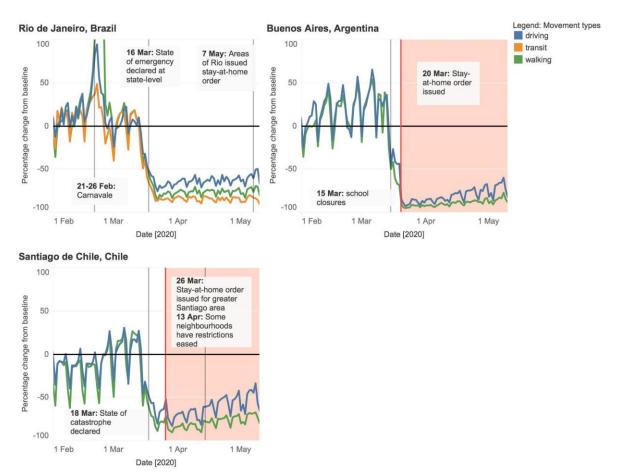
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Figure 2: population-level mobility data mapped against government action in South American cities

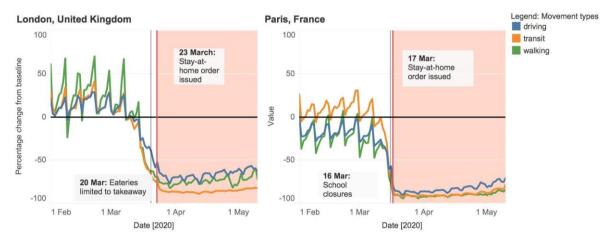


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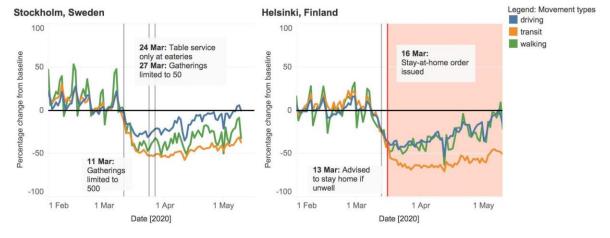
Figure 3: population-level mobility data mapped against government action in Western European cities



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Figure 4: population-level mobility data mapped against government action in Nordic cities

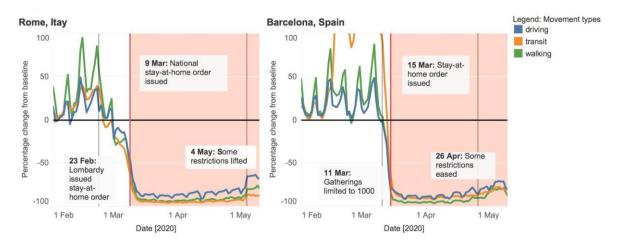


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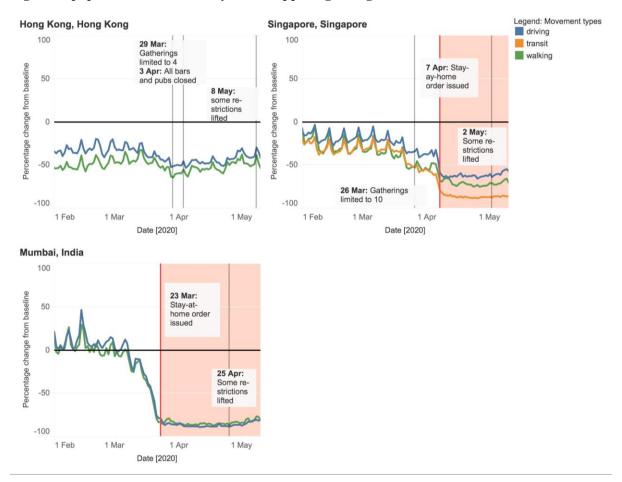
Figure 5: population-level mobility data mapped against government action in Southern European cities



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Figure 6: population-level mobility data mapped against government action in Asian cities



Government of Hong Kong. COVID-19. Hong Kong, Government of Hong Kong: 2020. https://www.coronavirus.gov.hk/eng/index.html (accessed May 2020).

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Legend: Movement types Sydney, Australia Auckland, New Zealand driving 100 100 transit 22 Mar: walking Stay-at-home order Percentage change from baseline rcentage change from baseline 25 Mar: 50 30 Mar: Only 50 Stay-at-home order issued permitted to leave house for essential business in groups 27 Apr: Some restrictions -50 -50 16 Mar: 13 Mar: Gatherings limited to 500 limited to 500 -100 -100 1 Feb 1 Mar 1 Feb 1 Mai 1 Apr 1 Apr 1 May 1 May Legend [2020] Date [2020]

Figure 7: population-level mobility data mapped against government action in Oceanic cities

New South Wales Government. Health. Sydney: Health, 2020. <a href="https://www.health.nsw.gov.au/Pages/default.aspx">https://www.health.nsw.gov.au/Pages/default.aspx</a> (accessed May 2020).

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Legend: Movement types Riyadh, Saudi Arabia Tel Aviv, Israel driving 100 100 walking 6 Apr: Stay-25 Mar: Stay-atat-home order home order Percentage change from baseline issued baseline 50 50 from 25 Apr: Some 26 Apr: Percentage change Some restrictions -50 -50 15 Mar: Many 14 Mar: recreational businesses Gatherings limited to 10 people -100 closed 1 Feb 1 Mar 1 May 1 Feb 1 Mar 1 Apr 1 May Date [2020] Date [2020]

Figure 8: population-level mobility data mapped against government action in Middle Eastern cities

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Legend: Movement types Johannesburg, South Africa Casablanca, Morocco driving 100 100 walking 20 Mar: Stay-at-home order issued Percentage change from baseline 26 Mar: Stay-Percentage change from baseline 50 50 at-home order issued 1 May: Some restrictions lifted -50 -50 18 Mar: Gatheri 16 Mar: Schoo limited to 100 closures -100 -100 1 Mar 1 Feb 1 Mar 1 Feb 1 May 1 Apr 1 May

Date [2020]

Figure 9: population-level mobility data mapped against government action in African cities

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Date [2020]