Evidence from Internet Search Data Shows Information Seeking Responses to News of Local COVID-19 Cases.

Supplementary Materials

A – Does the detection of the first case in Washington or neighboring states trigger a response in other states?

We implemented a number of sensitivity checks to address the confounding concern and other sources of information which can lead to misleading results. The figure shows the time varying effects of announcements of the first COVID-19 case in a state on searches for coronavirus in six settings: (1) all states as our baseline results, (2) excluding Washington, (3) only states that reported the first case in March (excluding WA, IL, CA, AZ, MA, WI, TX, and OR), (4) adjusting for timing of WA's first case (1 for periods following this particular announcement), (5) adjusting for timing of WA, IL, CA, AZ's first cases, and (6) adjusting for timing of the earliest announcement among a state's neighbor states. We retained similar findings to our baseline results after addressing these potential confounding concerns and other sources of information.

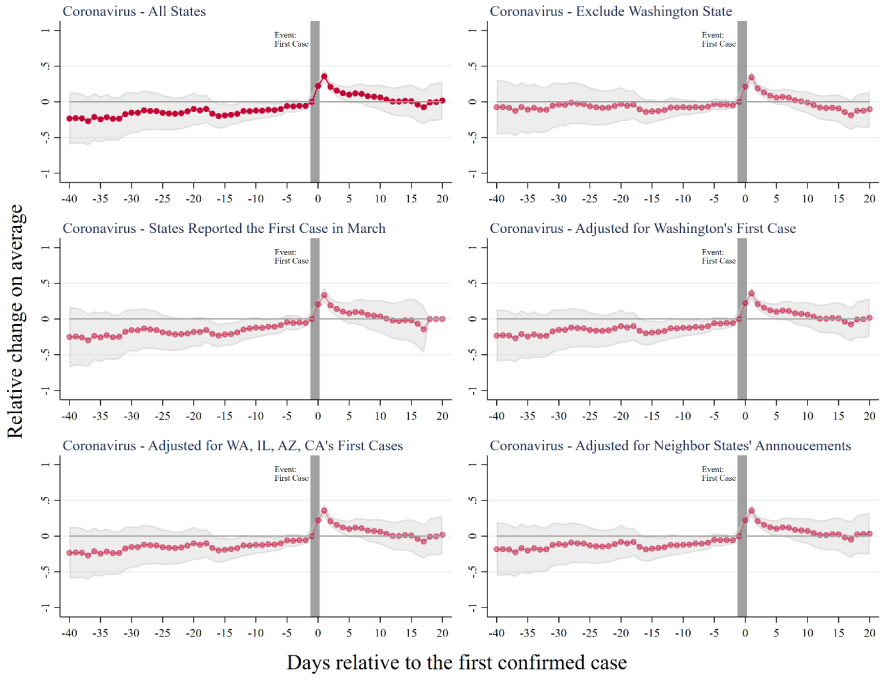

Figure A-1: Time Varying Effects of Announcements of the First COVID-19 Case on Google Searches for Coronavirus

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Notes: The outcome variable measures the daily share of all Google queries in a state that correspond to a particular term (coronavirus) between January 1, 2020 and March 18, 2020. The period prior to the treatment (first confirmed case) is set as a reference - grey vertical bar. In red are the estimated coefficients (95% CI grey band) in the Poisson model (differences in log-expected counts of search relative to the period prior to the event). The average search frequency of this term is 97,023.9 per state per day.

Table A-1: : Effects of the own state's announcement after controlling for confounding factors

	(1) Baseline model	(2) Adjusted for WA's first case	(3) Adjusted for WA, IL, CA, AZ's first case	(4) Adjusted for neighboring states' first case
Panel 1: Event study analysis				
1 day prior to the event	34803.3***	34803.3***	34803.3***	34660.6***
	P<0.001	P<0.001	P<0.001	4.44e-16
Post x WA's first case		812539.2***	536321.8***	
		P<0.001	P<0.001	
Post x IL's first case			81908.3***	
			P<0.001	
Post x CA and AZ's first case			194309.1***	
			P<0.001	
Post x earliest first case among neighboring states				12785.2**
				0.00592
Panel 2: Difference-in-difference estimates				
Post x own state's first case	26262.8***	26262.8***	26262.8***	26216.2***
	P<0.001	P<0.001	P<0.001	2.65e-08
Post x WA's first case		817412.4***	538470.1***	
		P<0.001	P<0.001	
Post x IL's first case			82675.6***	
			P<0.001	
Post x CA and AZ's first case			196266.7***	
			P<0.001	
Post x earliest first case among neighboring states				15389.5***
				0.000928
Dep. Variable Mean	97023.92	97023.92	97023.92	97023.92
Dep. Variable SD	1.6e+05	1.6e+05	1.6e+05	1.6e+05
Obs.	3978	3978	3978	3978

Notes: The outcome variable measures the daily share of all Google queries in a state that correspond to a particular term (coronavirus) between January 1, 2020 and March 18, 2020. Each row reports estimated differences in the outcome measure relative to the period prior to the event.

B – Treatment Effect Heterogeneity

Each state may experience different treatment effects of the first COVID-19 cases on online searches. First, we reported time varying differences in online search for COVID-19 within Washington as this state was hit first by the announcement in Figure B-1. The presented model is not a typical two-way fixed effects estimation as the model does not have control groups. The limited number of observations also make the estimation less precise: we observed the increases in online searches in the days following the announcement despite the standard errors are large.

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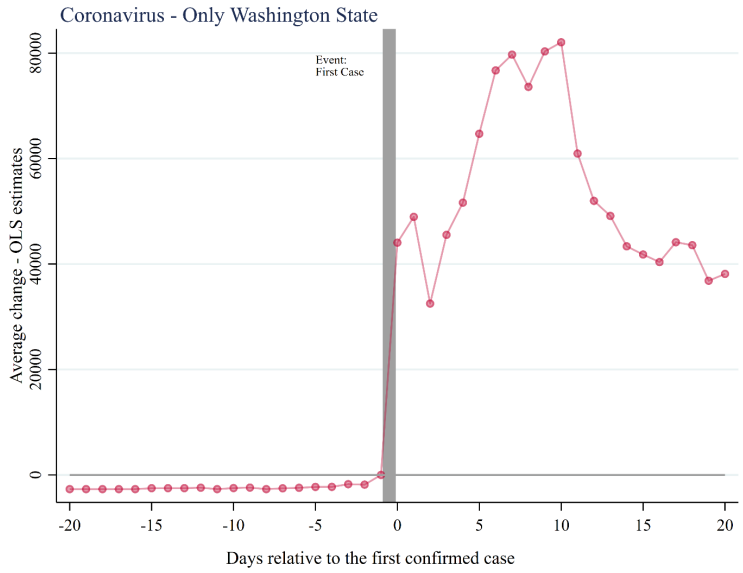

Figure B-1: Time Varying Effects of Announcements of the First COVID-19 Case on Google Searches within Washington State for Coronavirus

Notes: The outcome variable measures the daily share of all Google queries in Washington that correspond to a particular term (coronavirus) between January 1, 2020 and March 18, 2020. The period prior to the treatment (first confirmed case) is set as a reference - grey vertical bar. In red are the estimated coefficients in the linear regression model (ordinary least squares - OLS).

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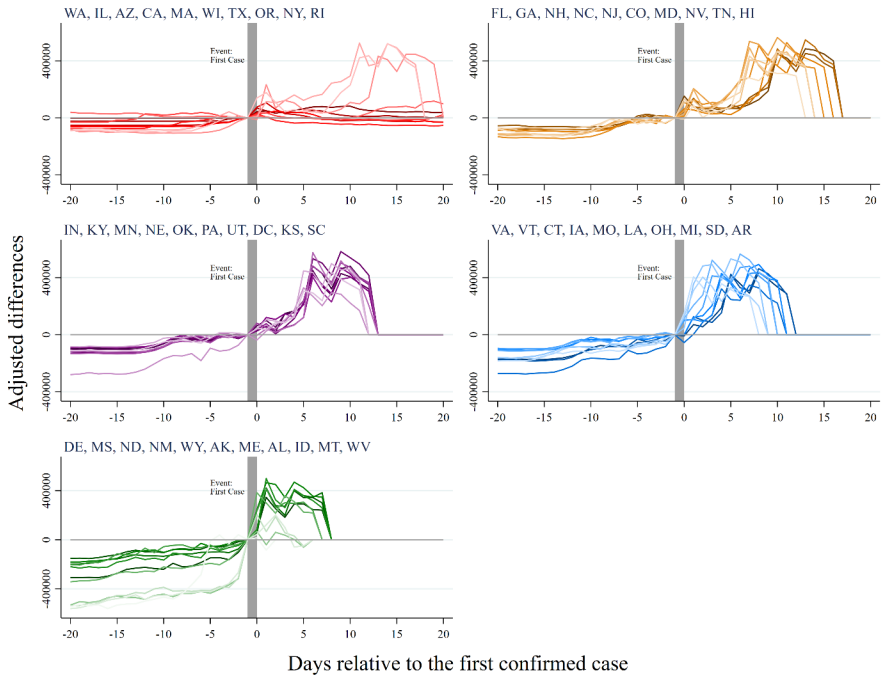

Figure B-2: Time Varying Effects of Announcements of the First COVID-19 Case on Google Searches by State

Notes: The outcome variable measures the daily share of all Google queries in each state that correspond to a particular term (coronavirus) between January 1, 2020 and March 18, 2020. The period prior to the treatment (first confirmed case) is set as a reference - grey vertical bar. In red are the estimated coefficients in the OLS model for the 10 states experiencing the first COVID-19 case: WA, IL, AZ, CA, MA, WI, TX, OR, NY, and RI (darker colors to lighter colors). In orange are the estimated coefficients in the OLS model for the following 10 states experiencing the first COVID-19 case: FL, GA, NH, NC, NJ, CO, MD, NV, TN, and HI. In purple are the estimated coefficients in the OLS model for the following 10 states experiencing the first COVID-19 case: IN, KY, MN, NE, OK, PA, UT, DC, KS, and SC. In blue are the estimated coefficients in the OLS model for the following 10 states experiencing the first COVID-19 case: VA, VT, CT, IA, MO, LA, OH, MI, SD, and AR. In green are the estimated coefficients

in the OLS model for the last 11 states experiencing the first COVID-19 case: DE, MS, ND, NM, WY, AK, ME, AL, ID, MT, and WV.

C – Data Validation Exercises

Prior work has discussed potential variations in the search output due to temporal changes in the interface and capacities of the Google Trends over time (Nuti et al (2014). It is important to examine the reproducibility by checking whether the findings are robust to the accessed date of the data. We rerun the analysis using the latest search output from Google Trends which retrieved on April 18 and compared to the current results using the data retrieved on March 20. We retained the same findings using the newer retrieved data, despite we observed some variations in the search output.

The average search frequency of coronavirus of the first dataset (retrieved on March 20) is 97,023.9 per state per day and those of the newer data (retrieved on April 18) is 96,928.32 (a 0.1% decline). These measures are strongly correlated (Pearson correlation coefficient is 0.9989). Similarly, the Pearson correlation coefficients are above 0.90 for coronavirus symptom (0.989), hand sanitizer (0.976), quarantine (0.962) while these coefficients are considerably lower for other keywords (coronavirus treatment: 0.522, testing: 0.392, isolation: 0.349, conspiracy: 0.453, hoax: 0.596).

Figure C-1: Time Varying Effects of Announcements of the First COVID-19 Case on Google Searches for Coronavirus with Different Data Accessed Dates

Notes: The outcome variables measure the daily share of all Google queries in a state that correspond to a particular term (coronavirus) between January 1, 2020 and March 18, 2020. The period prior to the treatment (first confirmed case) is set as a reference - grey vertical bar.

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In red are the estimated coefficients (95% CI grey band) in the Poisson model (differences in log-expected counts of search relative to the period prior to the event).