

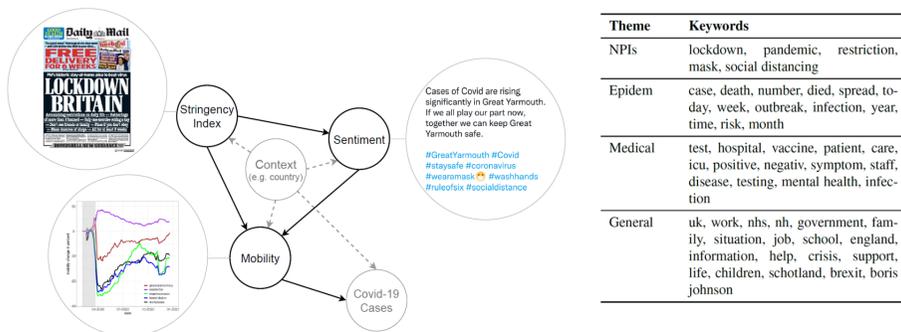


Causal Investigation of Public Opinion during the COVID-19 Pandemic via Social Media Text

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Motivation/Overview

Key research questions: (i) Does public opinion influence the willingness to accept restrictions introduced by a country's government and (ii) how large is the share of this influence compared to the direct effect that can be expected from government restrictions.

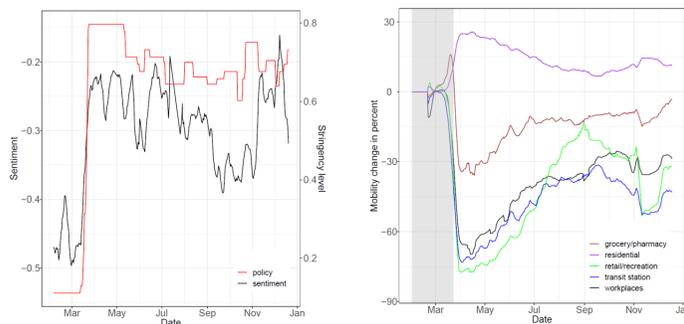


Data Collection

We focus our empirical analysis on the **United Kingdom (UK)** and the four countries of the UK. In addition, the analysis is also performed for **Sweden**, as this country is a major exception regarding less restrictive interventions and Tweets in English are quite common.

Standardize and aggregate NPIs at country level

Estimation of **unbiased effects** requires identification of **key confounders**



- **Treatment:** Policy
- **Mediator:** Public opinion on Twitter
- **Outcome:** Mobility (measure for the containment of the virus spread)
- **Confounders:** Epidemiological and unobserved time varying confounders

Causal Mediation Analysis

Total effect: "What would be the effect on mobility if we increase or decrease the Stringency Index of a country?"

$$TE = \mathbb{E}[f_Y(1, f_M(1, C), C) - f_Y(0, f_M(0, C), C)] \\ = \mathbb{E}[Y | do(T = 1)] - \mathbb{E}[Y | do(T = 0)]$$

Natural direct effect: "Among the actual sentiment of the population, would stronger/weaker government restrictions change mobility?"

$$NDE = \mathbb{E}[f_Y(1, f_M(0, C), C) - f_Y(0, f_M(0, C), C)] \\ = \mathbb{E}[Y_{1, M_0} - Y_{0, M_0}]$$

Natural indirect effect: "How would mobility change if the public sentiment had instead been more positive or more negative while keeping everything else (i.e. the Stringency Index) the same?"

$$NIE = \mathbb{E}[f_Y(0, f_M(1, C), C) - f_Y(0, f_M(0, C), C)] \\ = \mathbb{E}[Y_{0, M_1} - Y_{0, M_0}]$$

Effect estimates are based on an adapted version of the counterfactual mediation framework (Imai et al., 2010)

Empirical Analysis

United Kingdom

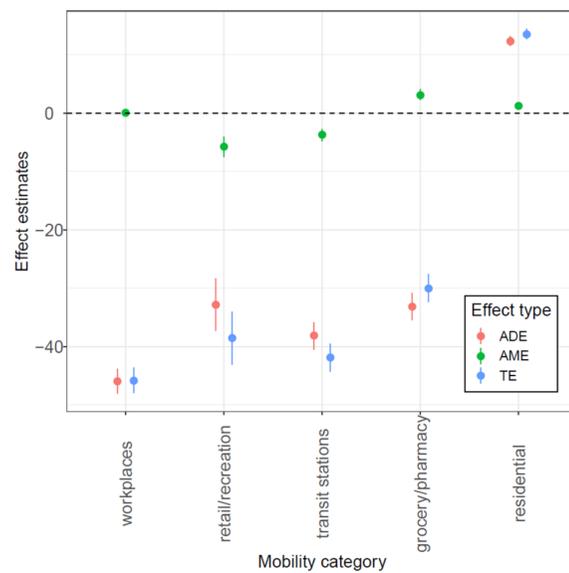
- OLS regression
- Weighted mixed effect analysis
- Ablation study

Sweden

- OLS regression

United Kingdom					
	Workplaces	Retail and Recreation	Transit stations	Grocery and pharmacy	Residential
Direct Effect	-37.0*	-26.5*	-30.7*	-26.7*	10.0*
Mediated Effect	0.2	-4.7*	-3.0*	2.5*	1.0*
Total Effect	-36.8*	-31.2*	-33.7*	-24.2*	11.0*

Sweden					
	Workplaces	Retail and Recreation	Transit stations	Grocery and pharmacy	Residential
Direct Effect	22.7*	-32.0*	-27.9*	-0.2	6.4*
Mediated Effect	8.3	-1.6	-4.8	-3.7	0.3
Total Effect	31.0*	-33.6*	-32.7*	-3.9	6.7*



Conclusion & Future Perspectives

- In the UK, the public opinion on the COVID-19 pandemic seems to have a **significant influence** on the mobility behavior. The results show that as people become more comfortable with the restrictions and the situation of how the pandemic is being managed, they begin to limit their mobility for non-essential places
- Compared to the UK, public opinion has no clearly visible influence on behavior in Sweden. Swedish citizens seem to **adjust their behavior** regardless of their opinion on the regulations and the current COVID-19 situation. (Irwin, 2020)
- Extend the linearity assumption to a more **general modelling** approach to verify the effect estimates.
- Gather and examine a more **heterogeneous data** set of additional countries.
- Examine this mediation study from a **time series perspective** by discovering causal effects of lagged versions of the treatment and confounders

References

Imai, K., Keele, L., and Tingley, D. (2010). A general approach to causal mediation analysis. *Psychological methods*, 15(4):309.

Irwin, R. E. (2020). Misinformation and decontextualization: international media reporting on sweden and covid-19. *Globalization and health*, 16(1):1–12.