Social Media and the Formation of Policy Preferences: Experimental Evidence in the times of COVID-19

Pre-Analysis Plan

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1 Introduction

This project studies the effect of social media on individuals' policy preferences. We study perceived endorsements, a central feature of social media, as evinced by common metrics of engagement: *likes* and *retweets*. Can the perceived engagement of social media messages affect how we evaluate policy choices? To answer this question, we will conduct an online controlled experiment with human subjects in the context of the COVID-19 pandemic policy trade-off.

2 Experimental design

We first collect data on subjects' pre-existing attitudes towards COVID-19 policies. Then, subjects are randomised into three treatments that expose them to social media signals that are i) pro-health, ii) pro-economy, or iii) neutral. Following the treatment, we collect data on their post-treatment attitudes towards separate COVID-19 policies.

2.1 Pre-treatment policy preferences

Subjects answer the following questions on a 1-7 Likert scale:

1. What do you think of the federal government's response measures in reaction to the COVID-19 pandemic? (extremely insufficient - extreme overreaction)

2. What do you think of your state government's response measures in reaction to the COVID-19 pandemic? (extremely insufficient - extreme overreaction)

3. Sweden's government has so far avoided implementing a lockdown in order to keep the economy going. What do you think of this policy? (strongly disagree - strongly agree)

4. The government's highest priority should be saving as many lives as possible even if it means the economy will recover more slowly. What do you think of this statement? (strongly disagree - strongly agree, reverse-coded)

5. It is becoming more important for the government to save jobs and restart the economy than to take every precaution to keep people safe. What do you think of this statement? (strongly disagree - strongly agree)

6. How confident are you in your answers to the questions above? (not confident at all - extremely confident)

We will use the first principal component of Questions 1-5 as a measure of pre-treatment policy attitude in subsequent regressions. We define larger magnitudes as being more pro-economy.

2.2 Treatments

We isolate the effects of perceived engagement on policy choices in an environment different from individuals' own social media, thereby relieving concerns over social image and feedback from friends. Instead, we expose individuals to strangers' tweets and strangers' policy endorsements, and examine the effects on individuals' policy preferences in an anonymous survey. Specifically, we expose subjects to policy messages with varying degrees of engagement (Figure 1) and examine whether this affects policy attitudes.

We create a set of tweets with the following input.

- **Text:** We ran a search of Covid-19 related tweets on Twitter and selected six tweets, three of which are pro-health and the rest are pro-economy.

Figure 1: Example of experimental variation

Notes: Individuals are exposed to the same message with different levels of engagement. Left tweet appears more popular than right tweet.

- **Metrics:** "Low" popularity tweets have between 0-10 likes and 0-1 retweets. "High" popularity tweets have between 50-100 likes and 10-20 retweets. These ranges are picked in order to make the popularity of tweets by strangers realistic. While a tweet with over one thousand likes may be more effective in changing policy views, such high popularity is typically associated with celebrity or high profile users which may introduce a confounding effect. The exact numbers are chosen from one author's own Twitter newsfeed.

- **User:** The profile pictures are generated by an algorithm using the website https://thispersondoesnotexist.com/. No username is shown.

- **Time:** we randomly pick several times and dates in July, 2020.

We use the tweet generator at https://www.tweetgen.com/ for our treatment manipulation.

In the pro-economy treatment, the three pro-economy tweets are given "high" popularity while the three pro-health tweets are given "low" popularity. In the pro-health treatment, the three pro-health tweets are given "high" popularity while the three pro-economy tweets are given "low" popularity. In the control group, all six tweets are given "low" popularity.

A second treatment dimension exposes half the subjects in each of the three above treatments to an *attention prime* prior to the social media signals. Subjects are shown a

neutral tweet followed by three questions about the content, number of likes, and timing of this tweet. This second treatment dimension is designed to prime subjects to pay attention to the subsequent signals.

2.3 Post-treatment policy preferences

After the six tweets, we elicit subjects' policy preferences again using a different set of questions. Subjects state their agreement on a 7-point Likert scale to the following:

- Closing the borders
- Prohibiting gatherings
- Prohibiting non-essential travels
- Closing daycares, schools, colleges and universities
- Closing non-essential businesses (bars, stores that are not food or health related, etc.)
- Handing out USD 1,000 fines to those who do not comply with social-distancing rules
- General lockdown of the population with a ban on leaving the home (except for medical reasons)
- Mandatory use of face-coverings in public places

We will use the first principal component of the above as a measure of post-treatment policy attitude in subsequent regressions. We again ask subjects to state their confidence in their answers to the above questions. We define larger magnitudes as being more pro-economy.

The full survey is included in the Appendix.

3 Setting, sample size and power

We recruit subjects using the data collection company Dynata. The sample is representative of the general US population in terms of age, gender and region. We expect around 1500 subjects and randomise them into one of the 6 treatments:

$$\{\text{control, pro-economy, pro-health}\} \times \{\text{attention prime, no attention prime}\}$$

We ensure balance across pre-treatment attitudes using Q3 in that block (which our pilot, briefly discussed below, revealed had a strong correlation with the measured policy attitudes of interest).

With 1500 subjects, we would have 0.8 power to detect an effect size of 0.15 of a standard deviation between the treatment and the control group at a 0.05 significance level.

We conducted a pilot using a smaller sample (N=600) in Ireland and Italy, this pilot was pre-registered on AsPredicted and the pre-registration will be made available upon request by referees. We analysed the pilot data prior to submitting this pre-analysis plan.

4 Hypotheses

Main hypothesis:

Hypothesis 1 *As users conform to others' preferences, social media affects policy attitudes by informing individuals about others' views. Individuals tend to conform to views which appear more popular, as revealed by social media support metrics (likes and retweets).*

Secondary hypothesis:

Hypothesis 2 *Individuals are primed by what they are first exposed to, so they conform to the first views they observe.*

Complementary hypothesis:

Hypothesis 3 *Both priming and popularity affect individuals' policy views, and there are positive complementaries: individuals first exposed to popular signals conform most to these views.*

5 Analysis

We define treatment effect in two ways. The first method looks at the effects of the pro-health and pro-econ treatments separately. We regress the outcome variable $postAttitudes_i$, the first principal component of the post-treatment attitude questions, on a treatment indicator that takes value 1 if subject i receives the treatment.

$$PostAttitudes_i = \alpha + \beta_1 ProEconTreatment_i + \beta_2 ProHealthTreatment_i + \delta PreAttitudes_i + \varepsilon_i$$

where ε_i is an individual-specific error term and $PreAttitudes_i$ is the variable measuring attitudes before the treatment. In some specification(s) we can include a vector of controls

$\mathbf{X_i}$ including age, gender, education, income and political leaning, which may increase the precision of our estimates (but should be orthogonal to our treatment since it is randomized). In all specifications we use robust standard errors.

Our hypotheses indicate that $\beta_1 > 0$ and $\beta_2 < 0$. Treatment effect is then defined as $\beta = (\beta_2 - \beta_1)/2$. We also test the null hypothesis that $\beta_1 = \beta_2$.

The second method pools both treatments and compares them with the control group to measure the overall effect of higher popularity, regardless of tweet content. We first define the outcome variable: d_i is the distance moved as the absolute difference between the first principal components of the post-treatment and pre-treatment attitude questions. This is done in all three treatments. If the subject moves *away* from the treatment (which by definition cannot happen in the control group), the distance is multiplied by -1. We then estimate the following equation:

$$d_i = \alpha + \beta Treatment_i + \mathbf{A^T X_i} + \varepsilon_i$$

where the treatment indicator takes value 1 if the subject receives *either* the Pro-Health or Pro-Economy treatment and 0 if the subject is in the control group. ε_i is an individual-specific error term and in some specification(s) we include the vector of controls $\mathbf{X_i}$. In all specifications we use robust standard errors. Treatment effect is then captured by the coefficient β, since the distance moved is hypothesized to be greater in the pooled treatments than in the control group.

5.1 Heterogeneous treatment effects

In addition, we test for heterogeneous effects along various dimensions by interacting the treatment dummy as described above with different variables. For instance, and importantly, for active social media users as:

$$\begin{aligned} PostAttitudes_i = \alpha &+ \beta_1 ProEconTreatment_i + \beta_2 ProHealthTreatment_i \\ &+ \theta_1 ProEconTreatment_i \times ActiveSMuser_i \\ &+ \theta_2 ProHealthTreatment_i \times ActiveSMuser_i \\ &+ \delta_1 PreAttitudes_i + \delta_2 ActiveSMuser_i + \varepsilon_i \end{aligned}$$

where $ActiveSMuser_i$ is an indicator equal to 1 if the individual spends more than one hour daily on Facebook or Twitter (combined).

Margins of heterogeneity we will explore, both in the full sample and splitting the

sample by: i) active social media users, and ii) by participants in the attention prime group, include:

- Active social media users (both in a dummy equal to 1 if individual spends more than one hour daily on Facebook or Twitter, and using an activity slider question)
- Being primed with the attention tweet
- Pre-treatment attitudes (Bail et al., 2018)
- Confidence in pre-treatment policy preferences (Bail et al., 2018)
- Frequency of discussing policy on and off social media
- Measure of attention to tweets (1 if more popular policy perceived from tweets coincides with treatment, 0 otherwise)
- First or last signal shown
- Political background: left-right scale or party voted in last election, whether pro-economy or pro-health is the more popular view within network of family and friends
- Demographic variables: age (Bond et al., 2017), gender, region, education, income
- Social preferences: risk attitude, altruism (one question each from Falk et al., 2018) and trust (from European Social Survey)
- Stubbornness, measured by i) resistance to change (Oreg, 2003) or ii) how easily influenced respondent is by policy views on and off social media
- Experience of pandemic: if employed as essential worker, effect on employment, concern about health, compliance with social-distancing and public health guidelines
- Media use: time spent per day on consuming news and social media, source of news, trust in media and government

5.2 Control variables

Our baseline specification includes:

- Pre-treatment attitude: first principal component of the pre-treatment attitude questions

In some specification(s) we include the following control variables:

- Gender: coded as a dummy
- Age: coded continuously
- State, grouped in regional dummies (three of the following: Northeast, Midwest, South, and West)
- Household income will be coded as the log of the midpoint of the interval specified by the respondent
- Education will be coded as a dummy for whether the respondent has at least a 2-year college degree
- Party affiliation will be coded as a dummy for being Republican

5.3 Mediation analysis

Our hypothesis is that higher popularity on a particular policy view will move subjects closer towards that view, this is mediated by a learning mechanism. Subjects are hypothesised to pay attention to the tweets by reading their contents and noticing the numbers of "likes" and "retweets", learn that a particular view is more popular, and update their attitude to conform to the more popular view.

We therefore conduct the following 2SLS analysis for each of the pro-health and pro-economy treatments. In the first stage, being exposed to pro-health tweets should result a higher likelihood of subjects answering "pro-health" to the question "Which of these two views had more likes in the 6 tweets shown earlier?", which is asked after the questions on post-treatment policy preferences. This is captured by a dummy $proHealthTweetsAwareness_i$ which equals 1 if the subject answers correctly ("pro-health") and 0 otherwise.

$$proHealthTweetsAwareness_i = \alpha + \beta_1 ProHealthTreatment_i + \delta PreAttitudes_i + \varepsilon_i$$

To explore heterogeneity, we will also split the sample by social media use and the attention prime treatment. We also test whether replacing *ProHealthTreatment* with $firstsignalhealth$ (*lastsignalhealth*), a dummy variable which equals 1 if the first (last) signal shown is pro-health, to study whether subjects pay more attention to the first (last) signal they are exposed to. In all cases we hypothesise that $\beta_1 > 0$ for a strong first stage.

In the second stage, we study whether subjects who learned from the popular social media view are more likely to shift their attitude towards that view. We therefore estimate the following regression:

$$PostAttitudes_i = \alpha + \beta_1 ProHealthT\hat{w}eetAwareness_i + \delta PreAttitudes_i + \varepsilon_i$$

where $ProHealthT\hat{w}eetAwareness_i$ is the predicted value from the first stage equation.

Even if the first stage is not strong, indicating that subjects do not consciously learn from the tweets they are shown, another channel through which the treatment works is subconscious learning. We therefore run the following reduced-form regression:

$$PostAttitudes_i = \alpha + \beta_1 ProHealthTreatment_i + \delta PreAttitudes_i + \varepsilon_i$$

If learning happens subconsciously, we hypothesise that $\beta_1 > 0$.

We then repeat the analysis with the pro-health treatment.

References

Bail, Christopher A, Lisa P Argyle, Taylor W Brown, John P Bumpus, Haohan Chen, MB Fallin Hunzaker, Jaemin Lee, Marcus Mann, Friedolin Merhout, and Alexander Volfovsky. 2018. "Exposure to opposing views on social media can increase political polarization." *Proceedings of the National Academy of Sciences*, 115(37): 9216–9221.

Bond, Robert M, Jaime E Settle, Christopher J Fariss, Jason J Jones, and James H Fowler. 2017. "Social endorsement cues and political participation." *Political Communication*, 34(2): 261–281.

Falk, Armin, Anke Becker, Thomas Dohmen, Benjamin Enke, David Huffman, and Uwe Sunde. 2018. "Global evidence on economic preferences." *The Quarterly Journal of Economics*, 133(4): 1645–1692.

Oreg, Shaul. 2003. "Resistance to change: Developing an individual differences measure." *Journal of Applied Psychology*, 88(4): 680.

Social Media and Pandemic Response in the US

Note: Unless otherwise stated, all response options are radio buttons. Headings are for researchers' use and will not be shown to participants.

This study is conducted by researchers at University College Dublin and has been approved by the university's ethics committee. You must be a US citizen between 18 to 75 years of age to participate in this study. If you do not fulfill these requirements, please do not continue any further. You are not allowed to participate in this study more than once. If you experience a technical error or problem, do not try to restart or retake the study. Rather, send us an email with a description of your problem and we will get back to you. If you have any questions regarding this study, please email margaret.samahita@ucd.ie.

This questionnaire will take about 10 minutes to complete. Your answers are anonymous; we will publish only aggregate results based on the survey and it will not be possible to trace the identity of any individual participant.

I have read and understood the above and want to participate in this study.

- Yes
- No

What is your age (in years)? _____

What is your gender?

- Male
- Female
- Prefer not to say
- Other: _____

In which state do you currently reside? (select from a list of US states)

It is vital to our study that we only include responses from people who devoted their full attention to this study. Will you pay full attention?

- Yes, I will read each question carefully and answer as best I can. (checkbox)

Part A. Pre-treatment COVID-19 attitude

Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?

- 0-10 Likert scale, You can't be too careful (0) to Most people can be trusted (10)

Please tell us, in general, how willing or unwilling you are to take risks.

- 0-10 Likert scale, Completely unwilling to take risks (0) to Very willing to take risks (10)

How willing are you to give to good causes without expecting anything in return?

- 0-10 Likert scale, Completely unwilling to do so (0) to Very willing to do so (10)

What do you think of the federal government's response measures in reaction to the COVID-19 pandemic?

- 1-7 Likert scale, Extremely insufficient (1) to Extreme overreaction (7)

What do you think of your state government's response measures in reaction to the COVID-19 pandemic?

- 1-7 Likert scale, Extremely insufficient (1) to Extreme overreaction (7)

Sweden's government has so far avoided implementing a lockdown in order to keep the economy going. What do you think of this policy?

- 1-7 Likert scale, Strongly disagree (1) to Strongly agree (7)

The government's highest priority should be saving as many lives as possible even if it means the economy will recover more slowly. What do you think of this statement?

- 1-7 Likert scale, Strongly disagree (1) to Strongly agree (7)

It is becoming more important for the government to save jobs and restart the economy than to take every precaution to keep people safe. What do you think of this statement?

- 1-7 Likert scale, Strongly disagree (1) to Strongly agree (7)

How confident are you in your answers to the questions above?

- 1-7 Likert scale, Not confident at all (1) to Extremely confident (7)

Part B. Attitude prime treatment manipulation

Please take a careful look at the tweet below.

We would like to ensure you are paying attention.

What is the name of the robot mentioned in the tweet?

- Grillo
- Flippy
- Filip
- Don’t know

How many likes did the tweet have?

- 2
- 13
- 86
- Don’t know

When was the tweet published?

- July 16th 2020
- July 4th 2020
- June 23rd 2020
- Don’t know

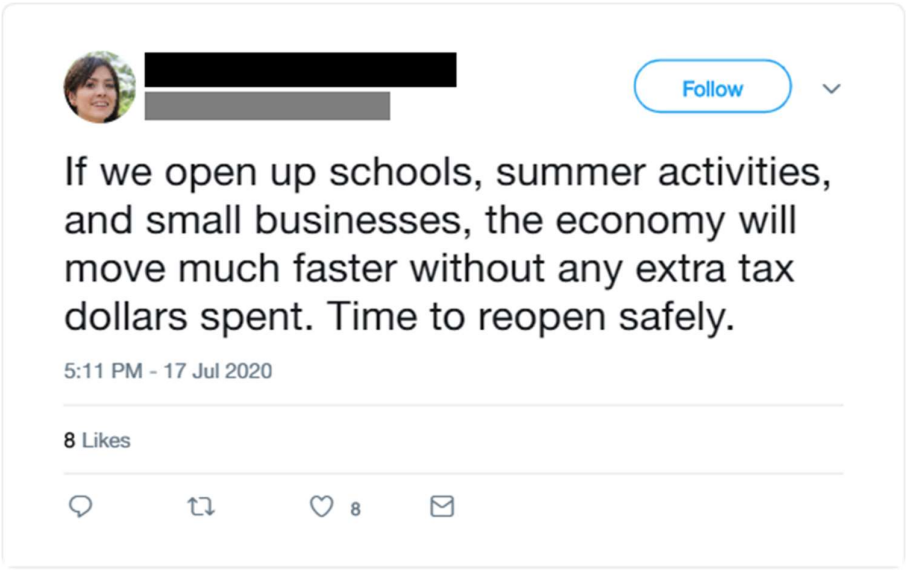
Part C. Main treatment manipulation

The algorithms used on social media may sometimes present you with posts by complete strangers. **You will now be shown 6 tweets.**

As if you were going through your own social media feed (eg Twitter or Facebook), please consider whether you would "like" or "retweet" each of the following 6 tweets.

CONTROL TREATMENT

3 pro-econ with low likes and 3 pro-health with low likes, order to be randomised



[redacted]

Follow

You can’t bankrupt the nation to keep furlough going beyond the summer just because you refuse to ease lockdown. Furlough is not the answer. Get the country back to work.

8:11 PM - 15 Jul 2020

4 Likes

4

[redacted]

Follow

Why are people pushing for more relaxing of lockdown and easing of 2m guidance? We still have people dying. People are still being admitted to hospitals. This is not under control! Where are the scientists?

10:11 AM - 18 Jul 2020

4 Likes

4

[redacted]

Follow

COVID 19 cases keep increasing after the easing of the lockdown... the government must take some necessary precautionary measures

1:55 PM - 12 Jul 2020

2 Likes

2

[redacted]

Follow

This idea of quickly opening up the economy is just wrong on all levels. In the US we put lives first. When it is safe we will open up our economy and we will be successful as a country

7:55 PM - 20 Jul 2020

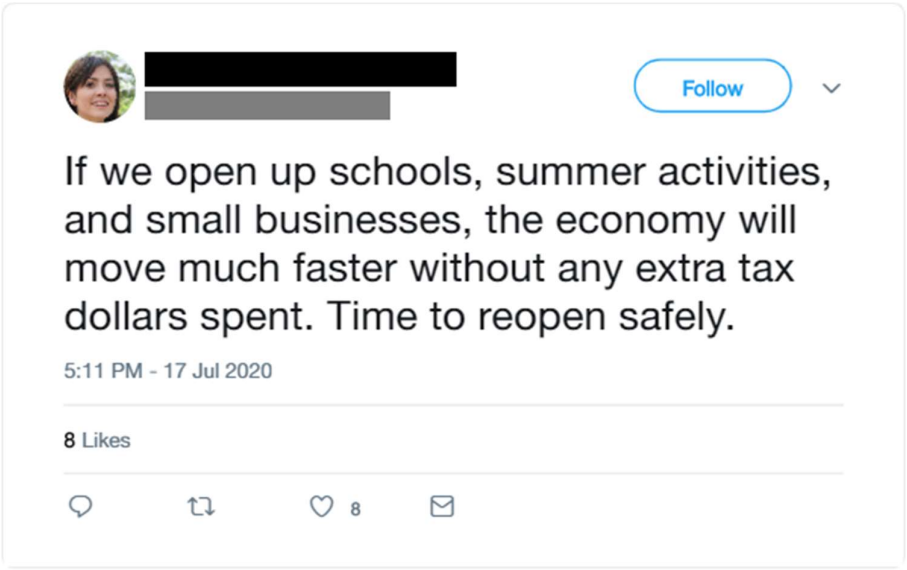
1 Retweets 6 Likes

1

6

PRO-HEALTH TREATMENT

3 pro-health with high likes and 3 pro-econ with low likes, order to be randomised



[redacted]

Follow

You can't bankrupt the nation to keep furlough going beyond the summer just because you refuse to ease lockdown. Furlough is not the answer. Get the country back to work.

8:11 PM - 15 Jul 2020

4 Likes

4

[redacted]

Follow

Why are people pushing for more relaxing of lockdown and easing of 2m guidance? We still have people dying. People are still being admitted to hospitals. This is not under control! Where are the scientists?

10:11 AM - 18 Jul 2020

21 Retweets **69** Likes

21 69

[redacted]

Follow

COVID 19 cases keep increasing after the easing of the lockdown... the government must take some necessary precautionary measures

1:55 PM - 12 Jul 2020

10 Retweets 55 Likes

10 55

[redacted]

Follow

This idea of quickly opening up the economy is just wrong on all levels. In the US we put lives first. When it is safe we will open up our economy and we will be successful as a country

7:55 PM - 20 Jul 2020

16 Retweets 82 Likes

16 82

PRO-ECONOMY TREATMENT

3 pro-econ with high likes and 3 pro-health with low likes, order to be randomised

[redacted]

Follow

You can’t bankrupt the nation to keep furlough going beyond the summer just because you refuse to ease lockdown. Furlough is not the answer. Get the country back to work.

8:11 PM - 15 Jul 2020

11 Retweets 95 Likes

11 95

[redacted]

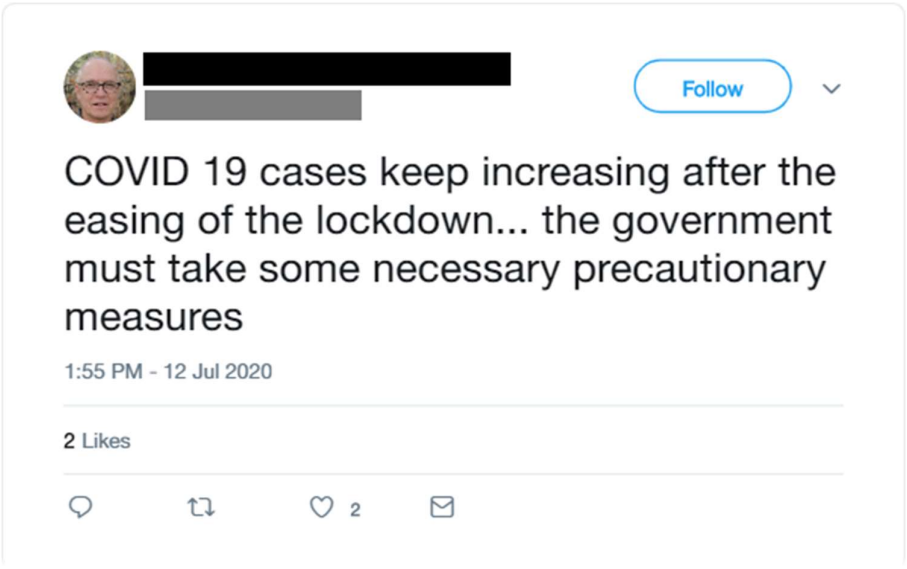
Follow

Why are people pushing for more relaxing of lockdown and easing of 2m guidance? We still have people dying. People are still being admitted to hospitals. This is not under control! Where are the scientists?

10:11 AM - 18 Jul 2020

4 Likes

4



Part D. Post-treatment COVID-19 attitude

What do you think of the following policies? (each question requires a response on a 1-7 Likert scale, Strongly disagree (1) to Strongly agree (7))

Closing the borders

Prohibiting gatherings

Prohibiting non-essential travels

Closing daycares, schools, colleges and universities

Closing non-essential businesses (bars, stores that are not food or health related, etc.)

Handing out USD 1,000 fines to those who do not comply with social-distancing rules

General lockdown of the population with a ban on leaving the home (except for medical reasons)

Mandatory use of face-coverings in public places

How confident are you in your answers to the questions above?

- 1-7 Likert scale, Not confident at all (1) to Extremely confident (7)

Views about COVID-19 policy response can be roughly split into 2:

1. **Pro-health:** prioritise **the elimination of COVID-19** over economic activities, for example by extending lockdown measures despite economic costs.

2. **Pro-economy:** prioritise **economic activities** over the elimination of COVID-19, for example by opening up the economy despite risks of a second wave.

Which of these two views had more likes in **the 6 tweets shown earlier**?

- Pro-health
- Pro-economy
- Neither (both had about the same number of likes)
- Don't know

Which of these two views has more support in **your own social network (including friends and family members)?**

- Pro-health
- Pro-economy
- Neither (both have about the same amount of support)
- Don't know

How much does public support of a given policy **on** social media influence your own support of that policy?

- 1-7 Likert scale, Not at all (1) to Completely (7)

How much does public support of a given policy **outside** social media influence your own support of that policy?

- 1-7 Likert scale, Not at all (1) to Completely (7)
-

How often do you discuss policy issues with your friends or family members **on** social media?

- Always
- Often
- Sometimes
- Rarely
- Never

How often do you discuss policy issues with your friends or family members **outside** social media?

- Always

- Often
- Sometimes
- Rarely
- Never

Part E. Demographic questionnaire

What is the highest level of education you completed?

- 8th grade
- High school diploma
- Associate degree or certificate
- Bachelor's degree
- Master's degree
- Doctorate degree
- Other: _____

Estimate your household's total net monthly income (including salary, pension, social security, sickness benefit).

- Less than or equal to 500 USD
- 500 up to and including 1000 USD
- 1000 up to and including 1500 USD
- 1500 up to and including 2000 USD
- 2000 up to and including 2500 USD
- 2500 up to and including 3000 USD
- 3000 up to and including 3500 USD
- 3500 up to and including 4000 USD
- 4000 up to and including 4500 USD
- 4500 up to and including 5000 USD
- Greater than 5000 USD
- Prefer not to say

In political matters, people talk of 'the left' and 'the right'. How would you place your views on this scale, generally speaking?

- 0-10 Likert scale, The left (0) to The right (10)

Which party did you vote for in the 2016 US election?

- Democrat
- Republican
- Other
- Prefer not to say
- Did not vote

Are you currently employed as an essential worker? (eg healthcare workers, grocery shop employees)

- Yes
- No

Overall, how has your employment been affected since the outbreak of the pandemic?

- No negative affect
- Affected a little eg having to work from home, but no financial impact
- Affected a lot eg number of hours have gone down or taken a pay cut
- I have been furloughed or lost my job

How worried are you about yourself or a family member contracting COVID-19?

- 0-10 Likert scale, Not worried at all (0) to Extremely worried (10)

To what extent have you complied with the following? (each question requires a response on a 0-10 Likert scale, Not at all (0) to Completely (10))

The social-distancing requirements in your state

Public health guidelines (eg wearing face coverings, practicing hand hygiene, not touching your face)

How much do you agree with the following? (each question requires a response on a 1-7 Likert scale, Strongly disagree (1) to Strongly agree (7))

I often change my mind

Once I come to a conclusion, I'm not likely to change my mind

I don't change my mind easily

My views are very consistent over time

Part F. Media exposure

How much time per day do you spend... (each question requires a response from: never, less than 30 minutes, from 30 minutes to 1 hour, more than 1 hour)

Watching, reading or listening to news about politics and current affairs

On Facebook

On Twitter

How active on social media (including browsing, liking and commenting) are ... (scale between 0 not active at all to 100 extremely active)

… you yourself

... your family and friends

In general, which of these do you rely on most for news about politics and current affairs: (select all that apply)

- Television
- Newspapers (including web version)

- Magazines
- Radio
- Social media
- Podcasts
- Other web sources (not social media)
- Other: _____

How much do you trust each of the following? (each question requires a response from: no trust at all, do not trust very much, trust somewhat, trust completely)

The national government

The media

What do you think this study is about?

Debriefing

Thank you for participating in our study.

This study aims to investigate the impact of social media metrics on changes in attitude regarding the Covid-19 pandemic.

The tweets were inspired by real tweets but the photographs and engagement metrics were not real.

As data collection is ongoing, we would like to ask you not to talk about this study with others for now. We would also like to reassure you that all the data you provided is anonymous, and will only be presented and analyzed in group format.

If you have any questions about the study, please feel free to contact Margaret Samahita (margaret.samahita@ucd.ie) or Laura Taylor (laura.taylor@ucd.ie).