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Global Behaviours and Perceptions at the Onset of the COVID-19 Pandemic

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We conducted a large-scale survey covering 58 countries and over 100,000 respondents between late March and early April 2020 to study beliefs and attitudes towards citizens' and governments' responses to the COVID-19 pandemic. Most respondents reacted strongly to the crisis: they report engaging in social distancing and hygiene behaviors, and believe that strong policy measures, such as shop closures and curfews, are necessary. They also believe that their government and their country's citizens are not doing enough and underestimate the degree to which others in their country support strong behavioral and policy responses to the pandemic. The perception of a weak government and public response is associated with higher levels of worries and depression. Using both cross-country panel data and an event-study, we additionally show that strong government reactions correct misperceptions, and reduce worries and depression. Our findings highlight that policy-makers not only need to consider how their decisions affect the spread of COVID-19, but also how such choices influence the mental health of their population.

Introduction

The COVID-19 pandemic caused by the novel coronavirus SARS-CoV-2 has substantially changed public and private life in most countries around the world. To contain the spread of the disease, governments first called on individuals to change their hygiene and social behaviors (e.g., avoiding handshakes, washing hands more frequently, and avoiding social gatherings), and subsequently imposed more stringent and costly protection measures, such as school and store closures, and stay-at-home orders (1, 2). While some of the less invasive measures have received sustained public support during past epidemics (3), adherence to and support of measures that are perceived as costliest, such as quarantines, has been mixed (4). Several questions thus emerge with respect to the COVID-19 pandemic: Do people adhere to recommendations by the government? How do people perceive the response of their fellow citizens and their governments? And in light of rising concerns as a result of the COVID-19 crisis (5–7), how is people’s mental health affected by government measures to contain the pandemic?

To shed light on these questions, we conducted a global online survey. Volunteers recruited through social media translated a short questionnaire into 69 languages. Survey participants were recruited globally through online snowball sampling (the survey instrument is provided in SI-B). Between March 20 and April 5, 2020, more than 110,000 individuals from 175 countries participated. At the launch of the survey, on March 20th, there had been 240,000 confirmed COVID-19 cases and 9,900 people deaths attributed to COVID-19 (8). Among the 32 countries with more than 1,000 confirmed cases, 47 percent had required workplace closures and 39 percent had imposed some form of restriction to internal mobility. Two weeks later, on April 5th, confirmed cases and deaths had increased four and five-fold, respectively. By then, over 85 percent of the countries with more than 1,000 confirmed cases had adopted various forms of workplace closure and restrictions to internal movement (9). Our data thus capture global pub-

lic attitudes in the early and accelerating phases of the pandemic, both before and after many governments faced challenging yet consequential policy decisions. In this article, we report results from the 58 countries in which at least 200 people participated, corresponding to a sample of 107,565 individuals. As of April 5th 2020, these countries accounted for 92% of all known COVID-19 cases globally, and 93% of deaths. In the analyses presented below, we re-weight observations to make them representative at the country level, based on respondent's gender, age, income, and education. Depending on the focus of the analysis, we also weight according to country population, or give all countries equal weight. All underlying data and code to reproduce our findings are available at the following OSF repository: <https://osf.io/3sn2k/>.

Broad adherence to COVID-19 protective behaviors and support for containment measures

We document broad adherence to COVID-19 protective behaviors in Figure 1, Panel A. Globally, 91% of respondents reported that they did not attend any social gatherings in the past week; 89% washed their hands more frequently than a month earlier; 93% say that they would have immediately informed people around them if they had experienced COVID-19 symptoms; 69% reported keeping a distance of at least 2 meters to other people; and 78% said that they stayed home in the past week (SI Figure 4 presents the country-level averages). People also plan to maintain these behaviors in the future; for example, while 42% of respondents report that they will leave their home in the next 5 days to buy food, only 19% say that they will go to work, and 45% of respondents say that they will not leave their home for any reason in the next 5 days. Thus, respondents report closely adhering to protective behaviors.¹

In line with their own behavior, a large majority of respondents believe that it is important for others to engage in protective behaviors (Figure 1, Panel B, dark gray bars): 97% believe

¹Broad adherence to COVID-19 protective measures has been noted for Italy (10). Our study complements work studying heterogeneity in responses to the COVID-19 outbreak using survey and cell phone data, with a particular focus on partisan ideology (11–13).

that people in their country should cancel their participation in social gatherings because of COVID-19; 92% say people should not shake each other's hands; 77% think that all shops other than particularly important ones, such as supermarkets, pharmacies, post offices, and gas stations, should be closed; and 81% support a general curfew that only excepts grocery shopping, necessary family trips, and the commute to work. Moreover, 90% of respondents believe that social distancing measures are “effective” or “very effective” and 70% of respondents think that risky behaviors should be financially punished.

In contrast, however, respondents do not believe that their fellow citizens hold similar beliefs (Figure 1, Panel B, light gray bars). Specifically, while 97% of respondents themselves believe that social gatherings should be cancelled, on average, they estimate that only 67% of their fellow citizens think the same—a 30 percentage point gap. Similarly, on average, respondents believe that 74% of people in their country support avoiding handshakes (18 percentage point gap); that 63% of people believe stores should be closed (14 percentage point gap); and that 55% are in favor of curfews (26 percentage point gap). Thus, respondents themselves hold strong normative beliefs about the importance of avoidance behaviors, but vastly underestimate the extent to which these beliefs are shared by their fellow citizens. This is important because both respondents' own beliefs and their perceived beliefs of others predict their tendency to engage in protective behaviors (for both: $p < 0.001$, see SI-Table 7).²

Globally, fewer than 9% of respondents believe that the response of their country's government has been too extreme (see Panel C in Figure 1). This pattern holds robustly across different social groups: when splitting the sample based on country, gender, median income, and median age, there is not a single socio-economic strata in which a majority of individuals think that the government reaction has been “somewhat extreme” or “too extreme” (see SI-G.1

²This finding is consistent with evidence on pluralistic ignorance (14). Misperceived social norms have been shown to be an important causal driver of high-stakes behaviors across domains, such as female labor force participation (15) and energy conservation (16).

for more details). Rather, many respondents believe that their government is not reacting sufficiently, with 45% of respondents across the 58 countries holding such beliefs. Similarly, 58% of respondents perceive that the reaction of their country's public to the COVID-19 outbreak has been insufficient. Further, 43% of respondents do not trust that their country's government is keeping them safe, and 43% of respondents perceive that their country's government has not been truthful about the COVID-19 outbreak. Panel D of Figure 1 however suggests that there is significant cross-country variation in these measures (see SI-Figure 5 for the cross country averages). We next explore this cross-country variation further.

Perception of insufficient response by government and broader public is related to lower mental health, which improves after decisive government action The widespread perceptions of an insufficient response by both governments and the public across countries are strongly associated with measures of mental health. In Figure 2, Panel A, we show that higher perceptions of insufficient government reaction to the pandemic are associated with higher worries about the pandemic ($p < 0.001$). In Panel B, we extend this analysis to a standard depression scale (PHQ-9, without the suicide question), and a misperception index, which measures the difference between own attitudes and perceived attitudes of others along the dimensions discussed above (description of indices and their construction in more detail in SI-C). We also consider additional explanatory variables, such as COVID-19 case prevalence across countries. We find that worries about COVID-19 strongly increase with perceptions of an insufficient reaction by the broader public ($p = 0.008$), and that our depression index strongly correlates with perceptions of an insufficient government ($p = 0.103$) and public reaction ($p < 0.001$). Similarly, our misperception index strongly increases as public and government reactions are viewed as insufficient (both $p < 0.001$). In turn, higher trust in governments to keep people safe, and perceptions of the truthfulness of government communication about the COVID-19 outbreak,

are associated with lower levels of worries and reduced misperceptions (both $p < 0.001$).

Can shifts in government policy affect these perceptions? In Panel C of Figure 2, we document that the adoption of more stringent COVID-19 containment policies increases the perceived sufficiency of the government's and the public's response. We use daily country-level data on the extent of different government COVID-19 interventions (9). To justify a causal interpretation, we exploit time variation in country-level COVID-19 responses, thus comparing each country to itself over time. We find that as a country imposes more stringent restrictions on public life, these changes (i) lower respondents' perception of an insufficient reaction by the public ($p < 0.001$) and the government ($p < 0.001$); (ii) increase trust that governments keep people safe ($p < 0.01$); and (iii) lower the depression index ($p < 0.001$).

Finally, we provide a more granular view of one such policy change in Panels D, E, and F of Figure 2. In the evening of March 23, 2020, Prime Minister Boris Johnson announced a nationwide lockdown in the United Kingdom (UK). This represented a drastic change in the UK's approach to COVID-19, both relative to itself and relative to other countries. We estimate a difference-in-differences model, comparing changes in perceptions in the UK before versus after the change, to changes in other countries at the same time (Germany, Sweden, the United States, and Brazil; these five countries make up 50% of the whole sample, and we have sufficient numbers of respondents on each day to estimate a meaningful difference-in-differences specification).

We find that the nationwide lockdown announcement in the UK led to notable effects among survey participants from the UK compared to participants from other countries. Panel D of Figure 2 shows that the lockdown increased the perceived appropriateness of the government's reaction by 18.2 percentage points ($p < 0.001$), and that of the public's reaction by 15.3 percentage points ($p < 0.001$). It also increased trust in the government (10.3 percentage points), and the government's perceived truthfulness (5.6 percentage points, $p < 0.001$). The lockdown

also strongly reduced misperceptions about fellow citizens' attitudes towards strong behavioral responses to the pandemic (0.52 of a standard deviation, $p < 0.001$). This suggests that people don't think others comply voluntarily, but do when required, and thus that government action is effective. Finally, the lockdown reduced the worries index by 0.150 of a standard deviation ($p < 0.001$), and the depression index by 0.049 of a standard deviation ($p < 0.1$). Panels E and F of Figure 2 display the event study for perceived appropriateness of the government response and the worries index, respectively. There were no noticeable pre-trends before the announcement of the lockdown on March 23, but we observe a marked change in perceived appropriateness and the worries index on the day following the announcement in the UK relative to other countries. Thus, timely and decisive government action can reduce misperceptions, worries, and depression.

Robustness Checks We conduct several checks to assess the robustness of our findings. First, the statistics described above used sampling weights to make the samples representative of each country's population in terms of age, gender, income, and education (see SI-F B for further information). When the results are re-estimated without these weights, the changes are minimal (See SI-Fig 9 and SI-Fig 10).

To examine robustness of our findings to a more representative sample, we repeated the survey with 2,000 participants from a representative online panel provided by Prolific in the United States and the UK.³ The results from the representative online panel are similar to those obtained in the main sample, suggesting that the snowball sampling approach we used did not bias our results (see SI- G.1). We also assessed the relevance of a potential social desirability bias by incorporating a list experiment in these representative surveys: a random half of participants (the control group) were presented with a list of four protective measures (e.g., handwashing),

³Prolific is a professional panel provider widely used in social science research (17).

and asked how many of them they favored. The other half of participants (the treatment group) were presented with the same list of four measures, plus one additional item: whether they think there should be a curfew in their country (details on list experiment is provided in SI-B.6). Respondents in the control group on average agreed with 2.91 statements, while respondents in the treatment group agreed with 3.64 items. The average difference in statements agreed with between the treatment and control group is thus 0.73, which very closely mirrors the share of respondents who, when asked directly, agree that there should be a curfew in their country (0.74 in the representative online panel; 0.71 in the main cross-country survey). These results suggest that social desirability bias did not play an important role when respondents indicated broad support to protective behaviors, consistent with recent evidence (18).

Conclusion Our results highlight that people across the world are responding strongly to the COVID-19 pandemic, both in terms of their own behavior, as well as their beliefs about how their fellow citizens should react to the crisis. Our analyses also reveal that a majority of respondents believes that their governments and fellow citizens are not doing enough, which heightens their worries and depression levels. However, decisive actions from policy-makers, we find, have the ability to alter how people perceive their governments and other citizens, and in turn improve mental health. As governments around the world debate whether to extend or loosen restrictions, our findings reveal that policy-makers not only need to consider how their decisions affect the spread of COVID-19, but also how such choices influence the mental health of their population.

Data and Code Availability Statement All data and code underlying the analyses reported in this paper are available at the following page: <https://osf.io/3sn2k/>. We have complied with all relevant ethical regulations and obtained exempt IRB review E-2065 from MIT.

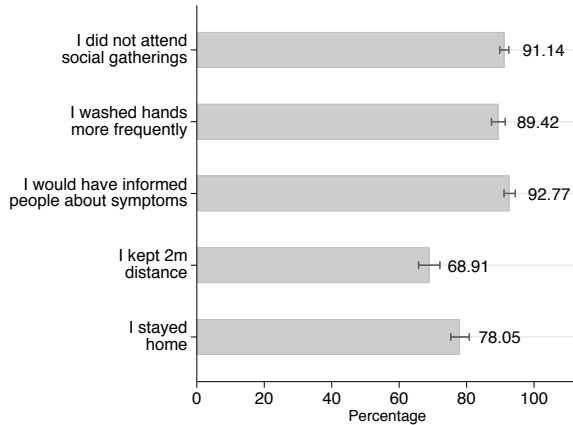
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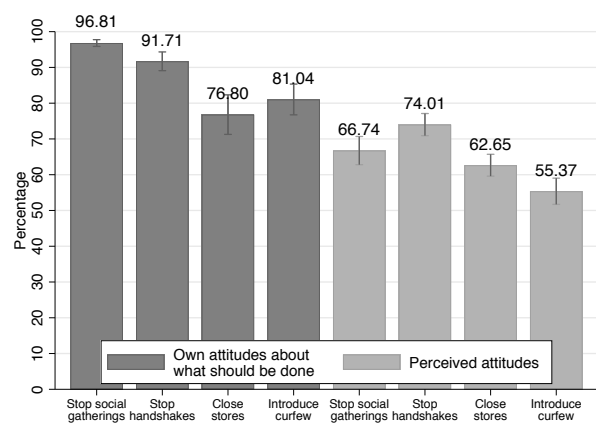
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Figure 1: Global Reactions and Perceptions of Reactions to COVID-19

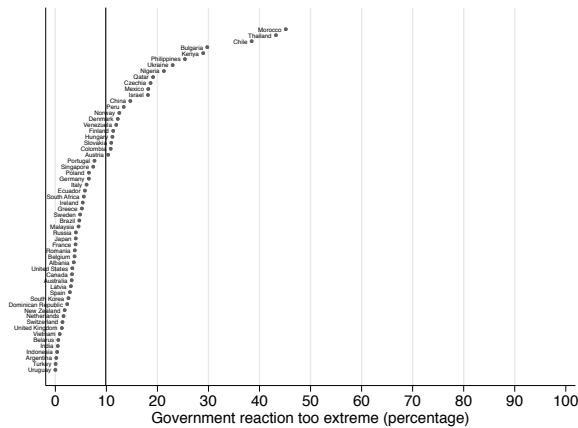
A High global compliance with protective behaviors



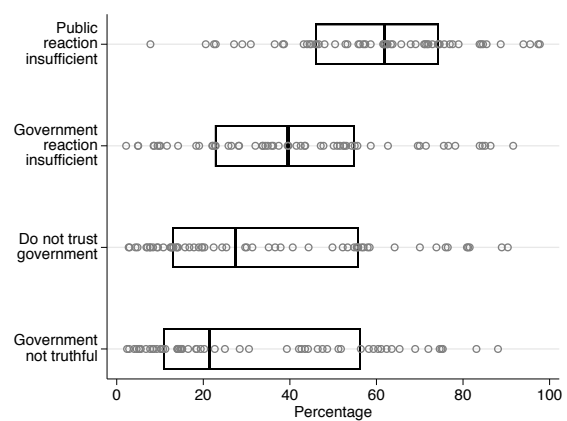
B Large under-estimation of others' attitudes



C Broad cross-country agreement that government response is not excessive



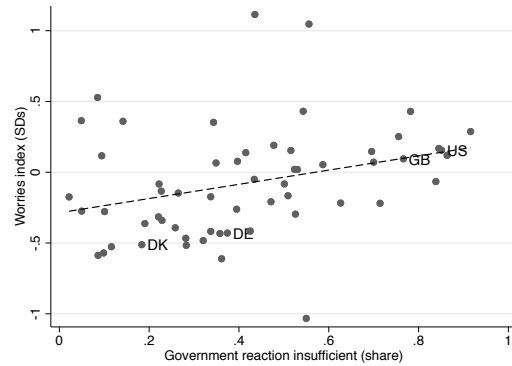
D Large cross-country variation in perception of sufficiency of government and public response



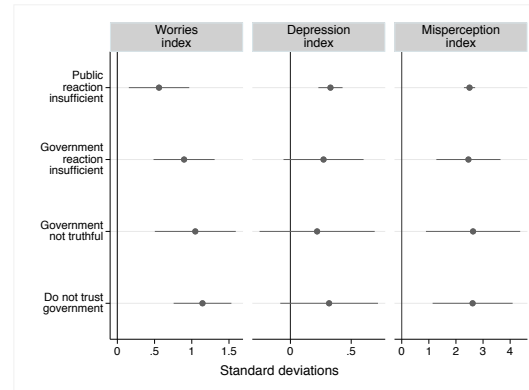
Notes: This figure shows descriptive statistics of personal and perceptions of societal reactions to COVID-19. Panel **A** presents self-reported engagement in protective behavior. Panel **B** contrasts respondents' attitudes and perceived attitudes of compatriots about protective behaviors and policies. Panel **C** shows the share of respondents who think that the government action has been excessive by country. Panel **D** displays cross-country variation in perceptions of sufficiency of government and public reactions to COVID-19 and of trust in and perceived truthfulness of governments. The sample was collected using snowball sampling from March 20th to April 6th 2020 ($N = 107,565$). Respondents from countries with at least 200 responses are included. Responses are weighted to be representative at the country level in terms of age, gender, income, and education. Panel A and B are further weighted by country population to account for different country sizes. Panel C and D display weighted country averages.

Figure 2: Perceptions of Government Policy, Public Reaction, Social Norms, and Mental Health

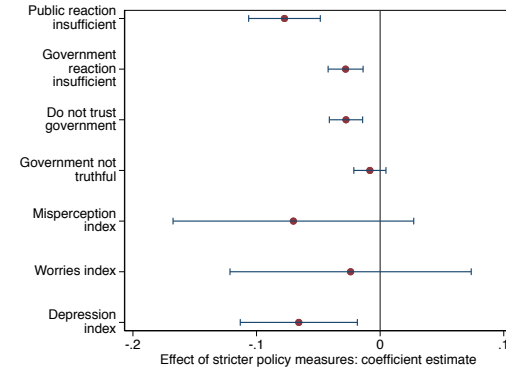
A Positive association of perceived insufficient government response and worries



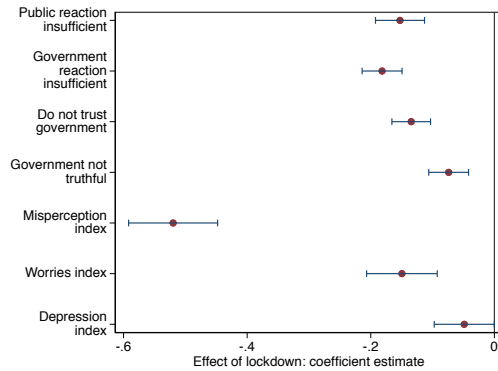
B Associations of perceived government/public reaction and mental health



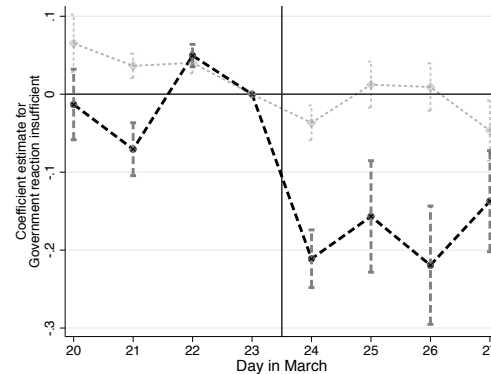
C Policy shifts to more restrictions reduce worries



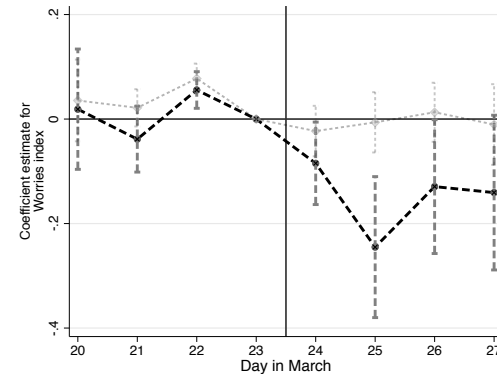
D UK lock down on March 23 reduced worries



E UK lock down immediately improved perception of government response



F UK lock down directly reduced worries



Notes: All indices are defined and described in SI-C. Regressions are further described in SI-E. Respondents from countries with at least 200 responses are included. Panel **A** shows the cross-country relationship between the share of respondents perceiving their government's response as insufficient and a worries index. Panel **B** captures pairwise relationship between the variables indicated in the figure heading and row across countries. The regressions in Panel **C** are estimated using the country x date weighted average data, controlling for country and day fixed effects; the independent variable is an index of strictness of government response in a country. The regressions in Panel **D** are estimated using the individual-level data from the UK and a set of control group countries. The regressions control for country-by-education-by-gender fixed effects and date fixed effects. The independent variable is an indicator variable taking the value 1 for respondents participating from the UK after the 23 March 2020. Panels **E** and **F** illustrate the impact of the UK lockdown announcement among respondents from the UK compared to the average time trend among participants from control group countries on perceptions of sufficiency of the government response and the worries index. The underlying data is the survey data that was collected using snowball sampling from March 20th to April 6th 2020 (N= 107,565).

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Pavlova, Piibi-Kai Kivik, Pooja N. Babu, Prabesh Gyawali, Prasanna Jain, Radhanjali Shukla, Raqib Faran, Rayyan Zahid, Reny Agustine, Ricardo da Silva, Said Farooq Shah, Sajit M. Mathews, Salar Rad, Samatha Mudigonda, Sarib Baloch, Satishchandra Gore, Sejal Deva, Shabnam Nadiya, Shambhavi Priyam, Shizhuo Wang, Silje Kristiansen, Simen Grythe, Solomon Michael, Sonia Deol, Stephane Francioni, Sundar Thapaliya, Susanna Berkouwer, Tamara Kerzhner, Tatsunori Ishii, Tea Kopperia, Thaís Barcellos, Thembinkosi KM Rushwaya, Toan Huynh Luu Duc, Tram Nguyen, Trudy Shanewise, Tsegay Gebrekidan Tekleselassie, Umida Djuraeva, Vasia Papoutsaki, Vera Vaš, Vinayaka R. Prasad, Wendy Nilsen, Wuraola Oyewusi, Yuval Nativ, Zikmund Bartoníček, Zulaikha Nizam. We also thank Prolific for sponsoring the participants for the survey experiment and Aristeo Marras for data advice.

Supplementary materials

The authors provide the following supplementary information.

Appendix A: Authors, affiliations and contribution statement

Materials and Methods Appendices

- Appendix B: Survey instrument
- Appendix C: Index construction
- Appendix D: Online survey reach statistics
- Appendix E: Statistical methodology
- Appendix F: Weight construction
- Appendix G: Robustness of findings

Appendices

A Authors, Affiliations and Contribution Statement

- Stefano Caria, Associate Professor, Department of Economics, Warwick University, UK. Survey design, literature and write-up review, GDPR compliance, and subgroup analysis.
- Thiemo Fetzner, Associate Professor, Department of Economics, Warwick University, UK. Organization, Media outreach, survey design, data preparation, data analysis, research design, write-up.
- Stefano Fiorin, Postdoctoral Research Associate, University of California - San Diego, US. Survey design, translation implementation.
- Friedrich M. Goetz, PhD Student, Department of Psychology, University of Cambridge, UK. Survey implementation, translation and maintenance.
- Margarita Gomez, Executive Director of the People in Government Lab, Blavatnik School of Government, University of Oxford, UK. Survey implementation and maintenance, communication, translation, outreach.
- Johannes Haushofer, Assistant Professor, Princeton University, US. Organization, survey implementation, translation and maintenance, outreach, survey design, data analysis, write-up.
- Lukas Hensel, Postdoctoral Research Associate, Blavatnik School of Government, University of Oxford, UK. Survey implementation, translation and maintenance; data preparation; weight construction; data analysis.

- Andriy Ivchenko, Expilab, Barcelona, Spain. Survey design, implementation, and maintenance, translation, website design, outreach.
- Jon M. Jachimowicz, Assistant Professor, Organizational Behavior Unit, Harvard Business School, US. Organization, survey design implementation, translation and maintenance, outreach, survey design, data analysis, write-up.
- Gordon Kraft-Todd, Postdoctoral Research Associate, Boston College. Survey implementation, translation, and maintenance.
- Elena Reutskaja, Associate Professor, IESE Business School, Barcelona, Spain. Survey design, outreach for data collection, media, translations, GDPR compliance.
- Christopher Roth, Assistant Professor, Department of Economics, Warwick University, UK. Survey design, survey implementation, translation and maintenance, write-up.
- Marc Witte, Postdoctoral Research Associate, Economics Department, New York University in Abu Dhabi. Survey design, maintenance, data preparation, data analysis, results preparation, write-up.
- Erez Yoeli, Research Scientist, MIT, US. IRB Application, survey implementation, translation and maintenance, analysis.

B Questionnaire

B.1 Self-Reported Past and Future Behaviors

In which country do you mostly live?

B.1.1 Past Behaviors

To what extent do the following statements describe your behavior for the past week? [Does not apply at all / Applies very much]

- I stayed at home.
- I did not attend social gatherings.
- I kept a distance of at least two meters to other people.
- If I had exhibited symptoms of sickness, I would have immediately informed the people around me.
- I washed my hands more frequently than the month before.

B.1.2 Future Behaviors

- Do you need to leave your home in the next 5 days? Yes/No
- What are the reasons for you to leave your home (check all that apply)? Please try to be as honest as possible. Your answers will be kept confidential.
 - Going to work
 - Walking a pet
 - Doing physical activity (e.g. exercising, jogging)
 - Procuring food for yourself or family
 - Going to the pharmacy
 - Going to the hospital / receiving medical treatments
 - Taking care of dependents

- Meeting friends or relatives
- Getting tired of being inside of the house
- Getting bored
- Getting some adrenaline (from breaking the law)
- Exercising my freedom
- Other

B.2 Beliefs, Perceptions, Emotions

B.2.1 Personal beliefs about coronavirus measures:

- What do you think: should people in your country cancel their participation at social gatherings because of the coronavirus right now? [Yes/No]
- What do you think: should people in your country not shake other people's hands because of the coronavirus right now? [Yes/No]
- What do you think: should all shops in your country other than particularly important ones, such as supermarkets, pharmacies, post offices, and gas stations, be closed because of the coronavirus right now? [Yes/No]
- What do you think: should there be a general curfew in your country (with the exception of grocery shopping, necessary family trips, and the commute to work) because of the coronavirus right now? [Yes/No]

B.2.2 Perception of others beliefs about coronavirus measures:

- How many of 100 people in your country do you think believe that participation at social gatherings should be cancelled because of the coronavirus right now?

- How many of 100 people in your country do you think believe that one should not shake other people's hands because of the coronavirus right now?
- How many of 100 people in your country do you think believe that all shops in your country other than particularly important ones, such as supermarkets, pharmacies, post offices, and gas stations, should be closed because of the coronavirus right now?
- How many of 100 people in your country do you think believe there should be a general curfew in your country (with the exception of grocery shopping, necessary family trips, and the commute to work) because of the coronavirus right now?

B.2.3 Financial sanctioning of risky behaviors:

- What do you think: should risky behaviours, which might enable further spread of the coronavirus, be financially punished? Yes/No
- Which fines should be enforced for the following risky behaviours (amount in your country currency)?
 - Participation at social gatherings
 - Going out despite exhibiting symptoms of coronavirus

B.2.4 Case predictions

- How many people in your country do you think will be infected 1 month from now?
- Without looking it up, what is your estimate of the number of people in your country who are currently infected?

B.2.5 Perceptions of government/public response & efficacy

- Do you think the reaction of your country's government to the current coronavirus outbreak is appropriate, too extreme, or not sufficient? [5-point scale]
- How much do you trust your country's government to take care of its citizens? [5-point scale]
- How factually truthful do you think your country's government has been about the coronavirus outbreak? [5-point scale]
- Do you think the reaction of your country's public is appropriate, too extreme, or not sufficient? [5-point scale]
- What do you think: How effective are social distancing measures (e.g., through a general curfew) to slow down the spread of the coronavirus? [5-point scale]

B.2.6 Worries battery

- I am nervous when I think about current circumstances. [5 point scale]
- I am calm and relaxed. [5 point scale]
- I am worried about my health. [5 point scale]
- I am worried about the health of my family members. [5 point scale]
- I am stressed about leaving my house. [5 point scale]

B.3 Personal Info

- What year were you born? [1919-2020]
- How many years of education did you complete?

- What is your monthly household income, before tax, your country's currency?
- What is your marital status? [a: married/co-habiting, b: single/divorced]
- How many people live in your household?
- Which gender do you identify with? [Male/Female/Other]
- How healthy are you? [poor/fair/good/excellent]
- How many of the following conditions do you have: cardiovascular diseases, diabetes, hepatitis B, chronic obstructive pulmonary disease, chronic kidney diseases, and cancer?
[0 - 5 or more]
- What is your postal code?

B.4 PHQ9

How often have they been bothered by the following over the past 2 weeks?

- Little interest or pleasure in doing things? [4 point scale]
- Feeling down, depressed, or hopeless? [4 point scale]
- Trouble falling or staying asleep, or sleeping too much? [4 point scale]
- Feeling tired or having little energy? [4 point scale]
- Poor appetite or overeating? [4 point scale]
- Feeling bad about yourself — or that you are a failure or have let yourself or your family down? [4 point scale]

- Trouble concentrating on things, such as reading the newspaper or watching television?
[4 point scale]
- Moving or speaking so slowly that other people could have noticed? Or so fidgety or restless that you have been moving a lot more than usual? [4 point scale]

B.5 Personality Battery

To which extent do the following questions apply to you? I see myself as ...

- Extraverted, enthusiastic [5 point scale]
- Critical, quarrelsome [5 point scale]
- Dependable, self-disciplined [5 point scale]
- Anxious, easily upset [5 point scale]
- Open to new experiences, complex [5 point scale]
- Reserved, quiet [5 point scale]
- Sympathetic, warm [5 point scale]
- Disorganized, careless [5 point scale]
- Calm, emotionally stable [5 point scale]
- Conventional, uncreative [5 point scale]

B.6 List experiment

B.6.1 Control condition

- In my opinion, my country should pay higher salaries to nurses.

- In my opinion, my country's government should continue paying the wages of workers who are laid off in response to the corona virus pandemic.
- In my opinion, my country should focus on providing free internet access to people working from home during the corona virus pandemic.
- In my opinion, my country's government should provide hospital beds for citizens of countries that are more affected by the corona virus pandemic.

B.6.2 Treatment condition

additional question:

- In my opinion, there should be a general curfew in my country (with the exception of grocery shopping, necessary family trips, and the commute to work) because of the coronavirus right now.

C Construction of Indices

C.1 Worries index

To measure worries we use all questions from the worries battery in section B.2.6. We construct the worries index based on the all worries items. We use the z-scored transformation of the sum of all items. Higher values indicate higher levels of worries.

C.2 Depression Index

To measure depression we employ the widely used personal health questionnaire (*I*). We construct the PHQ-9 index based on the all items of the PHQ-9 except for the suicide question (for details on the questions see Section B). We use the z-scored transformation of the sum of all PHQ-9 items. Higher values indicate higher levels of depression.

C.3 Misperception Index

We construct our misperception measures by taking the difference between people's beliefs about others' views minus the actual views of others regarding (i) cancellation of social gatherings, (ii) appropriateness of hand-shakes, (iii) store closures, (iv) a general curfew. We use the z-scored transformation of the sum of all misperception items to construct our misperception index. Higher values indicate higher levels of misperceptions.

C.4 Country-level policy restriction index

We leverage the data from (2) that is up to date as of April 6th. The data is a country-by-daily data set capturing the different measures countries adopt to constrain the spread of COVID-19.

We focus on the main subcomponents S1-S6 capturing government actions grouped as S1 - School closures, S2 Workplace closures, S3 Cancellation of public events, S4 Closure of public transportation, S5 Public information, S6 Restrictions on internal movement, S7 Restrictions on International travel.

The data distinguishes general - country-wide - restrictions versus targeted ones. Further, the data distinguishes recommendations versus requirements. We construct restrictions indices that are specific to our sample-countries and time window and not use the Stringency index that is provided by (2). This is because for the sample period under consideration, from March 20 to April 5, 2020, most countries had adopted already quite stringent measures with regard to international travel and public information campaigns. As a result, these and a few other subcomponents add little variation.

We use the (2) data to create a set of indicator variables that capture whether a country applied measures in a specific domain S1-S6 that are general – i.e. apply to the country as a whole. Similarly, we also use a robustness measure that constructs an index based on transformed indicator variables capturing whether restrictions in the domain S1-S6 are general and

are mandatory. Using these sets of dummy variables, we then construct the first principal component of the data for the set of countries in our estimations and for the time period under considerations.

Table 1 presents the factor loadings for the first three principal components for the measures S1-S6 that are coded as applying countrywide (but are not necessarily mandatory). We observe that the first principal component is positively loaded with little weight being placed, however, on the Public Information component. This is not surprising as most countries by March 20, 2020 had ongoing public information efforts.

Table 1: Principal components to construction COVID-19 country restriction index: general-country wide (but not necessarily mandatory) measures

	Comp1	Comp2	Comp3	Unexplained
General recommended/mandated School closures	0.407	-0.050	0.889	0.020
General recommended/mandated Workplace closures	0.451	-0.199	-0.388	0.329
General recommended/mandated Public event cancelation	0.425	0.207	-0.126	0.479
General recommended/mandated Public transport closure	0.400	-0.334	-0.159	0.458
General recommended/mandated Public information	0.222	0.892	-0.077	0.094
General recommended/mandated Restrictions internal movement	0.491	-0.086	-0.107	0.357

Table 2 presents the factor loadings for the first three principal components constructed on the dummy variables capturing general and mandated policy changes. Naturally, information campaigns do not have a “mandatory” dimension. As such, this feature, that already added little to the variation is dropped. As before we observe positive loading on all subcomponents.

Table 2: Principal components to construction COVID-19 country restriction index: general and mandatory restrictions

	Comp1	Comp2	Comp3	Unexplained
General mandated School closures	0.400	0.613	0.681	0.000
General mandated Workplace closures	0.476	-0.010	-0.252	0.393
General mandated Public event cancelation	0.436	0.347	-0.565	0.220
General mandated Public transport closure	0.412	-0.672	0.373	0.130
General mandated Restrictions internal movement	0.503	-0.228	-0.118	0.319

We use these two first principal components to study the impact of country-level policy changes on perceptions at the individual level presented in Figure 2.

D Online survey reach statistics

The link to the survey went live on March 20, 2020 with a call to participate being launched via social media. That launch produced nearly 1.4 million impressions and was retweeted 4,892 times. The initial tweets account for 31,211 clicks on the landing page <http://www.covid19-survey.org>. This is a minority of all clicks on the landing page, indicating that there was a substantial multiplication due to the link to the survey being broadly shared on social media, via email and through other channels. Several media outlets featured links to the landing page and the call to participate. The landing page was accessed by 391,476 different users from March 20 - April 8, 2020. Out of those visitors, 157,264 started the survey, while 112,136 survey completes were registered.

E Statistical methodology

This appendix describes the main empirical specifications for which we present regression coefficients in the main figures.

E.1 Figure 1

This figure shows descriptive statistics on reported engagement in protective behavior (panel A), own and perceived attitudes about what should be done (panel B), as well as perceptions of government response to the COVID-19 crisis (panels C and D). The sample includes respondents from countries for which we had at least 200 responses ($N = 107,565$). For all four panels, we first collapsed the individual-level data to obtain country-level averages. In this step, all individual responses were re-weighted to be representative of each respondent's country's demographic in terms of age bins, gender, income brackets, and education level using the weights described in Appendix F. For panels A and B, we then further collapsed the data to

generate global sample means. In this step, we weighted the averages by the country’s population for panels A and B. In Panel C and D we present the distribution of the country-averages to highlight the cross-country variation in the measures.

E.2 Figure 2

This figure shows bivariate and multivariate regressions of perceptions and mental health outcomes on government responses to the Covid-19 crisis. For six panels, we obtained country-level averages, weighting individual responses to be representative of each respondent’s country in terms of age and income brackets, gender, and education level (using the weights described in detail in Appendix F.

Panel A shows an unweighted country-level scatterplot of the proportion of respondents who think that government reaction has been insufficient and the worries index.

In panel B, we estimate country-level regressions of two mental health indices and a public attitude misperception index on four different indicators of perceptions of government response, for a total of 12 separate regressions. Each regression has the following form:

$$Y_c = \alpha + \beta * P_c + \gamma * X_c + \epsilon_c \quad (1)$$

where Y_c is the outcome of interest in country c – either the average worries index, the average depression index, or the average misperception index. The coefficient of interest that is displayed in panel b) is β , which is estimated in a separate regression for each outcome variable: i) the share of respondents who perceive government response as insufficient, ii) the share of respondents who perceive public response as insufficient, iii) the share of respondents who think the government has been truthful, and iv) the share of respondents who trust their country’s government. X_c is a vector of control variables consisting of the country-level means of i) the day-to-day change (Δ) in Covid-19 cases per capita, ii) the day-to-day change (Δ) in Covid-19

deaths per capita, and iii) the number of Covid-19 deaths per capita. In each regression, standard errors are robust and the countries are weighted by their population. The tabular versions of these results are presented in Table 3.

In panel C, we run country-day-level regressions of seven different outcome variables on an index of government restrictions, for a total of seven separate regressions. Each regression has the following form:

$$Y_{cd} = \alpha + \beta * R_{cd} + \gamma * X_{cd} + \nu_c + \nu_d + \epsilon_{cd} \quad (2)$$

where Y_{cd} is the outcome of interest in country c on day d – i) the share of respondents who perceive government response as insufficient, ii) the share of respondents who think the government has been truthful, iii) the share of respondents who trust their country’s government, iv) the share of respondents who perceive public response as insufficient, v) the average misperception index, vi) the average worries index, and vii) the average depression index. The coefficient of interest that is displayed in panel c) is β , which is estimated for the country’s daily general restriction index R_{cd} . X_{cd} is a vector of control variables consisting of the country-day means of i) the day-to-day change (Δ) in Covid-19 cases per capita, ii) the day-to-day change (Δ) in Covid-19 deaths per capita, and iii) the number of Covid-19 deaths per capita. ν_c and ν_d are country and day fixed effects. In each regression, standard errors are robust and the countries are weighted by their population. The tabular version of these results are presented in Panel A of Table 4.

In panel D, we run a similar analysis to panel c), however on individual-level data. In this difference-in-difference analysis, we compare respondents in the UK to non-UK respondents, pre- and post-UK-lockdown. We estimate the following regressions for all individuals from countries with at least 5000 respondents who took the survey between the 20th and 30th March 2020:

$$Y_i = \beta * L_i + \gamma * X_i + \nu_e + \nu_a + \nu_d + \epsilon_i \quad (3)$$

where Y_i is the outcome of interest of individual i – i) whether the respondent perceives government response as insufficient, ii) whether the respondent thinks the government has been truthful, iii) whether the respondent trusts their country’s government, iv) whether the respondent perceives public response as insufficient, v) the individual-level misperception index, vi) the individual-level worries index, and vii) the individual-level depression index. The coefficient of interest that is displayed in panel d) is β , which is estimated for an indicator variable L_i taking the value of one if the respondent’s country is the UK *and* the response day is after the announcement of UK’s lockdown on the evening of March 23rd, and zero otherwise.⁴ X_i is a vector of individual-level control variables consisting of the respondent’s country’s daily means of i) the day-to-day change (Δ) in Covid-19 cases per capita, ii) the day-to-day change (Δ) in Covid-19 deaths per capita, iii) the number of Covid-19 cases per capita, and iv) the number of Covid-19 deaths per capita. ν_e , ν_a and ν_d are country-education, country-age-gender and day fixed effects. In each regression, standard errors are clustered by country-age and gender of the respondents. The tabular version of these results are presented in Panel B of Table 4.

Panels e) and f) display event studies for the UK lockdown, estimated on individual-level data between March 20th and 30th.

$$Y_i = \sum_{d=20}^{30} t_d + \nu_a + \epsilon_i \quad (4)$$

where Y_i is the outcome of interest of individual i – i) whether the respondent perceives government response as insufficient and ii) the individual-level worries index. t_d are the daily coefficients. We plot these daily effects on the outcome of interest, centered around the 23rd

⁴Please note that the remaining difference-in-difference indicators for the country UK and for the post-lockdown days alone are absorbed by the fixed effects.

of March, once for the UK only and once for all other countries with at least 5000 responses in total except the UK. We include country-age fixed effects ν_a . In each regression, standard errors are clustered by country-age and gender of the respondents.

Table 3: Correlation between perceptions and mental health indices

	(1)	Worries index		(4)	(5)	Depression index			(9)	Misperception index		
		(2)	(3)			(6)	(7)	(8)		(10)	(11)	(12)
<i>Panel A: Fig 2b</i>												
Public reaction insufficient	0.560*** (0.202)				0.329*** (0.050)				2.502*** (0.103)			
Government reaction insufficient		0.897*** (0.205)				0.272 (0.164)				2.461*** (0.590)		
Government untruthful			1.047*** (0.271)				0.220 (0.236)				2.632*** (0.867)	
Don't trust government				1.144*** (0.193)				0.318 (0.200)				2.616*** (0.736)
Δ Mean confirmed Covid19 cases per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Mean confirmed Covid19 deaths per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean confirmed Covid19 deaths per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Observations at the country level. Standard errors are robust.

Table 4: Country-level and UK case study difference-in-difference studying impact of policy changes

	Government reaction insufficient (1)	Government not truthful (2)	Do not trust government (3)	Public reaction insufficient (4)	Misperception index (5)	Worries index (6)	Depression index (7)
<i>Panel A: Fig 2c</i>							
General Restrictions Index	-0.028*** (0.009)	-0.008 (0.008)	-0.028*** (0.008)	-0.077*** (0.018)	-0.070 (0.059)	-0.024 (0.059)	-0.066** (0.029)
Mean confirmed Covid19 cases per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean confirmed Covid19 deaths per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Fig 2d</i>							
After 23 March x UK	-0.153*** (0.024)	-0.182*** (0.020)	-0.135*** (0.019)	-0.074*** (0.019)	-0.520*** (0.044)	-0.150*** (0.035)	-0.049* (0.029)
Δ Confirmed Covid19 cases pc capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Confirmed Covid19 deaths per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Confirmed Covid19 cases per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Confirmed Covid19 deaths per capita	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-education FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-age-gender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Observations at the country level. Standard errors are robust.

F Weight Construction

This section describes the construction and use of weights included with the survey data. The included weights correct for differences in income, education, and age and gender structure between survey respondents and the general population in each country. For countries that lack data on one of the dimensions, the weights correct for the available dimensions.

We use data on the population structure from the United Nations statistical agency to construct the weights.⁵ To weight by income we use data from the Gallup World Poll.⁶

Table 5 displays the age-gender bins used for reweighting to account for the population structure. This definition means that we cannot construct weights for respondents who indicate ‘other’ as gender. To construct income weights, we use country-level income quintiles. Finally, we use three education categories to construct weights: less than 8 years of education, between nine and 14 years of education, and 15 and more years of education.

These age bins are then used to construct weights based on the frequency of observations in the survey data according to the following formula:

$$j_weight_{ibc} = \frac{weight_{jb} \cdot N_c}{N_{jb}} \quad (5)$$

where j_weight_{ibc} is the weight for individual i in bin b , for category j (age-gender, income, education), and country c . $weight_{jb}$ is the fraction of the population in bin b of category j . N_{jb} is the number of individuals in our survey in bin b and N_c is the number of observations in country c . Intuitively, this formula put more weight on individuals in in bins with few observations and individuals in larger bins.

To construct aggregate individual-level weights we multiply the weights in different cate-

⁵The data can be accessed here: <http://data.un.org/Data.aspx?d=POP&f=tableCode%3A22>.

⁶We use the latest available wave of data for each country.

gories.⁷

$$weight_{ijbc} = \Pi_{j \in (educ, inc, ag)} j_weight_{ibc} \quad (6)$$

We also construct weights that account for the differential sample size across countries (weighting all countries equally) by dividing the weights by the number of observations in our sample.

$$weight_sample_{ijbc} = weight_{ijbc} / N_c \quad (7)$$

Table 5: Age bins used for reweighting

Age bin
18 - 19
20 - 24
25 - 29
30 - 34
35 - 39
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65+

⁷This implicitly assumes independence of distributions of the different categories.

G Robustness of findings

G.1 Group-level analysis

In this Appendix, we report the results of an exercise that highlights the level of uniformity in attitudes towards social distancing measures and towards the broader government responses to the COVID-19 pandemic. We proceed in two steps. We first split our data by country, gender, median income, and median age. This produces 464 distinct social groups (with group size ranging from $N=2636$ to $N=15$). Second, for each question, we sort the groups by their average response and then plot them in Figure 6. In Figure 7 we show the same graph, but with dot sizes proportional to the number of observations per subgroup. Finally, we repeat the same exercise using the representative data for the UK and US (Figure 8).

This exercise shows a remarkable level of uniformity in attitudes towards social distancing and the broader government response to the pandemic. We are unable to find a single social group where the majority of individuals think that the reaction of their government has been excessive. Similarly, there is no social group where a majority of individuals believe that social distancing measures are not effective.

G.2 Robustness of UK case study

In this Appendix we show that the UK case study results are robust to (i) using a different set of counterfactual and to accounting for differential selection into the survey over time. The results of both analysis support the conclusions of the analysis presented in the main paper.

Varying counterfactuals For the main analysis we use a set of four countries (Germany, Sweden, the United States, and Brazil) as control group in the difference-in-differences estimation. The results of this analysis are displayed in Table 6. The main results on “Government reaction insufficient” are extremely robust to the choice of counterfactual. Further results are qualita-

tively similar for almost all specifications, though some estimates are more noisily estimated and not always statistically significant.

Table 6: Robustness of UK case study to using different counterfactuals

	UK vs Germany	UK vs US	UK vs Brazil	UK vs Sweden
Public reaction insufficient	-0.020 (0.044)	-0.009 (0.034)	0.042 (0.047)	-0.141*** (0.022)
Government reaction insufficient	-0.118*** (0.040)	-0.142*** (0.029)	-0.144*** (0.039)	-0.215*** (0.026)
Trust government	0.053 (0.055)	0.053 (0.035)	0.077* (0.039)	0.146*** (0.024)
Government truthful	0.031 (0.052)	0.052 (0.033)	0.075 (0.046)	0.104*** (0.024)
Misperception index	-0.185** (0.075)	-0.100* (0.057)	-0.107 (0.090)	-0.565*** (0.049)
Worries index	-0.096 (0.111)	-0.048 (0.074)	-0.114 (0.102)	-0.145** (0.056)
Depression index	-0.006 (0.083)	-0.127 (0.095)	-0.050 (0.093)	-0.080* (0.045)
Number of observations	19424	22208	22378	16894

Notes: Notes: Coefficient estimates represent the estimated treatment effect of the announcement of a lockdown in the UK as described in SI-E using different countries with more than 5000 responses as counterfactual. Columns indicate the country of comparison. Rows indicate the dependent variable. Heteroskedasticity robust standard errors are displayed in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Time varying selection into the survey Another potential concern is that the selection into the survey changed over time. This change in the composition of respondents could lead to differential answers to the survey that are not related to the announcement of the lockdown in the UK. To alleviate this concern, we reconstruct all weights based on the samples before

and after the lockdown announcement. Figure 3 shows that the main effects on perceptions of government and the public are robust to accounting for differential selection over time in this way. The effect on the worries index becomes somewhat muted when including these weights.

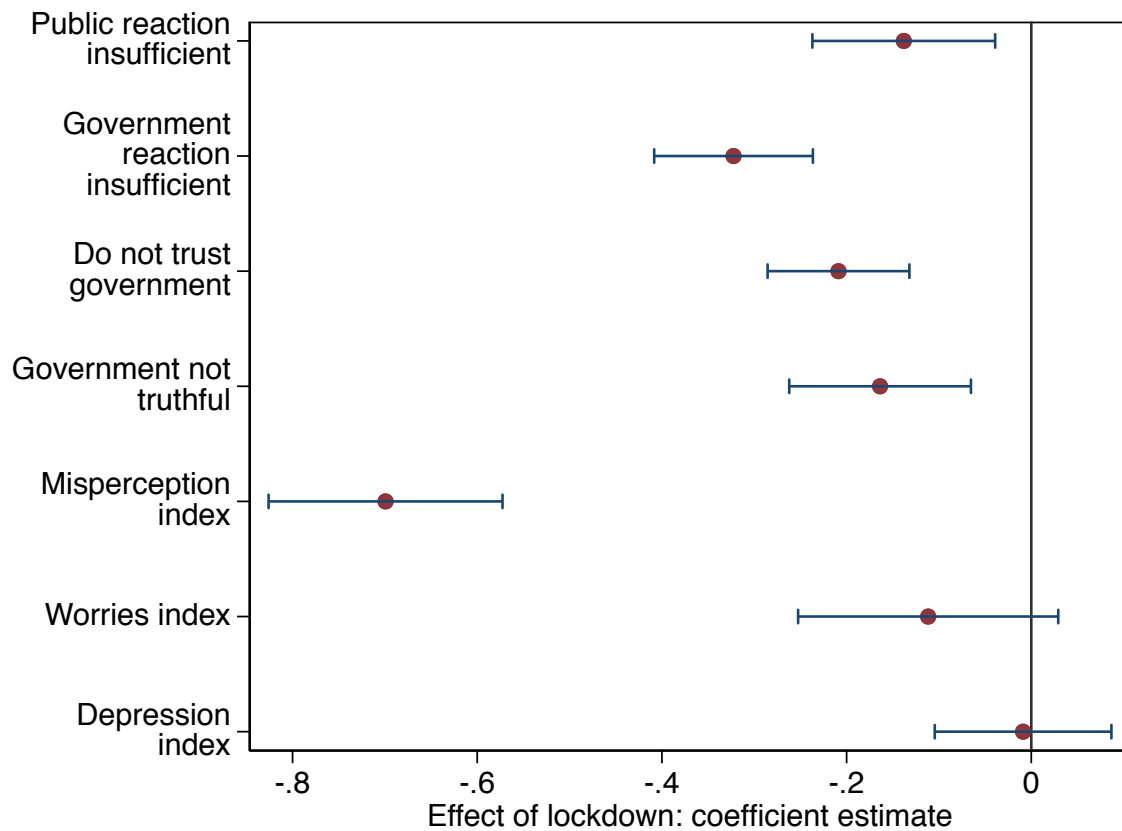
H Other Supplementary Figures and Tables

Table 7: Relationship between own behavior and own and perceived attitudes

	Self-reported behavior index			
	(1)	(2)	(3)	(4)
Own attitudes count	0.461*** (0.061)	0.292*** (0.028)	0.294*** (0.028)	0.296*** (0.027)
Perceived attitudes index	0.221*** (0.045)	0.115*** (0.029)	0.110*** (0.028)	0.107*** (0.028)
Age	No	No	Yes	Yes
Female	No	No	Yes	Yes
Income bracket	No	No	Yes	Yes
Education bracket	No	No	Yes	Yes
Own health	No	No	Yes	Yes
COVID-19 cases per capita	No	No	No	Yes
Lagged COVID-19 cases per capita	No	No	No	Yes
COVID-19 deaths per capita	No	No	No	Yes
COVID-19 deaths per capita	No	No	No	Yes
Country-age-gender FE	No	Yes	Yes	Yes
Observations	107565	107354	101678	101313

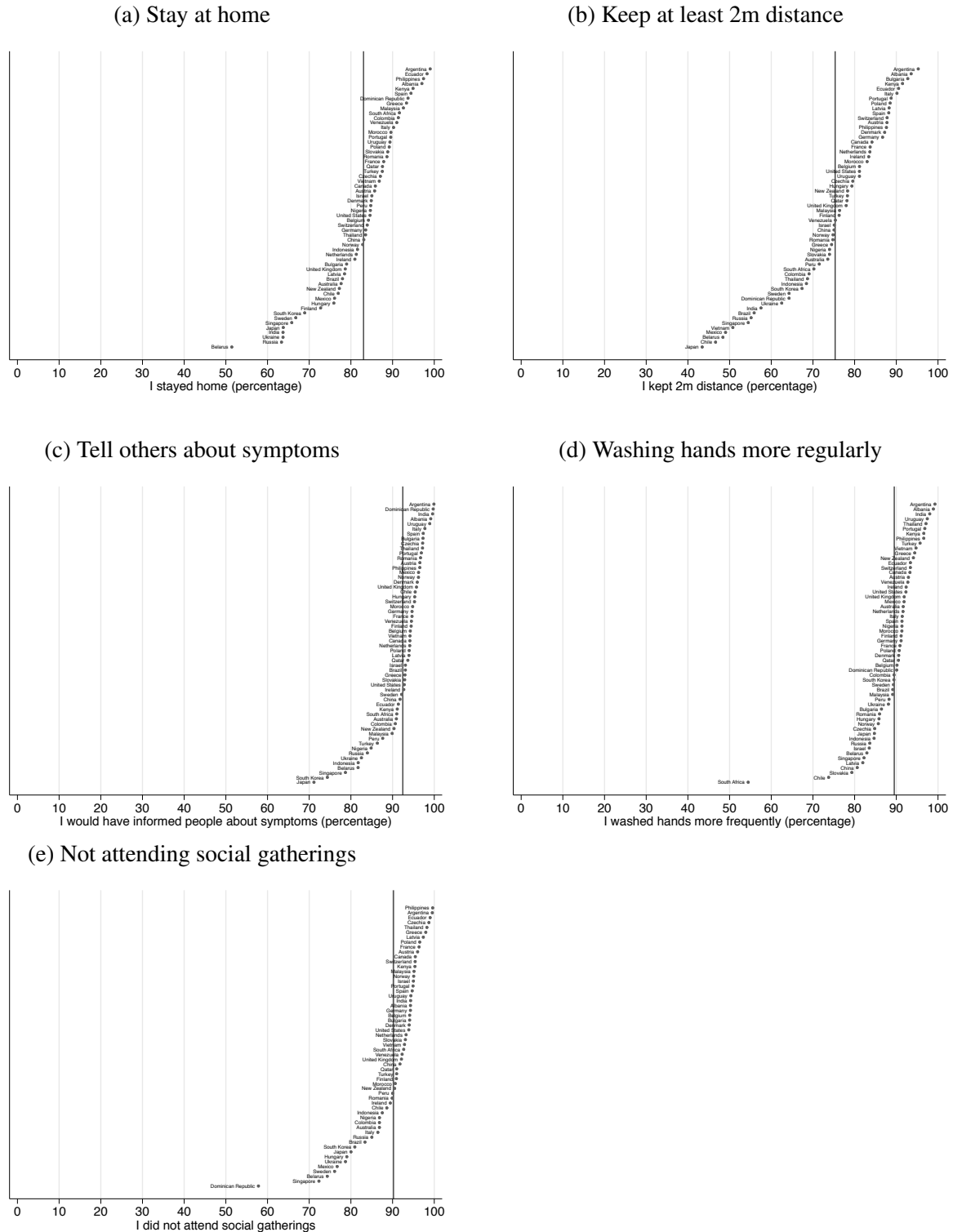
Notes: This tables shows four different regressions of the outcome variable specified in the column header on first-order and second-order attitudes towards protective behavior. Standard errors are clustered by country and are shown in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 3: Impact of lockdown announcement in the UK - reweighted



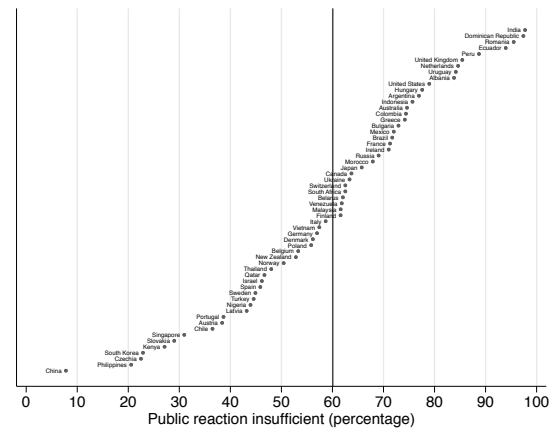
Notes: Notes: Coefficient estimates represent the estimated treatment effect of the announcement of a lockdown in the UK as described in SI-E using countries with more than 5000 responses as counterfactual. Observations are weighted to be representative of age, gender, education, and income. Weights are constructed as described in SI-F for the pre and post announcement period to account for differential selection into the survey. Horizontal bars indicate 90% confidence intervals. Standard errors are robust to heteroskedasticity.

Figure 4: Cross-country variation in self-reported COVID-19 protective behaviors in the last 7 days

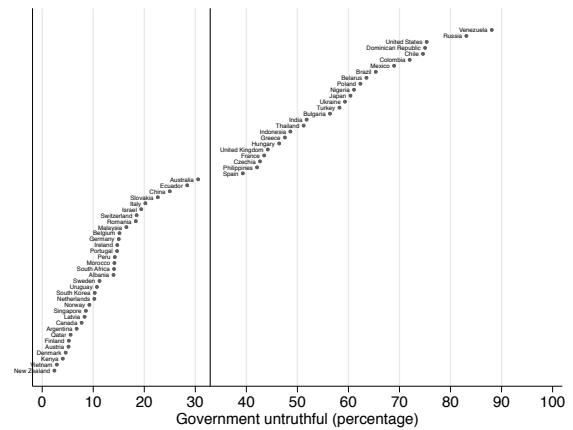


This figure presents the country averages for the five COVID-19 protective behaviors that were surveyed. Countries are included if they contributed at least 200 respondents. Individual observations were reweighted by education, gender, age and income to render them representative at the country-level.

(b) Public reaction insufficient



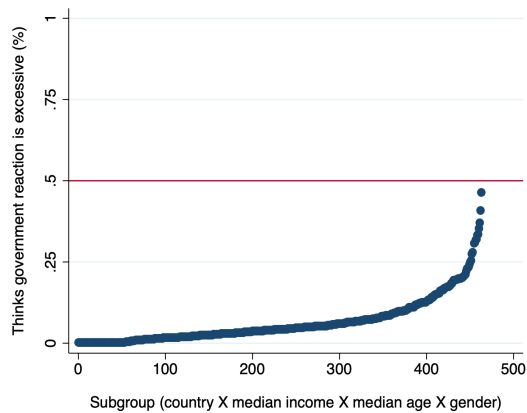
(d) Government has not been truthful about COVID-19



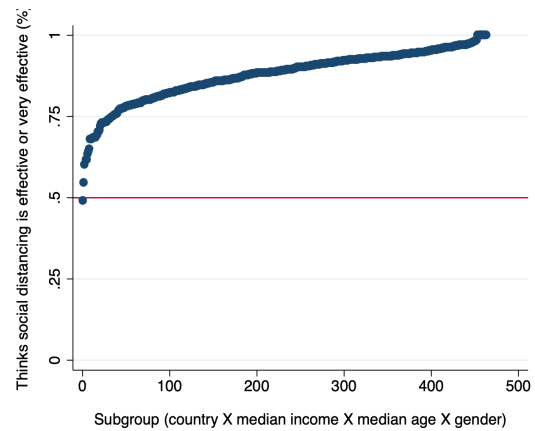
39

Figure 6: Average responses by subgroup
Snowball sample

(a) The reaction of the government has been extreme



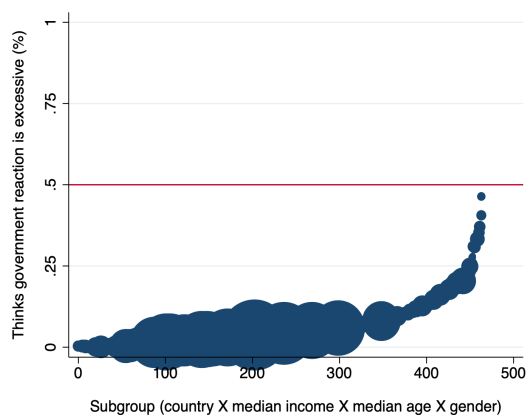
(b) Social distancing measures are effective



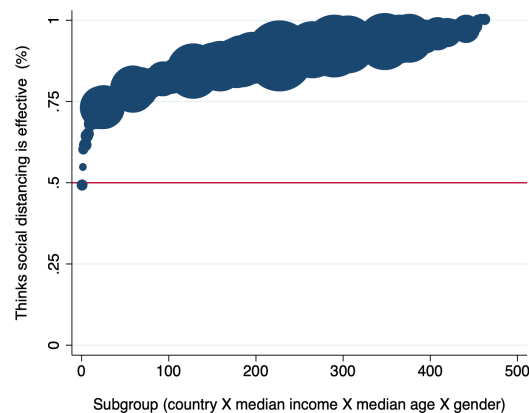
This figure shows subgroup averages of individual perceptions of (i) whether the government response to the COVID-19 pandemic has been excessive and (ii) whether social distancing is effective. The sample includes respondents from countries for which we have at least 200 responses ($N = 107,565$). To produce the figure, we first split the sample into 464 subgroups based on country, gender, median age and median income. We then calculate average perceptions in each subgroup, order the subgroups by their average perception, and plot these values in the figure.

Figure 7: Average responses by subgroup
Snowball sample, dots weighted by subgroup size

(a) The reaction of the government has been extreme



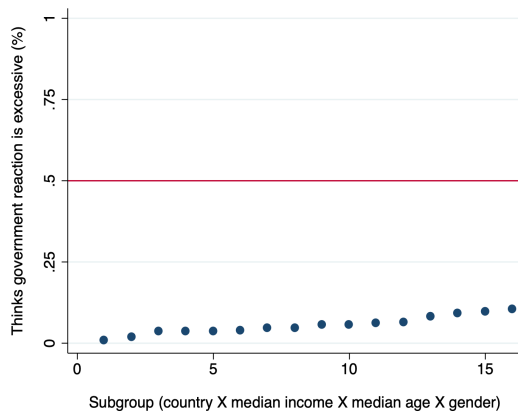
(b) Social distancing measures are effective



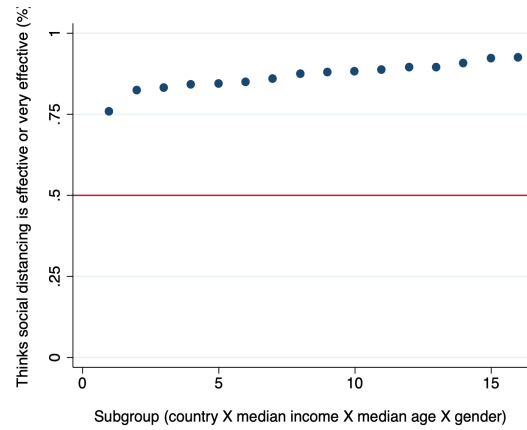
This figure shows subgroup averages of individual perceptions of (i) whether the government response to the COVID-19 pandemic has been excessive and (ii) whether social distancing is effective. The sample includes respondents from countries for which we have at least 200 responses ($N = 107,565$). To produce the figure, we first split the sample into 464 subgroups based on country, gender, median age and median income. We then calculate average perceptions in each subgroup, order the subgroups by their average perception, and plot these values in the figure, weighting each subgroup by its sample size in our data.

Figure 8: Average responses by subgroup
Representative sample

(a) The reaction of the government has been extreme



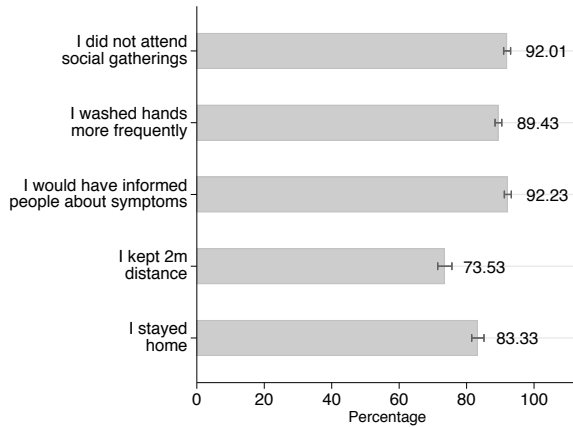
(b) Social distancing measures are effective



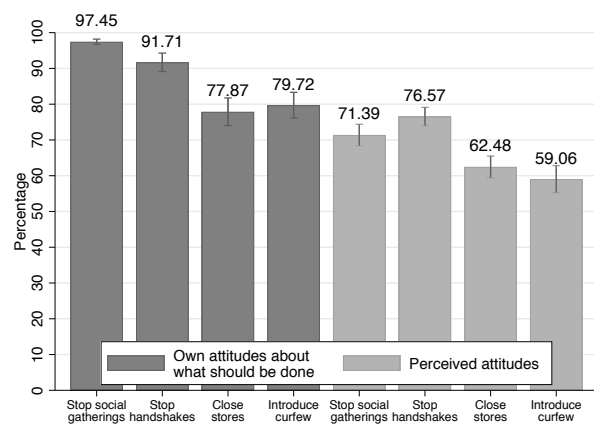
This figure shows subgroup averages of individual perceptions of (i) whether the government response to the COVID-19 pandemic has been excessive and (ii) whether social distancing is effective. The sample includes respondents from the representative surveys in the US and UK ($N = 2,000$). To produce the figure, we first split the sample into subgroups based on country, gender, median age and median income. We then calculate average perceptions in each subgroup, order the subgroups by their average perception, and plot these values in the figure.

Figure 9: Results without applying weights - Global Reactions and Perceptions of Reactions to COVID-19

A High global compliance with protective behaviors



B Large under-estimation of others' attitudes



C Broad cross-country agreement that government response is not excessive

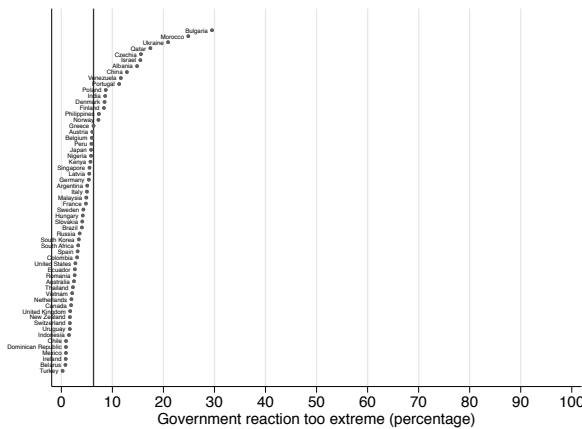
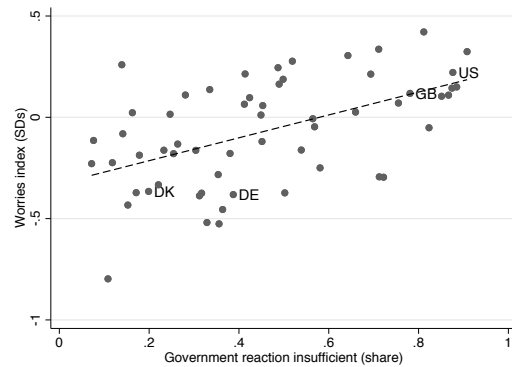
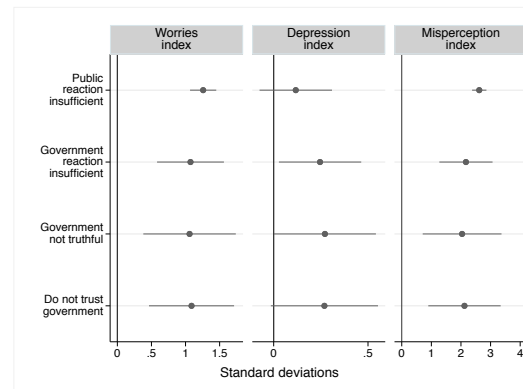


Figure 10: Results without applying weights - Perceptions of Government Policy, Public Reaction, Social Norms, and Mental Health

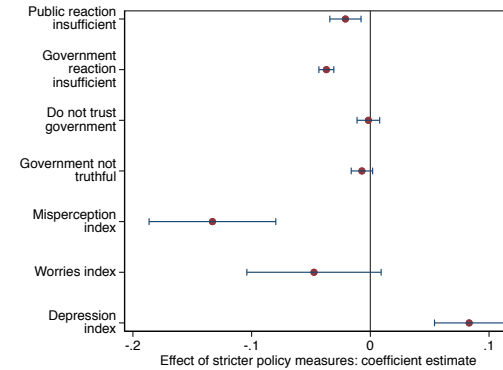
A Positive association of perceived insufficient government response and worries



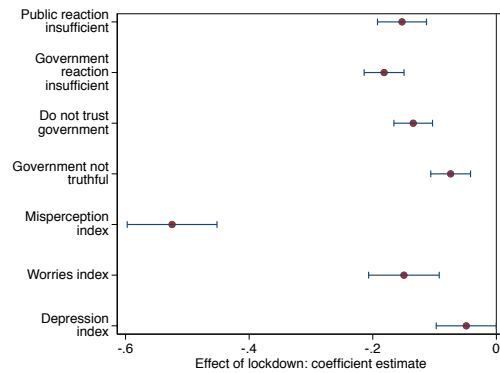
B Associations of perceived government/public reaction and mental health



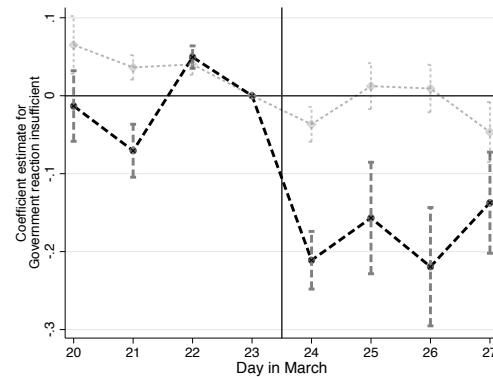
C Policy shifts to more restrictions reduce worries



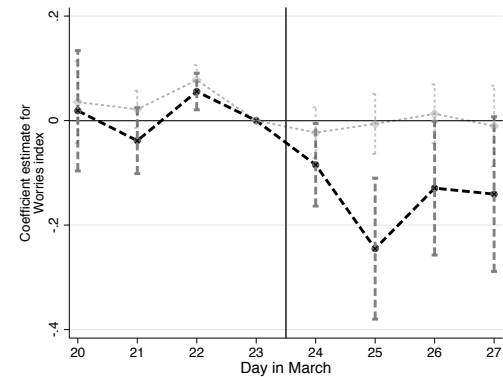
D UK lock down on March 23 reduced worries



E UK lock down immediately improved perception of government response



F UK lock down directly reduced worries



Notes: All indices are defined and described in SI-C. Regressions are further described in SI-E. Respondents from countries with at least 200 responses are included. Panel **A** shows the cross-country relationship between the share of respondents perceiving their government's response as insufficient and a worries index. Panel **B** captures pairwise relationship between the variables indicated in the figure heading and row across countries. The regressions in Panel **C** are estimated using the country x date weighted average data, controlling for country and day fixed effects; the independent variable is an index of strictness of government response in a country. The regressions in Panel **D** are estimated using the individual-level data from the UK and a set of control group countries. The regressions control for country-by-education-by-gender fixed effects and date fixed effects. The independent variable is an indicator variable taking the value 1 for respondents participating from the UK after the 23 March 2020. Panels **E** and **F** illustrate the impact of the UK lockdown announcement among respondents from the UK compared to the average time trend among participants from control group countries on perceptions of sufficiency of the government response and the worries index. The underlying data is the survey data that was collected using snowball sampling from March 20th to April 6th 2020 (N= 107,565).

References

1. K. Kroenke, R. L. Spitzer, J. B. Williams, *Journal of General Internal Medicine* **16**, 606 (2001).
2. T. Hale, A. Petherick, T. Phillips, S. Webster, Variation in government responses to COVID-19 (2020).