Covid-19 Exposure and Government Support in England

Pre-Analysis Plan

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Overview

Our study will use an original survey with embedded experiments to measure the effects of Covid-19 exposure on government support and responsibility attribution. We focus on three forms of exposure to Covid: epidemiological (having the disease), socioeconomic (experience of the social and economic costs of restrictions) and geotropic (local variation in prevalence compared to national averages).

Our unit of analysis is the individual survey respondent, restricting the sample to those resident in England for whom Covid-19 restrictions are the responsibility of the UK (Westminster) government. The sample is sourced from DeltaPoll's online panel in accordance with BPC compliant procedures, with around 1500 respondents in total.

Survey respondents are randomly assigned into one of five groups, including one control. All respondents are given an opening vignette outlining up to date figures on Covid deaths and vaccination rates in the United Kingdom. Groups 1 to 4 are then given additional vignettes, attributing responsibility toward and away from government for vaccine success (a positive outcome) and deaths (a negative outcome). The experimental treatment groups are summarised in the table below, and the full vignettes can be found in the appendix.

The remainder of the survey asks respondents a range of questions about their personal experiences with Covid, including whether they or their close ones have personally had the disease or received a vaccine, and how the pandemic has shaped their economic circumstances. In addition, respondents are asked a range of questions about how they

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Responsibility Treatment	Outcome Treatment	
	Vaccines (Positive)	Deaths (Negative)
Govt Responsible	Group 1 (n=300)	Group 3 (n=300)
Govt Not Responsible	Group 2 (n=300)	Group 4 (n=300)
Control	Group 5 (n=300)	

Figure 1: Summary of Treatment Groups

attribute responsibility for various pandemic-related outcomes, about their trust and approval of the government and NHS, and about their perceptions of local rates of deaths and vaccinations compared to the national average.

Empirical Expectations

Informational Effects

A core theoretical premise of the research is that responsibility attribution for Covid-related outcomes affect government support. When government responsibility over a positive outcome (vaccines) is primed, government support will increase. Conversely, when responsibility for a negative outcome (death rates) is emphasised, support will decline.

These phenomena are connected by the more general microfoundational assumption that voters reward and punish governments for issues over which they are perceived to be responsible (Powell and Whitten 1993). This expectation holds regardless of treatment groups, and is in effect positing that support is *mediated* by responsibility attribution. The experimental primes then simply cause responsibility attributions to update, with knock on effects for support. Each of these observable implications are summarised in H1-H6 below.

Experimental Hypotheses (Information)

H1 (Vaccines Responsibility | Vaccines Prime): Respondents in Group 1 (2) will see the government as more (less) responsible for the vaccine roll out, compared to Group 5.

H2 (Deaths Responsibility | Deaths Prime): Respondents in Group 3 (4) will see the government as more (less) responsible for Covid deaths, compared to Group 5.

H3 (Government Support | Vaccines Prime): Respondents in Group 1 (2) will have higher (lower) support for government handling of Covid-19, compared to Group 5.

H4 (Government Support | Deaths Prime): Respondents in Group 3 (4) will have lower (higher) support for government handling of Covid-19, compared to Group 5.

General Mechanism (Information)

H5 (Government Support | Vaccines Responsibility): Respondents who see the government as more (less) responsible for vaccines will have higher (lower) support for government handling of Covid-19.

H6 (Government Support | Deaths Responsibility): Respondents who see the government as more (less) responsible for Covid deaths will have lower (higher) support for government handling of Covid-19.

Exposure Effects

We also seek to make a novel contribution to the literature by testing the political effects of individual level exposure to the pandemic. We focus on three dimensions of exposure: epidemiological, socioeconomic and geotropic.

Epidemiological Exposure

Firstly we consider epidemiological exposure, asking respondents whether their close family or friends have had Covid, or if they have had the disease personally, alongside questions about vaccine receipt. For respondents exposed to Covid personally or through a close friend or family member, we also ask about the severity of symptoms, ranging from asymptomatic through to hospitalisation. In addition, we ask respondents if they are suffering from "long Covid", a drawn out version of the disease in which symptoms can last for several months after infection. Finally, we ask respondents if any of their close friends or family members have died from the disease.

As respondents are exposed to more severe Covid symptoms, we expect that they will see the government as having failed to protect them from the disease. This implies that their general approval of the government's handling of the pandemic and trust in government and political institutions will be negative, relative to those who were not infected. Respondents who either did not have the disease, or had it only asymptomatically, will have comparatively higher general support and political trust.

These effects might vary for particular aspects of government handling, however. Respondents exposed to severe Covid might be more likely to see lockdowns and their associated socioeconomic consequences as more necessary, given their lived experience of

the disease. As a result, such respondents will have higher support for the government's handling of Covid-related economic problems and educational attainment gaps, even if general support is lower as previously specified. For respondents who have exposure only to asymptomatic symptoms or who do not have the disease at all, we might expect less tolerance of the high economic and social costs of lockdowns. We measure this effect by seeing if respondents have *lower* support for government handling of these particular socioeconomic measures, and if respondents are more likely to agree that the social and economic costs of lockdowns outweigh the health benefits.

Tangentially, we also expect support for and trust in the NHS to be higher among respondents exposed to hospitalisation due to Covid, either personally or through a close friend or family member. Theoretically, this builds on existing work in Britain showing an association between the use of NHS services and support for the system (Appleby and Roberton 2016).

With respect to vaccines, we expect all respondents with exposure to vaccine receipt, either personally or through a close one, to have higher approval of the government's handling of the rollout. We expect receiving the vaccine personally to have an additional positive effect on support, allowing us to test whether a grievance exists among younger respondents not yet offered a dose. We ask respondents how long ago they received their first dose. Based on existing literature on recency bias, we expect positive approval effects to be higher for those who received the vaccine more recently.

Exposure to both deaths and vaccines are expected to condition the effects of the treatment vignettes. Respondents who report a close friend or family member dying will see larger effects from the deaths treatment. In line with the negativity bias literature, we expect such respondents to respond more negatively to the experimental prime attributing responsibility to the government for Covid deaths. In the other direction, we expect respondents who have received a vaccine to respond more positively to the prime associating government to the rollout.

The empirical implications of epidemiological exposure are summarised in the hypotheses below. "Exposure" generally refers to both the respondent personally and their close friends and family, operationalised later in the pre-analysis plan.[1] However we are aware that respondents could be more responsive to their own *personal* experiences of the disease, holding the condition of their close ones constant.

> **H7a** (Government Support (General) | Covid Exposure): Respondents more exposed to Covid will have lower support for the government's general handling of the pandemic.
>
> **H7b** (Political Trust | Covid Exposure): Respondents more exposed to Covid will have lower levels of political trust.

[1] Note that where hypotheses refer to a particular type of symptom, such as H8c, we measure only this symptom.

H8a (Government Support (Socioeconomic) | Covid Exposure): Respondents more exposed to Covid will have higher support for the government's handling of economic and educational consequences of the pandemic.

H8b (Lockdown Support | Covid Exposure): Respondents more exposed to Covid will be more likely to think the health benefits of lockdowns outweigh the socioeconomic costs.

H8c (Government Support (Socioeconomic) | Asymptomatic Exposure): Respondents more exposed to asymptomatic Covid will have lower support for the government's handling of economic and educational consequences of the pandemic, all else being equal.

H8d (Lockdown Support | Asymptomatic Exposure): Respondents more exposed to asymptomatic Covid will be less likely to think the health benefits of lockdowns outweigh the socioeconomic costs.

H9 (NHS Support | Hospitalisation): Respondents exposed to Covid hospitalisation will have higher support for and trust in the NHS.

H10 (Support | Personal Exposure): The effects of H7a - H9 will be larger for respondents who personally had Covid with the relevant symptom(s) of interest.

H11a (Government Support | Vaccine Exposure): Respondents more exposed to vaccines will have higher support for the government's handling of the vaccine rollout and greater general political trust.

H11b (Government Support | Vaccine Personal): The magnitude of H11a is higher for respondents who have personally received at least one dose of the vaccine.

H11c (Government Support | Vaccine Recency): The magnitude of H11b increases as personal vaccine exposure becomes more recent.

H12 (Government Support | Vaccine Prime & Vaccine Exposure): The effect of the vaccine prime on government support (H3) will be more positive for respondents with higher vaccine exposure.

H13 (Government Support | Deaths Prime & Deaths Exposure): The effect of the deaths prime on government support (H4) will be more negative for those with deaths exposure.

Socioeconomic Exposure

We also measure exposure to the socioeconomic consequences of the Covid pandemic, with a particular focus on economic and educational costs.

Firstly, we expect respondents who have experienced negative changes to their personal economic circumstances as a result of the pandemic to have lower levels of general support for the government, lower political trust and lower support for lockdowns. We expect unemployed and worse off respondents to feel that the government has failed to protect their economic interests throughout the pandemic, thus excluded from the government's rhetoric and actions with respect to furlough. This grievance implies that people see the government as having made an active choice to not take care of them, such that they see the government as more responsible for unemployment and the general state of the economy as a result of the pandemic.

Secondly, we expect the receipt of government assistance packages, such as furlough or equivalent grants for the self-employed, to increase government support but reduce perceived responsibility for unemployment and economic ills. Receiving government money in this way will lead voters to support the government's efforts, viewing residual unemployment and economic harm (occuring despite assistance programmes) as being beyond government control. We also expect government trust to be higher among such respondents, since the government has visibly protected their economic interests throughout the pandemic.

Thirdly, we expect respondents with children to hold the government more responsible for lost schooling, due to the increased probability that such people are directly impacted by the decision to close schools.

Fourthly, we expect respondents whose mental health has suffered more under the pandemic to have more negative evaluations of general government handling, handling of economic and educational outcomes, and support for lockdowns.

The empirical expectations from socioeconomic exposure are summarised in the hypotheses below:

> **H14a** (Government Support | Economically Affected): Respondents with negative economic exposure will have lower support for the government's handling of unemployment and the general economy over the course of the pandemic, and lower trust in government.
>
> **H14b** (Lockdown Support | Economically Affected): Respondents with negative economic exposure will be less likely to think the health benefits of lockdowns outweigh the socioeconomic costs.
>
> **H14c** (Government Support | Assistance): Respondents who received financial assistance from the government over the course of the pandemic will have higher support for the government's handling of unemployment and general economic performance.
>
> **H15a** (Government Responsibility | Neg Economically Affected): Respondents with negative economic exposure will see the government as more

responsible for unemployment and general economic performance over the course of the pandemic.

H15b (Government Responsibility | Assistance): Respondents who received financial assistance from the government over the course of the pandemic will see the government as less responsible for unemployment and general economic performance.

H16a (Government Support | Have Children): Respondents with children will have lower support for the government's handling of education over the course of the pandemic.

H16b (Government Support | N. Children): The magnitude of H14a will increase with the number of children a respondent has.

H17a (Government Responsibility | Have Children): Respondents with children will see the government as more responsible for lost schooling over the course of the pandemic.

H17b (Government Responsibility | N. Children): The magnitude of H15a will increase with the number of children a respondent has.

H18a (Government Support | Mental Health): Respondents who have had more severe mental health problems because of the pandemic will have lower support for the government's general handling, alongside more negative support for government handling of education and the economy.

H18b (Lockdown Support | Mental Health): Respondents who have had more severe mental health problems because of the pandemic will be less likely to think the health benefits of lockdowns outweigh the socioeconomic costs.

Geotropic Effects

There is significant subnational variation in Covid-19 death and vaccination rates. While restrictions have been uniform across the country since January, the probability of exposure to deaths or vaccines is still subject to large variation depending on where in England a respondent lives. We hence seek to test whether people's perceptions of national performance are in fact a function of local, "geotropic" variation. Such an argument shares elective affinities with recent literature on the local determinants of economic evaluations and incumbent support (Reeves and Gimpel 2012; Ansolabehere, Meredith, and Snowberg 2014).

To this end, our survey asks respondents how they perceive death and vaccination rates, alongside economic performance, in their local area compared to national averages. This gives insight into whether voters benchmark their response to Covid. We expect support for the government's handling of the pandemic to be higher for respondents who see

their local area as having a below average death rate or above average vaccination rate. We also expect support for lockdowns and perceptions of the government's handling of the economy to be worse for voters who see their local area as having had an above average economic downturn.

It is also possible that voters form geotropic perceptions in biased ways. Namely, respondents who approve of government handling in general might succumb to a form of motivated reasoning, claiming their local area has performed better in the specific. To address this issue, we will link respondents to objective measures of local unemployment, death and vaccination rates, as a way to test the accuracy of geotropic perceptions. This will provide insight about the origins of any benchmarking effect, if indeed one is present.

H19 (Government Support | Perceived Local Deaths): Respondents who perceive death rates in their local area to be above (below) the national average will have lower (higher) support for the government's handling of Covid deaths.

H20 (Government Support | Perceived Local Vaccines): Respondents who perceive vaccine rates in their local area to be above (below) the national average will have higher (lower) support for the government's handling of Covid deaths.

H21 (Perceived Local Deaths | Local Deaths): Respondents who perceive death rates in their local area to be above (below) the national average will live in areas where local death rates are objectively higher (lower) than the national average.

H22 (Perceived Local Vaccines | Local Vaccines): Respondents who perceive vaccine rates in their local area to be above (below) the national average will live in areas where local death rates are objectively higher (lower) than the national average.

H23 (Lockdown Support | Perceived Local Economy): Respondents who perceive economic performance in their local area to be below (above) the national average will be less likely to think the health benefits of lockdowns outweigh their socioeconomic costs.

H24 (Government Support (Economic) | Perceived Local Economy): Respondents who perceive economic performance in their local area to be below (above) the national average will have lower (higher) support for the government's handling of the economy.

H25 (Perceived Local Economy | Local Unemployment): Respondents who perceive economic performance in their local area to be below (above) the national average will live in areas where local unemployment rates are higher (lower).

Partisan and Demographic Effects

Finally, we expect partisan sympathies and demographic characteristics to bias responsibility attribution and performance evaluation, as has been established in the general literature.

On the one hand, partisan identifiers might respond more strongly to treatment in a manner that favours their preferred party (Evans and Pickup 2010). Under this biased information processing logic, respondents who feel close to the Conservative Party will attribute more responsibility to the government for vaccines in response to treatment, but less for deaths. Similarly, the increase in approval will be higher for vaccines, and any negative effects from deaths will be smaller. These trends are reversed for supporters of opposition parties.[2]

Alternatively, partisanship might dampen the effects of treatment on responsibility and approval (Tilley and Hobolt 2011). We might expect Conservative supporters to have a disproportionately high level of support for the government and to be more likely to attribute responsibility for positive outcomes, such as vaccines, prior to receiving treatment. These effects would be reversed for opposition supporters. From this high starting point, there may then be diminishing marginal returns to treatment. For example, baseline Conservative approval among supporters might be 8, increasing to 9 after receiving the vaccines treatment, an ATE of 1. For non partisan identifiers, the corresponding shift might be from 5 to 7, an ATE of 2. If such an account is correct, then treatment effects are attenuated by partisanship.

A further area of partisan bias relates to trust in experts. Both vignettes for the deaths treatment groups (groups 3 and 4) allude to experts believing that deaths are or are not the responsibility of the government. We expect Conservative supporters who receive the deaths responsibility treatment to trust experts less (and vice versa), since experts are contradicting their partisan priors. The reverse relationship will hold for opposition supporters.

We note that the British electorate has become increasingly volatile in recent years, with record numbers changing party choice and not feeling close to any party (Fieldhouse et al. 2019). This implies that there should be sufficient variation to leverage when addressing partisan heterogeneity.

Finally, we will interact treatment group with a range of demographic indicators (such as age, gender, education, income and home-ownership) to offer an initial exploration of effect heterogeneity. The findings can be used to inform future research in the field. One specific source of heterogeneity we wish to pre-register relates to the effect of

[2]By "opposition", we predominantly refer to the English Labour, Liberal Democrat and Green parties. We note that respondents supporting other right-leaning or socially conservative parties in the UK, such as UKIP or the Reform Party, might have more pro-Conservative partisan biases. However the number of respondents supporting such parties is expected to be incredibly low, with recent polling averages consistently putting their combined support at below 5%.

education on trust for experts, a phenomena of interest to scholars of populism. We broadly expect that respondents with higher levels of education will have greater trust in experts, all else being equal.

H26 (Government Support | Partisanship): Respondents who feel close to the Conservative Party (an opposition party) will have higher (lower) general support for the government's handling of the pandemic.

H27a (Government Support | Vaccines Prime & Partisan Processing): The positive effects of the vaccine responsibility prime on government support will be larger (smaller) among those who feel close to the Conservative (an opposition) party.

H27b (Government Support | Vaccines Prime & Partisan Diminishing Returns): The positive effects of the vaccine responsibility prime on government support will be smaller (larger) among those who feel close to the Conservative Party (an opposition party).

H28a (Government Support | Deaths Prime & Partisan Processing): The negative effects of the deaths responsibility prime on government support will be smaller (larger) among those who feel close to the Conservative (an opposition) party.

H28b (Government Support | Deaths Prime & Partisan Diminishing Returns): The negative effects of the deaths responsibility prime on government support will be larger (smaller) among those who feel close to the Conservative (an opposition) party.

H29 (Deaths Responsibility | Partisanship): Respondents who feel close to the Conservative Party (any other party) will see the government as less (more) responsible for death rates.

H30 (Vaccine Responsibility | Partisanship): Respondents who feel close to the Conservative Party (an opposition party) will see the government as more (less) responsible for the vaccine roll-out.

H31a (Vaccine Responsibility | Vaccines Prime & Partisan Processing): The positive effects of the vaccine responsibility prime on perceived government responsibility for vaccines will be larger (smaller) among those who feel close to the Conservative (an opposition) party.

H31b (Vaccine Responsibility | Vaccines Prime & Partisan Diminishing Returns): The positive effects of the vaccine responsibility prime on perceived government responsibility for vaccines will be smaller (larger) among those who feel close to the Conservative (an opposition) party.

H32a (Deaths Responsibility | Deaths Prime & Partisanship): The negative effects of the deaths responsibility prime on perceived government responsi-

bility for deaths will be smaller (larger) among those who feel close to the Conservative (an opposition) party.

H32b (Deaths Responsibility | Deaths Prime & Partisanship): The negative effects of the deaths responsibility prime on perceived government responsibility for deaths will be larger (smaller) among those who feel close to the Conservative (an opposition) party.

H33 (Trust Experts | Deaths Prime & Partisanship): Trust in experts will be lower (higher) among those who feel close to the Conservative Party and are in Treatment Group 3 (4). These effects are reversed for opposition supporters.

H34 (Trust Experts | Education): Trust in experts will be higher among respondents with a higher level of education.

Measures and Index Construction

Measuring Government Responsibility

We will provide two key measures of perceived government responsibility. Our survey instrument asks respondents to assess government responsibility over a range of Covid related issues (deaths, cases, unemployment, general macroeconomy, lost schooling, vaccine rollout and national lockdowns) on a scale of 1-10, where 10 signifies the highest level of responsibility. Where hypotheses are specific to one particular policy area, such as vaccines or deaths, we will use the response to that particular question. However, we will also run models that use a generalised measure of responsibility, taking the mean score across each of the 7 questions. For robustness, we will also use principal components analysis to develop optimal factor loadings for measuring general trust.

Measuring Government Support

In a similar vein, we will provide four measures of government support. We ask respondents to assess the government's handling of five Covid-related issues (overall handling, local handling, economic problems, vaccine rollout and educational impact), again on a scale of 1-10, where 10 signifies the highest level of approval. Where hypotheses are specific to one particular policy area, such as vaccines or deaths, we will use the response to that particular question. Where hypotheses relate to general government support, we will use two additional measures; the particular responses to overall handling of the pandemic, alongside an average across all 5 questions. Once again, we will also develop an alternative measure of general support using principal components analysis. In addition, we will also use Conservative voting intention as a supplementary measure of support for the government.

Measuring Political Trust

To measure general political trust, we will take the average trust given by respondents on a 1-10 scale for the government, parliament and political parties. We will also derive a measure using principal components analysis, which also accounts for trust in the NHS, media and experts. Where hypotheses refer to trust in a particular institution (e.g. the Government or the NHS specifically), we will use that specific question.

Measuring Epidemiological Exposure

Our core survey questions measuring epidemiological exposure focus on the experiences of the individual respondent and of their friends and family. We offer two central ways to operationalise these in the empirical analysis.

Firstly, we will run models which measure the number of people affected at each symptomatic level as distinct indicators, separating the respondent's personal experience with that of their close ones. This approach has the advantage that we allow each level of symptom to vary freely, allowing us to trace heterogeneous responses to some symptoms but not others. Yet it also carries the disadvantage that results are slightly harder to interpret, and neglects the fact that the respondent may be swayed by a combination of symptomatic experiences that is not picked up when each is measured independently.

To overcome this, we will also combine indicators into a singular index. While keeping personal exposure as a separate indicator (allowing us to measure H10), we will use a logarithmically weighted mean to measure exposure to the symptoms experienced by a respondent's close ones. This is specified in the equation below, where N_j refers the number of people who had covid at each level of syptomatic severity, and S_j represents a linear variable that increases from 1 to 4 for each level of severity. We apply a logarithmic weight to account for the fact that more people being affected by the disease represents greater exposure to the respondent, but that this effect has diminishing marginal returns. A problem with this approach is that we impose a linearity assumption onto each level of symptom. To ameliorate this, we will use different functional forms of S_j to reflect potential non-linearities. The resulting index converts severity and number of affected people into a convex function.

$$exposure_{covid_i} = \frac{\sum_{j=1}^{N} S_j}{N} \times ln(N+1) \tag{1}$$

Where hypotheses refer to hospitalisation, we recode symptoms to a binary measure of hospitalised (1) or not (0), and reconstruct the index accordingly. In the case of asymptomatic exposure, we measure the logged number of asymptomatic cases, and control for the functional forms of the number of cases more severe than this. Deaths exposure is operationalised as the logged number of reported deaths.

We use a similar technique to measure vaccine exposure, taking the log of the number of people who have received at least one dose. Again, personal exposure is measured as a seperate indicator, capturing various functional forms of the number of doses a respondent has received personally (0, 1 or 2).

Measuring Geotropic Exposure

To measure local variation in economic performance, vaccinations and death rates, we will use official government data. Respondents will be linked to their local area by the residence postcode they provide in the survey.

Death rates are available from coronavirus.data.gov.uk and disaggregated vaccination rates are available from england.nhs.uk/statistics. Both are updated daily, and will be taken up to the nearest available date prior to the survey being fielded. Local rates of unemployment are recored monthly and published by the House of Commons Library. We aim to use statistics at the lowest level of aggregation possible which we anticipate will be either the unitary or lower tier local authority level, roughly equivalent to the level of a town or small city, or a borough within a larger city. For death rates it might be possible to use more fine-grained data, while for unemployment data may only be available at the constituency level. In either case, we will evaluate effects at multiple levels.

Theoretically, we are interested in how local rates compare to those nationally. Therefore we will calculate the number of vaccinations and deaths per 100,000 people for each enumeration area, subtracting this from the corresponding UK-wide figures.

In models that seek to test the accuracy of respondents' perceptions, we will group each area into quintiles, corresponding to each point on the 5 point ordinal response scale (much worse through to much better) in the survey.

In models that simply control for local deaths and vaccines as a second level covariate, we will standardise the variable with mean 0 and standard deviation 1, prior to its inclusion in the regressions.

Estimation

Covariate Balance Test

To ensure that the randomisation process has been successful, we will present a balance check. The check will comprise a series of OLS models, in which membership of Groups 1-4, each compared to Group 5 (control), is modelled as a function of party identity, party closeness, leave-remain preference, age, gender, education and income. Our expectation is that no single demographic or political variable will exhibit a statistically significant and substantively large effect on treatment assignment. If this is the case,

we expect each models' F test to fail to reach statistical significance.

Initial Treatment Effects

Given that our key outcome measures are linear and treatment assignment is exogenous, treatment effects can be efficiently estimated with ordinary least squares (OLS) regression. Specifically, we will estimate models of the following form, where Y_i represents the outcome of interest (support/trust or responsibility) and β_1 represents the average treatment effect. While random assignment ensures that treatment effects are causally identified, covariate adjustment may be necessary if there is imbalance in the sample. In addition to this, for robustness we will run a set of models that include a vector of demographic and partisan covariates, γX_i, to enhance the precision of our estimates.

$$Y_i = \beta_0 + \beta_1 treat_i + \gamma X_i + \epsilon_i \tag{2}$$

In each case we compare a particular treatment group (1,2,3 or 4) to the control (5). This means that each regression is a pairwise comparison, such that adjustments for multiple arm treatment designs, such as a Bonferroni correction, are not necessary.

To model effect heterogeneity, we will interact treatment group status with each particular indicator of interest. This interaction can be interpreted as the marginal effect of the indicator on the causal effect of treatment.

Multilevel Treatment Effects

When considering the effect of local and national coronavirus rates, we are modelling social phenomena that occur at distinct levels of analysis. Individual survey respondents are nested local enumeration areas, at which variation in local death and vaccination rates occurs.

This hierarchical data structure will be handled in two ways. Firstly, we will use a standard OLS estimator as before, clustering standard errors by local authority (LA) to account for serial correlation within clusters (Abadie et al. 2017). Secondly, and as a robustness test, we will include a multilevel model with LA random slopes and intercepts. This allows us to trace cluster specific random effects but maintains partial pooling, such that the small number of individuals in each LA does not undermine the estimate as it might in a more demanding "within" fixed effects specification (Gelman and Hill 2007).

The model estimated will take the following form, where u_k represents the LA level variation in the intercept, v_k the subsequent variation in slope, and e_{ik} remaining individual-level error. G_k refers to geotropic vaccine or death rates.

$$Y_{ik} = (\alpha_0 + u_k) + (\beta_0 + v_k) treat_{ik} + \gamma X_{ik} + \eta G_k + \epsilon_{ik} \tag{3}$$

Causal Mediation Effects

Having established whether the treatment primes exhibit an effect on respondents' responsibility attributions and approval of government directly, we will perform a causal mediation analysis to analyse the mechanism in greater depth. This allows us to uncover the extent to which approval changes with responsibility attribution, as alluded to in H5 and H6. This relationship is outlined in the path diagram below.

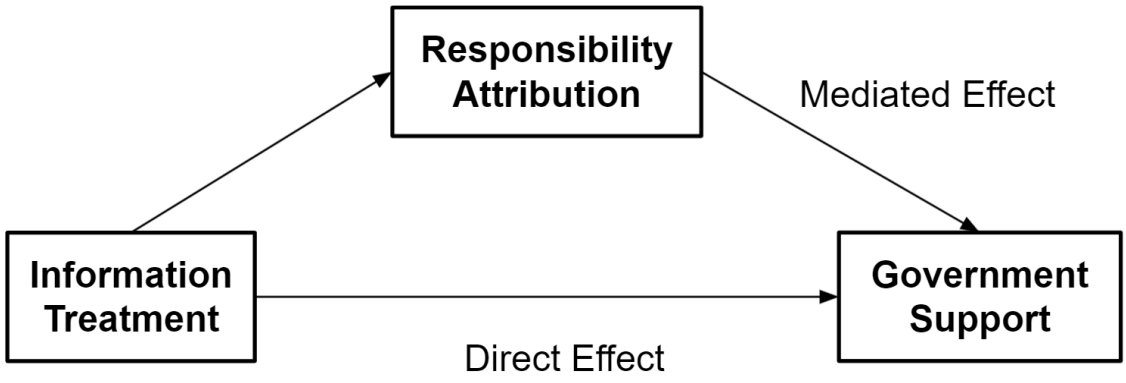

Figure 2: Mediation Mechanism

Specifically, we will use the `mediation` package in R (Tingley et al. 2014) to see whether responsibility attribution mediates any correlations between treatment assignment and government support. We will use the previously specified OLS models as our input, with and without a vector of demographic and partisan controls.

Mediation of this form requires making a two-pronged assumption of sequential ignorability (SIA) (Tingley et al. 2014). The first part of the assumption implies that treatment is ignorable with respect to pre-treatment covariates, which can be satisfied with random assignment. The second part implies that the mediator (perceived responsibility) is independent to potential outcomes (govt support), conditional on the observed treatment and pre-treatment covariates.

Substantively, we therefore assume that responsibility attribution is independent to government approval, conditional on demographic differences, party identity and treatment group. It is worth noting that the SIA is very strong and unlikely to ever be fully met in practice (Tingley et al. 2014). To partly address this, we will present sensitivity analyses in which variation in mediation effects are plotted against hypothetical deviations from the SIA. We also note that the mediation analysis is a supplementary test of our mechanism, rather than the empirical core of the paper.

Inference

For each OLS model we will report asymptotic and randomisation inference standard errors. In the case of randomisation inference, we will simulate different assignments of treatment and control to respondents, with 1,000 replications. This provides confidence that our findings are not dependent upon the particular random assignment that is realised in the experiment, meaning the assumption of treatment assignment ignorability, a core part of SUTVA, is empirically supported (Gerber and Green 2012).

For the mediation models, we will estimate uncertainty with a nonparametric bootstrap with 1,000 replications.

Power Analysis

A power analysis was conducted to ensure that our sample size (c. 300 respondents per treatment group) is sensitive enough for us to pick up substantively meaningful treatment effects. Based on existing survey data from YouGov to which one of the authors had special access, we assume a standard deviation of 0.85 in perceptions of government handling of the pandemic. This ensures that a sample size of 290 per treatment group gives 80% power for a third of a standard deviation treatment effect.

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