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Vax attacks: How conspiracy theory belief undermines vaccine support

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Abstract

As the world continues to respond to the spread of a novel coronavirus (SARS-CoV-2, which causes the disease commonly known as COVID-19), it has become clear that one of the most effective strategies for curbing the pandemic is the COVID-19 vaccine. However, a major challenge that health organizations face when advocating for the uptake of the COVID-19 vaccine is the spread of related misinformation and conspiracy theories. This study examines factors that influence vaccine hesitancy using two online survey samples, one convenience and one nationally representative, collected in the early summer of 2020 during the height of the second peak of coronavirus cases in the United States. Given extant literature on vaccine hesitancy and conspiracy belief, we expect that three factors—conspiracy theory belief, political identity, and anti-intellectualism—have served to reduce COVID-19 vaccination likelihood. Accordingly, across our two independent samples we find that anti-intellectualism, conspiratorial predispositions, and COVID-19 conspiracy theory belief are the strongest and most consistent predictors of COVID-19 vaccine hesitancy. Notably, we also find that partisanship and political ideology are inconsistently significant predictors of COVID-19 vaccine hesitancy once conspiracy theory beliefs, anti-intellectualism, and control variables are accounted for in the models. When political tendencies are significant, they demonstrate a relatively small substantive association with COVID-19 vaccine hesitancy. We discuss implications for ongoing mass vaccination efforts, continued widespread vaccine hesitancy, and related political attitudes.



1. Introduction

Vaccine hesitancy has existed since vaccines were first developed¹ and represents an ongoing threat to global public health. It can decrease vaccination rates both directly through lessening vaccine uptake and indirectly through hostility to mandatory vaccination policies.^{2,3} Decreases in vaccination rates have contributed to the increased prevalence of preventable deaths

and the reappearance of previously eradicated diseases such as polio and measles.² Vaccine hesitancy challenges public health to such an extent that the World Health Organization (WHO) called it 1 of the 10 biggest threats to global health.⁴

In light of the COVID-19 pandemic, vaccine hesitancy is a particularly salient concern. In the United States, approximately a third of Americans do not plan on getting the COVID-19 vaccine.⁵ In other countries, COVID-19 vaccine acceptance rates vary widely.⁶ Such widespread vaccine hesitance jeopardizes the pandemic recovery through insufficiently high vaccination rates, which in turn can contribute to the rise of vaccine-resistant strains.⁷

Given the seriousness of the issue, here we focus on understanding the role of three predicted contributors to vaccine hesitancy: partisanship, anti-intellectualism, and conspiracy theory predisposition and belief. Using two original online samples of U.S. adults collected through MTurk and Forthright, the latter of which was sampled to approximate national representativeness, we find that anti-intellectualism, conspiratorial predispositions, and COVID-19 conspiracy theory belief are the strongest and most consistent predictors of vaccine hesitancy. Notably, we also find that while partisanship and ideological self-placement are statistically significant predictors of vaccine hesitancy, once conspiracy theory, anti-intellectualism, and control variables are accounted for in the models, these relationships are no longer significant. When political tendencies are significant in these full models, they hold a relatively small substantive association with vaccine hesitancy.

In what follows, we first discuss what vaccine hesitancy is and what tends to drive vaccine hesitancy generally. Then, we discuss the role of misinformation, conspiracy theories, partisanship, and anti-intellectualism in vaccine hesitancy. Next, we apply this discussion to expectations surrounding COVID-19. Finally, we report direct tests of our hypotheses, and then discuss our results and their implications for on-going mass vaccination efforts, continued widespread vaccine hesitancy, and related political attitudes.



2. Literature review and framework

2.1 General vaccine hesitancy and uptake

In this section, we review contributing factors to vaccine hesitancy. In doing so we provide context for the role of misinformation and conspiracy theory spread as drivers of increased vaccine hesitancy. Vaccine hesitancy can be

defined as “a delay in acceptance or refusal of vaccination despite availability of vaccine services.”⁸ Others have extended this definition to include people who accept or receive some vaccines but remain concerned about their safety, effectiveness, or importance.⁹ Here, we use vaccine support as the inverse of vaccine hesitancy. Importantly, vaccine hesitancy is multifaceted and can vary across context, population, and vaccine type, although a more generalized predisposition toward hesitancy has been observed.^{8,10} Nonetheless, factors associated with increased vaccine hesitancy can be classified into three broad categories: convenience, complacency, and confidence.⁸

The convenience of getting vaccines is one factor determining vaccine hesitancy levels.⁸ For instance, it may be difficult to access vaccines in rural areas or places far from hospitals, clinics, or other providers.¹¹ Further, it may be inconvenient to get inoculated if it is financially costly; in this case, systems that have expensive health insurance, costly medical care, or other similar issues can increase vaccine hesitancy, particularly for the poor and disadvantaged.¹² Complacency and confidence are reflected in concerns over vaccine safety, effectiveness, and importance.^{13,14} Complacency encompasses concerns over importance, i.e., that people do not feel urgency or perceive risk in the vaccine-preventable disease.^{15,16} For example, some Americans underestimated the threat of COVID-19 during the pandemic, prompting reduced compliance with CDC guidelines for reducing the risk of contagion.¹⁷ Other research indicates that as Americans have lived through the pandemic, increased familiarity of the disease has coincided with decreased perceptions of threat.¹⁸ This desensitization to the pandemic, alongside misinformation about COVID-19, have led to increased vaccine hesitancy over time.¹⁸ Finally, vaccine confidence centers around concerns about safety and, to a lesser extent, effectiveness. Often individuals are worried about potential side effects, harmful “ingredients,” inefficacy, *and* that such information about these potential concerns are being withheld or unacknowledged.^{10,19,20} Such fears are compounded when individuals do not trust various experts and institutions, including doctors, scientists, and the pharmaceutical industry.^{14,21}

Vaccine hesitancy or anti-vaccine stances covary with several individual-level and group-based factors. For example, higher levels of vaccine hesitancy are observed among people who experience particular predispositions such as, higher conspiratorial thinking, blood and needle sensitivity, individualism, disgust sensitivity,^{22,23,24} injection fear,²⁵ and moral purity.²⁶ A study across 25 national samples in 12 countries found that being female, having trust in medical and scientific experts, and worry about COVID-19 are the most

consistent and robust predictors of willingness to receive the COVID-19 vaccine.²⁷ Importantly, vaccine hesitancy may constitute a social identity for some,²⁸ which can strengthen opposition to vaccines.^{29,30}

Alternatively, vaccine hesitancy may be grounded in community norms and practices. For example, many observant Muslims have foregone influenza vaccines that contained gelatin made from pork.³¹ Similarly, distrust in vaccines and modern medicine can be influenced by concerns over historical abuses and atrocities committed by the medical establishment. For example, the Tuskegee experiments have translated into lowered trust in medicine and therefore decreased vaccine confidence among the African American community.^{12,32} Ongoing racial discrimination within the health care system also contributes to decreased vaccine confidence among African Americans.³³ Similarly, political identity and rhetoric can also impact vaccine hesitancy and uptake. For example, in the United States and Italy, some political elites, such as populists and President Donald Trump, have advanced vaccine skepticism for political purposes even before the COVID-19 pandemic.³⁴ Politicization of vaccines can increase distrust toward medical experts among supporters of these politicians, though this politicization may also increase support for vaccines among those who oppose vaccine-skeptical politicians.³⁵ As a result, Republicans (vs Democrats) in the United States have been more likely to endorse vaccine misinformation and be vaccine hesitant.³⁶

2.2 Influence of misinformation and conspiracy theories on vaccine hesitancy

Information, including misinformation and conspiracy theories, about vaccines plays a large role in shaping concerns related to vaccine hesitancy,^{23,24,37,38} particularly during the COVID-19 pandemic.³⁹⁻⁴⁵ For example, one content analysis of anti-vaccination websites found that conspiracy theories were present on every website analyzed, and that misinformation, such as the misrepresentation of vaccine studies, was extensive.²¹

Although misinformation and conspiracy theories about vaccines are not entirely new phenomena, the proliferation of the internet and social media has facilitated their spread and has entrenched belief.⁴⁶ Recent research suggests that access to the internet accounts for the greater levels of vaccine hesitancy in richer countries compared to poorer countries.¹⁴ This is likely due to greater online access, which enables the spread of anti-vaccine misinformation.²¹ Furthermore, the widespread availability of medical information provides the illusion that people who search and find information on vaccines via the internet are adequately and credibly informed,

thus leading to higher confidence in their knowledge despite having wrong or incomplete information.⁴⁷

Social media in particular allows users to share information broadly, at a fast pace, and with increased anonymity, features that allow users to quickly spread unverified information.⁴⁸ Indeed, evidence suggests that tweets that contain misinformation are retweeted faster and by more Twitter users on average than tweets that contain factual information.⁴⁹ This is also true of other social media platforms. A content analysis of YouTube videos about vaccination found that negative videos—including those that question vaccine science and those that promote conspiracy theories about collusion between vaccine supporters and pharmaceutical companies—were more likely to receive a rating, have higher ratings, and receive more views than positive videos (e.g., those describing the benefits and safety of vaccines).⁵⁰ An analysis of exposure to information about HPV vaccines on Twitter found that HPV vaccine coverage was lower in states where misinformation and conspiracies made up a higher proportion of exposures, indicating that vaccine misinformation and conspiracy theories on Twitter may reflect or influence vaccine acceptance.^{45,51}

There is a well-established association between belief in conspiracy theories—specific to vaccines or otherwise—and anti-vaccine beliefs. One cross-sectional survey, conducted across 24 countries and Hong Kong, found that participants who believed more vaccine-related conspiracy theories were more likely to hold anti-vaccine attitudes. This association was significant across all locations, but was strongest in Western countries (US, Australia, UK, Canada, Germany).²³ Another study found that anti-vaccination beliefs are highly correlated with belief in the conspiracies that Obama is a Muslim and that the Bush administration knew about the 9/11 attacks ahead of time, indicating that anti-vaccination beliefs may be “best explained as an extension of a common psychological predisposition for conspiracy beliefs.”³⁷ Beyond belief in specific conspiracy theories, respondents who report more conspiracist ideation—a general willingness to believe conspiracy theories—are more likely to report concerns about the MMR vaccine.³⁵ Additionally, recent research indicates that conspiratorial thinking—the predisposition to interpret events as the result of conspiracies—is an important predictor of belief in conspiracy theories and misinformation. Enders et al. found that the established association between social media use and belief in conspiracy theories is contingent on conspiratorial thinking, such that the association strengthens as conspiratorial thinking increases.⁵²

Vaccine misinformation and conspiracy theories can directly impact vaccine uptake.^{30,45} For example, belief in the conspiracy theory that the pharmaceutical industry has conspired to cover up evidence of the relationship between vaccines and autism can lead people to avoid vaccinating their children. Jolley and Douglas found that both endorsement of anti-vaccine conspiracy theories and exposure to material supporting anti-vaccine conspiracy theories is associated with lower intentions to vaccinate a fictitious child.²⁴

2.3 Expected correlates of COVID-19 vaccine hesitancy

As our review above makes clear, the reasons for vaccine hesitancy can vary across different types of vaccines. The COVID-19 vaccine is no exception; several factors related to the development and dissemination of the COVID-19 vaccine have resulted in vaccine hesitancy unique to this vaccine.

For example, some are hesitant toward the COVID-19 vaccine because of its rapid development and dissemination; cross-nationally, many people believe that the COVID-19 vaccine was rushed and have been worried about the safety of a vaccine developed much quicker than usual.^{53,54} Additionally, the COVID-19 vaccine has been overtly politicized. Even prior to the COVID-19 pandemic, Donald Trump became the first president to publicly share anti-vaccination attitudes.³⁵ In one study, exposure to President Trump's anti-vaccination tweets—often about the disproven link between the MMR vaccine and autism—increased concern about vaccines among Trump voters but not among liberal voters.³⁵ Once the COVID-19 pandemic ensued, the response was politicized during its early stages and before a vaccine was developed. For example, an analysis of tweets sent by members of Congress during the early months of the pandemic found that Democrats were more likely to tweet about COVID-19 earlier and more frequently, and their tweets were more likely to focus on public health and direct aid to workers, whereas Republicans' tweets focused more on the perceived role of the Chinese government.⁵⁵

Several studies about indicate that willingness to receive a COVID-19 vaccine is lower among Republicans than among Democrats.^{5,56} Additionally, a longitudinal study conducted during the first 6 months of the pandemic found that favorable attitudes toward vaccines and intention to be vaccinated for COVID-19 and the flu decreased over time, and that this decrease was driven by Republicans.¹⁸ This political divide is reflected in vaccination rates as well. Democrats are more likely than Republicans to

report having received the COVID-19 vaccine, and the share of the total population that is fully vaccinated has increased more rapidly in counties that voted for Biden than counties that voted for Trump.⁵⁷

Belief in COVID-19 conspiracy theories, given the above discussion, is also likely to increase COVID-19 hesitancy.⁴⁵ Indeed, Allington et al. found that belief in COVID-19 conspiracy theories is predictive of COVID-19 vaccine hesitancy.³⁹ Another study also found that belief in conspiracy beliefs, related to COVID-19 specifically as well as vaccines more broadly, was positively associated with vaccine hesitancy.⁴² Republicans are also more likely to believe COVID-19 conspiracy theories than Democrats,⁵⁸ which, as noted above, are associated with anti-vaccine beliefs. Relatedly, we expect conspiratorial thinking to also be associated with COVID-19 vaccine hesitancy. For instance, one study found that the gender gap in COVID-19 conspiracy belief was explained in part by differences in conspiratorial thinking.⁵⁹

As noted above, vaccine hesitancy and vaccine misinformation endorsement tend to positively correspond with a distrust of experts and intellectuals,^{27,60,61} which is often described as anti-intellectualism.⁶¹ This concept is also deeply tied to more general populist attitudes. Stecula and Pickup assess two of the core dimensions of populism (conflict between average citizens and elites, and distrust of experts and intellectuals), identifying that populist beliefs are correlated with conspiracy beliefs about COVID-19, above and beyond partisanship, particularly for those who consume conservative media.⁸⁵ Additionally in the context of COVID-19, work by Merkley and Loewen finds that higher respondent scores of anti-intellectualism negatively and significantly correspond with following scientifically-backed behavioral recommendations to prevent the spread of COVID-19.⁶² This study also finds that anti-intellectualism significantly and positively predicts lower levels of COVID-19 information and news seeking behavior. Taken together, these studies suggest that anti-intellectualism should also be a significant predictor of COVID-19 vaccine hesitancy.

Given the above discussion, this study evaluates three explanations regarding vaccine hesitancy in the context of the COVID-19 pandemic: conspiracy theory beliefs (including both COVID-19 conspiracy theory beliefs and conspiratorial predispositions) political identity, and anti-intellectualism. Moreover, we explore whether any of these explanations is more robust than the others.



3. Hypotheses

Thus, we expect:

- Hypothesis 1a (H1a): Greater endorsement of COVID-19 conspiracy theories will covary with increased vaccine hesitancy and decreased vaccine support.
- Hypothesis 1b (H1b): Greater conspiratorial thinking will covary with increased vaccine hesitancy and decreased vaccine support.
- Hypothesis 2 (H2): That those on the political right will engage in greater vaccine hesitancy and lower reported vaccine support than those on the political left.
- Hypothesis 3 (H3): That those higher (vs lower) in anti-intellectualism will be more likely to be vaccine hesitant and less supportive of vaccines.



4. Data and methods

4.1 Data

We test these hypotheses and our research question using data from two panel studies, including one sampled to approximate national representativeness, recruited before and after the 2020 U.S. Presidential Election. The first sample was recruited from Amazon's Mechanical Turk platform (MTurk). MTurk samples are more diverse than student samples and more representative than typical Internet samples.^{63,64} The second study was quota sampled by Forthright, an online research panel with national representative sampling capabilities, part of market research agency Bovitz, Inc. We use data from Wave 1 of both panel studies (Sample 1, October 23–30, 2020, $N=1080$, 60.4% female and 39.5% male, 56.3% with at least a BA, 54.8% with family income greater than \$50,000, mean age=44.18, $SD=14.66$; White=83.98%; Sample 2, October 27–November 2, 2020, $N=1140$, 52.80% female and 46.50% male, 32.6% with at least a BA, 50.7% with family income greater than \$50,000, mean age=46.34, $SD=17.04$; White=62.11%). Analyses are conducted using multivariate OLS regression through Stata 14.

4.2 Measures

All measures were rescaled to range from 0 to 1. Descriptive statistics for the two samples are provided within [Table 1](#). Question wording and response scales are available in [Appendix A](#). Replication data and syntax are available at:

4.3 Dependent variable

Vaccine support. Scholars have utilized multiple measures of vaccine hesitancy, ranging from a single item assessing vaccine intention^{65,66} to more varied measures assessing multiple dimensions of vaccination.⁶⁷ Our dependent variable, based on Betsch et al.⁶⁷ is a measure of vaccine support and hesitancy. This measure is an index of five items scored on a one to seven agreement scale. This scale utilizes questions that encompass the dimensions of vaccine hesitancy described above, including confidence, complacency, and convenience. Respondents were asked items such as, “I am completely confident that vaccines are safe,” and “When everyone else is vaccinated, I don’t have to be vaccinated, too.” The five items were averaged and recoded to range from 0 to 1 (Sample 1, mean = 0.71, std.dev = 0.19, alpha = 0.82; Sample 2, mean = 0.67, std.dev = 0.19, alpha = 0.79). Higher values correspond to greater vaccine support and less vaccine hesitancy; whereas lower values correspond to less vaccine support and more vaccine hesitancy.

4.4 Independent variables

Conspiracy theory belief. Our first explanatory variable is a COVID-19 CT index consisting of the average of responses to eight CT beliefs. The question wording for all measures are available in [Appendix A](#). Prior work has established that COVID-19 conspiracy theories may be monological,⁵⁸ thus justifying the use of a composite index (Sample 1 alpha = 0.82, Sample 2 alpha = 0.80).

Conspiratorial thinking. Another dispositional factor that is positively related to CT beliefs (including endorsement of COVID-19 CTs)^{58,68} is conspiratorial thinking—the tendency to view events as the product of a conspiracy.⁶⁹ However, as there may be an underlying predisposition toward conspiracy beliefs beyond endorsement of target-specific COVID-19 conspiracy theories which may also be subject to political motivated reasoning, we employ a more generalized measure of conspiracy theory belief that assesses an underlying predisposition for conspiracy theory belief. This was as measured via a four-item, five-point agree/disagree scale validated by

Table 1 Descriptive statistics.

	Sample 1		Sample 2	
	N	%	N	%
Age (in years)	Avg:		Avg:	
	(Range S1 18–89; S2 18–79; S318–93)	1007 44.18	995 46.06	
Sex				
	Female	650 60.24	515 52.18	
	Male	429 39.76	472 47.82	
Education				
	Up to and including high school diploma/GED	341 31.6	618 55.78	
	Some post–high school, no bachelor’s degree	519 48.2	381 34.38	
	Bachelor’s degree	82 7.6	90 8.12	
	Graduate degree or post-bachelor’s degree	402 29.2	19 1.71	
Income				
	Under \$19,999	118 10.9	431 38.41	
	\$20,000 to \$29,999	108 10.0	208 18.54	
	\$30,000 to \$49,999	259 21.7	304 28.88	
	\$50,000 to \$99,999	398 36.9	159 14.17	
	\$100,000 and above	197 18.2	10 0.89	
Race				
	Nonwhite	173 16.02	364 36.58	
	White	907 83.98	631 63.42	
Ideology				
	Extremely liberal	131 13.00	112 11.58	
	Liberal	201 19.94	145 14.99	
	Somewhat liberal	107 10.62	102 10.55	
	Moderate	183 18.15	323 33.40	
	Somewhat conservative	137 13.59	94 9.72	
	Conservative	166 16.47	118 12.20	

Continued

Table 1 Descriptive statistics.—cont'd

	Sample 1		Sample 2	
	N	%	N	%
Extremely conservative	83	8.23	73	7.55
Party Identification				
Republican (and leaners)	387	39.33	310	35.59
Independents	80	8.13	113	12.97
Democrats (and leaners)	517	52.54	448	51.44
COVID-19 CT Belief				
T1 mean (std. dev)	1013	0.26 (0.20)	911	0.32 (0.21)
Conspiratorial Thinking				
T1 mean (std. dev)	1007	0.48 (0.28)	909	0.52 (0.25)
Anti-intellectualism				
T1 mean (std. dev)	542	0.28 (0.20)	487	0.31 (0.22)
Learned Helplessness				
T1 mean (std. dev)	1010	0.33 (0.22)	917	0.36 (0.22)
External Efficacy				
T1 mean (std. dev)	1009	0.36 (0.22)	910	0.40 (0.24)
Internal Efficacy				
T1 mean (std. dev)	1009	0.35 (0.21)	910	0.39 (0.22)
Political Interest				
T1 mean (std. dev)	1010	0.69 (0.22)	908	0.63 (0.24)
Democratic Satisfaction				
T1 mean (std. dev)	1004	0.52 (0.20)	915	0.52 (0.21)
Trust				
T1 mean (std. dev)	1009	0.43 (0.17)	909	0.42 (0.18)
Political Knowledge				
T1 mean (std. dev)	1005	0.81 (0.23)	916	0.70 (0.27)

Note: Sample 1: MTurk; Sample 2: Forthright.

Uscinski et al.⁷⁰ The measures are internally consistent across samples (Sample 1 alpha = 0.88; Sample 2 alpha = 0.84).

Political identity. As political predispositions have been widely associated with beliefs in COVID-19 related conspiracy theories⁵⁸ as well as likelihood to vaccinate,^{5,18,36,56} we controlled for an *ideological self-placement* and *partisanship*. Ideology was measured using a seven-point measure ranging from extremely liberal = 1 to extremely conservative = 7. Partisanship was assessed using two dummy variables for Republican and Independent, with Democratic identity serving as the reference category.

Anti-intellectualism. In recent years, scholars have expanded their investigation of anti-intellectualism, linking it not only to political outcomes and support for politicians and political movements that are skeptical of experts,⁶¹ split by partisan identities,⁷¹ but also to the COVID-19 pandemic.⁶² In order to assess anti-intellectualism, we utilized the three-items specifically aimed at measuring anti-intellectualism borrowed from a larger, 20-item measure developed by Oliver and Rahn, also utilized by Stecuła and Pickup (Sample 1 alpha = 0.69; Sample 2 alpha = 0.68).^{72,85}

Control variables. Prior work has demonstrated that those who are politically disaffected are distrusting of the political system, less likely to engage in politics, less satisfied with political systems, and tend to engage in greater conspiratorial thinking.⁷³⁻⁷⁵ Given that the latest vaccines have been supported by government institutions, and because many communities have been marginalized and experienced abusive relationships with mandatory vaccines we control for five measures of political disaffection.⁷⁶ *Trust* was measured using a generalized index of trust in federal and local government, media, people in general, and law enforcement (Sample 1 alpha = 0.68, Sample 2 alpha = 0.72). *Internal and External Efficacy* were each measured using short two-item batteries,⁷⁷ both presenting moderate consistent internal consistency across samples (IE: Sample 1 alpha = 0.54, Sample 2 alpha = 0.44; EE: Sample 1 alpha = 0.70, Sample 2 alpha = 0.67). While similar to some measures of efficacy, we also assessed *Learned Helplessness*, which provides a unique approach to assess perceptions of loss of control due to one's repeated attempts and failures, inside and outside of the political domain.⁷⁸ People who are higher in learned helplessness (LH) are more likely to engage in conspiratorial thinking⁷⁴ and more likely to engage in COVID-19 related conspiracy theories.⁵⁹ It was measured here using a short six-item battery validated by Farhart,⁷³ which was taken from the original 20-items.⁷⁹ This index also presented substantial internal consistency across the two samples (Sample 1 alpha = 0.90, Sample 2 alpha = 0.87). *Satisfaction*

was assessed using a two-item index averaging satisfaction with democracy and life in general (Sample 1 $\alpha=0.65$, Sample 2 $\alpha=0.65$).⁸⁰ All measures were recoded to scale from 0 to 1, with higher values correspond to higher trust, efficacy, helplessness, and satisfaction.

We also include other demographic and attitudinal control variables as covariates. First, we included the following demographics: *age* (rescaled 0–1), *income* (ordered categories rescaled from 0 to 1), *gender* (0=male, 1=female), *education* (ordered categories rescaled from 0 to 1), and *race* (0=nonwhite, 1=white). Second, we controlled for knowledge about and interest in politics using two variables (1) *Political knowledge* was assessed using eight factual political knowledge items (Sample 1 $\alpha=0.76$, Sample 2 $\alpha=0.76$).⁸¹ Items were scored 0 (incorrect) or 1 (correct), summed, and averaged; (2) *Political interest* was assessed using three items that evaluated interest in and importance of politics (Sample 1 $\alpha=0.75$, Sample 2 $\alpha=0.75$).⁸²



5. Results

5.1 Effect of conspiracy belief on vaccine support and hesitancy

Given extant literature, we expect that greater conspiracy belief would lead to greater vaccine hesitancy and reduced vaccine likelihood. To test this in a more robust way, we examine our first two hypotheses with two separate measures of conspiracy belief: an index of COVID-19 related conspiracy theory beliefs (H1a) and a predisposition toward conspiratorial ideation, conspiratorial thinking (H1b). We find that across both samples and for both measures of conspiracy belief reported in Table 2 that indeed greater conspiracy belief leads to greater vaccine hesitancy demonstrated by reduced vaccine support (COVID-19 CT index: Model 1 $b=-0.56$, $P<0.05$; Model 2 $b=-0.45$, $P<0.05$; conspiratorial thinking: Model 3 $b=-0.27$, $P<0.05$; Model 4 $b=-0.25$, $P<0.05$). Through four separate tests of the effect of conspiracy theory belief on vaccine hesitancy, we find strong support for both H1a and H1b.

Fig. 1 demonstrates the relative effect of each covariate on vaccine hesitancy illustrated by vaccine support through the display of coefficients across models by sample.

Table 2 Effects of conspiracy theory belief, political identity, and anti-intellectualism on vaccine support.

	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age	-0.05	-0.06	-0.03	-0.07+	0.01	-0.05	-0.00	-0.06	-0.04	-0.06
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Female	-0.00	0.01	-0.00	0.00	-0.00	-0.01	0.00	-0.03+	-0.00	-0.01
Dummy	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
White	0.01	0.02	0.03	0.03	0.06*	0.07*	0.02	0.02	0.00	0.03
Dummy	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)	(0.03)
Income	0.01	0.01*	0.05*	0.01	0.04	0.01+	0.03	0.01	-0.03	0.01*
	(0.02)	(0.00)	(0.03)	(0.00)	(0.03)	(0.00)	(0.03)	(0.00)	(0.04)	(0.00)
Education	-0.02	0.05	-0.02	0.08*	0.00	0.07+	-0.07	-0.00	-0.06	-0.06
	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.06)	(0.05)
Political	0.00	0.05	0.11*	0.15*	0.12*	0.17*	0.12*	0.15*	0.00	0.07
Knowledge	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Political	0.06*	0.00	0.04	0.01	-0.03	0.00	0.03	-0.03	0.02	-0.02
Interest	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Democratic	-0.07+	-0.05	-0.13*	-0.11*	-0.07	-0.07	0.06	-0.11+	0.04	-0.05

Continued

Table 2 Effects of conspiracy theory belief, political identity, and anti-intellectualism on vaccine support.—cont'd

	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Satisfaction	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.07)
Internal	-0.02	-0.02	-0.05	0.03	-0.11*	0.05	-0.09	0.04	-0.04	0.05
Efficacy	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
External	-0.03	-0.04	-0.06	-0.07+	-0.04	-0.09*	-0.06	-0.01	-0.05	-0.16*
Efficacy	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.06)	(0.07)
Trust	-0.05	0.02	-0.07	0.01	0.01	0.08	0.01	0.10	-0.02	0.05
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)	(0.07)	(0.07)	(0.08)
Learned	-0.13*	-0.04	-0.14*	-0.10*	-0.15*	-0.18*	-0.03	-0.10+	-0.04	-0.08
Helplessness	(0.03)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
COVID CT	-0.56*	-0.45*							-0.39*	-0.38*
Index	(0.04)	(0.05)							(0.10)	(0.08)
Conspiratorial			-0.27*	-0.25*					-0.13*	-0.09
Thinking			(0.02)	(0.04)					(0.05)	(0.06)
Ideology					-0.21*	-0.11*			-0.06	0.00
					(0.04)	(0.04)			(0.06)	(0.06)

Republican					0.01	-0.09*			0.02	-0.08*
Dummy					(0.02)	(0.03)			(0.04)	(0.04)
Independent					0.02	-0.07*			-0.03	-0.15*
Dummy					(0.03)	(0.03)			(0.04)	(0.05)
Anti-							-0.44*	-0.37*	-0.19*	-0.18*
Intellectualism							(0.05)	(0.05)	(0.08)	(0.07)
Constant	0.94*	0.82*	0.88*	0.77*	0.78*	0.68*	0.76*	0.77*	1.02*	1.01*
	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)	(0.07)	(0.09)	(0.08)
<i>N</i>	570	477	567	477	503	420	312	255	207	170
<i>adj. R2</i>	0.434	0.320	0.312	0.224	0.295	0.233	0.313	0.290	0.524	0.493

Note: Sample 1: MTurk; Sample 2: Forthright. Standard errors in parentheses + $P < 0.10$, * $P < 0.05$.

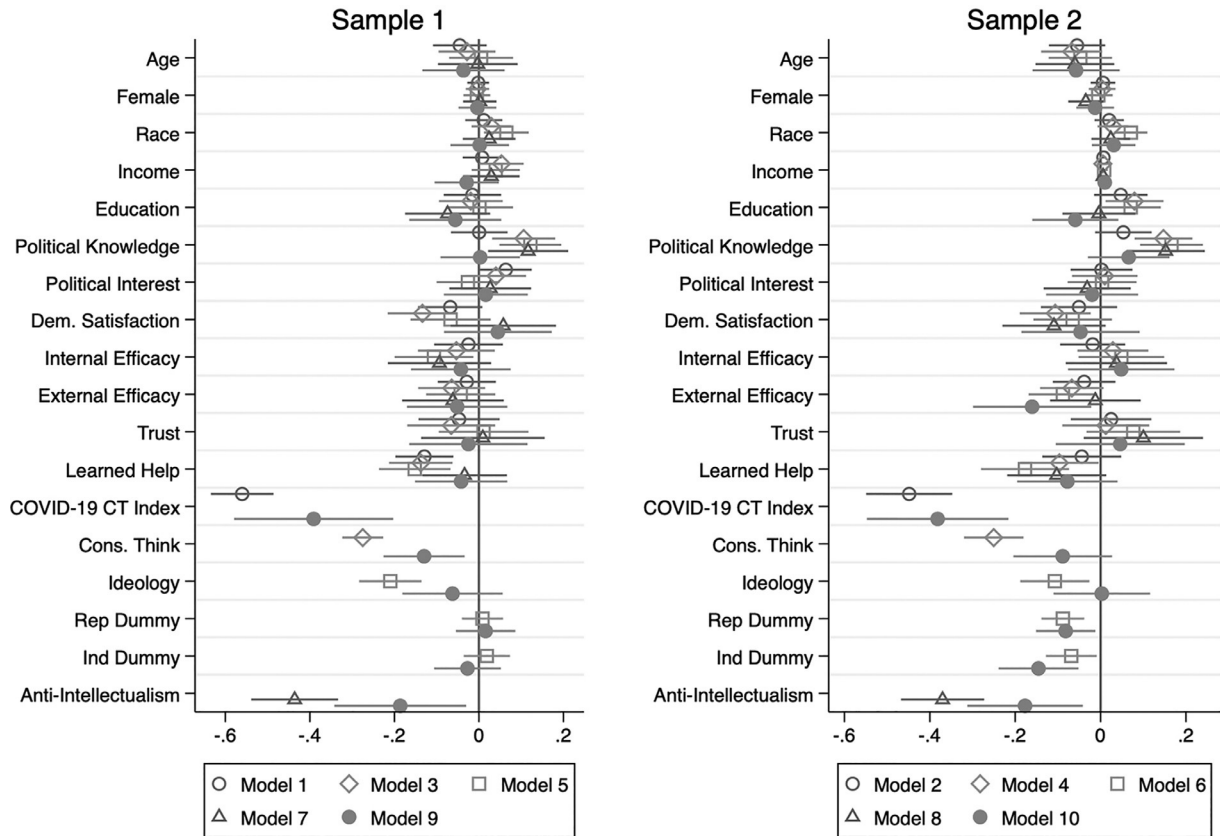


Fig. 1 Coefficient plot illustrating main effects on vaccine support.

5.2 Effect of political identity on vaccine support and hesitancy

Next, we assess the effect of political identity on vaccine hesitancy. As a result, we expect that those on the political right will exhibit greater vaccine hesitancy. We test this hypothesis (H2) by examining the effect of political ideology and partisanship on vaccine hesitancy. Across both samples reported in Table 2, we find robust evidence in support for political ideology such that as conservatism increases, vaccine hesitancy increases and support significantly decreases (Model 5 $b = -0.21$, $P < 0.05$; Model 6 $b = -0.11$, $P < 0.05$). However, the results for partisanship are more mixed across samples. In Sample 1, we do not see a significant effect of partisanship, controlling for political ideology, on vaccine support. In contrast, Sample 2 shows that both Republicans and Independents, relative to Democrats (and while controlling for political ideology), significantly report reduced vaccine support (Model 6 Republicans $b = -0.09$, $P < 0.05$; Independents $b = -0.07$, $P < 0.05$). Thus, in three out of four tests of the effect of political identity on vaccine support and hesitancy, we find evidence in support of H2.

5.3 Effect of anti-intellectualism on vaccine support and hesitancy

Our third hypothesis engages the question of whether anti-intellectualism is robustly related to vaccine hesitancy. We expect that those who report higher levels of anti-intellectualism will be more vaccine hesitant (H3). Across both samples, we find strong effects of anti-intellectualism on increased vaccine hesitancy illustrated through significant decreases in vaccine support (Model 7 $b = -0.44$, $P = 0.05$; Model 8 $b = -0.37$, $P < 0.05$; Table 2). This illustrates that there are additional concerns for the way in which decreased trust in experts and science can contribute to potentially dire public health consequences such as increased vaccine hesitancy and potentially reduced uptake, particularly as the COVID-19 vaccine has been identified as one of the most robust mechanisms for curbing the pandemic and slowing the spread of COVID-19.

5.4 Comparative effects

While testing each of the prior hypotheses independently provides support for our expectations, we are unable to assess them against one another. Thus, we ask a more general research question as to whether one explanation—conspiracy belief, political identity, or anti-intellectualism—is more robust

in explaining vaccine hesitancy during the COVID-19 pandemic. To evaluate this research question, we included all of our key measures in the same model to assess covariation and multicollinearity. For Samples 1 and 2 reported in Models 9 and 10, we find that the COVID-19 CT index is the most robust predictor, such that as COVID-19 conspiracy belief

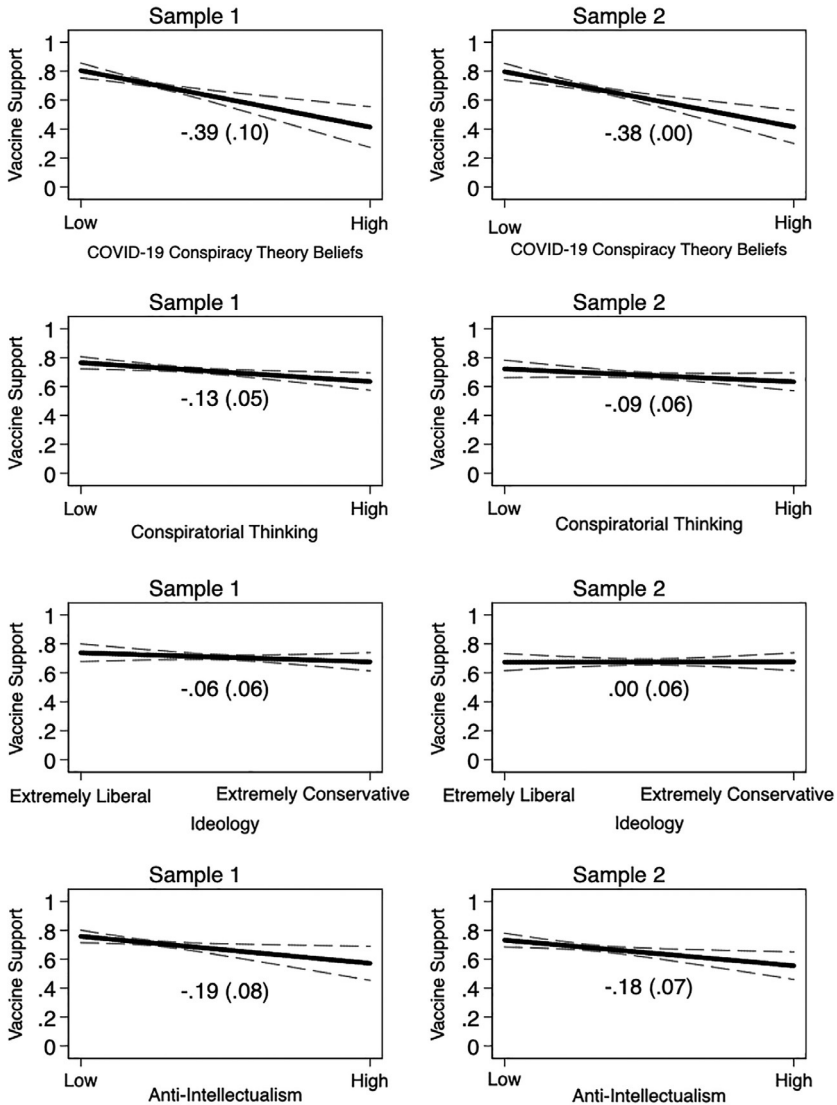


Fig. 2 Effects of conspiracy belief, political identity, and anti-intellectualism on vaccine Support.

increases, vaccine hesitancy clearly increases illustrated by significant decreases in vaccine support (Model 8 $b = -0.39$, $P < 0.05$; Model 9 $b = -0.38$, $P < 0.05$). Moving from low conspiracy belief to high conspiracy belief, we see a 38% and 39% increase in vaccine hesitancy. Conspiratorial thinking is still statistically significant in Sample 1 (Model 8 $b = -0.13$, $P < 0.05$), but drops out of significance in Sample 2. This may suggest that specific COVID-19 conspiracy beliefs, rather than general conspiratorial orientations, are more consequential for vaccine hesitancy. Again, in these comparative models, we find inconsistent effects of political identity. Political ideology drops out of significance in both samples, and partisanship is only significant in Sample 2 (Model 10 Republicans $b = -0.08$, $P < 0.05$; Independents $b = -0.15$, $P < 0.05$). Lastly, while not quite as large but still just as robust, anti-intellectualism remains a strong predictor for increased vaccine hesitancy across both samples (Model 9 $b = -0.19$, $P < 0.05$; Model 10 $b = -0.18$, $P < 0.05$). This carries substantive effects such that moving from low anti-intellectualism to high anti-intellectualism translates to an 18% and 19% increase in vaccine hesitancy. Fig. 2 also demonstrates the independent effects for each key measure for vaccine hesitancy for Models 9 and 10 across the samples.



6. Discussion and conclusion

In this study, we sought to assess whether three prominent explanations for vaccine hesitancy are also affecting vaccine uptake in the context of the COVID-19 pandemic. We find that COVID-19 related conspiracy belief and anti-intellectualism have the most consistent effects on vaccine hesitancy in the COVID-19 context, in line with expectations from other research.^{39,45,62} Additionally, political identity—assessed through both political ideology and partisanship—was also consequential, consistent with prior research.^{5,56} Specifically, self-identified conservatism and identification with the Republican (vs Democratic) party covaried with reduced vaccine uptake, although these effects were no longer significant in three of four tests when accounting for conspiratorial thinking, conspiracy theories, and anti-intellectualism in the same models. This stands in contrast to some previous work suggesting that vaccine hesitancy, including COVID-19 vaccine hesitancy, corresponds strongly with partisan identities.^{5,18,36,56,58} This finding is likely due to other significant factors, such as conspiracy theory belief^{8,3} or epistemic hubris and anti-intellectualism,⁷¹ being closely related to partisanship and political ideology. Together, these results demonstrate

that attitudes toward expertise, belief in COVID-19 conspiracies theories, and (to a much lesser extent) identification with conservative partisan and ideological groups undermine support for vaccination, independent of a host of control variables known to predict attitudes toward science, perceptions of the pandemic, and willingness to engage in COVID-19 behavioral mitigation.

One key limitation of this study is that both samples were conducted in the US context, where polarization on policy responses and rampant spread of misinformation and conspiracy theories about the virus have taken place. Previous research has found that base levels of general vaccine hesitancy vary widely,¹⁴ as well as levels of COVID-19 vaccine hesitancy and uptake.^{6,27} Taken together, non-US contexts may yield findings different from those in the present study. Additionally, the data was collected before any vaccines were granted emergency use authorization through the FDA, and attitudes have continued to evolve following the approval of multiple vaccines and large campaigns to improve vaccine uptake across the United States and worldwide. However, vaccine hesitancy remains an obstacle for mass vaccination efforts.

The high degree of politicization and polarization about the virus, particularly at the beginning of the COVID-19 pandemic, added to the influence of right-leaning media regularly discussing CTs and misinformation, led audiences to see COVID-19 as less dangerous and negatively impacted engagement with protective behaviors and vaccine support (e.g., Motta, Stecula, Farhart 2020; Romer and Hall Jamieson 2020; Romer and Hall Jamieson 2021),^{38,86,87} and even more significantly in the United States than the United Kingdom (Pennycook et al. 2020a).⁸⁸ The pandemic has activated a perfect storm of psychological, political, and situational factors at the root of conspiracy theory beliefs, particularly those emerging regarding COVID-19.⁵⁸ These specific conspiracy theory beliefs have challenged governments, and health and medical experts in their journey to control the spread of the virus and tackle resistance to preventative and containment-related behaviors,^{89,90} as well as future vaccine likelihood.⁸⁶

Combating science skepticism, medical mistrust, anti-intellectualism, and conspiracy beliefs, while working toward increasing vaccine uptake is exceptionally challenging. Health officials could more frequently discuss with the public the risks of the virus, mechanisms of transmission, and confront science skepticism to reinforce the integrity of the scientists working to gather data and combat infectious diseases, possibly through fact checks.⁹¹ Over the course of the COVID-19 pandemic, scholars have sought solutions and suggestions for policymakers and public health officials. One solution

may lie with developing work on conspiracy theory inoculation.^{93,94,99,100} Specifically in the context of COVID-19, tracking COVID-19 conspiracy theories and vaccine misinformation in real-time and engaging with social media to disseminate correct information may inoculate and help safeguard the public against misinformation and misinformed behaviors.⁹⁵ Framing of messaging aimed at targeting vaccine hesitancy is essential—individuals who receive information about the safety and efficacy of the COVID-19 vaccine may be more open to receiving the vaccine, whereas those who receive information that others are vaccine reluctant are going to report greater vaccine hesitancy themselves.⁴⁴ Moreover, urging social media users to consider the accuracy of the information they share has the potential to reduce the spread of COVID-19 conspiracy theories and misinformation.⁹⁶ Additionally, encouraging collectivism in messaging could increase engagement with protective behaviors.^{97,98} However, given prior experience with Zika and yellow fever, corrective information may not entirely reduce misperceptions or improve support for control policies and intentions to engage in preventive behaviors.⁹²

The results of our study raise important questions about the spread of conspiracy theories and misinformation about COVID-19, the growth of anti-intellectualism, and the consequences for public health, particularly in regard to attacks against the vaccine.⁸⁴ As national and international health agencies and governments continue to struggle to respond to the global spread of COVID-19, they are faced with the spread of misinformation and conspiracy theories about the virus. Lower-quality information environments, along with growing anti-intellectualism and entrenched political polarization, undermines public debate and understanding surrounding protective behaviors and policies in the context of the COVID-19 pandemic. In particular, our results demonstrate that on-going mass vaccination efforts may need to navigate the landmines created by anti-intellectual attitudes, vaccine misinformation, and COVID-19 conspiracy theories more acutely. This is no small matter. It is a critical priority for research going forward to inform the way in which pandemic responses should be formulated and communicated, vaccination efforts should be facilitated and sustained, and how we can curb the continued spread of COVID-19 and the pernicious consequences of misinformation worldwide.



Appendix A. Question Wording

(Response options in italics; questions are identical across surveys unless otherwise noted)

A.1 Vaccine hesitancy

I am completely confident that vaccines are safe.

Vaccination is unnecessary because vaccine-preventable diseases are not common anymore.

Everyday stress prevents me from being vaccinated.

Vaccination is unnecessary because vaccine-preventable diseases are not common anymore.

Everyday stress prevents me from being vaccinated.

When I think about being vaccinated, I weigh its benefits and risks to make the best decision possible.

When everyone else is vaccinated, I don't have to be vaccinated, too.

Response options: *Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree.*

A.2 COVID-19 conspiracy theory belief

Some people believe that the coronavirus (COVID-19) is a bioweapon engineered by the Chinese government to wage war on America and Western countries. Others do not believe this. What do you think? The coronavirus (COVID-19) is...

Definitely a bioweapon engineered by the Chinese government to wage war.

Probably a bioweapon engineered by the Chinese government to wage war.

Probably not a bioweapon engineered by the Chinese government to wage war.

Definitely not a bioweapon engineered by the Chinese government to wage war.

Some people believe that the coronavirus (COVID-19) panic has been an orchestrated effort by powerful people to close down businesses and destroy capitalism. Others do not believe this. What do you think? The coronavirus (COVID-19) panic...

Definitely has been orchestrated by powerful people to close down businesses and destroy capitalism.

Probably has been orchestrated by powerful people to close down businesses and destroy capitalism.

Probably has not been orchestrated by powerful people to close down businesses and destroy capitalism.

Definitely has not been orchestrated by powerful people to close down businesses and destroy capitalism.

Some people believe that the coronavirus (COVID-19) was originally engineered by the U.S. military. Others do not believe this. What do you think? The coronavirus (COVID-19) was...

Definitely engineered by the U.S. military.

Probably engineered by the U.S. military.

Probably not engineered by the U.S. military.

Definitely not engineered by the U.S. military.

Some people believe that the infection rate from coronavirus (COVID-19) is different than is reported, so as to cover up how many people have been infected. Others do not believe this. What do you think? The coronavirus (COVID-19) infection rate is...

Definitely different than reported to cover up the number of infections.

Probably different than reported to cover up the number of infections.

Probably not different than reported to cover up the number of infections.

Definitely not different than reported to cover up the number of infections.

Some people believe that former Microsoft CEO Bill Gates is creating a tracking device to be injected with the coronavirus vaccine. Others do not believe this. What do you think? Former Microsoft CEO Bill Gates...

Definitely is creating a tracking device to be injected with the coronavirus vaccine.

Probably is creating a tracking device to be injected with the coronavirus vaccine.

Probably is not creating a tracking device to be injected with the coronavirus vaccine.

Definitely is not creating a tracking device to be injected with the coronavirus vaccine.

Some people believe that 5G technology is causing the coronavirus to spread faster. Others do not believe this. What do you think? 5G technology ...

Definitely is causing the coronavirus to spread faster.

Probably is causing the coronavirus to spread faster.

Probably is not causing the coronavirus to spread faster.

Definitely is not causing the coronavirus to spread faster.

Some people believe that Donald Trump is lying about getting COVID-19 in order to improve his reelection prospects. Others do not believe this. What do you think? Donald Trump...

Definitely is lying about getting COVID-19 in order to improve his reelection prospects.

Probably is lying about getting COVID-19 in order to improve his reelection prospects.

Probably is not lying about getting COVID-19 in order to improve his reelection prospects.

Definitely is not lying about getting COVID-19 in order to improve his reelection prospects.

Some people believe that Donald Trumps political opponents intentionally infected him with COVID-19 in order to undermine his reelection

prospects. Others do not believe this. What do you think? Donald Trumps opponents...

Definitely infected him intentionally with COVID-19 in order to undermine his reelection prospects.

Probably infected him intentionally with COVID-19 in order to undermine his reelection prospects.

Probably did not infected him intentionally with COVID-19 in order to undermine his reelection prospects.

Definitely did not infected him intentionally with COVID-19 in order to undermine his reelection prospects.

A.3 Conspiracy predisposition/conspiratorial thinking

Much of our lives are being controlled by plots hatched in secret places.

Even though we live in a democracy, a few people will always run things anyway.

The people who really run the country are not known to the voters.

Big events like wars, economic recessions, and the outcomes of elections are controlled by small groups of people who are working in secret against the rest of us.

Response options: *Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree.*

A.4 Partisanship

Generally speaking, do you usually think of yourself as a Democrat, a Republican, an Independent, or what? *Democrat, Republican, Independent, Other Party, please specify.*

[Branched if Democrat] Would you call yourself a strong Democrat or a not very strong Democrat? *Strong Democrat, Not very strong Democrat.*

[Branched if Republican] Would you call yourself a strong Republican or a not very strong Republican? *Strong Republican, Not very strong Republican*

[Branched if Independent or Other Party] Do you think of yourself as closer to the Democratic Party or the Republican Party? *Closer to the Democratic Party, Closer to the Republican Party, Closer to Neither Party*

A.5 Political ideology

We hear a lot of talk these days about liberals and conservatives. Here is a seven-point scale on which the political views that people might hold are arranged from extremely liberal to extremely conservative. Where would

you place yourself on this scale? *Very Liberal, Somewhat Liberal, Middle of the Road, Somewhat Conservative, Conservative, Very Conservative.*

A.6 Anti-intellectualism

Id rather put my trust in the wisdom of ordinary people than the opinions of experts and intellectuals.

When it comes to really important questions, scientific facts dont help.

Ordinary people can really use the help of experts to understand complicated things like science and health.

Response Options: *Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree.*

A.7 Trust

How much of the time do you think you can trust the following to do what is right:

The federal government in Washington, D.C.

Local government.

Law enforcement.

Media.

People in general.

Response Options: *Almost always, Most of the time, Some of the time, Almost never.*

A.8 Internal efficacy

How often do politics and government seem so complicated that you cant really understand whats going on?

Always, Most of the time, About half the time, Some of the time, Never.

How well do you understand the important political issues facing our country?

Extremely well, Very well, Moderately well, Slightly Well, Not well at all.

A.9 External efficacy

How much do public officials care about what people like you think?

A great deal, A lot, A moderate amount, A little, Not at all.

How much can people like you affect what the government does?

A great deal, A lot, A moderate amount, A little, Not at all.

A.10 Learned helplessness

No matter how much energy I put into a task, I feel I have no control over the outcome.

Other people have more control over their success and/or failure than I do.

I feel that I have little control over the outcomes of my work.

I feel that anyone else could be better than me in most tasks.

No matter how hard I try, things never seem to work out the way I want them to.

When I do not succeed at a task, I do not attempt any similar tasks because I feel that I will fail them also.

Response Options: *Strongly agree, Agree, Disagree, Strongly disagree.*

A.11 Satisfaction

On the whole, how satisfied are you with the way democracy works in the United States?

All things considered, how satisfied are you with your life as a whole these days?

Response Options: *Very satisfied, Fairly satisfied, Not very satisfied, Not at all satisfied.*

A.12 Political knowledge

We would like to ask you a few questions about public figures and the political system in general. Please respond to each of the following questions as thoroughly as possible. Please do NOT look up answers to these questions online. It is very important that you provide your honest answer.

What job or political office does John Roberts currently hold? *Secretary of Defense, Attorney General, Senate Majority Leader, Secretary of the Interior, Justice of the Supreme Court.*

What job or political office does Mike Pence currently hold?

Attorney General, Vice President, Secretary of State, Speaker of the House, Governor of New Hampshire.

What job or political office does Boris Johnson currently hold? *Speaker of the United Nations General Assembly, Prime Minister of the United Kingdom, Minister of Australia, U.S. envoy to the United Nations, Head of the European Commission.*

What job or political office does Nancy Pelosi currently hold?

Attorney General, Vice President, Secretary of State, Speaker of the House, House Chief of Staff.

Which political party currently has the most members in the Senate in Washington?

Democrats, Republicans, Both parties have the same number of members.

How long is the term of office for a U.S. senator?

2 years, 4 years, 5 years, 6 years, 8 years.

Which political party currently has the most members in the House of Representatives in Washington? *Democrats, Republicans, Both parties have the same number of members.*

Whose responsibility is it to nominate judges to the Federal Courts — the President, the Congress, or the Supreme Court? *The President, Congress, The Supreme Court.*

A.13 Political interest

Some people seem to follow whats going on in government and public affairs most of the time, whether theres an election going on or not. Others arent that interested. Would you say you follow whats going on in government and public affairs most of the time, some of the time, only now and then, or hardly at all?

Most of the time, Some of the time, Only now and then, Hardly at all.

My political attitudes and beliefs are an important reflection of who I am.

Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree,

Agree, Strongly agree.

In general, my political attitudes and beliefs are an important part of my self-image.

Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree,

Agree, Strongly agree.

A.14 Age

What age did you turn on your last birthday?

A.15 Race

Please indicate your race/ethnicity. [Select all that apply].

Latino/Hispanic, Black/African American, Asian/Asian American, White/Caucasian, Native American, Other Self-identify[].

A.16 Gender

What is your gender? *Male, Female, Self-identify*[].

A.17 Education

What is your highest level of education?

elementary school, junior high, some high school, high school graduate, some college, associates degree, bachelors degree, some graduate school, masters degree, MBA, JD, MD, PhD, other advanced degree.

A.18 Income

What is your total family (including parent income if dependent on parents) income?

Less than \$10,000, \$10,000–\$19,999, \$20,000–\$29,999, \$30,000–\$39,999, \$40,000–\$49,999, \$50,000–\$59,999, \$60,000–\$69,999, \$70,000–\$79,999, \$80,000–\$89,999, \$90,000–\$99,999, \$100,000 or greater.

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