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Elite Cues and the Rapid Decline of Trust in Scientists on COVID-19

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Abstract

The COVID-19 pandemic has been marked by political divisions in US public trust of scientists. Such divisions are well known on other topics, but regarding COVID-19 they arose suddenly, with disastrous results. Distrust of scientists elsewhere has been variously explained in terms of belief systems, cognitive factors, peer influences, or elite cues. Three surveys conducted from March to July 2020 in the state of New Hampshire observed rapid change, providing a test of explanations in this case. Trust in science agencies such as the CDC fell dramatically among Republicans, while views among Democrats and Independents changed little; the Democrat–Republican gap grew from 10 to 64 points. This rapid change coincided with a reversal of views toward the CDC expressed by President Donald Trump, and amplified by conservative media. People expressing lower trust in scientists also report less compliance with science-based behavioral recommendations, and less support for scientifically-informed policies.

Keywords

COVID-19, CDC, coronavirus, science trust, survey research, elite cues, Trump

1. INTRODUCTION

The scattered and frequently ineffective US response to COVID-19, from government policy down to individual behavior, highlights deep political divisions regarding the relevant science. Politicized distrust of scientists on this topic is striking not only for its unfortunate consequences, but also for having arisen suddenly, almost as fast as the virus itself. Some major scientific fields such as biology and geology have long histories of political controversy, including pressure to limit discussion of central ideas in textbooks or teaching, and even to exclude them from measures of science literacy (Bhattacharjee 2010). More recently, climate change became one of the most politically divisive questions on surveys, correlating so strongly with ideology and party that climate views behave like an indicator for political identity (Kahan 2015; Hamilton et al. 2020). Even in the case of climate change, however, the transition in public perceptions from scientific concern to identity indicator took years to accomplish (Brulle et al. 2012; Carmichael et al. 2017; Gauchat et al. 2017). That transition is notable in part for its top-down origins, as rejection of scientists' conclusions about human-caused climate change spread from economic and political elites through media to the public (Dunlap and McCright 2015).

COVID-19, however, is a word that did not exist until February 2020. Deep political divisions spun up almost overnight, and seemingly from nowhere, although of course they built upon elements that were already there. Conspiratorial distrust of medical science has long been a centerpiece of anti-vaccination sentiments (Goldberg and Richey 2020), which like rejection of evolution or climate change tend to be more prevalent among conservatives (Berinsky 2012; Bernat et al. 2009; Hamilton 2015; Hamilton et al. 2015; Lewandowsky et al. 2020; Pew 2009; Reitera et al. 2011), including 2016 presidential candidate Donald Trump (Youngdahl 2016). Although vaccination against COVID-19 remained hypothetical during the pandemic's early months, medically-advised steps such as wider testing, quarantines, stay-at-home orders and mask-wearing caused economic and social disruption. To some people who were not immediately affected by the disease itself, or far from its initial urban centers, these disruptions seemed needless and perhaps conspiratorial. Pre-COVID disregard for the seriousness of pandemics in general was also apparent in the Trump administration's 2018 dismantling of Obama-era programs for disease security (Sun 2018) and cuts to the Centers for Disease Control and Prevention (CDC) budget (Morris 2020). During the 2016 Zika virus pandemic, surveys observed political differences in public trust of science agencies such as CDC for information about the virus, parallel to but milder than differences regarding science agencies such as NASA for information about climate change (Hamilton and Safford 2020a; Safford et al. 2017, 2020).

Although many precedents foreshadowed distrust of scientists on COVID-19, the speed and depth of politicization in this new case have been striking. How did it happen? Research on previous cases of science rejection offers possible explanations that might be grouped into four broad categories: *characteristics of the science itself*; *individual-level cognitive or behavioral factors*; *peer group or cultural influences*; and *messaging by elites*. These categories are not mutually exclusive; all four could be reinforcing each other on deeply polarized topics such as

climate change. Regarding COVID-19, our question here is not whether one type of explanation is uniquely correct, but whether one stands out as the main driver behind a very fast change.

To explore this question, we analyze data from three surveys conducted in spring and summer 2020, which caught change in progress. Each carried an identically-worded item about trusting science agencies such as CDC for information on the coronavirus. Overall trust dropped from 77% in March to 59% in July—but this was entirely due to a more precipitous decline in one subgroup. The details of this change point toward an explanation for how attitudes toward scientists were politicized. Our analysis contributes to a growing literature on what might be termed “the social bases of COVID concern” (Adolph et al. 2020; Alcott et al. 2020; Brzezinski et al. 2020; Cassese et al. 2020; Gadarian et al. 2020; Graham et al. 2020; Green et al. 2020; Grossman et al. 2020; Hill et al. 2020; Merkley and Loewen 2020; Motta et al. 2020; Pennycook et al. 2020; Shepherd et al. 2020; Sides et al. 2020). The social bases characterize who took the pandemic most or least seriously, with consequences for everyone.

2. BACKGROUND

Historically, Americans have tended to regard science and scientists more highly than most other institutions. Concerning science in general, the high regard appears fairly stable and broad-based (American Academy of Arts and Science 2018; Funk and Kennedy 2020). For example, a recent Pew Research poll found 73% agreement that science has had a mostly positive effect on society (Funk 2020). This result fits with 17 previous surveys from 1979 to 2016, all of which found between 68% and 80% agreement (mostly, in low to mid 70s) on the predominantly positive effects of scientific research (National Science Board 2018). Within this broad overall agreement, however, researchers often see somewhat lower confidence in science among conservatives (Gauchat 2012; Mann and Schleifer 2020; Nadelson et al. 2014).

Ideological or political differences become more pronounced when surveys focus on particular topics. Scholars have offered many explanations for why certain scientific topics face politicized resistance. These explanations might be grouped into four broad categories, briefly summarized below.

[1] *Characteristics of the science itself*, or of scientists and their communication. For example, scientific findings might contradict individuals’ worldviews, have ideologically or economically unpalatable implications, or be presented in ways perceived as off-putting. Some major fields including biology and geology stand out for having central conclusions that are accepted by virtually all scientists (e.g., that humans evolved from earlier species, or the Earth is billions of years old) while being rejected by a large fraction of the public. On these topics, objections are linked to religious beliefs (Ayala 2008). Another dimension of conflict is identified in Allan Schnaiberg’s distinction between *impact science*, which may point out harmful consequences from economic activities, and *production science*, intended to enhance economic production

(Schnaiberg 1977, 1980; McCright et al. 2013). Conservatives are expected to view impact science skeptically, while being more favorable toward production science.

[2] *Individual-level cognitive or behavioral factors*, such as information-processing habits, or a tendency toward conspiratorial thinking. Individuals may selectively acquire and retain information that reinforces their existing prejudices (*biased assimilation*: Corner et al. 2012; Ehret et al. 2017; McCright and Dunlap 2011). Preferences for politically-slanted news sources are a key mechanism of biased assimilation (Bolin and Hamilton 2018; Feldman et al. 2014; Krosnick and MacInnis 2010; Slater 2007). People also apply *motivated reasoning* to reach predetermined conclusions (Druckman and McGrath 2019; Kraft et al. 2015; Kunda 1990; Taber and Lodge 2006), or *solution aversion* to discount the reality of problems that imply a need for unwanted solutions (Campbell and Kay 2014; Fogg et al. 2020). Propensities toward *conspiratorial thinking* are prominent in public discourse on climate change, vaccines and other topics, making them a focus of recent studies (Hornsey et al. 2018; Lewandowsky et al. 2016; Uscinski and Olivella 2017; van der Linden et al. 2020). *Anti-intellectualism*, associated with opposition to scientific positions on climate change and other topics (Merkley 2020; Motta 2017, 2018), casts expert discourse as objectionable in itself.

[3] *Peer group or cultural influences*, in which science attitudes are adopted from and reinforced by one's peers (*cultural cognition*: Kahan et al. 2011), or *performatively* expressed for approval (Mann and Schleifer 2020).

[4] *Messaging by elites*, linking rejection of scientific conclusions with sociopolitical identity, so that attentive individuals learn what views are appropriate for them. In contrast to science content and individual or social-group explanations, *elite cues* (and related theories) point toward external drivers: the role of economic interests or political and media elites informing their followers about what views they should hold. John Zaller's (1992) seminal analysis of surveys examined how exposure to elite discourse forms individual opinions. Adam Berinsky (2009) observes US public opinion responding to elite cues more than events during World War II and the Iraq War. Experimental work confirms the prevalence of elite-cue effects (reviewed by Tappin et al. 2020, with a meta-analysis in Tappin 2020; also see Bakker et al. 2020; Barber and Pope 2019; Cohen 2003; Kam 2005; Tesler 2018). Elite cues have been prominent regarding climate change (Brulle et al. 2012; Carmichael and Brulle 2017), overshadowing individual processes such as motivated reasoning (Merkley and Stecula 2018, 2020). Elite messaging often serves an agenda, as when corporate polluters build public opposition to formerly popular environmental protections (Gauchat et al. 2017; Jacques et al. 2008), or fossil-fuel interests derail mitigation of climate change (Dunlap and McCright 2015).

The four types of explanations sketched above, [1]–[4], are not mutually exclusive but they have different scope. Either science characteristics that conflict with basic values [1], or messaging from elites [4], could plausibly explain the origins of science rejection on particular topics. Tesler (2018), for example, finds that elite rhetoric dominates public rejection of climate change; but it has little effect with regard to evolution, where resistance comes from more stable beliefs. Individual cognitive [2] and social [3] processes, on the other hand, could serve as intermediate

or mediating factors that maintain and intensify science rejection that has become identity-linked. They also help to explain individual variation. The receive-accept-sample (RAS) framework of Zaller (1992) effectively integrates these ideas by suggesting that messaging from political elites drives opinions [4], but individuals differ in their awareness and response to such messages [2]. The most politically-aware individuals, having assimilated messages from their elites, can spread these among less-aware peers [3].

Although some experimental research finds that such processes can affect both liberals and conservatives, other studies report asymmetries (Jost 2017). For example, conservatives tend to have more politically homogeneous networks on online platforms such as Twitter (Boutyline and Willer 2017), to be more politically selective in choosing their sources of information (Rodriguez et al. 2017), show greater interest in pseudoscience (Lewandowsky et al. 2020) and ideologically compatible fake news (Guess et al. 2018), and are more inclined toward conspiratorial thinking (Cassese et al. 2020; Goldberg and Richey 2020; Jamieson and Albarracin 2020; Lewandowsky and Cook 2020; Lewandowsky et al. 2016; van der Linden et al. 2020). Studies also find conservatives paying closer attention to cues about identity-appropriate positions (Bullock 2011; Carmichael et al. 2017). Such asymmetries help account for the disproportionately conservative distrust in scientists observed across a range of topics (e.g., Hamilton 2015).

In the first half of 2020, conservative distrust of scientists became a dominant feature of the US public reaction to COVID-19 (Brzezinski et al. 2020; Cassese et al. 2020; Lewandowsky and Cook 2020; Safford and Hamilton 2020; multiple polls linked in Saletan 2020). Elite cues were certainly involved (Allcott et al. 2020; Bisbee and Lee 2020; Gadarian et al. 2020; Green et al. 2020; Grossman et al. 2020, Sides et al. 2020). In a revealing counterpoint, Merkley et al. (2020) observe that both elite and public polarization were lower in Canada. Apart from elite influences, however, the new topic also evokes old forces such as anti-intellectualism (Merkley 2020; Merkley and Loewen 2020; Motta 2017, 2018). Politicized resistance to mitigation steps such as testing and tracing, restrictions on mobility or gatherings, and mask policies was widely expressed in terms of conservatives valuing individual freedom. Both mask wearing and non-wearing were socially stigmatized in different circles (Gorman and Gorman 2020). The politicized distrust of science relating to COVID-19 essentially “checks all the boxes” of explanations reviewed above—but was there a primary driver?

In this paper we address that question through analysis of three surveys conducted during early months of the US pandemic. Each survey carried a question asking people whether they trusted science agencies such as the CDC for information about the coronavirus. Initial responses display fairly bipartisan support. This bipartisan initial condition deteriorated quickly, however. Within just four months, the Democrat–Republican gap widened from 10 to 64 points, following a sharp reversal of attitudes toward the CDC expressed by President Donald Trump and amplified by conservative media. Although other value, cognitive and social factors came into play, the suddenness and narrowness of this change implicates elite cues.

3. DATA AND METHODS

3.1 *Three Surveys*

The Survey Center at the University of New Hampshire collected data for this study through online surveys of people recruited randomly from phone numbers across the state. Past comparisons between New Hampshire and nationally representative telephone surveys found similar responses on science and environment-related questions, suggesting that the state can provide a rough proxy for the US on such topics (e.g., Hamilton 2016; Hamilton et al. 2018). Parallel comparisons using New Hampshire and national online surveys have not yet been attempted, although the New Hampshire online and telephone methodologies are well benchmarked against each other.

Three online surveys with COVID-19 questions were conducted in the first half of 2020 from March 17 to 26 ($n = 650$), April 16 to 20 ($n = 1,155$), and July 16 to 28 ($n = 959$). Preliminary reports summarize the pandemic context and results from each survey (Hamilton and Safford 2020b, 2020c; Safford and Hamilton 2020). There is some overlap among respondents in successive surveys. For example, 650 people responded to the March survey, and 1,155 in April. Those 1,155 April respondents included 496 who had also responded in March. A small group (194) responded to all three surveys, although anonymity arrangements prevent our tracking them as a distinct panel. For the four dependent variables that were asked only on the July survey, the issue of overlapping respondents does not arise. It might have relevance for analysis of one question (*change behavior*, see Table 1) asked on March and April surveys, and another question (*trust CDC*) that was asked on all three. Tests described in the Robustness of Findings section indicate, however, that this issue makes no difference to the conclusions.

Within each survey, weights proportional to the inverse probability of selection were calculated, adjusting sample profiles toward New Hampshire's adult population in terms of sex, age, education and region (based on targets from the most recent American Community Survey conducted by the US Census Bureau), as well as political party registration (provided by the New Hampshire Secretary of State). Such weights are applied to all analyses in this paper.

As context for interpreting these 2020 surveys, we also show comparable results from two surveys conducted in fall 2016, which asked about trusting science agencies such as CDC for information regarding the Zika virus pandemic. The designs of these earlier surveys, although not these specific results, have been previously described (Safford et al. 2017, 2020).

3.2 *Variable Definitions*

Table 1 lists six questions about COVID-19 behavior or perceptions that define our dependent variables. Along with question wording, the table shows weighted response percentages and the month (March, April and/or July) in which each question was asked. It also lists codes for regression analysis. Survey results indicate a predominantly cooperative response to the pandemic. In the early days, even before the governor's stay-at-home order in late March, more than three-fourths already said they were making major changes in their daily routines, such as

leaving home less often (*change behavior*). Later, as masks were recommended, 77% reported that they always wore a mask in public, or always did so unless they were outside and social distancing (*wear mask*). Such behavior helps to explain why the state's COVID-19 infection rates remained relatively low, by US standards, through this period. Other items in Table 1 likewise suggest majorities took the pandemic seriously.

Table 1: COVID-19 variable definitions, with months in 2020 when questions were asked, and codes used for regressions in Table 3.

Change behavior (March, April) — Have you changed your daily routine in any way specifically because of the coronavirus?

- No changes in my daily routine (0, 8%)
- Minor changes only, such as washing hands more often (0, 14%)
- Major changes, such as leaving home less often (1, 78%)
- no answer (0, 0.2%)

Wear mask (July) — What best describes your own current use of a face mask (covering mouth and nose) as a COVID-19 precaution, when going out in public places such as stores, restaurants, or parks?

- I always use a face mask in public places (1, 29%)
- I always use a face mask when out in public, unless I am outdoors and can maintain social distance (1, 48%)
- I sometimes use a face mask in public places (0, 15%)
- I never use a face mask in public places (0, 7%)
- no answer (0, 2%)

Worry health (July) — How worried are you that you, or someone in your family, might become sick with COVID-19 over the next year?

- Very worried (1, 26%)
- Moderately worried (1, 31%)
- Slightly worried (0, 25%)
- Not at all worried (0, 18%)
- no answer (0, 1%)

Priority virus (July) — Which of the following do you think should be the highest priority of state and federal governments, with regard to COVID-19?

- The government's highest priority should be to contain the spread of COVID-19, even if that hurts the economy (1, 60%)
- The government's highest priority should be to restart the economy, even if that increases the risk to public health (0, 30%)
- no answer (0, 10%)

Worst to come (July) — Which of the following statements do you think is more accurate concerning the coronavirus or COVID-19 in the United States?

- The worst is yet to come (1, 59%)
- The worst is behind us (0, 21%)
- COVID-19 has not really been a major problem in the US? (0, 6%)
- no answer (0, 14%)

Trust CDC (March, April, July) — As a source of information about the coronavirus, would you say that you trust, don't trust, or are unsure about science agencies such as the Centers for Disease Control (CDC) that study infectious diseases?

- Trust (1, 69%)
 - Don't trust (0, 13%)
 - Unsure (0, 18%)
-
-

Table 2 lists independent variable definitions and coding. These include respondent age, gender, education and political party, along with survey month. Table 2 also list two other political-identity indicators, Fox News watching and Trump support, which may be predictive of COVID opinions (e.g., Hamilton and Safford 2020c). These two questions were not asked on all surveys, so are not used in the multivariate analysis of Table 3, but bivariate analysis of July results (Figure 3) confirms strong negative associations with trusting the CDC.

Table 2: Independent variables and codes, with weighted summary statistics.

Age — Range 18 to 91 years, mean 49 years. Missing values: 2% gave no answer.

Gender — Male (0, 48%), Female (1, 49%). Missing values: a total of 3% identified as transgender, nonconforming or nonbinary, or gave no answer.

Education — High school or less (−1, 35%), technical school or some college (0, 31%), college graduate (1, 21%), postgraduate (2, 12%). Missing values: 1% gave no answer.

Party — *Democrat* (1 if yes, 0 otherwise, 47%), *Independent* (1 if yes, 0 otherwise, 9%), *Republican* (1 if yes, 0 otherwise, 42%). Missing values: 2% said other party, or gave no answer.

Month — March 2020 (0, $n = 650$), April 2020 (1, $n = 1,155$), July 2020 (4, $n = 959$)

Fox News (Figure 3 only; not asked on all surveys) — Don't know or watch never (1, 58%), occasionally (2, 23%), at least several times per week (3, 19%)

Trump (Figure 3 only; not asked on all surveys) — Disapprove (1, 61%), approve (3, 37%), neither approve nor disapprove, or don't know (omitted, 2%)

3.3 Regression Modeling

Codes given for dependent variables in Table 1 simplify each into binary $\{0,1\}$ form, suitable for binomial logit regression. The “1” category in each case identifies the most salient and substantively important response, such as wearing a mask most of the time ($29 + 48 = 77\%$). Analysis with binomial logit offers parsimony and interpretive advantages over multi-category methods such as ordered or multinomial logit, but all yield similar conclusions, as summarized in the Robustness of Findings section.

Independent variable definitions are given in Table 2. *Age* is measured in years, and *gender* represented by a $\{0,1\}$ dichotomy. About 3% of the respondents chose one of several nonbinary gender identities (transgender, nonconforming, other) or gave no answer. These nonbinary identities could be of substantive interest for some research, but their numbers are too small for meaningful analysis in our surveys. *Education* is coded with four values from −1 to +2, centered (for interaction-effect purposes) on technical school or some college (0). Previous studies have shown monotonic and approximately linear effects of such four-degree education indicators on a wide range of science- or environment-related dependent variables (Fogg et al. 2020; Hamilton and Fogg 2019; Safford et al. 2020), including “trust scientists for information” items similar to

the *trust CDC* question here (Hamilton 2015; Hamilton et al. 2015a). Political party involves self-identification as Democrat, Independent or Republican. Two percent selected some other party or gave no answer. Again, these minor-party and no-party categories are potentially intriguing, but too sparse for analysis here.

The final independent variable in Table 2 is survey *month*, coded as 0, 1 or 4 for March, April or July—representing the calendar sequence 3, 4, 7 but with an interpretable zero point for interaction purposes. This variable matters for two models that analyze questions asked in two or three different months. Four other models analyze questions that were only asked in July.

4. RESULTS

Table 1 summarized univariate distributions of responses to six coronavirus questions. One of these, *trust CDC*, is most interesting because we can track changes across three surveys in 2020, and also through comparison with two 2016 surveys that asked a nearly identical question regarding the Zika virus pandemic. After characterizing temporal changes, and bivariate associations between *trust CDC* and respondent characteristics, we apply regression methods to test a common set of characteristics as predictors for each of the coronavirus items.

4.1 Trust in Science Agencies

During the Zika pandemic in 2016, random-sample US and New Hampshire telephone surveys (described in Safford et al. 2017, 2020) asked,

As a source of information about the Zika virus, would you say that you trust, don't trust, or are unsure about science agencies such as the Centers for Disease Control (CDC) that study infectious diseases?

The US survey (**Figure 1a**) found that trust in science agencies such as the CDC regarding Zika was high among both Democrats (83%) and Republicans (72%). The New Hampshire survey (Figure 1b) found almost identical results among Democrats (82%), but a smaller majority among Republicans (57%). These 2016 Zika results provide historical benchmarks.

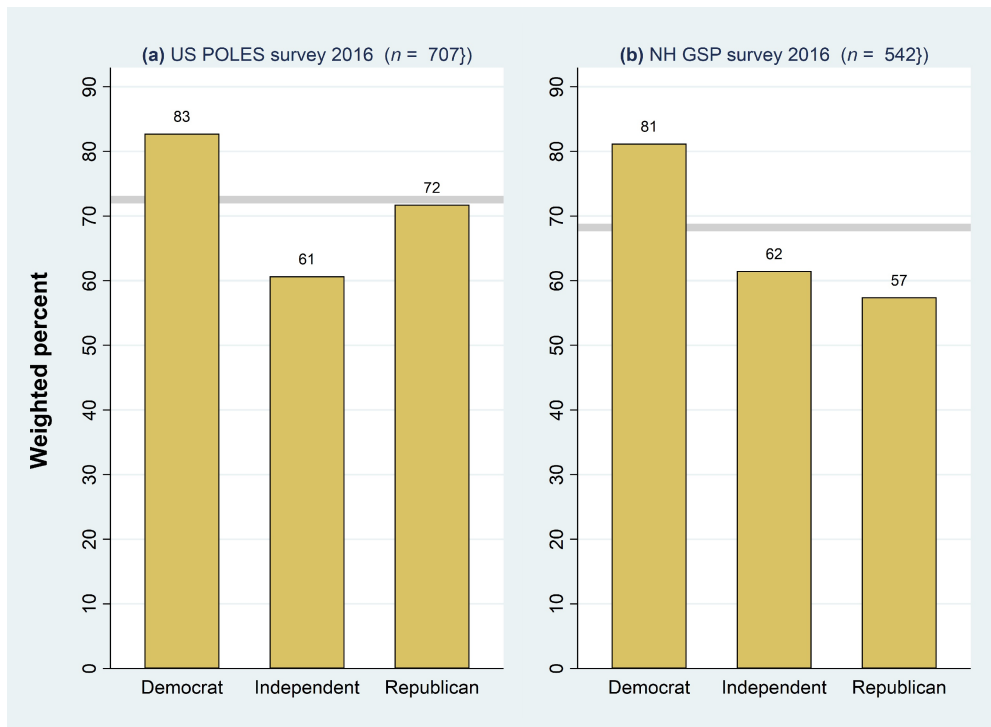


Figure 1: Percent who trust science agencies such as CDC for Zika virus information, by political party on two fall 2016 surveys: (a) US nationwide POLES survey, and (b) New Hampshire GSP survey. See Safford et al. 2017, 2020 for background on these two surveys.

On our 2020 New Hampshire surveys, we asked a coronavirus version of this question (*trust CDC* defined in Table 1). The March 2020 survey found 77% trust overall, higher than either of the 2016 surveys and indicative of bipartisan support. By July 2020, however, overall trust in science agencies such as CDC for information about the coronavirus had fallen to just 59%, well below 2016 levels (**Figure 2**).

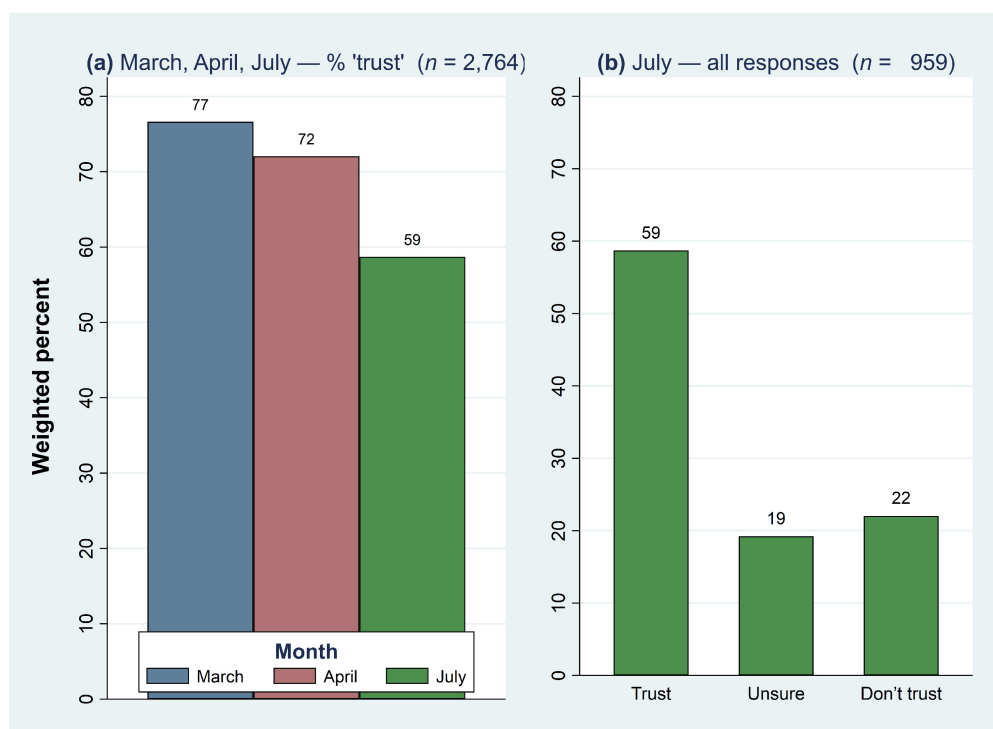


Figure 2: As a source of information about the coronavirus, would you say that you trust, don't trust, or are unsure about science agencies such as the Centers for Disease Control (CDC) that study infectious diseases? (a) Percent "trust" responses to March, April and July 2020 surveys, and (b) all responses to the July survey.

Who trusts science agencies for coronavirus information? **Figure 3** charts July 2020 "trust" percentages by respondent characteristics. Gender and age differences are not significant. Trust is significantly higher among college graduates, and lower among respondents with high school education or less. The most dramatic differences, however, involve political identity: 89% of Democrats but only 25% of Republicans said they trust science agencies. Similarly wide gaps are seen between those who do or do not approve of President Trump, and frequently or never watch Fox News—two alternative indicators for political identity. Only 19% of those who approve Trump, and 22% of frequent Fox News viewers, said they trust science agencies such as CDC for information. (For other indications of conservative media effects on COVID-19 perceptions and behavior, see Bursztyn et al. 2020; Hamilton and Safford 2020a, 2021; Jamieson and Albarracin 2020; Simonov et al. 2020.)

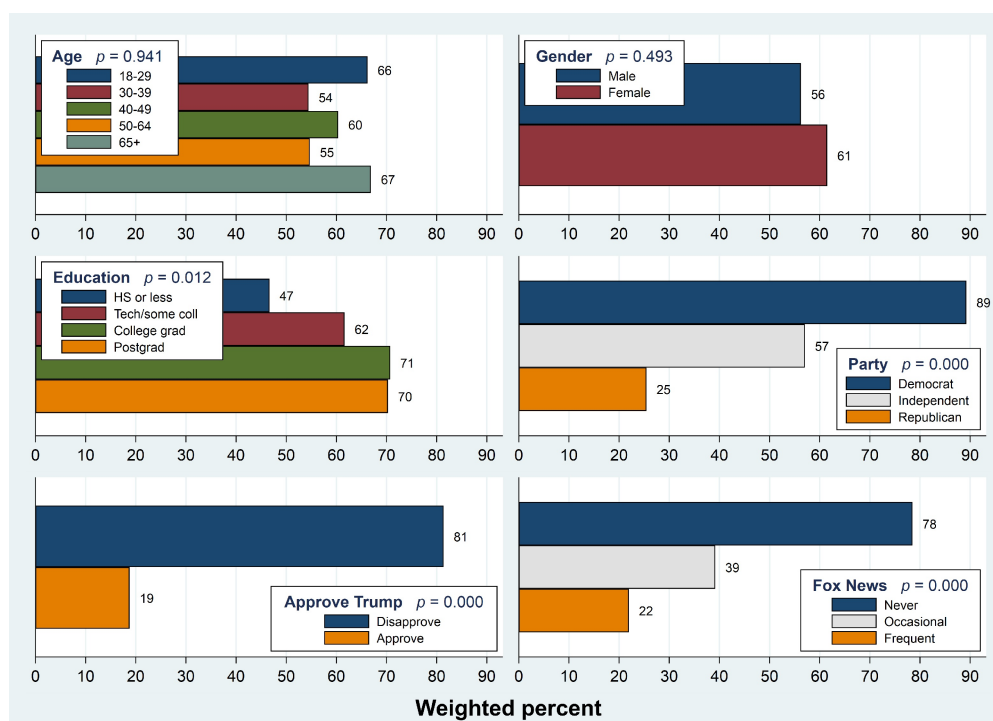


Figure 3: Percent who trust science agencies such as CDC for coronavirus information (July 2020 survey), by respondent characteristics.

The overall decline in trust charted in Figure 2a, together with background differences seen in Figure 3, raises an obvious question: Who lost trust? **Figure 4** supplies a clear answer. At the time of the March survey, Republican trust in science agencies such as CDC for coronavirus information was notably higher than that of Independents, and only 10 points lower than Democrats (74% vs. 84%). Subsequently, however, Republican trust fell off steeply: from 74% in March to just 25% in July. Expressions of trust by Democrats and Independents, meanwhile, were slightly higher in July than in March, so the Democrat–Republican gap exploded from 10 points in March to 64 points in July.

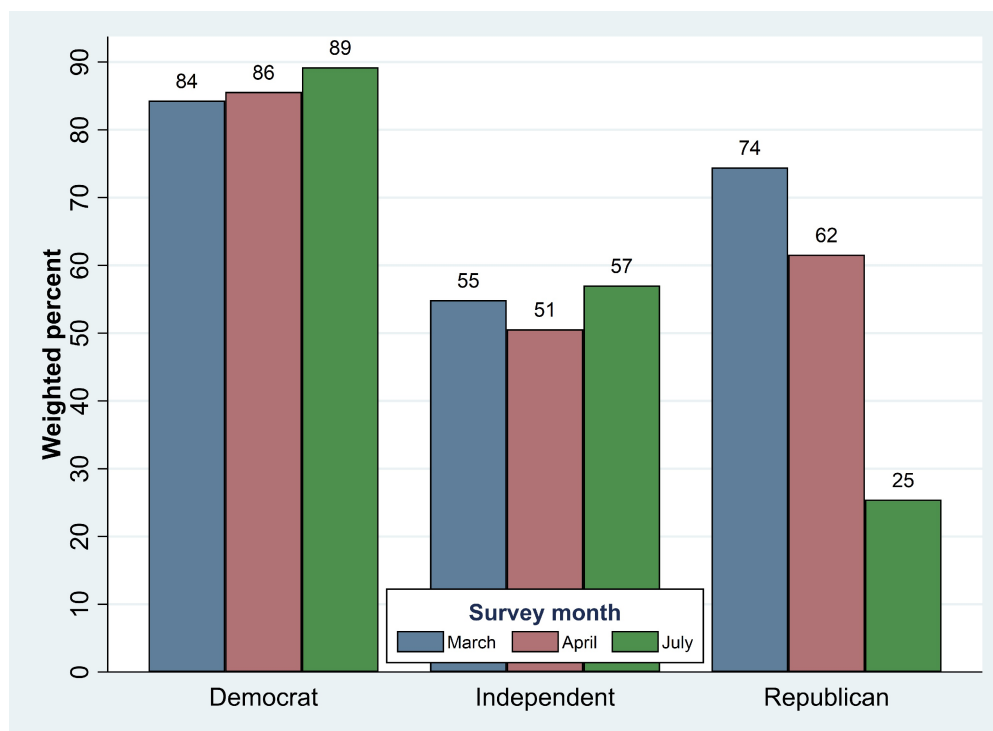


Figure 4: Percent who trust science agencies such as CDC for coronavirus information, by survey month and respondent political party.

4.2 Predictors of Behavior and Perceptions

Might the Republican decline in trust charted in Figure 4 be partly spurious, or reflect sampling variation between surveys? **Table 3** tests this possibility, and explores the social basis of COVID-19 behavior and perceptions more generally, through logit regressions involving the six dependent variables defined in Table 1. Each COVID-19 variable is regressed on a common set of predictors—respondent *age*, *gender*, *education* and $\{0,1\}$ indicators for *Independent* or *Republican* party (Democrat being the reference category). For the *change behavior* question asked on two surveys, or *trust CDC* asked on three, we also test for change by entering survey *month* as a predictor.

Table 3. Predictors of behavior and perceptions related to COVID-19. Odds ratios from weighted logit regressions; see Table 1 for variable definitions and coding.

Predictor	Dependent variable					
	1. <i>Change behavior</i>	2. <i>Wear mask</i>	3. <i>Worry health</i>	4. <i>Priority virus</i>	5. <i>Worst to come</i>	6. <i>Trust CDC</i>
<i>Age</i>	1.013	1.058***	1.018	0.998	1.016	0.995
<i>Gender (F)</i>	2.411**	0.933	1.180	0.839	0.713	0.824
<i>Education</i>	1.170	0.665	1.158	0.654*	0.809	0.930
Party						
<i>Democrat</i>	(base)	(base)	(base)	(base)	(base)	(base)
<i>Independent</i>	0.334*	0.130**	0.883	0.064***	0.200**	0.205***
<i>Republican</i>	0.301***	0.015***	0.109***	0.007***	0.020***	0.506*
Education×party						
<i>Democrat</i>	(base)	(base)	(base)	(base)	(base)	(base)
<i>Independent</i>	1.003	1.577	0.414*	1.478	0.974	1.619*
<i>Republican</i>	0.861	2.528*	0.807	2.272*	1.816	1.546*
<i>Month</i>	1.230	....	....	....	....	1.100
Month×party						
<i>Democrat</i>	(base)	(base)	(base)	(base)	(base)	(base)
<i>Independent</i>	....	....	....	....	....	0.913
<i>Republican</i>	....	....	....	....	....	0.534***
<i>F statistic</i>	9.53***	9.70***	18.51***	25.09***	23.91***	17.58***
Survey months	Mar, Apr	Jul	Jul	Jul	Jul	Mar, Apr, Jul
Estimation sample	1,739	899	899	899	899	2,638

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ (two-tailed tests)

All models in Table 3 include education×party interaction terms. Education×party effects, or similar interactions involving other knowledge and political indicators, have been found in previous studies to affect responses on science trust (Hamilton et al. 2015a; Safford et al. 2020) and many other science-related topics (Drummond and Fischhoff 2017; Hamilton 2008, 2011; Hamilton et al. 2012, 2015b; Kahan et al. 2011; McCright and Dunlap 2011; Shao et al. 2014; Tranter 2019; Zummo et al. 2020). Their usual form is that trust in scientists rises with education among Democrats and Independents (or liberals and moderates), but stays level or declines with education among the most conservative. If education×party interactions exist but are left out of the models, analysts risk underestimating the effects of both education and party. Model 6 for *trust CDC*, the only question asked on all three surveys, also includes month×party interaction terms suggested by Figure 4.

Although older respondents were more likely to report mask wearing (model 2, July), we otherwise see no significant age effects, contrary to what might be expected from relative health risks, or the higher social cost of compliance with mobility reductions among young people

(Merkley and Loewen 2020). Women more often said they made major changes in daily routines (model 1, March and April), but gender effects are otherwise nonsignificant. Education exhibits no main effects, but because the models include education×party interactions, that result is conditional. The (lack of) main effects from education simply means that responses did not change with education among Democrats, the reference category of party.

The main effects shown for *Independent* and *Republican* represent contrasts between those respondents and Democrats, among people having technical school or some college education (*education* = 0) and, for model 6 only (with its month×party interaction), in March (*month* = 0). Republicans with technical school/some college education, for example, are less likely than Democrats to (1) have changed their behavior early in the pandemic, (2) wear a mask, (3) worry about themselves or their family getting sick, (4) view controlling the virus as a higher priority, (5) think that for the US, the worst is yet to come, or (6) trust science agencies such as CDC for information about the virus. Independents gave responses intermediate between Republicans and Democrats on most of these issues.

4.3 Interaction Effects

Partisan identity has consistently significant main effects in the same direction across all models in Table 3: Republicans take the pandemic less seriously. Party has further impacts through education×party interactions and, in model 6, a month×party interaction. (A month×party interaction could in principle have been included with model 1 also, but its effect with just two months is not significant, and raises collinearity problems.) **Figure 5** plots predicted probabilities from the education×party and month×party interactions in model 6.

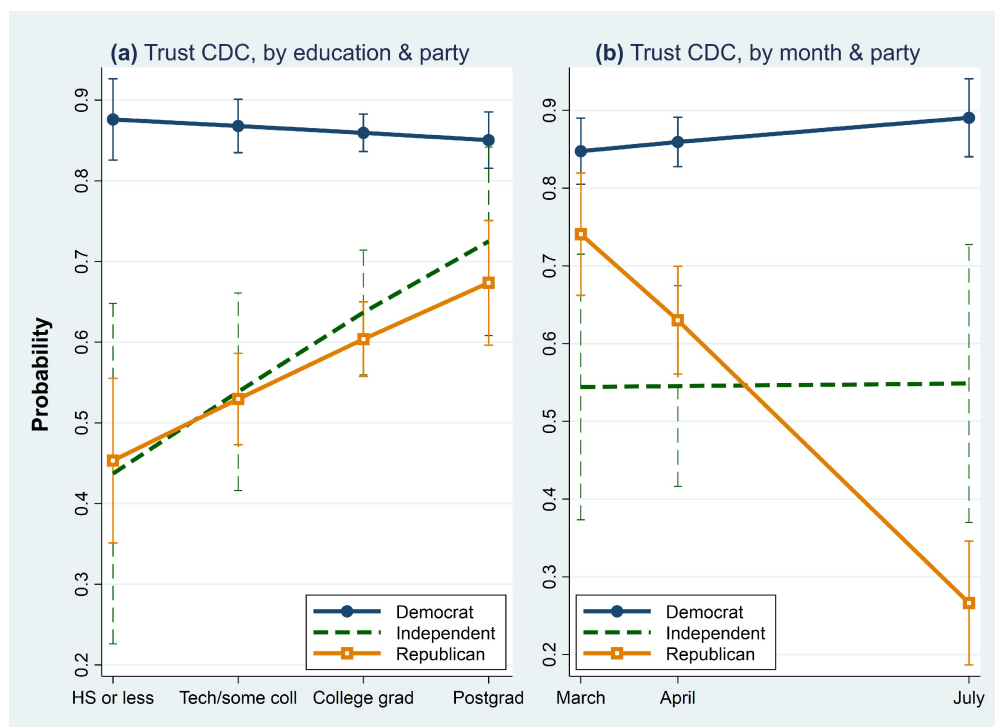


Figure 5: Margins plots showing (a) education×party and (b) month×party interaction effects on trust in science agencies such as CDC, calculated from model 6 in Table 3 (with 95% confidence intervals).

As mentioned earlier, education×party (or similar) interactions have previously been documented for science trust, climate change, and other science or environment-related topics. In those instances, however, the interactions could be visualized as a right-opening megaphone, wherein the gap between Democrats and Republicans, or liberals and conservatives, widens with higher education. In Figure 5a we see the opposite: the gap narrows with higher education, as college-educated Republicans and Independents express relatively greater trust in science agencies. The widest partisan gap occurs among those with high school or less. Similar patterns occur with education×party effects in models for *wear mask*, *priority virus* and *worst to come*.

The month×party interaction graphed in Figure 5b depicts an extraordinary change over the course of three surveys. Among Republicans only, there was a steep decline of trust in science agencies such as the CDC. This regression adjusts for other background factors, but the decline’s magnitude remains similar to that seen in the unadjusted analysis of Figure 4. In contrast, studies that have repeated questions about trust in scientists on other topics report considerable stability (Hamilton 2015; Hamilton et al. 2017).

4.4 Robustness of Findings

Statistical analysis requires many decisions, which arguably could be made different ways. While trying to make the best decisions in each case, it remains important to explore reasonable alternatives, evaluating the sensitivity of findings. This section describes a number of alternative analyses, all of which support the robustness of main conclusions.

Alternatives to binomial logit: The wording of some survey questions in Table 1 is intrinsically binary or categorical (*priority virus, trust CDC*), making binomial logit an obvious choice. Other questions (*wear mask, change behavior, worry health*), however, offer three or four responses that might be viewed as ordinal. For the analysis in Table 3 we chose to dichotomize these, emphasizing distinctions of practical importance (major lifestyle changes, usually wearing a mask, worried about health). Alternatively, they could be analyzed in ordinal form using ordered logit regression, or even ordinary least squares (OLS). We estimated binomial logit, ordered logit and OLS versions of each model, and found that the same predictors have significant main effects in each case: *gender, Independent* and *Republican* predict *change behavior*; *age, Independent* and *Republican* predict *wear mask*; *Republican* predict *worry health*. The only differences occurred with education×party interactions, which are stronger in binomial versions.

Drawbacks of an ordered-logit approach include complexity, more abstract interpretation, and a proportional-odds assumption (that the relationship between all pairs of successive groups is the same) which is rejected in each case by post-estimation tests. Linear regression might be more robust, but here would assume a constant difference between categories—so “no changes” and “washing hands more often” (for the *change behavior* variable) are assumed to be as far apart as “washing hands” and “leaving home less often.” Even if this were true in a regression sense (so that party and *education* have constant effects on probabilities) these steps are not comparable in their health impacts. For substantive reasons, we prefer the dichotomous approach to focus on the most salient and health-relevant distinctions. A secondary consideration is that with binomial logit, all models in Table 3 employ the same estimation strategy, and have coefficients in the same metric (odds ratios) as model 6 which is our main focus.

Independent observations: Independent observations are assumed for the usual standard errors. This assumption is violated by our panel data, which include some repeat respondents. Cluster-robust standard errors (based on a Huber/White/sandwich estimator), however, do not require this assumption, allowing for clustered observations—in this case, panel respondents. We estimated alternative versions of the two multi-month regressions, models 1 and 6, using cluster-robust standard errors. Although cluster-robust standard errors are slightly larger, the same effects and interactions are significant, at similar levels, either way. As a second test, we estimated a version of model 6 keeping only the unique respondents (estimation sample $n = 1,758$ instead of 2,638). Again, substantive conclusions are the same, even setting aside one-third of the data.

Treatment of no-answer responses: If no-answer respondents are discarded from the *priority virus* regression, the estimation sample drops from $n = 899$ to 833. However, the same effects (*education, Independent, Republican, education×Republican*) are significant, with comparable magnitude, either way. If no-answer respondents are discarded from the *worst to come* regression (model 5 in Table 3), the estimation sample drops from $n = 899$ to 805. Again, the same effects (*Independent, Republican*) are significant, with comparable magnitude, either way. From these indications, the no-answer responses do not appear problematic. We chose not to discard observations from the Table 3 analyses because (1) results apply to the representative sample, rather than a restricted sample of people who gave definite answers; and (2) interpretation is

straightforward, contrasting people who think containing the virus should be the highest priority, or that worst was yet to come, with people who do not hold those views.

Other respondent characteristics: The July survey asked about employment status and income, so it is possible to estimate versions of models 2–5 (but not 1 or 6) including these as predictors. Income shows a significant effect only in model 3 (*worry health*): respondents from higher-income households worry less about their health. Employment status has significant effects only in models 3 (*worry health*) and 5 (*worst to come*): in both, retired people express lower worry than those employed full time. Retirement effects are hard to interpret, however, being confounded with age. No other employment statuses make a significant difference. Substantive conclusions about political identity are not changed in any of these models, but we lose about 10% of the sample (due to missing values of income), and also give up comparability with models 1 and 6. For these reasons we kept the simpler, comparable versions of models 2–5 in Table 3.

Three-way interaction: Model 6 in Table 3 includes two 2-way interactions, education×party and month×party, both of which prove to be significant. We tested for a 3-way month×education×party interaction, but that was not significant and brought no improvement in fit.

5. DISCUSSION

Replications are needed to assess the generality of these New Hampshire findings, but the “social bases of COVID concern” seen in our data are broadly consistent with those found in many other studies cited above—including evidence of rapid polarization (Sides et al. 2020). An overall decline of public trust in science agencies such as the CDC also appears in a nationwide CBS poll (De Pinto 2020).

We noted that four kinds of explanations have been applied to explain politicized distrust of scientists: characteristics of the science itself, cognitive factors, peer or cultural influences, and cues from elites. The relative importance of different processes in creating and reinforcing public attitudes no doubt varies from case to case, but the drop we observe in trust of science agencies such as the CDC for information about the coronavirus was strikingly large (almost 50 points), narrow (Republicans only), and rapid (four months), even while public communication from the CDC was comparatively muted. These observations implicate elite cues as the probable explanation.

Over the four months spanned by our surveys, President Trump’s pronouncements about the CDC, amplified by conservative media, transformed from exuberant praise into wariness and then active hostility. In the early days of the pandemic he tweeted praise:

“The Coronavirus is very much under control in the USA. We are in contact with everyone and all relevant countries. CDC & World Health have been working

hard and very smart. Stock Market starting to look very good to me!” (February 24)

On February 26 he tweeted that CDC was “doing a great job,” and the next day thanked “all of the many professionals doing such a fine job at CDC & all other agencies on the Coronavirus situation.” These expressions set the stage for the high Republican trust in CDC seen on our March survey, which was not far below that of Democrats, and higher than Republican trust in CDC during the Zika virus pandemic.

As March progressed, however, Trump began to criticize the CDC for failures he said originated under President Obama. A “Trump-Fox feedback loop” of misinformation on COVID-19, in which Trump and Fox News each amplified the other (Stelter 2020), widened the reach of this criticism. A modest Republican decline in CDC trust appears on our survey in April.

On April 21 (just after the April survey) CDC Director Robert Redfield warned that a second wave of the coronavirus, coming in winter, could be even more difficult than the first. This warning proved accurate, but it contradicted Trump’s public assurances that the disease would soon disappear. Trump reacted with a tweet denying that the Redfield interview was authentic:

“CDC Director was totally misquoted by Fake News @CNN on Covid 19. He will be putting out a statement.” (April 22)

Shortly before the July survey, Trump tweeted that CDC was wrong to advise caution, and should have their minds changed:

“I disagree with @CDCgov on their very tough & expensive guidelines for opening schools. While they want them open, they are asking schools to do very impractical things. I will be meeting with them!!!” (July 8)

That same day he retweeted to his 80 million followers a quote from TV game show host Chuck Woolery accusing the CDC of lying. Conservative media repeated this accusation. By our July survey, Republican trust in CDC scientists had fallen by almost 50 points. Meanwhile, trust among Democrats and Independents changed little. Looking back over five surveys and two pandemics, CDC trust among Democrats or Independents had been remarkably stable—varying by just 7 points among Democrats, or 11 points among the smaller subsamples of Independents.

Trump’s public disparagement of the organization subsequently intensified. His attacks on scientists led to unprecedented editorials condemning the president in *Science*, *Nature*, *Scientific American* and the *New England Journal of Medicine* (Thorpe 2020; Nature 2020; Scientific American 2020; NEJM 2020). Analysis by Evanega et al. (2020) found the US president to have been internationally the largest driver of COVID-19 misinformation.

Distrust of scientists regarding climate change and environmental protection took root less suddenly than with COVID-19, but these too are comparatively modern phenomena. Jacques et al. (2012) document the elite-driven counter-movement weakening US public support for environmental protections, in large part by attacking the credibility of environmental scientists. Multiple studies (Brulle et al. 2012; Carmichael et al. 2017; Dunlap and McCright 2015; Merkley and Stecula 2018) examine the role of elite cues in raising public doubts about scientists on

climate change. Our COVID-19 conclusions fit with these previous studies, but show a much faster timeline.

Research on environmental protection and climate change often reports education×party interactions in which divisions widen with education, interpreted to indicate that better educated partisans are more attuned to elite cues—consistent with Zaller’s (1992) point that elite discourse reaches more politically-aware individuals. The education×party interaction seen in Figure 5a, however, goes in the opposite direction: better educated individuals exhibit less polarization. If replicated, this hints at different information dynamics around COVID-19. Although we see no education gradient related to Fox News viewership in the July survey, there is one for conservative talk radio listeners, who tend to be less educated and hold more extreme views on the pandemic (Hamilton and Safford 2020c, 2021). Some online media not explored here might have similar profiles. College-educated conservatives, conversely, are more likely than less educated conservatives to consume mainstream media such as newspapers and public radio, potentially exposing them to more diverse views.

As for the CDC itself, the organization was created to deal with just such a crisis, but its response to COVID-19 has been criticized by experts. Although the agency started planning for tests to detect the new virus in January, soon after reports began emerging from China, the first test kits it produced did not work. Replacements were delayed and too few in number so that US diagnostic and tracking efforts fell far behind those of other countries, and behind the spread of the virus itself (*Washington Post* 2020). Under Trump-appointed director Robert Redfield the CDC kept a low profile. Its scientists were rebuked or prevented from speaking out, and even Redfield was contradicted by the president (Lipton et al. 2020). At a time when strong scientific advice was urgently needed, the advice coming from CDC often seemed weak, contradictory, and out of step with the conclusions of independent scientists. Political operatives overruled scientists’ advice, leading to an extraordinary op-ed by two leading public health experts: “It has come to this: Ignore the CDC” (Varmus and Shah 2020; for CDC insiders’ accounts see Weiland 2020). With a vaccination campaign coming soon, CDC missteps and political interference cost the agency credibility it urgently needed (Sun and Achenbach 2020). Thus, there are good reasons to expect trust in the CDC might decline among Democrats as well, but that was not evident over the months of these surveys.

6. CONCLUSIONS

Three New Hampshire surveys conducted in March, April and July 2020 tracked a dramatic decline of trust in science agencies such as the CDC for information about the coronavirus. This decline occurred only among Republicans, who dropped from 74% trust (not far below that of Democrats) in March, to 62% in April and 25% in July. These changes follow a reversal of views on the CDC expressed by President Trump, and amplified by conservative media. The pattern suggests *elite cues* in action: top-down messages creating deep public divisions regarding science that, at the start of this period, enjoyed relatively bipartisan approval in keeping with Trump’s initially positive cues. Similar elite-driven processes have been noted by other researchers

regarding environmental protection and climate change, but the COVID-19 case is extreme. Other questions on the surveys likewise reflect politicized views of the science: Republicans were less likely to wear a mask, worry about themselves or family getting sick, consider controlling the virus as a higher priority than restarting the economy, or to believe scientists' warnings (unfortunately since confirmed) that without such measures, the worst of the pandemic was yet to come.

REFERENCES

- Adolph, Christopher, Kenya Amano, Bree Bang-Jensen, Nancy Fullman and John Wilkerson. 2020. "Pandemic politics: Timing state-level social distancing responses to COVID-19." medRxiv preprint <https://doi.org/10.1101/2020.03.30.20046326>
- Allcott, Hunt, Levi Boxell, Jacob Conway, Matthew Gentzkow, Michael Thaler and David Y. Yang. 2020. "Polarization and public health: Partisan differences in social distancing during the Coronavirus pandemic." NBER Working Paper, (w26946). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3574415
- American Academy of Arts and Sciences. 2018. *Perceptions of Science in America: A Report from the Public Face of Science Initiative*. Cambridge MA: American Academy of Arts and Sciences.
- Ayala, Francisco J. 2008. "Science, evolution, and creationism." *Proceedings of the National Academy of Sciences* 105(1):3–4. <https://doi.org/10.1073/pnas.0711608105>
- Bakker, Bert N., Yphtach Lelkes and Ariel Malka. 2020. "Understanding partisan cue receptivity: Tests of predictions from the bounded rationality and expressive utility perspectives." *The Journal of Politics* 82(3). <https://doi.org/10.1086/707616>
- Barber, Michael and Jeremy C. Pope. 2019. "Conservatism in the era of Trump." *Perspectives on Politics* 17(3):719–736. <https://doi.org/10.1017/S153759271900077X>
- Berinsky, Adam J. 2009. *In Time of war: Understanding American Public Opinion from World War II to Iraq*. Chicago: University of Chicago Press.
- Berinsky, Adam. 2012. "Public support for vaccination remains strong." YouGov America. <https://today.yougov.com/news/2012/12/05/public-support-vaccination-remains-strong/>
- Bernat, Debra H., Scott B. Harpin, Marla E. Eisenberg, Linda H. Bearinger, and Michael D. Resnick. 2009. "Parental support for the human papillomavirus vaccine." *Journal of Adolescent Health* 45:525–527. doi:10.1016/j.jadohealth.2009.04.014
- Bisbee, James and Diana Lee. 2020. "Mobility and elite cues: Partisan responses to Covid-19." <https://doi.org/10.33774/apsa-2020-76tv9>
- Bolin, Jessica L. and Lawrence C. Hamilton. 2018. "The news you choose: News media preferences amplify views on climate change." *Environmental Politics* 27(3):455–476. <https://doi.org/10.1080/09644016.2018.1423909>

- Boutyline, Andrei and Robb Willer. 2017. "The social structure of political echo chambers: Variation in ideological homophily in online networks." *Political Psychology* 38:551–569. <https://doi.org/10.1111/pops.12337>
- Brulle, Robert J., Jason Carmichael and J. Craig Jenkins. 2012. "Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010." *Climatic Change* 114:169–188. <https://doi.org/10.1007/s10584-012-0403-y>
- Brzezinski, Ada, Valentin Kecht, David Van Dijke and Austin L. Wright. 2020. "Belief in science influences physical distancing in response to COVID-19 lockdown policies." Working Paper No. 2020-56, Becker Friedman Institute. <https://bfi.uchicago.edu/working-paper/belief-in-science-influences-physical-distancing-in-response-to-covid-19-lockdown-policies/> accessed 7/31/2020
- Bullock, John G. 2011. "Elite influence on public opinion in an informed electorate." *American Political Science Review* 105:496–515. <https://doi.org/10.1017/S0003055411000165>
- Burszty, Leonardo, Aakaash Rao, Christopher P. Roth and David H. Yanagizawa-Drott. 2020. "Misinformation during a pandemic." Working Paper 27417, National Bureau of Economic Research. <https://www.nber.org/papers/w27417>
- Campbell, T.H. and A.C. Kay. 2014. "Solution aversion: On the relation between ideology and motivated disbelief." *Journal of Personality and Social Psychology* 107(5):809–824. <https://doi.org/10.1037/a0037963>
- Carmichael, Jason T., Robert J. Brulle and Joanna K. Huxster. 2017. "The great divide: Understanding the role of media and other drivers of the partisan divide in public concern over climate change in the USA, 2001-2014." *Climatic Change* 141:599–612. <https://doi.org/10.1007/s10584-017-1908-1>
- Cassese, Erin C., Christina E. Farhart and Joanne M. Miller. 2020. "Gender differences in COVID-19 conspiracy theory beliefs." *Politics and Gender* <https://doi.org/10.1017/S1743923X20000409>
- Cohen, G.L. 2003. "Party over policy: The dominating impact of group influence on political beliefs." *Journal of Personality and Social Psychology* 85(5):808–822. <https://doi.org/10.1037/0022-3514.85.5.808>
- Corner, Adam, Lorraine Whitmarsh and Dimitrios Xenias. 2012. "Uncertainty, scepticism and attitudes towards climate change: Biased assimilation and attitude polarisation." *Climatic Change* 114:463–478. <https://doi.org/10.1007/s10584-012-0424-6>

- De Pinto, Jennifer. 2020. "Voters skeptical about potential COVID-19 vaccine and say that one this year would be rushed — CBS News Poll." CBS News, September 6.
<https://www.cbsnews.com/news/voters-covid-19-vaccine-opinion-poll/> accessed 9/9/2020.
- Druckman, James N. and Mary C. McGrath. 2019. "The evidence for motivated reasoning in climate change preference formation." *Nature Climate Change* 9:111–119.
<https://doi.org/10.1038/s41558-018-0360-1>
- Drummond, Caitlin and Baruch Fischhoff. 2017. "Individuals with greater science literacy and education have more polarized beliefs on controversial science topics." *Proceedings of the National Academy of Sciences*. <https://doi.org/10.1073/pnas.1704882114>
- Dunlap, Riley E. and Aaron M. McCright. 2015. "Challenging climate change: The denial countermovement." Pp. 300–332 in Riley E. Dunlap and Robert J. Brulle (eds), *Climate Change and Society: Sociological Perspectives*. New York: Oxford University Press.
- Ehret, Phillip J., Aaron C. Sparks and David K. Sherman. 2017. "Support for environmental protection: An integration of ideological-consistency and information-deficit models." *Environmental Politics* 26(2):253–277. <https://doi.org/10.1080/09644016.2016.1256960>
- Evanega, Sarah, Mark Lynas, Jordan Adams and Karinne Smolenyak. 2020. "Coronavirus misinformation: Quantifying sources and themes in the COVID-19 'infodemic'." <https://int.nyt.com/data/documenttools/evanega-et-al-coronavirus-misinformation-submitted-07-23-20-1/080839ac0c22bca8/full.pdf> themes in the COVID-19 'infodemic.'" Cornell University accessed 10/1/2020.
- Feldman, Lauren, Edward W. Maibach, Connie Roser-Renouf and Anthony Leiserowitz. 2012. "Climate on cable: The nature and impact of global warming coverage on Fox News, CNN, and MSNBC." *The International Journal of Press/Politics* 17(1):3–31.
<https://doi.org/10.1177/1940161211425410>
- Fogg, Linda M., Lawrence C. Hamilton and Erin S. Bell. 2020. "Views of the highway: Infrastructure reality, perceptions and politics." *Sage Open*.
<https://doi.org/10.1177/2158244020963609>
- Funk, Cary 2020. "Key findings about Americans' confidence in science and their views on scientists' role in society." Pew Research Center, February 12.
<https://www.pewresearch.org/fact-tank/2020/02/12/key-findings-about-americans-confidence-in-science-and-their-views-on-scientists-role-in-society/> accessed 9/22/2020.
- Funk, Cary and Brian Kennedy. 2020. "Public confidence in scientists has remained stable for decades." Pew Research, August 27.
<https://www.pewresearch.org/fact-tank/2020/08/27/public-confidence-in-scientists-has-remained-stable-for-decades/> accessed 9/22/2020.

Gadarian, Shana Kushner, Sara Wallace Goodman and Thomas B. Pepinsky. 2020. “Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic.” SSRN. <http://dx.doi.org/10.2139/ssrn.3562796>

Gauchat, Gordon. 2012. “Politicization of science in the public sphere: A study of public trust in the United States, 1974 to 2010.” *American Sociological Review* 77:167–87. <https://doi.org/10.1177/0003122412438225>

Gauchat, Gordon., Timothy O’Brien, and Oriol Miroso. 2017. “The legitimacy of environmental scientists in the public sphere.” *Climatic Change* 143 (3–4):297–306. <https://doi.org/doi:10.1007/s10584-017-2015-z>

Goldberg, Zachary J. and Sean Richey. 2020. “Anti-vaccination beliefs and unrelated conspiracy theories.” *World Affairs* <https://doi.org/10.1177/0043820020920554>

Gorman, Sara and Jack M. Gorman. 2020. “The psychology of wearing a mask: Mask-wearing is more complex than politics alone.” *Psychology Today* (September 4), <https://www.psychologytoday.com/intl/blog/denying-the-grave/202009/the-psychology-wearing-mask> accessed 1/9/2021.

Graham, Amanda, Frank Cullen, Justin Pickett, Cheryl Jonson, Murat Haner and Melissa Sloan. 2020. “Faith in Trump, moral foundations, and social distancing defiance during the coronavirus pandemic.” *Socius* 6:1–23. <https://doi.org/10.1177/2378023120956815>

Green, Jon, Jared Edgerton, Daniel Naftel, Kelsey Shoub and Skyler J. Cranmer. 2020. “Elusive consensus: Polarization in elite communication on the COVID-19 pandemic.” *Science Advances* 6(28):eabc2717. <https://doi.org/10.1126/sciadv.abc2717>

Grossman, Guy, Soojong Kim, Jonah M. Rexer and Harsha Thirumurthy. 2020. “Political partisanship influences behavioral responses to governors’ recommendations for COVID-19 prevention in the United States.” *Proceedings of the National Academy of Sciences* 117(39):24144–24153. <https://doi.org/10.1073/pnas.2007835117>

Guess, A., B. Nyhan and J. Reifler. 2018. “Selective exposure to misinformation: Evidence from the consumption of fake news during the 2016 U.S. presidential campaign.” Princeton University Center for the Study of Democratic Politics. <https://csdp.princeton.edu/publications/selective-exposure-misinformation-evidence-consumption-fake-news-during-2016-us> accessed 1/27/2020.

Hamilton, Lawrence C. 2008. “Who cares about polar regions? Results from a survey of U.S. public opinion.” *Arctic, Antarctic, and Alpine Research* 40(4):671–678. [https://doi.org/10.1657/1523-0430\(07-105\)\[HAMILTON\]2.0.CO;2](https://doi.org/10.1657/1523-0430(07-105)[HAMILTON]2.0.CO;2)

Hamilton, Lawrence C. 2011. “Education, politics and opinions about climate change: Evidence for interaction effects.” *Climatic Change* 104:231–242.

<https://doi.org/10.1007/s10584-010-9957-8>

Hamilton, Lawrence C. 2015. “Conservative and liberal views of science: Does trust depend on topic?” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/252/>

Hamilton, Lawrence C. 2016. “Where is the North Pole? An election-year survey on global change.” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/285/>

Hamilton, Lawrence C. and L.M. Fogg. 2019. “Physical-world knowledge and public views on climate change.” Presented at American Association of Geographers annual meeting in Washington DC. https://scholars.unh.edu/faculty_pubs/648/

Hamilton, Lawrence C. and Thomas G. Safford. 2020a. “Ideology affects trust in science agencies during a pandemic.” Durham, NH: Carsey School of Public Policy.

<http://scholars.unh.edu/carsey/391>

Hamilton, Lawrence C. and Thomas G. Safford. 2020b. “Trusting scientists more than the government: New Hampshire perceptions of the pandemic.” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/401>

Hamilton, Lawrence C. and Thomas G. Safford. 2020c. “Conservative media consumers less likely to wear masks and less worried about COVID-19.” Durham, NH: Carsey School of Public Policy. <https://scholars.unh.edu/carsey/415>

Hamilton, Lawrence & Thomas Safford. 2021. “The worst is behind us: Media choice and false optimism in the summer of 2020.” *Academia Letters*, article 232.

<https://doi.org/10.20935/AL232>

Hamilton, Lawrence C., Matthew J. Cutler and Andrew Schaefer. 2012. “Public knowledge and concern about polar-region warming.” *Polar Geography* 35(2):155–168.

<https://doi.org/10.1080/1088937X.2012.684155>

Hamilton, Lawrence C., Joel Hartter and Kei Saito. 2015a. “Trust in scientists on climate change and vaccines.” *Sage Open* <https://doi.org/10.1177/2158244015602752>

Hamilton, Lawrence C., Joel Hartter, Mary Lemcke-Stampone, David W. Moore and Thomas G. Safford. 2015b. “Tracking public beliefs about anthropogenic climate change.” *PLoS One*

10(9):e0138208. <https://doi.org/10.1371/journal.pone.0138208>

Hamilton, Lawrence C., Jessica Brunacini and Stephanie Pfirman. 2017. “Eyes off the Earth: Public opinion regarding climate science and NASA.” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/308/>

Hamilton, Lawrence C., Erin Bell, Joel Hartter and Jonathan D. Salerno. 2018. "A change in the wind? U.S. public views on renewable energy and climate compared." *Energy, Sustainability and Society* 8(11). <https://doi.org/10.1186/s13705-018-0152-5>

Hamilton, Lawrence C., Joel Hartter and Curt Grimm. 2020. "Sociopolitical silos: Environmental views and the multiplicative effects of same-party friends." UNH Scholars Repository https://scholars.unh.edu/faculty_pubs/923/

Hill, Terrence, Kelsey Gonzalez and Andrew Davis. 2020. "The nastiest question: Does population mobility vary by state political ideology during the novel coronavirus (COVID-19) pandemic?" *Sociological Perspectives* <https://doi.org/10.1177/0731121420979700>

Hornsey, M.J., E.A. Harris and K.S. Fielding. 2018. "Relationships among conspiratorial beliefs, conservatism and climate scepticism across nations." *Nature Climate Change*. <https://doi.org/10.1038/s41558-018-0157-2>

Jacques, Peter J., Riley E. Dunlap and Mark Freeman. 2008. "The organisation of denial: Conservative think tanks and environmental scepticism." *Environmental Politics* 17:3:349–385. <https://doi.org/10.1080/09644010802055576>

Jamieson, Kathleen H. and Dolores Albarracin. 2020. "The relation between media consumption and misinformation at the outset of the SARS-CoV-2 pandemic in the US." *Harvard Kennedy School Misinformation Review*, Special Issue on Covid and Misinformation. <https://doi.org/10.37016/mr-2020-012>

Jost, John T. 2017. "Asymmetries abound: Ideological differences in emotion, partisanship, motivated reasoning, social network structure, and political trust." *Journal of Consumer Psychology* 27(4):546–553. <https://doi.org/10.1016/j.jcps.2017.08.004>

Kahan, Dan M., Hank Jenkins-Smith and Donald Braman. 2011. "Cultural cognition of scientific consensus." *Journal of Risk Research* 14(2):147–174. <https://doi.org/10.1080/13669877.2010.511246>

Kahan, Dan M. 2015. "Climate-science communication and the measurement problem." *Advances in Political Psychology* 36(Supplement 1):1–43. <https://doi.org/10.1111/pops.12244>

Kam, Cindy D. 2005. "Who toes the party line? Cues, values, and individual differences." *Political Behavior* 27(2):163–182. <https://doi.org/10.1007/s11109-005-1764-y>

Kraft, Patrick W., Milton Lodge and Charles S. Taber. 2015. "Why people 'Don't trust the evidence': Motivated reasoning and scientific beliefs." *Annals, American Academy of Political and Social Science* 658:121–133. <https://doi.org/10.1177/0002716214554758>

- Krosnick, Jon A. and Bo MacInnis. 2010. "Frequent viewers of Fox News are less likely to accept scientists' views of global warming." Report. Stanford, CA: Woods Institute for the Environment, Stanford University.
<https://woods.stanford.edu/publications/frequent-viewers-fox-news-are-less-likely-accept-scientists-views-global-warming> accessed 7/31/2020.
- Kunda, Ziva. 1990. "The case for motivated reasoning." *Psychological Bulletin* 108(3):480–498.
- Kushner Gadarian, Shana, Sara Wallace Goodman and Thomas B. Pepinsky. 2020. "Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic." SSRN.
<http://dx.doi.org/10.2139/ssrn.3562796>
- Lewandowsky, Stephan and John Cook. 2020. "Coronavirus conspiracy theories are dangerous — here's how to stop them spreading." *The Conversation* April 20.
<https://theconversation.com/coronavirus-conspiracy-theories-are-dangerous-heres-how-to-stop-them-spreading-136564> accessed 7/31/2020.
- Lewandowsky, Stephan, John Cook and Elisabeth Lloyd. 2016. "The 'Alice in Wonderland' mechanics of the rejection of (climate) science: Simulating coherence by conspiracism." *Synthese*. <https://doi.org/10.1007/s11229-016-1198-6>
- Lewandowsky, Stephan, Jan K. Woike and Klaus Oberauer. 2020. "Genesis or evolution of gender differences? Worldview-based dilemmas in the processing of scientific information." *Journal of Cognition* 3(1):1–25. <https://doi.org/10.5334/joc.99>
- Lipton, Eric, Abby Goodnough, Michael D. Shear, Meghan Twohey, Apoorva Mandavilli, Sheri Fink and Mark Walker. 2020. "The CDC waited 'Its entire existence for this moment.' What went wrong?" New York Times June 3, updated August 14.
<https://www.nytimes.com/2020/06/03/us/cdc-coronavirus.html> accessed 9/29/2020.
- McCright, Aaron M. and Riley E. Dunlap. 2011. "The politicization of climate change and polarization in the American public's views of global warming, 2001–2010." *The Sociological Quarterly* 52, 155–194. <https://doi.org/10.1111/j.1533-8525.2011.01198.x>
- McCright, Aaron M., Katherine Dentzman, Meghan Charters and Thomas Dietz. 2013. "The influence of political ideology on trust in science." *Environmental Research Letters* 8(4):044029.
<https://doi.org/10.1088/1748-9326/8/4/044029>
- Mann, Markus and Cyrus Schleifer. 2020. "Love the science, hate the scientists: Conservative identity protects belief in science and undermines trust in scientists." *Social Forces* 99(1):305–332. <https://doi.org/10.1093/sf/soz156>
- Merkley, Eric. 2020. "Anti-intellectualism, populism, and motivated resistance to expert consensus." *Public Opinion Quarterly*. <https://doi.org/10.1093/poq/nfz053>

- Merkley, Eric and Peter J. Loewen. 2020. "Social distancing as a public goods dilemma: High economic cost reduces voluntary compliance." OSF Preprints. <https://osf.io/yht9v>
- Merkley, Eric and Dominik A. Stecula. 2018. "Party elites or manufactured doubt? The informational context of climate change polarization." *Science Communication* 40(2):258–274. <https://doi.org/10.1177/1075547018760334>
- Merkley, Eric and Dominik Stecula. 2020. "Party cues in the news: Democratic elites, Republican backlash, and the dynamics of climate skepticism." *British Journal of Political Science*. <https://doi.org/10.1017/S0007123420000113>
- Merkley, Eric, Aengus Bridgman, Peter John Loewen, Taylor Owen, Derek Ruths and Oleg Zhilin. 2020. "A rare moment of cross-partisan consensus: Elite and public response to the COVID-19 pandemic in Canada." *Canadian Journal of Political Science* 53:311–318. <https://doi.org/10.1017/S0008423920000311>
- Mole, Beth. 2020. "Amid coronavirus outbreak, Trump proposes slashing CDC budget." *Ars Technica*, February 11. <https://arstechnica.com/science/2020/02/amid-coronavirus-outbreak-trump-proposes-slashing-cdc-budget/> accessed 9/23/2020.
- Motta, Matt. 2017. "The dynamics and political implications of anti-intellectualism in the United States." *American Politics Research* 46:465–498. <https://doi.org/10.1177/1532673X17719507>
- Motta, Matt. 2018. The polarizing effect of the March for Science on attitudes toward scientists. *Political Science & Politics* 51(4):782–788. <https://doi.org/10.1017/S1049096518000938>
- Motta, Matt, Dominik Stecula and Christina Farhart. 2020. "How right-leaning media coverage of COVID-19 facilitated the spread of misinformation in the early stages of the pandemic in the US." *Canadian Journal of Political Science* 53(2):335–342. <https://doi.org/10.1017/S0008423920000396>
- Nadelson, Louis, Cheryl Jorcyk, Dazhi Yang, Mary J. Smith, Sam Matson, Ken Cornell and Virginia Husting. 2014. "I just don't trust them: The development and validation of an assessment instrument to measure trust in science and scientists." *School Science and Mathematics* 114:76–86. <https://doi.org/10.1111/ssm.12051>
- National Science Board. 2018. "Science and engineering indicators 2018." National Science Board. <https://nsf.gov/statistics/2018/nsb20181/report/sections/science-and-technology-public-attitudes-and-understanding/public-attitudes-about-s-t-in-general> accessed 9/22/2020.
- NEJM. 2020. "Dying in a leadership vacuum." *The New England Journal of Medicine* 383(15):1479–1480. <https://doi.org/10.1056/NEJMe2029812>

Nature. 2020. “Why *Nature* supports Joe Biden for US president.” *Nature* 586:335.
<https://doi.org/10.1038/d41586-020-02852-x>

Pennycook, Gordon, Jonathan McPhetres, Bence Bago and David G. Rand. 2020. “Predictors of attitudes and misperceptions about COVID-19 in Canada, the U.K., and the U.S.A.” working paper,
<https://files.osf.io/v1/resources/zhjkp/providers/osfstorage/5e9629a5f135350453d57d00?action=download&direct&version=3> accessed 8/22/2020

Pew. 2009. “Growing interest in swine flu, many see press overstating its danger.” Pew Research Center.
<http://www.people-press.org/2009/10/15/growing-interest-in-swine-flu-many-see-press-overstating-its-danger/>

Reitera, Paul L., Annie-Laurie McRee, Jessica A. Kadis, and Noel T. Brewer. 2011. “HPV vaccine and adolescent males.” *Vaccine* 29:5595–5602. doi:10.1016/j.vaccine.2011.06.020

Rodriguez, C.G., J.P. Moskowitz, R.M. Salem and P.H. Ditto. 2017. “Partisan selective exposure: The role of party, ideology and ideological extremity over time.” *Translational Issues in Psychological Science* 3(3):254–271. <https://doi.org/10.1037/tps0000121>

Safford, Thomas G. and Lawrence C. Hamilton. 2020. “Views of a fast-moving pandemic: A survey of Granite Staters’ responses to COVID-19.” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/396>

Safford, Thomas G., Lawrence C. Hamilton and Emily H. Whitmore. 2017. “The Zika virus threat: How concerns about scientists may undermine efforts to combat the pandemic.” Durham, NH: Carsey School of Public Policy. <http://scholars.unh.edu/carsey/299/>

Safford, Thomas G., Emily H. Whitmore and Lawrence C. Hamilton. 2020. “Questioning scientific practice: Linking beliefs about scientists, science agencies, and climate change.” *Environmental Sociology* 6(2):194–206. <https://doi.org/10.1080/23251042.2019.1696008>

Saletan, William. 2020. “There’s a new potential risk group for spreading the coronavirus.” *Slate* March 17.
<https://slate.com/news-and-politics/2020/03/polls-republicans-coronavirus-spread.html> accessed 4/4/2020.

Scientific American. 2020. “*Scientific American* endorses Joe Biden.” *Scientific American* 323(4):12–13. <https://doi.org/10.1038/scientificamerican1020-12>

Schnaiberg, Allan. 1977. “Obstacles to environmental research by scientists and technologists: A social structural analysis.” *Social Problems* 24:500–520.

Schnaiberg, Allan. 1980. *The Environment: From Surplus to Scarcity*. New York, NY: Oxford University Press.

Shao, Wanyun, Barry D. Keim, James C. Garland and Lawrence C. Hamilton. 2014. "Weather, climate, and the economy: Explaining risk perceptions of global warming, 2001–2010." *Weather, Climate, and Society* 6(1):119–134. <https://doi.org/10.1175/WCAS-D-13-00029.1>

Shepherd, Hana, Norah MacKendrick and G. Cristina Mora. 2020. "Pandemic politics: Political worldviews and COVID-19 beliefs and practices in an unsettled time." *Socius* 6:1–18. <https://doi.org/10.1177/2378023120972575>

Sides, John, Chris Tausanovitch and Lynn Vavreck. 2020. "The politics of covid-19: Partisan polarization about the pandemic has increased, but support for health care reform hasn't moved at all." *Harvard Data Science Review*, Special Issue 1-COVID-19. <https://doi.org/10.1162/99608f92.611350fd>

Simonov, Andrey, Szymon K. Sacher, Jean-Pierre H. Dubé and Shirsho Biswas. 2020. "The persuasive effect of Fox News: Non-compliance with social distancing during the COVID-19 pandemic." Working Paper 27237, National Bureau of Economic Research. <http://www.nber.org/papers/w27237>

Slater, Michael D. 2007. "Reinforcing spirals: the mutual influence of media selectivity and media effects and their impact on individual behavior and social identity." *Communication Theory* 17(3):281–303. <https://doi.org/10.1111/j.1468-2885.2007.00296.x>

Stelter, Brian. 2020. "Hannity has said to me more than once, 'he's crazy': Fox News staffers feel trapped in the Trump cult." *Vanity Fair*, August 20. <https://www.vanityfair.com/news/2020/08/sean-hannity-fox-news-staffers-feel-trapped-in-trump-cult> accessed 8/23/2020.

Sun, Lena H. 2018. "Top White House official in charge of pandemic response exits abruptly," *Washington Post* May 10. <https://www.washingtonpost.com/news/to-your-health/wp/2018/05/10/top-white-house-official-in-charge-of-pandemic-response-exits-abruptly/> accessed 9/23/2020.

Sun, Lena H. and Joel Achenbach. 2020. "CDC's credibility is eroded by internal blunders and external attacks as coronavirus vaccine campaign looms." *Washington Post* September 28. <https://www.washingtonpost.com/health/2020/09/28/cdc-under-attack/> accessed 9/28/2020.

Taber, Charles S. and Milton Lodge. 2006. "Motivated skepticism in the evaluation of political beliefs." *American Journal of Political Science* 50(3):755–769. <https://doi.org/10.1111/j.1540-5907.2006.00214.x>

- Tappin, Ben M. 2020. “Estimating the between-issue variation in party elite cue effects.” PsyArXiv Preprints. <https://doi.org/10.31234/osf.io/p48zb>
- Tappin, Ben M., Gordon Pennycook and David G. Rand. 2020. “Thinking clearly about causal inferences of politically motivated reasoning: Why paradigmatic study designs often undermine causal inference.” *Current Opinion in Behavioral Sciences* 34:81–87. <https://doi.org/10.1016/j.cobeha.2020.01.003>
- Tesler, Michael. 2018. “Elite domination of public doubts about climate change (not evolution).” *Political Communication* 35(2):306–326. <https://doi.org/10.1080/10584609.2017.1380092>
- Thorpe, H. Holden. 2020. “Trump lied about science.” *Science* 369(6510):1409. <https://doi.org/10.1126/science.abe7391>
- Tranter, Bruce K. 2019. “Does public knowledge of climate change really matter in Australia?” *Environmental Communication*. <https://doi.org/10.1080/17524032.2019.1696853>
- Uscinski, Joseph E. and Santiago Olivella. 2017. “The conditional effect of conspiracy thinking on attitudes toward climate change.” *Research and Politics*. <https://doi.org/10.1177/2053168017743105>
- van der Linden, Sander, Costas Panagopoulos, Flávio Azevedo and John T. Jost. 2020. “The paranoid style in American politics revisited: An ideological asymmetry in conspiratorial thinking.” *Political Psychology* 42(1). <https://doi.org/10.1111/pops.12681>
- Varmus, Harold and Rajiv Shah. 2020. “It has come to this: Ignore the C.D.C.” *New York Times*, August 31. <https://www.nytimes.com/2020/08/31/opinion/cdc-testing-coronavirus.html> accessed 9/9/2020.
- Washington Post. 2020. “What we know about delays in coronavirus testing.” *Washington Post*, April 18. <https://www.washingtonpost.com/investigations/2020/04/18/timeline-coronavirus-testing> accessed 9/29/2020.
- Weiland, Noah. 2020. “‘Like a hand grasping:’ Trump appointees describe the crushing of the C.D.C.” *New York Times*, December 16. <https://www.nytimes.com/2020/12/16/us/politics/cdc-trump.html>
- Youngdahl, Karie. 2016. “President-elect Donald Trump and vaccines.” *The History of Vaccines*, College of Physicians of Philadelphia, November 10. <https://www.historyofvaccines.org/trump-and-vaccines> accessed 9/22/2020.
- Zaller, John R. 1992. *The Nature and Origins of Mass Opinion*. Cambridge, UK: Cambridge University Press.

Zummo, Lynne, Brian Donovan and K.C. Busch. 2020. "Complex influences of mechanistic knowledge, worldview, and quantitative reasoning on climate change discourse: Evidence for ideologically motivated reasoning among youth." *Journal of Research in Science Teaching*. <https://doi.org/10.1002/tea.21648>