


Partisanship, Messaging, and the COVID-19 Vaccine: Evidence From Survey Experiments

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Abstract

Purpose: To investigate partisanship in COVID-19 attitudes, and assess partisan or scientific messaging effects on COVID-19 vaccination intentions.

Design: Two-wave survey with two-arm randomized experiment.

Setting: Recruited Pennsylvania residents online.

Sample: 2037 (May 2020) and 1577 (October 2020) Pennsylvania residents, aged 18–94 years.

Intervention: Respondents saw messaging that presented either President Trump or scientists endorsing the vaccine, then reported their vaccination intentions.

Measures: Likert scale items measuring COVID-19 attitudes (May), including mask wearing and vaccination intentions (May and October).

Analysis: Partisan differences in attitudes were analyzed by chi-square; differences in support for mask wearing and vaccination intentions were also analyzed by Mann–Whitney U. The messaging experiment was analyzed by chi-square, Mann–Whitney U, and survey-weighted multivariate logistic regression.

Results: Significant partisan differences were found in all attitudes. The partisan split in support for mask wearing increased from May to October, whereas the split in vaccination intentions decreased. Compared to partisan messaging, scientific messaging increased overall odds of intending to vaccinate by 32% in May (adjusted odds ratio [AOR]=1.32, 95% confidence interval [CI] = 1.06–1.65), and increased odds among Democrats by 142% in October (AOR = 2.42, CI = 1.29–4.55). Scientific messaging had no significant effect on independents or Republicans.

Conclusion: Partisan COVID-19 attitudes were widespread and persistent. Partisan endorsement of the vaccine positively influenced those with congruent beliefs, while scientific messaging produced consistent effects across political affiliation.

Keywords

partisanship, COVID-19 vaccine, elite messaging

Introduction

Though the COVID-19 pandemic is a shared threat to the United States, Americans largely believe that the nation has grown more divided since its onset.¹ The federal government's response has been slow, fragmented, and inconsistent.^{2,3} Throughout the first year of the pandemic, the Trump administration contributed to the spread of politically motivated misinformation about preventative behaviors and incited distrust in scientific experts.⁴ President Trump's dismissal of public health recommendations has been reflected in the differential response between

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Democratic-led and Republican-led states,^{5,6} as well as in polarized attitudes toward preventative behaviors. Compared to Republicans, Democrats show greater support for masking, social distancing, and stay-at-home orders.⁷⁻⁹

The COVID-19 vaccine has similarly been a polarizing focus of public discourse. For many, vaccination represents a return to normal life, but mistrust in the accelerated development timeline and concerns about a politicized approval process threatens sufficient uptake.¹⁰ In April 2020, nearly three-quarters of Americans indicated that they would get a vaccine¹¹; by September, the proportion fell to just over half.¹² Though hesitancy decreased following vaccine rollout in 2021, the partisan divide in COVID-19 vaccination intentions has held, with Democrats being markedly more receptive than Republicans.¹³

Promoting compliance with public health measures rests on ensuring that messages are clear, consistent, and come from trusted sources.¹⁴ However, this is difficult to achieve in a politicized environment. People selectively collect information based on the narratives they want to hear and the messengers they trust. When being consistent with one's partisan identity is especially salient in forming attitudes about an issue, the desire to protect this identity leads to partisan motivated reasoning.¹⁵ Messengers themselves can also exacerbate polarization; for example, political elites increasingly invoke moral outrage at the other side in their rhetoric, increasing public perception of partisan differences.¹ In the context of COVID-19, messaging surrounding treatments was subject to this. The National Institutes of Health began a clinical trial of hydroxychloroquine in May 2020,¹⁶ but scientists rebuffed its therapeutic potential shortly thereafter.¹⁷ President Trump continued to promote it, however, and when he contracted COVID-19 in October, hydroxychloroquine resurged as a topic of contentious public discourse.¹⁸ It is therefore critical to understand not only the nature of public attitudes towards the pandemic, but also how partisan narratives and messengers shape these attitudes.

Our study contributes to this understanding by exploring the effects of partisan or scientific endorsement on COVID-19 vaccination intentions, given that intentions are known to strongly correlate with actual behavior in contexts such as influenza vaccination.¹⁹ Public assessment of the Trump administration's pandemic response is starkly partisan.⁹ Since the start of the COVID-19 outbreak, the partisan divide in trust in medical researchers has also widened.¹¹ In our previous experiment investigating partisan polarization and resistance to elite messengers, we found no evidence of resistance to strict reopening policies when specifically endorsed by "public health experts."²⁰ However, attributing the endorsement to "government officials" decreased support among Democrats, independents, and Republicans. As the term "government officials" did not provide an obvious partisan cue, we wanted to investigate whether partisan differences in attitudes could be revealed by attributing messages to the Trump administration.

Here, we present the results from 2 waves of an online survey of Pennsylvania adults, conducted in May and October

2020. In addition to assessing partisan differences in COVID-19 attitudes in the May survey, we randomized all respondents in both survey waves to view a statement that presented the COVID-19 vaccine as being endorsed by either President Trump or scientists. We hypothesized that scientist-focused messaging would result in greater intentions to receive the COVID-19 vaccine than Trump-focused messaging. We also expected to find stark partisan polarization in vaccination intentions, and were interested in exploring the effects of messaging on polarization.

Methods

Participant Recruitment

We partnered with the polling company Civiqs to field 2 online surveys, both conducted prior to Emergency Use Authorization of the Pfizer/BioNTech and Moderna vaccines. We recruited respondents from the online Civiqs research panel of approximately 19 000 Pennsylvania residents. As a swing state that was central to the 2020 presidential election, Pennsylvania is fitting to study in the context of partisan polarization.²¹ Home to a number of influential research and clinical trial centers, it has also played a substantial role in the COVID-19 vaccine effort.^{22,23}

The first survey (hereafter, "May survey") was conducted from May 30th to June 2nd, 2020, preceding a rise in COVID-19 cases and deaths. We recruited an initial sample of 2045 Pennsylvania adults from the Civiqs panel. The second survey (hereafter, "October survey") was conducted from October 17th to 21st, 2020, in the run-up to the November 3rd presidential election and at the height of concerns about a politicized vaccine approval process.¹⁰ Here, we recruited a sample of 1577 Pennsylvania adults. To track changes in masking and vaccination attitudes over time, we resampled individuals from the May wave in October; 861 participated in both waves. The study protocol was determined by the University of Pennsylvania Institutional Review Board (IRB) to meet eligibility criteria for IRB review exemption. All respondents provided informed written consent, and no incentive was given for participation.

May Survey

The 24-question May survey (available in the [Supplemental File](#)) included 16 items related to COVID-19 and eight items related to public policy and politics. Six of the COVID-19-related items were of interest to this study. For brevity, respondents were randomly assigned to indicate how much they trusted COVID-19 information coming from either President Trump, Pennsylvania Governor Wolf (D), or medical experts. Response options were on a four-point scale (1 = "not at all," 2 = "not very much," 3 = "a good amount," 4 = "a great deal"). Respondents were also asked about their belief in the importance of social distancing, and their perception of

neighbors' beliefs in the importance of social distancing. Response options were on a five-point scale (1 = "not at all important," 2 = "not very important," 3 = "somewhat important," 4 = "very important," 5 = "extremely important"). Finally, support for mask wearing was assessed by asking respondents whether they agreed or disagreed with the statement "everyone in Pennsylvania needs to wear a mask every time they leave the house," with response options on a five-point scale (-2 = "strongly disagree," -1 = "somewhat disagree," 0 = "unsure," 1 = "somewhat agree," 2 = "strongly agree").

Where possible, our items were designed based on prior surveys. For example, the trust items were adapted from those appearing in the Social Capital Community Benchmark Survey.²⁴ However, the novelty of the COVID-19 pandemic required us to develop new items to capture emerging constructs. In doing so, we used existing response scales drawn from the General Social Survey²⁵ and consulted other research on COVID-19 policies and behaviors.^{8,26} In addition, most of the novel items were pre-tested on at least 1 of 2 separate surveys. One was fielded to 1912 Pennsylvania residents between April 4th and April 8th, 2020,²⁰ while the other was fielded to 626 residents of the City of Philadelphia between May 5th and May 8th, 2020.

Survey Experiment: Effects of Messaging on COVID-19 Vaccination Intentions

To assess the effects of partisan or scientific messaging on COVID-19 vaccination intentions, all respondents were further randomized to 2 experimental conditions. Respondents were told that either "President Trump" (hereafter, "Trump cue") or "scientists and researchers" (hereafter, "scientist cue") were "optimistic that a safe and effective coronavirus vaccine will be available in the United States in 2021." Our specific use of "President Trump," a highly visible and controversial political figure in the COVID-19 space, reflected our intent to create a condition involving political polarization. Conversely, our general use of "scientists and researchers" reflected our intent to create a condition that was removed from politics; Dr Anthony Fauci, arguably the most visible scientist in the United States COVID-19 space, was too politically polarizing to suit this end.¹⁰ Respondents were asked to rate their likelihood of getting the vaccine on a five-point scale (-2 = "very unlikely," -1 = "somewhat unlikely," 0 = "not sure," 1 = "somewhat likely," 2 = "very likely"). Response options were adapted from previous surveys of COVID-19 vaccination intentions.^{9,12} We used a Likert scale item to capture more nuanced intentions, and included a midpoint to allow respondents to express a neutral opinion.

October Survey

The 19-question October survey (available in the [Supplemental File](#)) mostly included items related to public

policy and the 2020 presidential election that were outside the scope of this study. Of interest, the October survey exactly replicated the randomized experiment about the effects of partisan or scientific messaging on COVID-19 vaccination intentions from the May survey. Randomization to the Trump or scientist cue was independent between the 2 waves. The item from the May survey about mask wearing was also replicated.

Data Analysis

Sample weights were calculated by Civiqs to allow for survey weighting to reflect the demographic distributions of Pennsylvania. We combined respondents who indicated their political affiliation as "other or none" with independents. We analyzed categorical differences in COVID-19 attitudes, including mask wearing and vaccination intentions, by chi-square tests. To preserve the nuance captured by our ordinal Likert-style items, we also calculated mean and median scores for mask wearing support and vaccination intentions on a scale from -2 to 2, and analyzed differences by political affiliation and survey cue by Mann-Whitney U tests. We calculated the effect size r by dividing the z value by the square root of the sample size.²⁷

To assess the causal relationship between our experimental Trump vs scientist survey cue and vaccination intentions, we re-coded response options as a binary outcome (-2-0 = "do not intend to get the vaccine" and 1-2 = "intend to get the vaccine"). We first estimated a survey-weighted multivariate logistic regression model predicting vaccination intentions by survey cue and political affiliation, controlling for socio-demographic factors. We then modeled the interaction of survey cue and political affiliation, as well as the interaction of survey cue and race for exploratory purposes. Joint significance of the interaction terms were assessed by Wald test. Finally, we estimated a model that assessed the three-way interaction between survey wave, survey cue, and political affiliation, which included only those individuals who responded in both waves. All reported odds ratios are adjusted to control for other predictors. Model fit was assessed by McFadden's pseudo R-squared, ρ^2 .

Results

Sample Characteristics

Table 1 displays descriptive statistics characterizing the sample. Of the 2045 Pennsylvania adults who completed the May survey, 8 respondents under 18 years old were excluded from analysis. This resulted in a sample of 2037 that was weighted to be 48.4% male and ranged in age from 18-89 years ($M = 50.5$, $SD = 16.1$). 1577 Pennsylvania adults completed the October survey, resulting in a sample that was weighted to be 48.2% male and ranged in age from 18-94 years ($M = 50.4$, $SD = 16.3$). The weighted May sample

consisted of 35.9% Democrats, 32.2% independents, and 31.9% Republicans, and the weighted October sample consisted of 36.4% Democrats, 32.0% independents, and 31.5% Republicans.

Partisan Polarization in COVID-19 Attitudes

Supplemental Figure A (available in the **Supplemental File**) illustrates partisan differences in attitudes toward social distancing. Personal importance of social distancing was highest among Democrats, with 90% responding “extremely” or “very important” (55% of independents; 28% of Republicans). Similar trends were seen in perceptions of the importance of social distancing to neighbors, with 44% of Democrats, 29% of independents, and 21% of Republicans responding “extremely” or “very important.” Responses for both personal and neighbors’ importance significantly differed by political affiliation. Respondents thus perceived that social distancing was generally less important to their neighbors than to themselves, with the greatest discrepancy seen among Democrats.

Trust in different sources of COVID-19 information was also politically polarized, as illustrated in **Supplemental Figure B** (available in the **Supplemental File**). Only 6% of Democrats indicated that they trusted information from President Trump “a great deal” or “a good amount,”

whereas 45% of independents and 86% of Republicans did so. Conversely, 88% of Democrats, 52% of independents, and 17% of Republicans indicated that they trusted information from Pennsylvania’s Democratic governor, Tom Wolf. Trust in information from medical experts was least polarized, with 92% of Democrats, 65% of independents, and 36% of Republicans indicating a positive degree of trust. Responses for trust in all 3 sources of information significantly differed by political affiliation. Notably, only 20% Republicans indicated that they trusted the non-partisan source of information (medical experts) “not at all,” whereas 54% of Republicans indicated this for the opposing partisan source (Governor Wolf).

Partisan Polarization in Support for Mask Wearing

Supplemental Figure C (available in the **Supplemental File**) illustrates partisan differences in attitudes toward mask wearing. In May, 79% of Democrats, 53% of independents, and 20% of Republicans “strongly” or “somewhat” agreed that “everyone in Pennsylvania needs to wear a mask every time they leave the house.” On the item’s original scale from -2 to 2, with negative numbers indicating opposition and positive numbers indicating support, the median score was 2 among Democrats and -2 among Republicans, a

Table I. Sample Characteristics.

| | May 2020 (N = 2037) | | | Oct 2020 (N = 1577) | | |
|---------------------------|---------------------|-------------|------------|---------------------|-------------|------------|
| | Weighted Mean | Weighted SD | Range | Weighted Mean | Weighted SD | Range |
| Age | 50.5 | 16.1 | 18-89 | 50.4 | 16.3 | 18-94 |
| | N | % | Weighted % | N | % | Weighted % |
| Gender | | | | | | |
| Female | 1029 | 50.5 | 50.0 | 770 | 48.8 | 50.9 |
| Male | 975 | 47.9 | 48.4 | 792 | 50.2 | 48.2 |
| Other | 33 | 1.6 | 1.6 | 13 | 0.8 | 0.8 |
| Race/ethnicity | | | | | | |
| Black or African-American | 155 | 7.6 | 12.1 | 104 | 6.6 | 12.4 |
| Hispanic/Latino | 47 | 2.3 | 5.0 | 19 | 1.2 | 4.6 |
| Other | 61 | 3.0 | 3.4 | 30 | 1.9 | 3.6 |
| White | 1774 | 87.1 | 79.5 | 1422 | 90.2 | 79.3 |
| Political affiliation | | | | | | |
| Democrat | 835 | 41.0 | 35.9 | 614 | 38.9 | 36.4 |
| Independent | 569 | 27.9 | 32.2 | 441 | 28.0 | 32.0 |
| Republican | 633 | 31.1 | 31.9 | 520 | 33.0 | 31.5 |
| Education | | | | | | |
| Some high school | 23 | 1.1 | 1.7 | 19 | 1.2 | 1.4 |
| High school graduate | 364 | 17.9 | 20.6 | 292 | 18.5 | 18.3 |
| Some college | 726 | 35.6 | 43.7 | 659 | 41.8 | 47.1 |
| College graduate | 564 | 27.7 | 20.0 | 354 | 22.4 | 20.0 |
| Post-graduate degree | 331 | 16.2 | 12.0 | 240 | 15.2 | 12.4 |
| Other | 18 | 0.9 | 1.3 | 11 | 0.7 | 0.8 |

significant difference. Mean scores and Mann–Whitney U test results are reported in [Supplemental Table A](#) (available in the [Supplemental File](#)). In October, 94% of Democrats, 56% of independents, and 22% of Republicans indicated support. The median score was 2 among Democrats and –2 among Republicans, a significant difference by political affiliation. By survey wave, October scores were significantly higher than May scores among Democrats, and there was no difference between waves among independents or Republicans.

Partisan Polarization in COVID-19 Vaccination Intentions

[Supplemental Figure D](#) (available in the [Supplemental File](#)) illustrates partisan differences in vaccination intentions by survey wave. In May, 77% of Democrats, 57% of independents, and 42% of Republicans indicated that they were “very” or “somewhat likely” to get the vaccine. On the item’s original scale from –2 to 2, with negative numbers indicating unlikeliness and positive numbers indicating likeliness, the median score was 2 among Democrats and –1 among Republicans, a significant difference. In October, 70% of Democrats, 50% of independents, and 51.2% of Republicans indicated likeliness to vaccinate. The median score decreased to 1 among Democrats and increased to 0 among

Republicans, a significant difference by political affiliation. By survey wave, October scores were significantly lower than May scores among Democrats, significantly higher among Republicans, and did not significantly differ among independents.

Survey Experiment: Effects of Trump or Scientist Cue on COVID-19 Vaccination Intentions

[Figures 1](#) and [2](#) illustrate partisan differences in COVID-19 vaccination intentions by survey cue. In May, 75% of Democrats who saw the Trump cue indicated that they were “very” or “somewhat” likely to get the vaccine, compared to 80% of Democrats who saw the scientist cue. Among independents, 55% of those who saw the Trump cue and 58% of those who saw the scientist cue indicated likeliness. Among Republicans, 42% of those who saw either cue indicated likeliness. The distribution of responses in May did not differ by survey cue for Democrats, independents, or Republicans. On a scale from –2 to 2, the only significant difference in vaccination intentions due to survey cue was seen among Democrats, at a median score of 1 for the Trump cue and 2 for the scientist cue.

In October, 65% of Democrats who saw the Trump and 76% of Democrats who saw the scientist cue indicated likeliness to get the vaccine. Among independents, 46% of

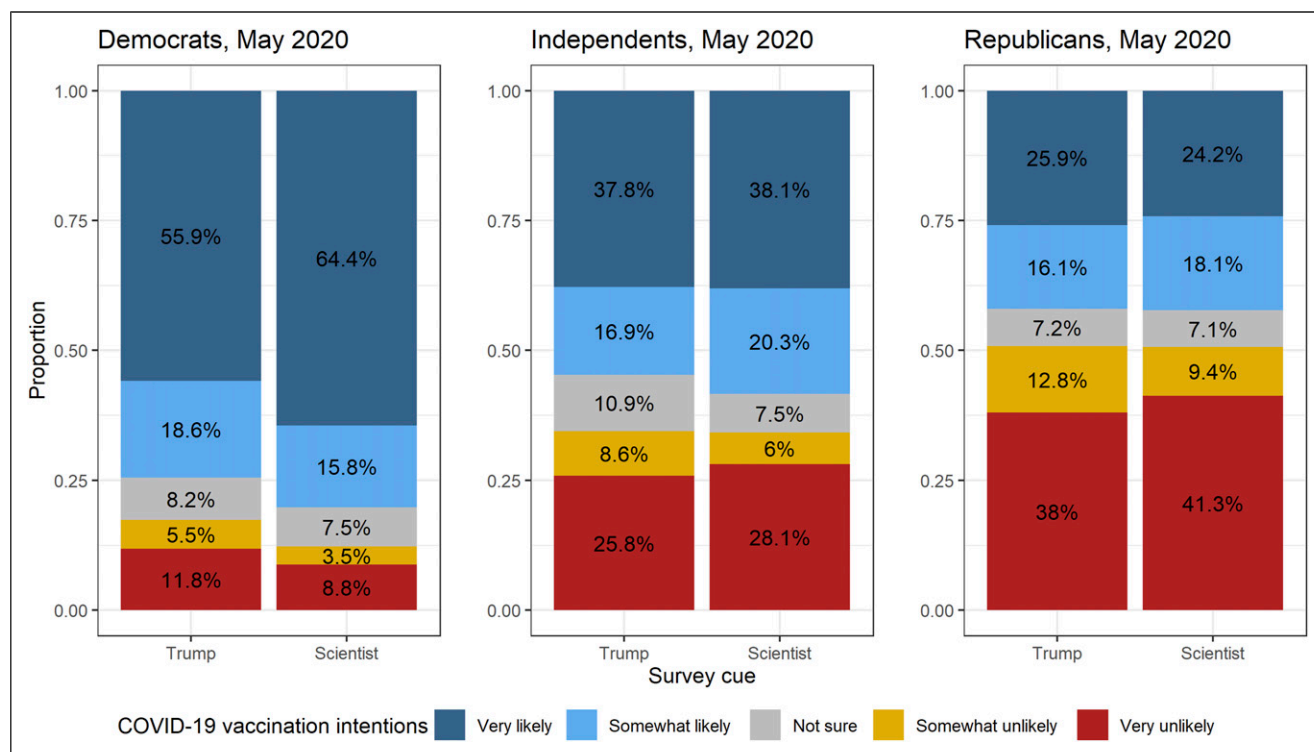


Figure 1. Effects of Trump vs Scientist survey cue on COVID-19 vaccination intentions; May 2020^a. ^a By chi-square test, the distribution of responses did not significantly differ by survey cue among Democrats ($X^2(4)=7.14$, $P = .13$), independents ($X^2(4)=4.09$, $P = .39$), or Republicans ($X^2(4)=2.59$, $P = .63$).

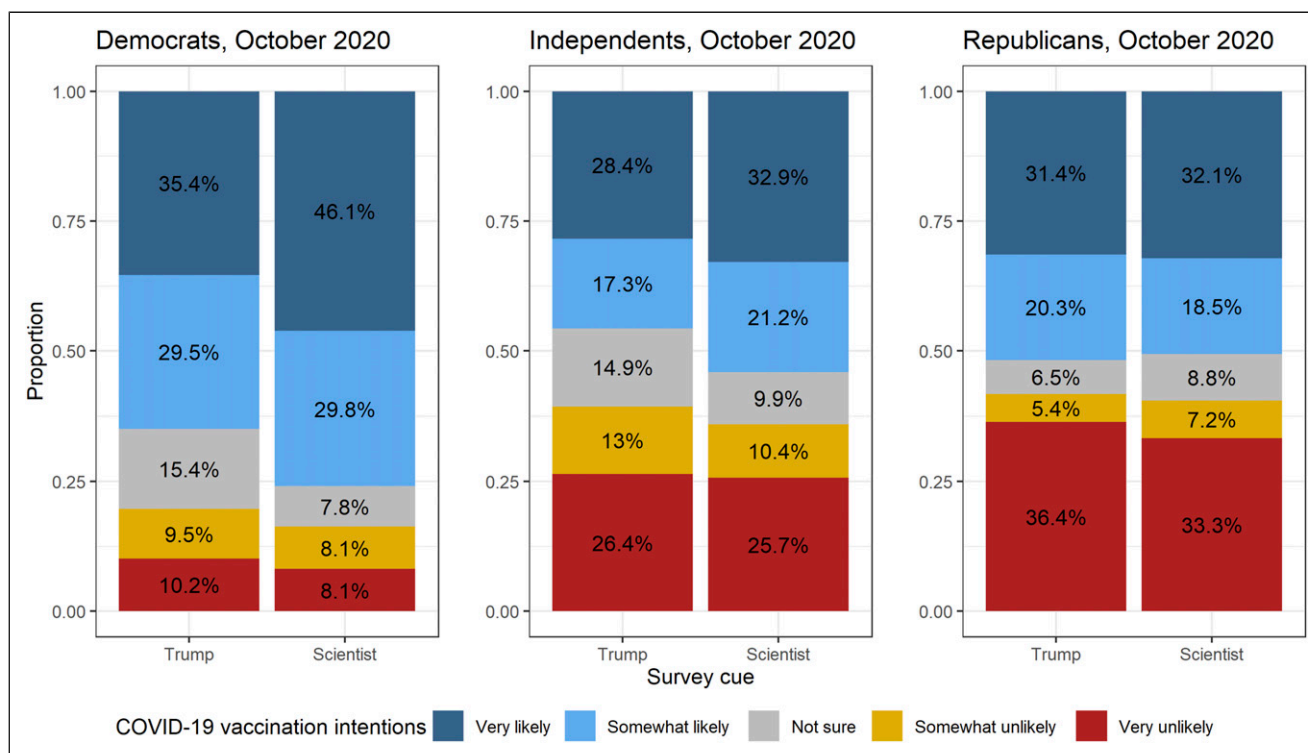


Figure 2. Effects of Trump vs Scientist survey cue on COVID-19 Vaccination Intentions; October 2020^a. ^a By chi-square test, the distribution of responses significantly differed by survey cue among Democrats ($X^2(4) = 12.66, P = .01$), but not among independents ($X^2(4) = 4.38, P = .36$) or Republicans ($X^2(4) = 2.19, P = .70$).

those who saw the Trump cue and 54% of those who saw the scientist cue indicated likeliness. Among Republicans, 52% of those who saw the Trump cue and 51% of those who saw the scientist cue indicated likeliness. The distribution of responses in October significantly differed by survey cue for Democrats, but not for independents or Republicans. On a scale from -2 to 2 , the median score among Democrats was 1 for both survey cues, but the scientist cue significantly increased vaccination intentions by Mann-Whitney U test, as reported in [Supplemental Table A](#) (available in the [Supplemental File](#)).

[Table 2](#) reports the results of logistic regression models predicting COVID-19 vaccination intentions as a binary outcome. In May, the scientist cue increased the odds of intending to get the vaccine (AOR = 1.32, CI = 1.06-1.65). There was a non-significant increase due to the scientist cue in October (AOR = 1.22, CI = .94-1.58). Increases in odds were associated with each 10-year increase in age (October: AOR = 1.13, CI = 1.02-1.25), post-graduate degree attainment (May: AOR = 3.65, CI = 1.27-10.48), Democratic affiliation (May: AOR = 5.44, CI = 4.06-7.28; October: AOR = 2.36, CI = 1.65-3.37), and independent affiliation (May: AOR = 1.90, CI = 1.44-2.50). Decreases in odds were associated with female gender (May: AOR=.70, CI=.56-.88; October: AOR=.73, CI=.56-.96), Black or African American identity (May: AOR=.44, CI=.28-.68; October: AOR=.42, CI=.23-.75), and

other racial identity (May: AOR=.46, CI=.23-.94). For robustness, we also limited this analysis to the subset of individuals who responded to both survey waves, reported in [Supplemental Table B](#) (available in the supplement). The effect of the scientist cue in May with the limited subsample was directionally similar, though non-significant (AOR = 1.20, CI = .87-1.67).

[Table 2](#) also includes interactions between political affiliation and survey cue. The interaction between Democratic affiliation and the scientist cue was non-significant in May (AOR = 1.32, CI = .78-2.26), but increased the odds of intending to get the vaccine in October (AOR = 2.42, CI = 1.29-4.55). As reported in [Supplemental Table B](#) (available in the supplement), this significant interaction held when we limited the sample to individuals who responded to both waves (AOR = 4.21, CI = 1.39-12.74). Joint interactions between political affiliation and survey cue were non-significant in May and significant in October. As reported in the exploratory analysis in [Supplemental Table C](#) (available in the supplement), the interaction between Hispanic/Latino identity and the scientist cue increased the odds of intending to get the vaccine in May (AOR = 11.00, CI = 2.21-54.79), and the joint interaction between race and survey cue was significant. Finally, as reported in [Supplemental Table D](#) (available in the supplement), there was a significant three-way interaction effect between Democratic affiliation, the October survey wave, and

Table 2. Survey-weighted Logistic Regression Models Predicting COVID-19 Vaccination Intentions.

| Variable | May 2020 ^a | | Oct 2020 | |
|-----------------------------|---|---|----------------------------------|---|
| | Vaccination Intentions ^{b,c} (Base) | Vaccination Intentions (Interaction) | Vaccination Intentions (Base) | Vaccination Intentions (Interaction) |
| Intercept | .37 (.13-1.12) | .41 (.14-1.23) | .37 (.12-1.14) | .49 (.16-1.46) |
| Older age (10 years) | 1.04 (.97-1.13) | 1.04 (.97-1.13) | 1.13 ^d (1.02-1.25) | 1.13 ^d (1.02-1.25) |
| Gender | | | | |
| Male | Ref | Ref | Ref | Ref |
| Female | .70 ^e (.56-.88) | .70 ^e (.56-.88) | .73 ^d (.56-.96) | .73 ^d (.56-.96) |
| Other gender | .99 (.42-2.33) | .98 (.42-2.32) | 2.13 (.43-10.58) | 2.26 (.40-12.63) |
| Race/ethnicity | | | | |
| White | Ref | Ref | Ref | Ref |
| Black or African-American | .44 ^f (.28-.68) | .44 ^f (.28-.68) | .42 ^e (.23-.75) | .41 ^e (.22-.75) |
| Hispanic/Latino | .65 (.31-1.38) | .65 (.31-1.37) | .62 (.22-1.74) | .61 (.22-1.68) |
| Other race/ethnicity | .46 ^d (.23-.94) | .46 ^d (.23-.93) | .44 (.17-1.11) | .45 (.18-1.14) |
| Education | | | | |
| Some high school | Ref | Ref | Ref | Ref |
| High school graduate | 1.07 (.38-3.06) | 1.10 (.39-3.11) | 1.01 (.36-2.80) | .97 (.36-2.61) |
| Some college | 1.41 (.50-3.93) | 1.45 (.52-4.05) | 1.50 (.55-4.09) | 1.43 (.54-3.79) |
| College graduate | 2.11 (.75-5.92) | 2.17 (.77-6.08) | 2.02 (.72-5.64) | 1.92 (.71-5.19) |
| Post-graduate degree | 3.65 ^d (1.27-10.48) | 3.78 ^d (1.32-10.91) | 2.44 (.85-7.00) | 2.36 (.85-6.55) |
| Other education | .53 (.12-2.21) | .53 (.13-2.23) | 1.81 (.30-10.87) | 1.86 (.30-11.67) |
| Political affiliation | | | | |
| Republican | Ref | Ref | Ref | Ref |
| Democrat | 5.44 ^f (4.06-7.28) | 4.72 ^f (3.26-6.83) | 2.36 ^f (1.65-3.37) | 1.57 ^d (1.00-2.45) |
| Independent | 1.90 ^f (1.44-2.50) | 1.53 ^d (1.06-2.21) | 1.03 (.74-1.46) | .82 (.51-1.32) |
| Survey cue | | | | |
| Trump cue | Ref | Ref | Ref | Ref |
| Scientist cue | 1.32 ^d (1.06-1.65) | 1.04 (.72-1.51) | 1.22 (.94-1.58) | .77 (.50-1.20) |
| Interactions ^g | | | | |
| Democrat x Scientist cue | — | 1.33 (.78-2.26) | — | 2.42 ^e (1.29-4.55) |
| Independent x Scientist cue | — | 1.53 (.89-2.63) | — | 1.61 (.84-3.09) |
| ρ^2 | .10 ^f | .10 ^f | .05 ^f | .06 ^f |

^aMay 2020 $N = 1918$; October 2020 $N = 1536$.

^bValues are adjusted odds ratios and 95% confidence intervals.

^cVaccination intentions were re-coded from the original Likert-style vaccination acceptance response options as a binary outcome variable: "do not intend to vaccinate (0)" = "very unlikely (-2)," "somewhat unlikely (-1)," and "not sure (0);" "intend to vaccinate (1)" = "somewhat likely (1)" and "very likely (2)."

^d $P < .05$.

^e $P < .01$.

^f $P < .001$.

^gBy Wald test, the political affiliation x survey cue interaction term was jointly non-significant in May ($F(2, 1893) = 1.25, P = .29$) and jointly significant in October ($F(2, 1519) = 3.81, P = .02$).

the scientist cue (AOR = 4.21, CI = 1.39-12.74), and the joint three-way interaction was also significant.

Discussion

Rather than inspiring Americans to unite against a shared threat, the devastating impact of COVID-19 was exacerbated by partisan polarization,¹ undermining trust in legitimate sources of information⁴ and leading to partisan differences in

compliance with preventative behaviors.^{7,8} Partisan differences in vaccine acceptance also threatened to slow the United States' distribution of multiple COVID-19 vaccines in 2021.²⁸ Understanding how partisanship was reflected in COVID-19 attitudes, as well as how attitudes can be influenced by partisan or scientific messaging, will help promote compliance with public health measures and craft effective vaccination programs, in the COVID-19 pandemic and in similar public health crises in the future.

In our two-wave survey of Pennsylvania adults in May and October 2020, we found strong partisan polarization in all measured COVID-19 attitudes. Our results are consistent with previous findings of disproportionately higher trust in President Trump or medical experts as sources of COVID-19 information among Republicans or Democrats, respectively.¹¹ We also expand on previous findings that people are more trusting of COVID-19 information from co-partisan leaders.²⁹ Republican respondents indicated extreme distrust in Pennsylvania's Democratic governor, Tom Wolf, at a nearly three-fold-higher rate than they did in medical experts. Given the Wolf administration's concordance with Centers for Disease Control and Prevention guidelines,³⁰ this suggests that partisan motivated reasoning, rather than opinions on specific health policies themselves, influenced attitudes.

Our results likewise demonstrated strong partisan polarization in support for mask wearing and vaccination intentions, as was consistently reported throughout the pandemic.^{12,28,31} We found an increased partisan split in support for mask wearing from May to October 2020, driven by an increase among Democrats. Conversely, the split in vaccination intentions decreased from May to October, showing a decline among Democrats and an increase among Republicans. The October wave coincided with reported low points in both overall vaccine acceptance and partisan polarization.¹³ Our results may have reflected differential responses to salient partisan cues, such as news about pressure from the Trump administration on the FDA to rush vaccine approval prior to the presidential election.³²

Our randomized experiment assigned respondents to read a statement about either "President Trump" or "scientists and researchers" endorsing a COVID-19 vaccine, prior to rating their likelihood of getting it. The scientist cue significantly increased overall odds of intending to get the vaccine by 32% in May, and non-significantly increased odds by 22% in October. By political affiliation, this increase was only significant among Democrats, and held over time. Notably, the scientist cue significantly increased odds by 142% among Democrats in October, supporting the notion that the potential of an approved vaccine to boost President Trump's chances of re-election may have influenced Democrats' attitudes. Still, the scientist cue did not deter independents or Republicans, despite our survey results and other polls showing a growing partisan divide in trust in scientists since the onset of the pandemic.⁹

Two important lessons for future vaccine promotion campaigns can be drawn from our results. First, partisan differences in COVID-19 related attitudes are stark and pervasive over time. Partisans are likely to resist cues about mitigation strategies or support for the vaccine, unless they are congruent with prevailing beliefs or come

from trusted messengers.¹⁵ This partisan motivated reasoning effect was likely at work in October 2020, when Democrats showed a decreased willingness to be vaccinated, especially when exposed to partisan messaging. Public health officials should therefore recognize the ideological realities behind people's intentions to get vaccinated or not, or to engage in complementary mitigation strategies such as masking.

Second, it will be important to rapidly and comprehensively evaluate the impact of endorsements and other "credibility enhancing displays" from public officials and other leaders to promote vaccination; their effects may vary by political party, identity of the messenger, and underlying vaccination preferences.^{33,34} While our study offered cues about the vaccine related to scientific or partisan endorsement, other cues worth testing include statements about vaccine effectiveness, safety data, and side effects. The public's perceptions of the equity and fairness of vaccine supply allocation and prioritization policies may also shape willingness to be vaccinated.^{35,36} Going forward, public health officials will need to distinguish which messaging interventions succeed in actually shifting preferences and attitudes, in addition to helping those already motivated to vaccinate to follow through on their intentions.³⁷

Limitations

Our study has important limitations to note. Generalizability may be limited as we surveyed only Pennsylvania residents, and the Civiqs panel may have been more politically engaged than the average Pennsylvanian. While we resampled the May respondents in the October wave, we included additional participants from the Civiqs panel to increase our sample size, preventing the comparison from being truly longitudinal. We drew from previous surveys of COVID-19 related attitudes to create our novel items and pre-tested them in independent survey experiments. However, the specific phrasing and formatting of items, including the survey cue item, may have affected our results. Further validation of our items would strengthen inferences beyond the scope of this randomized experiment, and future studies should test alternate phrasing. Our inclusion of other political items in the survey may also have extended a partisan prime beyond that of the experimental Trump cue, decreasing the salience of the scientist cue. Presenting respondents with the experimental item in isolation may have resulted in a larger effect. Finally, our experiment did not include a neutral messaging condition to assess baseline vaccination intentions, though the aforementioned political distractor items would have also prevented this from being a truly neutral condition.

SO WHAT?

What is already known on this topic?

Stark partisan divides exist in many COVID-19 attitudes, including in those towards mitigation strategies and the vaccine. Partisans selectively collect information from trusted messengers, facilitating misinformation and undermining a unified pandemic response. Little is known about how messaging influences COVID-19 attitudes, however.

What does this article add?

This study confirms widespread and persistent polarization in COVID-19 attitudes, and furthers our understanding of messaging effects on vaccination intentions. Scientific endorsements increased intentions among Democrats, and had no significant effects on independents or Republicans. Partisan endorsements may only increase intentions when congruent with beliefs and narratives.

What are the Implications for Health Promotion Practice or Research?

Partisanship reveals heterogeneous differences in attitudes that are masked by overall trends. When promoting compliance with COVID-19 measures or designing vaccination campaigns, partisan messaging effects should be carefully considered. Scientific endorsements show promise in producing consistent effects.

Author Contributions

DJH, SPB, and AMB conceived of the study, developed the methodology, and acquired the data. DJH acquired funding for the project. AMG analyzed, interpreted, and visualized the data, and wrote and edited the manuscript in consultation with DJH, SBP, and AMB. All authors discussed and approved of the results to be published.

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Ethical Approval

The study protocol was determined by the University of Pennsylvania Institutional Review Board (IRB) to meet eligibility criteria for IRB review exemption. All respondents provided informed written consent prior to their participation.

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Supplemental Material

Supplemental material for this article is available online.

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