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Mistrust in public health institutions is a stronger predictor of vaccine hesitancy and uptake than Trust in Trump

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ABSTRACT

Study goal: This study examines the sources of COVID-19 vaccine hesitancy and refusal in Americans by decomposing different forms of government trust/mistrust including trust in Trump and mistrust in public health institutions.

Methods: Using linear panel regression models with data from 5,446 US adults (37,761 responses) from the Understanding America Survey, the likelihoods of vaccine hesitancy, uptake, and trust in various information sources were examined.

Results and conclusion: We find that the likelihoods of hesitancy and having negative perceptions of COVID-19 vaccines were consistently much higher among PHI mistrusters, showing even a stronger hesitancy than Trump trusters. This tendency has persisted over time, resulting in only 49% of PHI mistrusters having been vaccinated in the most recent survey wave. However, a large portion of PHI mistrusters still trusted physicians, family, and friends. These findings suggest that mistrust in PHIs is a salient predictor of vaccine hesitancy and reduced uptake on its own, which is compounded by trust in Trump.

1. Introduction

Vaccine hesitancy predated COVID-19 and was named as one of the top ten global health threats in the world by the World Health Organization in 2019 (WHO, 2019). Vaccine hesitancy has further amplified during the pandemic and public trust has emerged as one of the strongest predictors of hesitancy both at the national and individual levels. In the United States (U.S.), institutional mistrust and disease politicization posed particularly salient barriers to effectively responding to the COVID-19 pandemic, most recently as it pertains to vaccine uptake. COVID-19 vaccines became available in the U.S. in December 2020 following the FDA's emergency use authorization. However, the daily increase in the percentage of fully vaccinated people stagnated after reaching nearly half of the population despite severe shortages of vaccines in many other countries (Centers for Disease Control and Prevention (CDC), 2022).

Vaccine hesitancy is not a new phenomenon and has been observed historically and in the contemporary period for a number of other vaccine-preventable illnesses, including smallpox (Brimnes, 2004), the Measles, Mumps, and Rubella (MMR) vaccine (Dubé et al., 2013), and the cervical cancer vaccine (Patel and Berenson, 2013). What appears to

be different about COVID-19 vaccination in the U.S., however, is how rapidly hesitancy and intention to vaccinate polarized along partisan lines. Since COVID-19 vaccines became broadly available to the general public age 12 and above, sharp divergences in uptake have emerged along partisan lines, with Republican party identification, in general, and identifying as a Trump supporter, in particular, being one of the strongest predictors of low intention to vaccinate and vulnerability to misinformation across surveys (Kates et al., 2021; Lewis, 2020). Moreover, an ecologic relationship has emerged whereby places with a high vote share for Trump have lower vaccination rates, making these areas more susceptible to outbreaks and hospital overcrowding (Kates et al., 2021; Liu and Li, 2021).

However, it is not clear why vaccine hesitancy polarized in the way that it did and whether party identification *per se* or other underlying factors associated with party identification is driving COVID-19 vaccine hesitancy. Research from before COVID-19 pointed to childhood vaccine hesitancy being potentially greater among more liberal elite parents and in urban centers (Motta, 2018; Olive et al., 2018). Furthermore, initial concerns about the COVID-19 pandemic pointed to heightened vaccine hesitancy among minority populations who do not tend to identify as conservative (Callaghan et al., 2021; Strully et al., 2021). These mixed

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findings imply that there could therefore be a broader factor driving vaccine hesitancy other than partisanship *per se*.

Different explanations have emerged for the growing partisan divides in COVID-19 vaccine hesitancy. One explanation points to an “exogenous” hypothesis that partisanship *per se* drives political conservatives to be more vaccine-hesitant. This explanation focuses on how the pandemic response became politicized and subsequently polarized along partisan lines (e.g., [Gadarian et al., 2021](#); [Shepherd et al., 2020](#)). Under this hypothesis, a party or particular leader sends cues about the nature of a threat, or supplies direct misinformation, to supporters that affect their attitudes and behaviors toward the threat. A second hypothesis highlights a “correlation” between political conservatism and other correlates, in particular, trust in government and the medical establishment. This explanation focuses more on how underlying values or personality traits, which tend to map onto party identification/support, might shape vaccine hesitancy and/or refusal. For instance, individualistic personality characteristics and a tendency toward distrust of elites and experts might contribute both toward conservative party identification as well as skepticism towards vaccines, especially when mandated by the government ([Jamison et al., 2019](#); [Merkley and Loewen, 2021](#); [Taylor and Asmundson, 2021](#)). In this explanation, the relationship between party identification and vaccine hesitancy may be more coincidental than causal.

Numerous studies across diverse settings have identified trust in government as one of the known factors that have a strong influence on vaccination even prior to the pandemic (e.g., [Jamison et al., 2019](#); [Larson et al., 2018](#)). More recent studies conducted in the context of the COVID-19 pandemic have reported similar findings that trust in government and the medical establishment has a strong influence over vaccine acceptance and uptake ([King et al., 2021](#); [Prickett and Chapple, 2021](#); [Soares et al., 2021](#); [Trent et al., 2021](#)). Since COVID-19 vaccines were developed and distributed with full government support, generalized mistrust in government may foster doubts about the vaccines’ efficacy and safety.

In this paper, we seek to tease out to what extent vaccine hesitancy is driven by trust in particular conservative political leaders/partisan actors (i.e., former President Trump) versus underlying dispositions that drive more generalized mistrust of particular government institutions. Using a nationally representative panel survey collected by the Understanding America Survey (UAS) project, the study aims to contribute to research on public trust and compliance with public health guidelines and inform current debates on how to increase COVID-19 vaccine uptake among hesitant populations. We do so by decomposing and distinguishing trust in Trump from mistrust in public health institutions (PHIs) more broadly and examining the contribution of each to gaps in vaccine confidence and uptake during the pandemic.

The results demonstrate that mistrust in PHIs is a critical predictor of vaccine hesitancy and uptake that is even stronger than trust in Trump *per se*. Moreover, the results further show that hesitancy among PHI mistrusters has persisted over time, resulting in only 35% of vaccinations occurring in that group in the last wave of the survey. These results also hold when examining party affiliation rather than trust in Trump, suggesting that low trust in institutions may be a more profound driver of vaccine hesitancy than partisan politics *per se*. Furthermore, we find that, while PHI distrusters are distrustful of nearly all information sources, they are the least distrustful of their personal doctors. This suggests that this source may still be a viable outlet for increasing vaccine acceptance. These findings provide a fresh perspective to the current discussion on determinants of and solutions to COVID-19 vaccine hesitancy, where partisanship has become recognized as the strongest driver of hesitancy, suggesting more tailored strategies to address different sources of hesitancy.

2. Literature review

Even before COVID-19 vaccines were made widely available, party

identification rapidly became the strongest predictor of compliance with other policy responses against COVID-19. For instance, [Gadarian et al. \(2021\)](#) found that partisanship was a stronger predictor of social distancing than any other measure examined, surpassing income, education, and other demographic characteristics. Likewise, [Kerr et al. \(2021\)](#) found that liberals consistently reported greater compliance with health-protective behaviors than conservatives (e.g., face covering). Once COVID-19 vaccines became available, evidence from opinion polls (e.g., [Owens, 2021](#); [Tyson et al., 2020](#))s and academic literature (e.g., [Cao et al., 2021](#); [Liu and Li, 2021](#); [Shepherd et al., 2020](#); [Viswanath et al., 2021](#)) began highlighting the partisan gaps in vaccination rates across individuals and US counties. However, the mechanisms underlying this gap are unclear and continue to be debated and assessed. In particular, it remains unclear how much of the partisan effect is being driven by “social cuing” about the nature of a threat and misinformation by political partisans that sew seeds of mistrust in vaccines versus individuals being drawn to vaccine-hesitant positions due to experiences that contribute to skepticism towards the government and medical establishment. Below we consider these two relevant hypotheses and elaborate on the different pathways and mechanisms and their relevance to the current study.

2.1. Exogeneity hypothesis: effects of partisanship on vaccine hesitancy

Previous literature has found that when scientific guidance is unclear or when threats become politicized, individuals tend to fall back on political worldviews to make sense of this information and determine how to respond ([Albertson and Gadarian, 2015](#); [McCright and Dunlap, 2011](#)). For instance, [Albertson and Gadarian \(2015\)](#) find that the public tends to trust experts most of the time unless threats become politicized. When threats become politicized and parties begin to disagree over policy responses to a threat vocally, political partisans start seeking out information from sources that tend to reinforce their worldview. This effect is more extreme for strong political partisans who are more likely to take their signals from their preferred party ([Kahan, 2013](#)). This occurs because partisanship often functions as a source of social identity that shapes the attitudes and behaviors of party members ([Huddy et al., 2015](#); [Mason, 2018](#)). Partisanship is believed to be increasingly influential in American people’s policy support and political life. It has been further amplified by ideologically aligned media ([Prior, 2013](#)) and rising partisan polarization at the political level ([Layman et al., 2006](#)).

In particular, since the COVID-19 pandemic, partisanship has received renewed attention as a strong predictor of vaccine hesitancy and uptake. Particular Republican leaders and media outlets, such as Fox News, have contributed to disseminating narratives and messages downplaying the risk of COVID-19 and the efficacy and safety of COVID-19 vaccines, whereas other political leaders have been supportive of vaccination as a means to stop the pandemic ([Engel-Rebitzer et al., 2022](#); [Yang and Bennet, 2021](#)). Rich evidence suggests that these polarizing messages have had a significant impact on people’s compliance with public health recommendations, such as mask wearing and social distancing (e.g., [Kerr et al., 2021](#); [Simonov et al., 2020](#)). Thus, in short, according to the explanation of these studies, vaccine hesitancy is likely to have polarized along partisan lines in the U.S. because the political polarization and partisan messages already pervaded the country.

However, even accepting this explanation, it is still unclear whether party identification *per se* or support for Trump in particular is more responsible for the polarization in vaccine hesitancy. Different studies examining the effects of partisanship on COVID-19 related behaviors have measured party identification in different ways, including political conservatism ([Stroope et al., 2021](#)), ideology ([Kerr et al., 2021](#)), and party identification ([Cao et al., 2021](#); [Viswanath et al., 2021](#)). For instance, [Gadarian et al. \(2021\)](#) measure partisanship in three ways — party identification, support for President Trump, and left-right ideological positioning — and find that each explains different aspects of

American people's policy support and health behaviors. Trump's political worldview is widely regarded as a form of ideological conservatism that is distinct from the Republican Party and more aligned with populist views that run counter to conventional Republican platforms (Donovan and Redlawsk, 2018). Recent evidence suggests that support for Trump and particular subsets of political conservatives may be more susceptible to vaccine misinformation and hesitancy rather than other Republicans more broadly. Shepherd et al. (2020) find that the approval of former President Trump, as well as party affiliation, was linked to lower risk perception and relevant beliefs about COVID-19. Moreover, a recent large poll by the new Public Religion Research Institute has shown that only certain subsets of Republican party identifiers are more likely to refuse vaccines, specifically those who identify as evangelical Christian, consume far-right television news and believe in the QAnon conspiracy (Durkee, 2021).

There are good reasons to think that support for Trump, in particular, might cause greater vaccine hesitancy among followers. Throughout the pandemic, Trump has misled the public by downplaying the risks of COVID-19 and promoting unproven cures for COVID-19 (Yamey and Gonsalves, 2020; Yang and Bennet, 2021). At various times before and during his presidency, he courted the anti-vax movement, including exploring the possibility of setting up a commission led by noted anti-vax advocate Robert Kennedy Jr and implying that vaccines could cause autism during a Presidential debate (Wadman, 2017). Further, while it is true that Trump has noted his vaccination status at speeches and rallies and was responsible for authorizing Operation Warp Speed (e.g., Axelord, 2021), he was intentionally far less public with his position than other political leaders who were vaccinated publicly.

2.2. Correlation hypothesis: effects of low trust in institutions on vaccine hesitancy

An alternative hypothesis for the observed relationships between partisanship and vaccine hesitancy is that it is not causal but correlational. Individuals who are conservative may be drawn to vaccine hesitancy not because they support a particular party/candidate but because they have certain underlying values or dispositions that contribute to hesitancy that are also likely to be high among political conservatives.

Among diverse factors related to political conservatism in the U.S., mistrust in government and the medical establishment has been considered one of the well-known factors of vaccine hesitancy and refusal since before the COVID-19 pandemic (Jamison et al., 2019; Larson et al., 2018). While the academic definition of public trust varies, studies similarly find that public trust in government involves normative expectations or confidence that the government's actions are good and right (Cook and Gronke, 2005; Levi and Stoker, 2000; Nye et al., 1997). Many empirical studies have shown that confidence in vaccination is consistently higher among people with a higher level of trust in government and science, long before the COVID-19 pandemic (Dubé et al., 2013; Habersaat and Jackson, 2020; Karafillakis et al., 2019; Ozawa and Stack, 2013). Medical mistrust, in particular, has been identified as a source of heightened vaccine hesitancy among non-Hispanic Blacks (Khubchandani and Macias, 2021), women (Callaghan et al., 2021; Salmon et al., 2015), and those who endorse "anti-vax" viewpoints generally (Hotez, 2020, 2021). While PHIs have generally enjoyed relatively high degrees of trust (Kowitt et al., 2017), mistrust of the medical and scientific establishment and public institutions more generally has been widespread and growing in a number of groups in American society fostered by medical racism and growing distrust of elites (Bajaj and Stanford, 2021; Motta, 2018).

Since the COVID-19 pandemic, several studies have further observed that public trust in government is associated with COVID-19 vaccine hesitancy, resonating with findings from the pre-pandemic studies (King et al., 2021; Prickett and Chapple, 2021; Soares et al., 2021; Trent et al., 2021). For example, Jennings et al. (2021) found based on a survey

conducted in the United Kingdom that different types of trust (e.g., government, experts, health institutions), were highly correlated with COVID-19 vaccine hesitancy, following age, while the effect of social trust on vaccine hesitancy was minor. Liu et al. (2021) similarly reported by using survey data collected in China that trust in government was the second-highest predictor of COVID-19 vaccine hesitancy following vaccine confidence.

Partisanship may affect individual trust toward the government (Baumgaertner et al., 2018), but mistrust of institutions is not limited to political conservatives. Vaccine hesitancy predated COVID-19 and has previously been identified in diverse populations whose mistrust of vaccinations is grounded in different sources and life experiences across a number of diverse settings, both domestically and internationally (Dubé et al., 2013; MacDonald et al., 2015; Ozawa and Stack, 2013). Moreover, political conservatism has been tied to a number of values that are also likely to contribute to undermining trust in government health experts' ability to fight COVID-19, including anti-intellectualism (Merkley and Loewen, 2021; Motta, 2018), populism (Falkenbach and Greer, 2018; Kellner, 2021), and anti-science attitudes (Tollefson, 2020). In other words, the worldviews that are often observed among political conservatives may drive individuals towards right-wing populism and also cause them to be distrustful of vaccines. Under this explanation, there is nothing about group membership *per se* that makes individuals more hesitant other than sharing low expectations of the government's COVID-19 responses that drives them to hesitancy. Thus, party identification or support for a particular candidate is merely a correlated factor.

Low trust in government has been one of the most consistent predictors of vaccine hesitancy globally, suggesting that underlying trust issues within countries may drive hesitancy on a broader scale (e.g., Lazarus et al., 2021). In a survey of five countries in West Africa, only around a third of respondents reported that they trust their government to ensure that any vaccine is safe before it is offered to citizens (Seydou, 2021). Research by Ward et al. (2020) in France has shown that those who reject establishment politics on the left and the right are the most vaccine-hesitant.

While we acknowledge that we cannot fully disentangle these complex and interrelated mechanisms explained so far, we suggest that in order to shed further light on how much of COVID-19 vaccine hesitancy can be attributed specifically to support for Trump and/or partisanship versus underlying mistrust in PHIs, it is helpful to decompose these groups. This subgroup approach enables us to observe variations within each group, compared to a conventional method of employing an interaction term of the two groups.

3. Methods

3.1. Data

This study uses nine waves – the 21st to the 29th – of the COVID-19 survey of the UAS project from the Center for Economic and Social Research at the University of Southern California (Alattar et al., 2018). This longitudinal data covers the period from December 23rd, 2020, to July 21st, 2021, after the first COVID-19 vaccine became available to the general public in the US. The UAS survey panel was launched in February 2014 with an initial sample of 10,329 participants who had agreed to participate in the survey. Since April 2020, the UAS has surveyed a nationally representative sample of respondents age 18 or older to investigate the impact of the COVID-19 pandemic on US society. Participants were randomly selected and completed the survey online or by a tablet provided with internet access. Respondents were compensated with \$20 for 30 min to complete the surveys. The average number of respondents across the nine waves was 4,196. The average response rate in the study period was 74%. Appendix 1 provides the data collection period, the number of participants, and the response rate of the data used in this study.

In the data cleaning process, we conducted listwise deletions and simple imputations. The initial sample included 39,521 responses from 5,579 respondents from the national sample batch. We first dropped 824 incomplete observations without an end date. [Appendix 3](#) presents the missing values in the variables used in this study after excluding the incomplete observations. After excluding the incomplete observations, there were inconsistent answers in the race (9 records) and gender (2 records) variables which are not likely to change during the study period. These were imputed by using the most frequent value of each respondent (*i.e.*, mode). We then dropped 936 responses with missing values in vaccination, vaccine attitudes, COVID-19 infection, trust, and sociodemographic questions, as shown in [Appendix 2](#). We did not conduct a multiple imputation by considering that the missing values were only a small portion of the sample (2.42% of 38,697 responses after excluding incomplete observations) and did not show any visible patterns ([Jakobsen et al., 2017](#)). As a result, the final study sample of 37,761 responses from 5,446 respondents was used in the analysis.

3.2. Outcome variables

The analysis examined five binary dependent variables. In the first part of the analysis, we compared vaccine hesitancy and uptake among the four groups. Respondents were asked if they had received a COVID-19 vaccine, and if not, they were asked how likely they were to get one in the future. Vaccine hesitancy was measured as 1 if respondents reported that they were somewhat or very unlikely to get vaccinated. This question was given only to those who had not been vaccinated or were unsure about their vaccination status. Hesitancy in this study is therefore best thought of as self-reported intention not to vaccinate among the remaining unvaccinated in wave *t*. Vaccine uptake was coded as 1 if the respondent had received at least 1 dose of COVID-19 vaccines to account for the fact that some vaccines only require one dose (*e.g.*, Johnson & Johnson).

We further examined the three sources of hesitancy and low uptake – perceptions of usefulness and effectiveness, benefits of vaccines to society, and availability of vaccines, corresponding to the 3Cs of vaccine hesitancy, *i.e.*, confidence, complacency, and convenience ([MacDonald et al., 2015](#)). Perceived effectiveness was measured as strongly/somewhat disagreeing with the statement that vaccines “are useful and effective”; complacency was measured as strongly/somewhat disagreeing that vaccines “provide important benefits to society”; and convenience was measured as answering yes to the questions that “Coronavirus vaccines are currently available for people in your community.” Different groups of trusters/mistrusters may vary in the source of their hesitancy, with some more concerned about usefulness/effectiveness, others discounting the societal benefit, while for others, the physical availability or saliency of the issue may be reduced by a lack of convenient access. We anticipated that PHI mistrusters and Trump trusters would be more likely to discount the effectiveness and social benefits of vaccines while showing a similar perspective on the availability.

Finally, the last part of the analysis further examined which information sources PHI mistrusters and Trump trusters would trust across six types of information sources: physicians, contacts on social network services (SNS), national/local newspapers, family and close friends, and other acquaintances, such as coworkers and classmates. These variables were coded as 1 if respondents completely/mostly trust each of them (distributions of the responses to the questions are presented in [Appendix 4](#)). These trust questions also invited some inconsistent answers across the time, but we did not exclude such responses, as we focused on the most recent wave of the survey when examining these variables.

3.3. Independent variable: trust in public health institutions and trump

The main independent variables compare four mutually exclusive groups created along two dimensions: PHI mistrusters and Trump

trusters. PHI mistrusters were measured as 1 if respondents reported that they do not trust (somewhat or at all) local public health department officials, the Department of Health and Human Services (DHHS), and the CDC. Whereas PHI trusters were coded as 0 if respondents reported that they trust or completely trust at least one of the three institutions. Trump trusters were defined as respondents who reported that they completely/mostly trust Donald Trump.

Though trust is typically considered as an individual propensity that is relatively stable over time provided there are no external shocks, *e.g.*, government scandals ([Keele, 2007](#); [Newton and Zmerli, 2011](#)), there were respondents who gave inconsistent answers to trust questions over the study period. To construct a consistent category of individual propensity by controlling the inconsistency, we calculated the individual average of mistrust in PHIs and trust in Trump, respectively, over the study period and dichotomized them. Thus, PHI mistrusters and Trump trusters in this study are defined as those who showed consistent mistrust and trust in PHIs and Trump. In dichotomizing the measures, we used different cutpoints for trust in PHIs and trust in Trump, where a jump in the individual average of vaccine hesitancy (*i.e.*, the number of reported hesitancy divided by the number of completed surveys) was observed. Mistrust in PHIs was coded as 1 if the average mistrust was 0.5 or higher, while trust in Trump was coded as 1 if the average trust was 0.1 or higher. [Appendix 5](#) presents the distributions that support these decisions. Considering that this is a data-driven approach rather than a theoretical approach, we also conducted a sensitivity analysis with different cutpoints.

Using these two binary measures, we finally created four categories (see [Appendix 6](#) for the frequency table of the final categories): PHI mistrusters who trust Trump (21%), PHI mistrusters who mistrust Trump (21%), PHIs trusters trusting Trump (15%), and PHIs trusters mistrusting Trump (42%, baseline category). Overall, we anticipated that mistrust in PHI would be a stronger predictor of hesitancy than trust in Trump *per se*. We anticipated that those who mistrust Trump and trust in PHI should be the most vaccine confident and exhibit the highest vaccine uptake, whereas those who trust Trump and mistrust PHIs should be the most hesitant and exhibit the lowest uptake. We also hypothesized that those who mistrust both PHIs and Trump would be more vaccine-hesitant than those who trust both PHIs and Trump.

To break out Trump support from partisanship, as a robustness check, we also decomposed PHI mistrusters by party affiliation by connecting the Politics survey from the UAS project with the COVID-19 survey to see if similar patterns hold. Respondents were asked to answer with which party affiliation they were “more closely aligned” using 7 choices: “Democrats,” “Republicans,” “Independents,” “Libertarians,” “Green party,” “some other party,” and “not aligned with any political party.” We re-coded this measure into a standard measure of their party affiliation – Democrat being a reference category, Republican, and Independent/other. The majority of Republicans were coded as Trump trusters (65%), while only 14% of Democrats and 30% of the others were coded as Trump trusters ([Appendix 7](#)). The full detail of the data cleaning process of the Politics survey and results using the party affiliation variable are provided in [Appendix 17](#).

The control variables included testing positive for COVID-19, race-ethnicity, female, age, educational attainment, household income, and being a US citizen. Details of these variables and their coding can be found in [Appendix 8](#).

3.4. Statistical analyses

We first compared frequencies and means of the variables among the four groups with descriptive statistics and trends of outcome variables over time. We then examined repeated cross-sectional models for examining vaccine hesitancy and attitudes toward vaccines in [Figs. 2 and 4](#) and two-way fixed effects models to compare the predicted probability of vaccine hesitancy and vaccine uptake among the four groups over time in [Fig. 3](#).

We used linear regressions by considering the known problem of the logistic approach that the risk of overestimation gets higher as the odds ratio increasingly deviates from 1 (Davies et al., 1998). In all estimations, we used a state-level fixed effect model and clustering rather than an individual- or a household-level specification because we were interested in variations across individuals. These analyses were two-tailed tests and were conducted by using STATA 17. Statistical significance was determined at the 95% confidence level. More detailed descriptions of the identification strategy are provided in Appendix 9.

4. Results

4.1. Vaccine hesitancy, attitudes, and uptake

Among the four comparison groups, the largest group of respondents were those who both trust PHIs and mistrust Trump. This group comprised 42% of the sample (2,300 respondents). The second largest group at 21% of respondents reported trusting PHIs but mistrusting Trump (1,167 respondents). A similar portion trusted both PHIs and Trump, comprising 21% of the sample (1,135 respondents). Another 15% both trusted Trump and mistrusted PHIs (844 respondents). Overall, differences between PHI mistrusters and others and between Trump trusters and others are bigger regarding their attitudes to vaccination and trust than sociodemographic differences (Appendix 8).

Fig. 1 compares the trends of vaccine uptake and attitudes toward COVID-19 vaccines among the four groups (see Appendix 8 for the

sample characteristics by survey wave). Nearly 72% of the respondents had received at least one COVID-19 shot by the last wave of the survey. As the vaccine uptake had increased steeply since the 22nd wave of the survey (Fig. 1A), the percentage of answering that COVID-19 vaccines are not available had decreased in all groups (Fig. 1E). However, the overall vaccination rate was strikingly low among PHI mistrusters whether they supported Trump or not: while 93% of PHI trusters mistrusting Trump had received at least one dose of COVID-19 vaccines by the last survey wave, the rate was only 49% among PHI mistrusters (Fig. 1A). Low vaccination rates among PHI mistrusters were compounded by trust in Trump: 41% of PHI mistrusters who trust Trump was vaccinated compared with nearly 56% of PHI mistrusters who mistrust Trump.

As of the last wave, 21% of the sample was vaccine-hesitant (unvaccinated and reported being unlikely to get the vaccine). Similar to vaccine uptake, PHI mistrusters had consistently been much more likely to be vaccine-hesitant and have negative perceptions of COVID-19 vaccines, while Trump trusters had shown a relatively moderate hesitancy and higher vaccine uptake than PHI mistrusters. Nearly 50% of PHI mistrusters who trust Trump reported being hesitant and close to 34% of PHI mistrusters who do not trust Trump were hesitant (Fig. 1B–D). Mistrust in PHI was associated with dramatically higher hesitancy even among Trump supporters: the percentage of hesitancy was 35%p lower among people who trust Trump but trust PHIs (50% vs. 15%).

Fig. 2 compares the likelihood of hesitancy, perceived effectiveness,

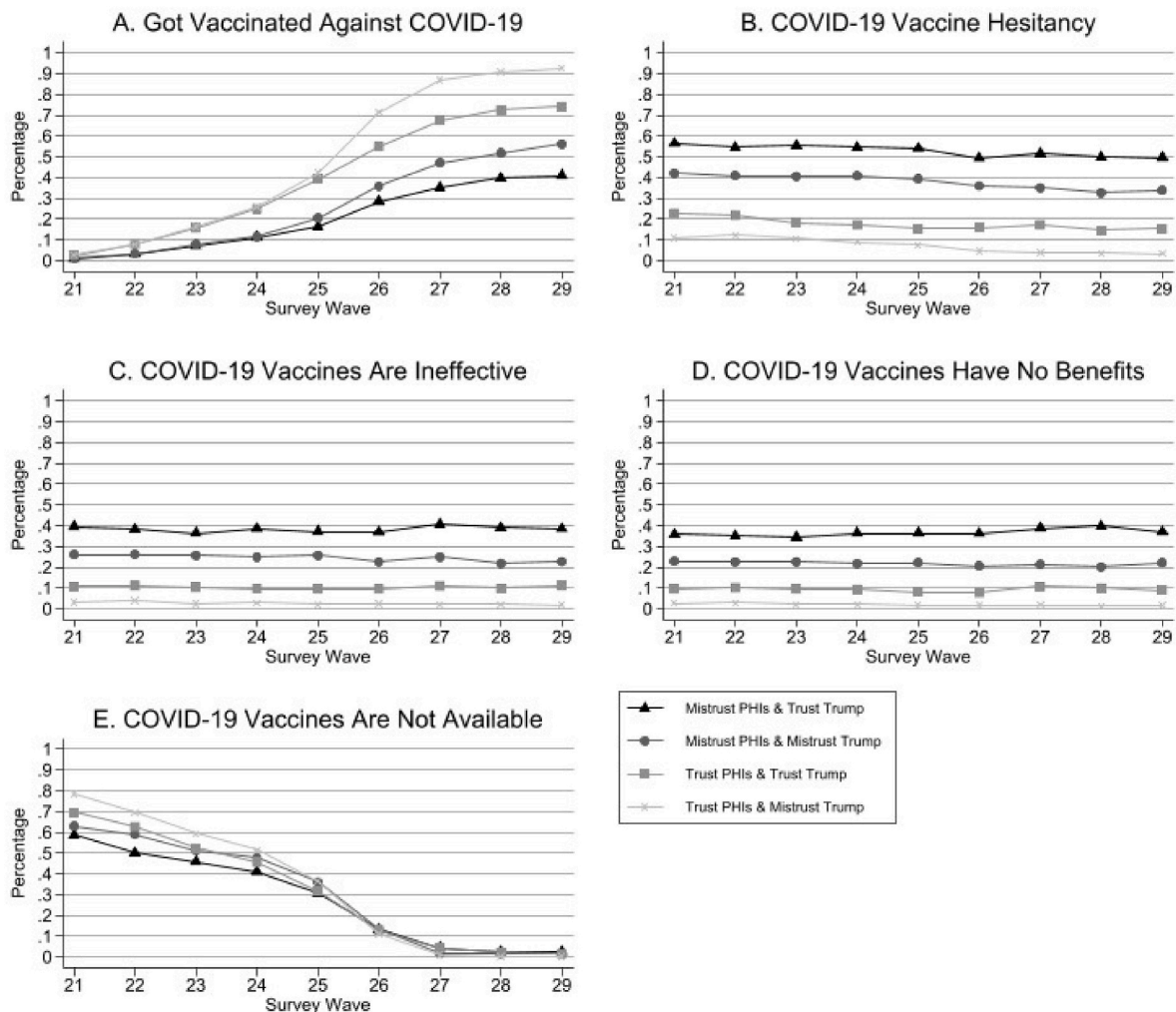


Fig. 1. Trends of the outcome variables in the study period.

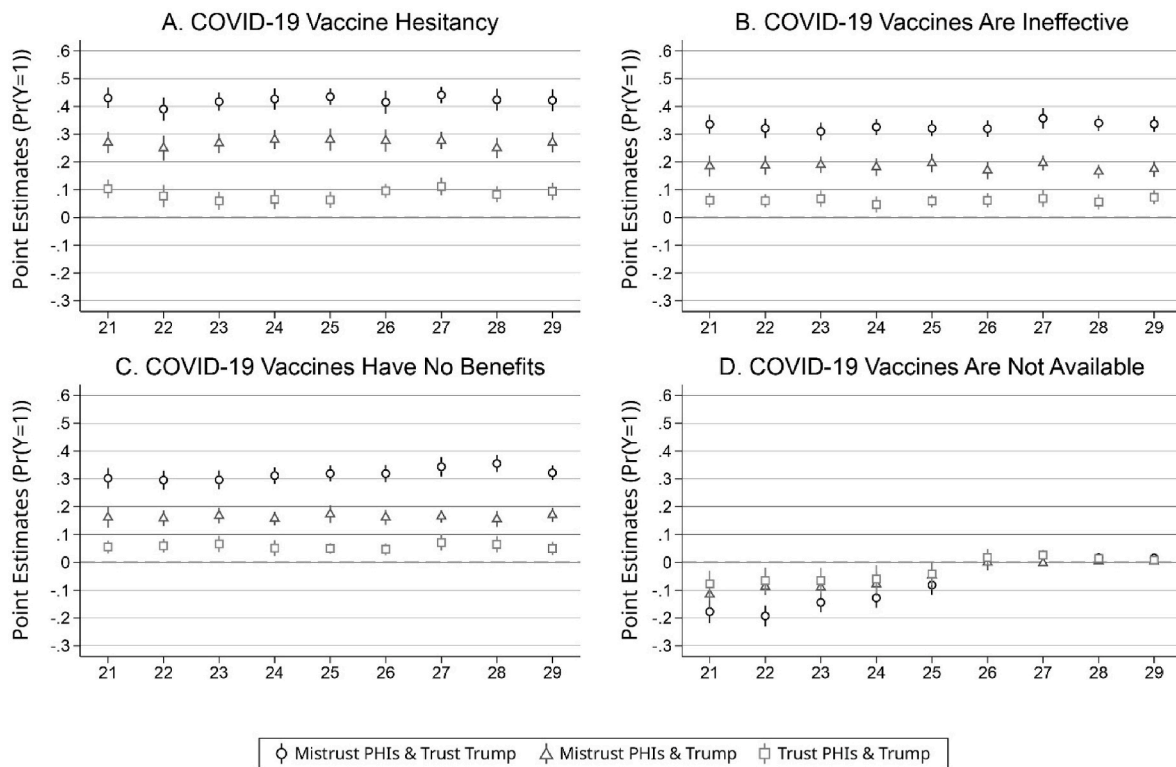


Fig. 2. Comparison of Hesitancy and Perceptions on Effectiveness, Social Benefits, and Availability of COVID-19 Vaccines by Group. Notes: Markers represent the point estimates of each variable. Spikes indicate 95% confidence intervals. Gray dotted line indicates 0. Controls included but not shown: diagnosed with COVID-19, race-ethnicity, gender, age, educational attainment, household income, and being a US citizen.

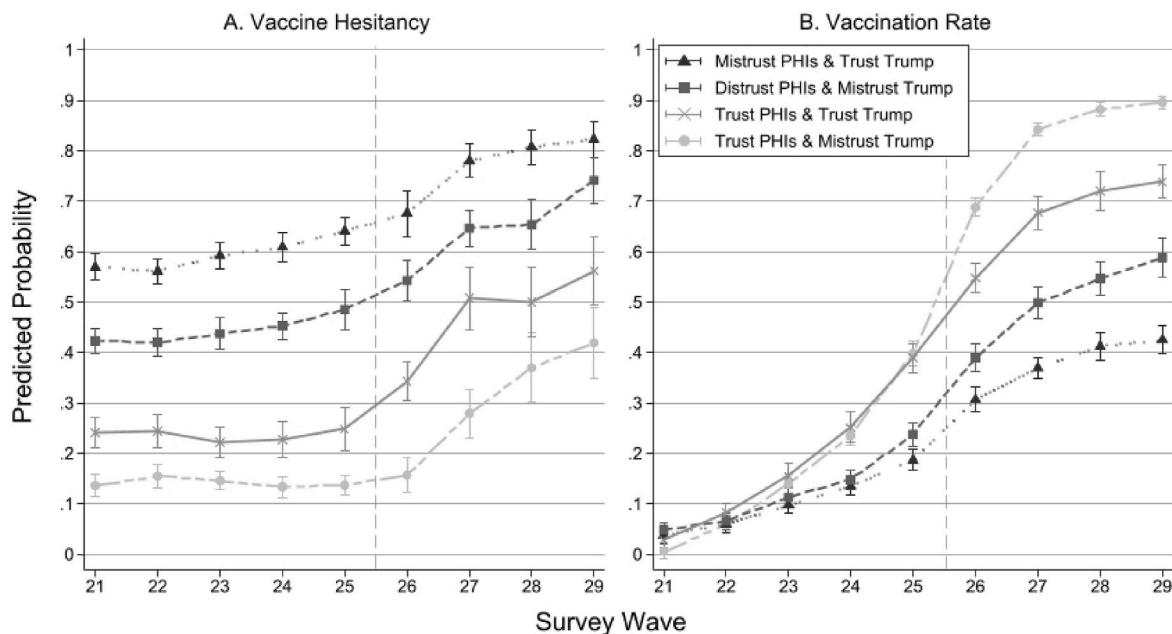


Fig. 3. Predictive Probabilities of Vaccine Hesitancy and Vaccination Uptake by Survey Wave. Notes: Lines represent the predictive probability of each group. Spikes around the line indicate 95% confidence intervals. Vaccine hesitancy represents the proportion reporting that they are unlikely to get vaccinated among those who have not been vaccinated. Vaccine uptake represents the proportion reporting they have received at least one dose of a COVID-19 vaccine. Controls included but not shown: diagnosed with COVID-19, race-ethnicity, gender, age, educational attainment, household income, and being a US citizen. Dotted vertical line indicates COVID-19 vaccines became eligible for most US adults.

social benefits, and availability of COVID-19 vaccines among the comparison groups in each survey wave (see [Appendices 10-13](#) for the full regression outputs). [Fig. 2A](#) shows that the likelihood of vaccine

hesitancy had consistently been higher among PHI mistrusters and Trump trusters than among PHI mistrusters who mistrust Trump in the study period. When adjusting for confounders, the likelihood of being

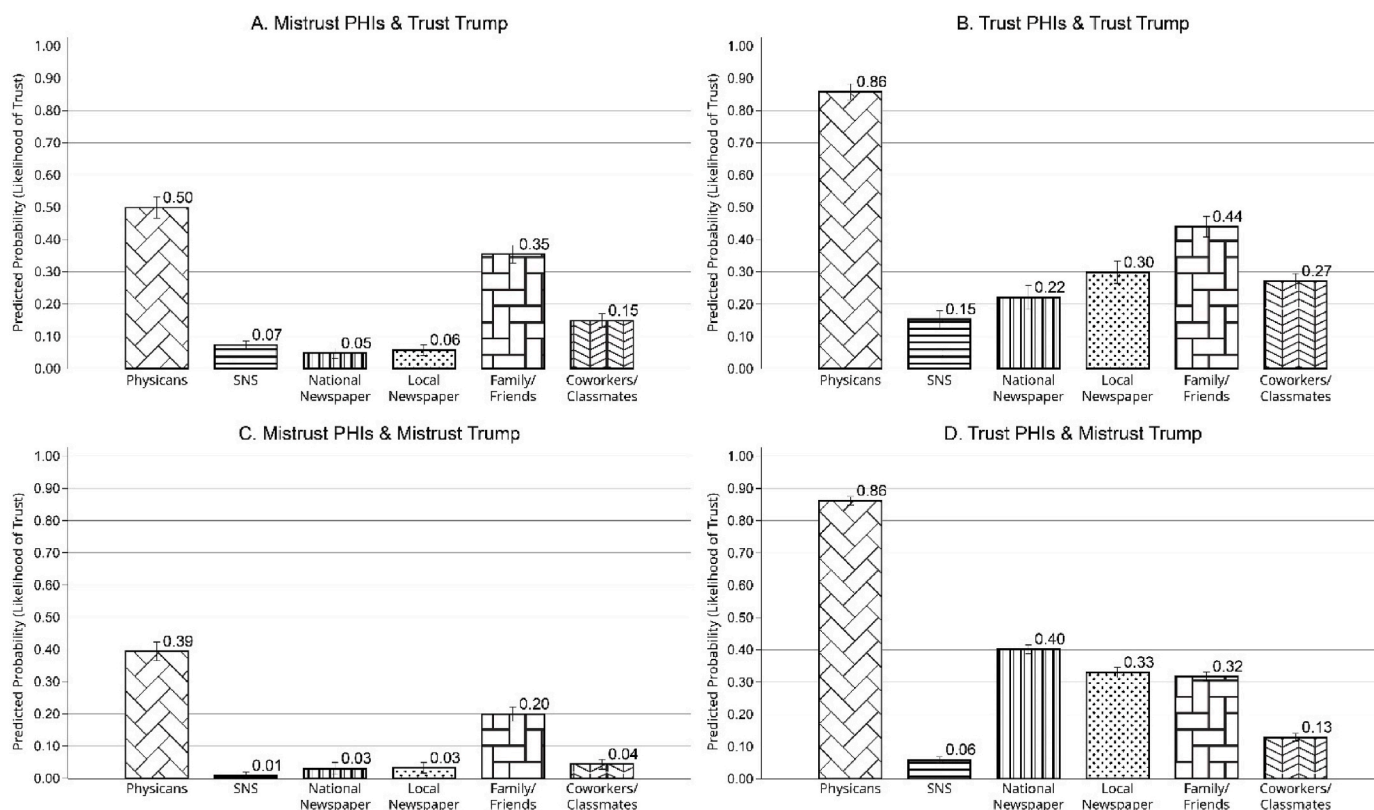


Fig. 4. Likelihood of Having Trust toward Various Informants in the Last Wave of the Survey. Bars represent the predictive probability of each group. Spikes indicate 95% confidence intervals of predictive probabilities. Controls included but not shown: diagnosed with COVID-19, race-ethnicity, gender, age, educational attainment, household income, and being a US citizen.

hesitant was greater among PHI mistrusters, even among Trump trusters. Whereas the likelihood of vaccine hesitancy was nearly 43%p higher among people who mistrust PHIs and trust Trump in the last wave of the survey (95% confidence interval (CI) = 0.4, 0.5; $P < 0.001$), among those who trust Trump but also trust PHIs, the likelihood was only 10%p higher (95% CI = 0.1, 0.1; $P < 0.001$) compared with those who do not trust Trump but trust PHIs. Those who mistrust both PHIs and Trump showed a 27%p higher likelihood, compared with the baseline group (95% CI = 0.2, 0.3; $P < 0.001$).

A similar tendency was found when it comes to attitudes toward vaccines (Fig. 2B and C). The same magnitude of the difference is found in terms of perceived ineffectiveness and social benefits of COVID-19 vaccines – the likelihoods were 30–36%p higher among Trump trusters/PHI mistrusters across the survey wave, compared with 5–7%p higher likelihoods among Trump supporters/PHI trusters. However, all groups had similar likelihoods in terms of being unlikely to believe that vaccines were not easily available (Fig. 2D). Rather, the substantively low perceived availability was found among those age 65 or older from the 23rd to 26th survey waves where COVID-19 vaccines were not widely available to the general public (Appendix 13).

Influences of other sociodemographic factors over hesitancy and having negative perceptions of COVID-19 vaccines were relatively minor compared with the effect of mistrust in PHIs. We found that the likelihoods were lower in the age group of 65 or older and at some household income levels and higher among Black people, but the magnitude ranged from -0.12 to 0.9.

These findings are robust against various cutpoints for dichotomizing the measures used for creating the comparison categories – mistrust in PHIs and trust in Trump – and different compositions of the mistrust PHIs. With higher cutpoints for mistrust in PHIs and trust in Trump, we found that PHIs mistrusters consistently show significantly higher vaccine hesitancy and unfavorable views of COVID-19 vaccines than PHI

trusters (Appendices 14 and 15). A higher cutpoint for PHI mistrust made both groups of PHI mistrusters (trust Trump or not) more vaccine-hesitant, progressively selecting a smaller set of individuals most likely to be mistrustful of PHIs. However, the overall pattern that mistrust in PHIs had a stronger influence over the outcomes remained the same across the different cutpoints. Even when testing each mistrust measure of the three institutions (the DHHS, the CDC, and local public health department officials, respectively), these alternative measures did not overturn this pattern (Appendix 16).

The findings also largely remained similar when testing with a standard partisanship measure – i.e., Democrats, Republicans, and Independents/others – instead of trust in Trump (Appendix 17). In this result, those who mistrust PHIs had significantly more negative attitudes toward COVID-19 vaccines and had been more vaccine-hesitant on average in all party affiliations. Republicans who mistrust PHIs were continuously most likely to be vaccine-hesitant. Furthermore, Independents/others and Democrats who mistrust PHIs were even more likely to be vaccine-hesitant than other Republicans who trust PHIs. This implies that trust in PHIs is still a stronger predictor of COVID-19 vaccine hesitancy than party affiliation.

Fig. 3 presents predictive probabilities of vaccine hesitancy and vaccination across all the survey waves (see Appendix 18 for the full regression outputs). Fig. 3A shows that self-reported hesitancy among unvaccinated people had grown across all groups, with steeper increases since the 26th wave of the survey when COVID-19 vaccines became available to most US adults. By the most recent wave, wave 29, nearly 82% of Trump trusters/PHI mistrusters and 74% of Trump mistruster/PHI mistrusters were likely to report being hesitant.

Fig. 3B shows that the likelihood of uptake has also been significantly lower among PHI mistrusters and Trump trusters and lowest among those who mistrust PHIs and trust Trump. While the likelihood of vaccine uptake among those who trust PHIs but mistrust Trump has steeply

increased since the beginning of the study period and reached nearly 90% in the last wave of the survey, the likelihood has remained only 43% for Trump trusters/PHI mistrusters and 59% for Trump mistrusters/PHI mistrusters. Yet, nearly 74% of people who trust PHIs and Trust Trump were likely to get vaccinated by the last survey wave.

4.2. Channels for communication

Fig. 4 presents predictive probabilities of trust in six information sources among respondents in the last survey wave (see Appendix 19 for the full regression outputs). PHI mistrusters had the lowest levels of trust across the board (Fig. 4A and C). However, there were variations among PHI mistrusters depending on whether they trusted Trump. A large portion of PHI mistrusters who trust Trump (Fig. 4A) reported having trust in physicians (50%) and family/friends (35%). By contrast, smaller portions of PHI mistrusters who mistrust Trump reported trusting these same sources, including only 39% reporting that they trusted physicians. Trust in local and national newspapers was especially low among PHI mistrusters, with only 3–6% of respondents trusting these sources. By contrast, 1–7% of PHI mistrusters trusted contacts on social media, though PHI trusters put even higher trust in social media contacts (6–15%).

5. Discussion

By decomposing different forms of government trust/mistrust, we identified different subsets of the population with low vaccine intentions and uptake. Overall, the results highlight that mistrust in PHIs is a strong driver of vaccine hesitancy and low vaccine uptake. While both the exogeneity and correlation hypotheses explained the association between trust in Trump and vaccine hesitancy, trust in Trump or partisanship alone was not as strong as mistrust in PHIs. Rather, it appears that a subset of Trump supporters is also highly mistrustful of PHIs (21% of the sample), which compounds vaccine hesitancy and low uptake. An additional small but meaningful subset of Americans (15%) mistrust Trump but also mistrust PHIs, with similarly strong effects on vaccine intentions and uptake.

As of the time of this writing (July 2022), US vaccine uptake is hovering at 79% of individuals who have had at least one vaccine dose and about 67% who are considered fully vaccinated (CDC, 2022). We found that the likelihood of receiving at least one vaccine dose among people who both trust in PHIs and mistrust Trump by July 21st, 2021, was 90%. By contrast, the likelihood was much lower in other groups, especially among PHI mistrusters who trust Trump showing a strikingly low likelihood of uptake, only 43% by the last wave. These estimates were adjusted for other covariates suggesting that these were the effects attributable to trust alone. The two groups of PHI mistrusters were also 27–43% more likely to report low trust in the effectiveness and social benefits of COVID-19 vaccines. Importantly, there were no meaningful differences observed in the reported availability of vaccines across the different groups, suggesting that low uptake was not attributable to vaccine shortages or disparities in access.

This study reiterates findings from previous research on the effects of partisanship and public trust in government and medical institutions on vaccine hesitancy but goes further by suggesting that the need to build trust in PHIs cuts across partisan lines and is not exclusively driven by Trump's anti-science rhetoric. More broadly, studies suggest that mistrust in government and PHIs is a highly contextual phenomenon, and therefore, providing correct information alone cannot combat vaccine doubting (Keele, 2007; Larson and Broniatowski, 2021). A better understanding of the sources giving rise to mistrust in different subgroups can help in designing strategies to build or re-build trust in PHIs (Larson and Broniatowski, 2021; Salmon et al., 2021). This may ultimately require structural interventions over time that address the root causes of declining trust, including declining social capital (Thomas, 1998).

Our findings also suggest that elite endorsements by politicians may not be as effective as if the mechanism were simply a “follow-the-leader” effect. Research suggests that we should rather avoid using dismissive and derogatory language about vaccine-hesitant populations to avoid deepening pre-existing suspicions and the appearance of elitism (Burgess et al., 2021). For instance, Republican Senate minority leader Mitch McConnell urged his constituents to get vaccinated, but it is unclear what impact this has had (Kentucky Health News Report, 2021). Elite endorsements have already been extensively tested during the pandemic with mixed results (e.g., Myers, 2021; Spälti et al., 2021). Rather, the emphasis may need to be a longer term goal of building back trust while aiming to walk back politicization at the same time (Sharfstein et al., 2021).

We also need a more sophisticated understanding of the association between Trump support and vaccine hesitancy. While we found that trust in Trump on its own is a less salient predictor of hesitancy than trust in PHIs and that a substantial proportion of Trump trusters mistrust PHIs, our analysis did not confirm whether messages and misinformation from Trump and other conservative opinion leaders shape the mistrust or Trump trusters share certain dispositions drawing them to mistrust PHIs. Future research efforts addressing this question will further help decide whether the partisan difference in vaccine hesitancy and uptake is attributable to Trump and other conservative opinion leaders or merely reflects on the diversity in values and dispositions in the U.S. population.

Lastly, trust in PHIs was a useful factor in breaking down the typical partisan categories into meaningful subgroups. As we demonstrated, there were still substantive variations in vaccine intentions and uptake within the groups of Trump trusters and Republicans. Using trust in PHIs to decompose partisan categories, we were able to capture the variations hitherto understudied and the subgroups' differing levels of social trust. Public health authorities in the U.S. may benefit from customized vaccine communication strategies for these subgroups to combat the various root causes of vaccine hesitancy. We found that PHI trusters were generally likely to trust most information sources, except for contacts on social media. Trump trusters were still quite trustful of physicians and reported high likelihoods of trust in other personal contacts, including family/friends and coworkers/classmates, although they were less likely to trust information from newspapers. This suggests that messaging via local physicians and community social networks may still be a useful strategy to increase vaccine uptake among Trump trusters. However, we found that it may be harder to persuade PHI mistrusters, with fewer available, trustworthy channels to leverage. Although those mistrustful of PHIs were generally mistrustful of nearly every available information source, it still makes sense to involve local physicians to effectively persuade them as they tend to trust physicians more than the other sources.

5.1. Limitations

There are some limitations to this study that must be acknowledged. First, because the survey waves ended in July of 2021, we cannot observe any significant changes in partisan dynamics since that time. Following that period, a surge in cases from the Delta and Omicron variants that resulted in substantial hospitalizations in areas of low vaccination could have had an effect on attitudes and behaviors towards vaccines. Also, while our data is longitudinal, we do not claim to be making causal inferences about whether trust in Trump versus mistrust in PHIs is a causal predictor of outcomes. Our results remain at the descriptive level.

6. Conclusions

Vaccine hesitancy is a highly contextual problem influenced by political, cultural, and social values that set the stage for whether individuals or communities trust or mistrust authority (Larson and

Broniatowski, 2021; Lee et al., 2016; Salmon et al., 2021). In the US, vaccine hesitancy and low uptake have been linked to conservative ideology generally and support for former President Donald Trump specifically. However, we find that broader mistrust in PHIs is an even stronger and more consistent predictor of vaccine hesitancy and low uptake than trust in Trump alone, or party identification. With the vaccination rate seemingly stagnant despite the availability of the vaccines, future research should pay attention to determinants of the public's mistrust in PHIs and develop long-term strategies to mitigate these negative views.

Credit author statement

Yongjin Choi: Conceptualization, Methodology, Software, Formal analysis, Data curation, Writing – Original Draft, Writing – Review & Editing, Visualization. Ashley M. Fox.: Conceptualization, Methodology, Writing – Original Draft, Writing – Review & Editing.

Data availability

The data are accessible on the Understanding America Study's web page: <https://uasdata.usc.edu>. The STATA code that supports the findings of this study is available at: <https://github.com/TheYongjinChoi/SSM-trust-vaccine-hesitancy>.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2022.115440>.

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