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Anti-scientific beliefs predict health behaviors during the COVID-19 pandemic

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Abstract   There exist today many forms of anti-scientific beliefs, from extreme views like the QAnon conspiracies, to misconceptions about vaccines and cancer treatment. The COVID-19 pandemic has presented to us a situation in which the public is being asked by medical experts and politicians alike to trust in science and follow after various health recommendations like wearing masks or getting vaccinated against the virus. We used an anti-science belief scale [Morgan et al., 2018] to assess how preexisting beliefs that run counter to the scientific narrative predict behaviors during the pandemic. We found that people who were more accepting of those anti-scientific positions trusted medical information and experts less and engaged less in recommended health behaviors, while simultaneously showing a more favorable view of Trump's actions as President during the pandemic.

In October of 2017, a series of anonymous messages posted to a public message board laid the foundation for QAnon, an increasingly popular theory that U.S. President Donald Trump was leading a war against perverted powerful people in government, large corporations, and the media [Wendling, 2021]. This anonymous messenger, calling themselves "Q", claimed special knowledge about current and future events that suggested a reckoning coming for those people being called out. Although these theories may seem quite far-fetched to many people, NBC News reports that as many as one to three million people may hold to QAnon-type beliefs [Sen and Zadrozny, 2020].

QAnon itself aside, other general anti-science beliefs have existed in a variety of ways for many years, beliefs that aren't as extreme as those proclaimed by QAnon. Gauchat [2008] and Gauchat [2012] attributes anti-science attitudes to lack of scientific knowledge, religious faith, and social contexts, while Li and Qian [2021]

show in a review that political ideology, gender, and race also play significant roles in public trust in science. Although many scientists believe that the general public has fairly little knowledge about science [Besley and Nisbet, 2013], Millstone and van Zwanenberg [2000] caution that focusing only on public knowledge of science may fail to address the actual concerns that people have about science.

Morgan et al. [2018] developed a scale to measure anti-science beliefs that extend beyond a lack of knowledge into more fundamental concerns about issues with science. Their study demonstrated that eleven different beliefs, such as anti-vaccine attitudes, skepticism about cancer treatments, or belief in astrology or ESP, all of which run counter to current scientific thought, were associated with perceptions that science was not only confusing, but also corrupt, heretical to religious beliefs, and limited in its ability to explain the world. Motta [2018] showed that it may often be the case that people distrust the scientists or scientific authorities more than they distrust the general idea of science. Similarly, Batelaan [2021] showed that narratives about racism or systemic inequality can be a better representation of anti-vaccine sentiments in the African-American community than simple "anti-science" attitudes. There seems to exist a widespread distrust of experts [Merkley, 2020] where people don't necessarily believe that scientists act in the best interest of the public [Funk, Hefferon et al., 2019]. To clarify the extent of this mistrust, it should be noted that mistrust in scientists is not a majority of the population. The Pew Research Center [Funk, Tyson et al., 2020] reported that across 20 samples in Europe, the Asia-Pacific region, and North and South America, a median of 76% of respondents indicated some or a lot of trust in scientists. While that may not be a majority, there is still a significant portion of the people in the U.S. who express attitudes of distrust towards scientists. Mede and Schäfer [2020] suggested that these anti-science sentiments are indicative of a growing populism, in which people attribute virtue to the public but corruption to the elite, reacting against political decision-making sovereignty.

Anti-science attitudes during COVID-19

Amidst this wide anti-science sentiment, the COVID-19 pandemic has presented to people very specific opportunities to either show trust in political and scientific entities or not. The CDC and other governing bodies have issued recommendations and guidelines for behavior to reduce the spread of COVID-19, and although nearly everyone is well-aware of the pandemic, relatively few are following all of the recommended health guidelines [Hager et al., 2020]. These health behaviors, such as social distancing and washing hands, are associated with belief that the avoidance behavior is helpful [Seale et al., 2020]. Engaging in hygienic or avoidance behaviors is also not all-or-nothing [Seale et al., 2020]. Instead, there are significant associations among these behaviors, such as between wearing a mask and social distancing [Taylor and Asmundson, 2021]. Following guidelines like wearing a mask has been associated with belief that the masks have efficacy to stop the spread of the virus [Taylor and Asmundson, 2021]. Plohl and Musil [2021] examined the effects of trust in science and perception of COVID-19 risk on compliance with COVID-19 guidelines, finding that both trust and perceptions of risk were mediators for politics, religion, ideation of conspiracy, and intellectual curiosity. Trust in science was also mediated by perception of risk. Safford, Whitmore and Hamilton [2021] observed that this trust in science was difficult for people who do not think scientists themselves to be credible. The source of this trust or lack of trust has been blamed at least partially on

inconsistent messaging, dependent on where a person gets their information [Bekalu et al., 2021; Haytko, Mai and Taillon, 2021].

Distrust for a COVID-19 vaccine is also related to distrust in science. Latkin et al. [2021] identified significant distrust in the COVID vaccine, where participants specified that they distrusted the process by which it was made. People with greater trust in the CDC, health departments, and mainstream news were more trusting of the vaccine. Latkin et al. also identified several demographic effects of vaccine distrust, where the African-American community was less trusting of the vaccine than other U.S. Americans [see Batelaan, 2021], and women trusted the vaccine less than men. Additionally, Sokol and Grummon [2020] showed that parents who already typically vaccinate their children were likely to give their kids another flu vaccine during the COVID-19 pandemic, but the pandemic was not a sufficient reason to begin vaccinating for those who had not vaccinated in the past. Although the flu vaccine is not new like the COVID vaccine, it is apparent that the opportunity for extra precautions that the pandemic presented to the world was not necessarily sufficient to induce extra precautions in line with scientific recommendation. Pivetti et al. [2021] found evidence that attitudes toward COVID-19 vaccines were indirectly related to both general anti-science beliefs and belief in COVID-19 conspiracies, though other explanations include belief in the efficacy of the vaccine [Baeza-Rivera et al., 2021], and trust in information sources [Soveri et al., 2021].

Lastly, the COVID-19 pandemic presented to people a specific option to demonstrate trust in governments and health organizations like WHO and the CDC. In New Zealand, Sibley et al. [2020] showed that people in the midst of a national lockdown reported higher levels of trust in science, politicians, and police than similar people pre-lockdown [see also Oude Groeniger et al., 2021].
The authors suggest that these results indicate that a strong national response can increase these trust levels, implying that trust in scientists may be result-based and not just based on predisposition. Similarly, Seale et al. [2020] showed that trust in governmental authorities led to increased adherence to health guidelines, while this trust is also associated with trust in the vaccine as well [Latkin et al., 2021].

During the pandemic, conspiracy theories about COVID-19 itself have been offered. Tonković et al. [2021] examined beliefs in several COVID-19 conspiracies, like the pandemic coming from pharmaceutical companies who want to make money or that the 5G cell network was spreading the virus. They found evidence that these beliefs are directly and negatively related to trust in science. Banai, Banai and Mikloušić [2021] found similar results, also seeing that these beliefs result in lower adherence to compliance with guidelines.

Given the wide arrange of beliefs that run counter to the science of today [Morgan et al., 2018] and given a host of behaviors during the COVID-19 pandemic that do not align with or explicitly contradict scientific recommendations for slowing the spread of the virus and maintaining good health, we were curious about how the anti-science beliefs might be at work during the pandemic to explain some of these behaviors. If something such as a health recommendation from a governing body runs counter to your beliefs, especially if it is an important belief like a protected value [see Visschers and Siegrist, 2014], those beliefs may be able to override other considerations by acting as a one-rule heuristic [see Hoffrage and Reimer, 2004].

Therefore, we used attitudes and behaviors related to the pandemic as direct predictors of the eleven anti-science beliefs from Morgan et al. [2018]. We expected to find that support for these anti-science beliefs would run contrary to adherence to recommended health guidelines and belief in vaccine or mask efficacy.

Trust, as reviewed, has been operationalized in a variety of models as an interaction term [Granados Samayoa et al., 2021], as a meditator [Plohl and Musil, 2021], as a direct predictor [Latkin et al., 2021; Seale et al., 2020; Soveri et al., 2021], and as an outcome variable [Oude Groeniger et al., 2021; Latkin et al., 2021]. The models that we observed in this literature used trust as an outcome or direct predictor when there were multiple types of trust being assessed. Following Latkin et al. [2021], who measured trust in information sources from several different places and treated each of them as a unique predictor of trust in the COVID-19 vaccine, we chose to examine trust as direct predictors of anti-science beliefs alongside the other variables of interest, as we too have multiple indexes dealing with trust.

H1: Anti-science attitudes will be negatively related to trust in medical information and experts during the pandemic.

H2: Anti-science attitudes will be negatively related to perceptions of the risk of becoming ill in the pandemic.

H3: Anti-science attitudes will be negatively related to adherence to recommended health guidelines.

H4: Anti-science attitudes will be negatively related to trust in the COVID-19 vaccine.

In addition to these, given that President Trump's rhetoric was often perceived as contrary to the medical experts [Granados Samayoa et al., 2021], we expected to find that those holding anti-science beliefs would view Trump's actions in the pandemic more favorably.

H5: Anti-science attitudes will be positively related to trust in President Trump as a leader during the pandemic.

Data for this project was collected between the presidential election of 2020 and the time that President Joe Biden took office in January 2021. In this way, we were able to observe data during the window where people were looking back on Trump's handling of the pandemic and forward to how Biden would handle the pandemic. This allows for another snapshot that is reflective of a populace with more experience in the pandemic, compared to the initial wave of research in this area that occurred when the shutdowns initially hit in the spring of 2020 [see van Mulukom et al., 2022]. Reinders Folmer et al. [2021] observed that after the initial lockdown in the spring of 2020, compliance with recommended behaviors declined significantly, due to knowledge changes, changes in threat perception, moral alignment, and social norms [see also Liu et al., 2021].

Method

Sample

421 participants were recruited from Amazon's MTurk population, which is an Amazon platform for survey distribution where researchers pay workers monetary compensation for workers on the site to complete surveys or other tasks. 21 incomplete responses in our sample were removed from the dataset, leaving a total of 400 usable responses. Our sample permitted respondents from any geographic location and was not limited simply to respondents in the U.S., although it is likely that the majority of the sample was from the U.S., since 75% of the MTurk population is U.S. based [Difallah, Filatova and Ipeirotis, 2018]. Turkers have been shown to be more representative and produce similar levels of validity, compared to other common sampling types like college student samples, convenience samples, or other online samples [Berinsky, Huber and Lenz, 2012; Buhrmester, Kwang and Gosling, 2016; Casler, Bickel and Hackett, 2013; Clifford, Jewell and Waggoner, 2015]. 143 respondents indicated that they were male, 252 female, 4 non-binary, and 1 chose not to indicate gender. Participants' ages ranged from 19 to 83 years ($M = 46.03$, SD $= 14.72$), and 84.3% of participants self-identified as white. 56.3% of participants indicated they had a bachelor's degree or higher. 14.5% of participants reported income below \$25k, 30% between \$25k and \$50k, 25.3% between \$50k and \$80k, 18% between \$80k and \$130k, 9% above \$130k, and 3.3% chose not to disclose income levels. Our sample had a diverse sampling also of religious and political orientations, with 49.3% considering themselves somewhat or very unreligious, with 8.8% saying they are neither religious nor unreligious, 49.5% considering themselves somewhat or very liberal, with an additional 30.6% considering themselves somewhat or very conservative.

Procedure

Participants were presented with a short survey that first informed them of the general nature of the survey and asked for their consent to proceed. The survey then took them through items dealing with the pandemic and the government's handling of the pandemic. The survey then asked whether they hold to eleven different anti-science beliefs and finished with demographic questions.

Measurements

All items, outside of demographic items, were measured on the same five-point Likert type scale of strongly disagree (1) to strongly agree (5).

Trust in pandemic authorities.   Trust in pandemic authorities was measured in two dimensions. First, five items asked about President Trump's actions (TA) during the pandemic. The items were:

- President Trump's comments about the Coronavirus have generally been quite helpful.

- President Trump should have worn a mask more often than he did (reverse coded).

- The rallies that President Trump held during the pandemic were irresponsible, putting those who attended at higher risk for getting the Coronavirus (reverse coded).

- President Trump should have done more from the beginning to combat the pandemic (reverse coded).

- The pandemic has been handled poorly by the U.S. government (reverse coded).

Most of these are reversed, as noted, such that a higher score would indicate higher trust in President Trump and his actions. A second dimension of trust in pandemic authorities engaged with medical information and experts (MIE).

- All things considered, the Coronavirus pandemic is no worse than a regular seasonal out-break of the flu virus.

- The medical threat of the Coronavirus is no greater than the common flu.

- I think the seriousness of the pandemic has been exaggerated by the medical experts.

- In general, the "experts" on infectious disease have provided bad advice on how to stay protected from the Coronavirus.

This entire index was reverse coded, such that a higher score indicates greater trust in the medical information and experts.

Pandemic risk.   The perceived risk of the pandemic (PR) in terms of catching COVID-19 was assessed with two items. The two items were:

- I believe that the chances that I might catch the Coronavirus are extremely slim (reverse coded).

- I believe that one of my family members or close friends is likely to catch the Coronavirus.

Following guidelines.   To assess whether participants adhered to recommended guidelines, two dimensions were examined. Three items were used to assess daily behavior (DB). These items were:

- I try hard to engage in social distancing recommendations.

- I wear a face mask in situations when it is recommended during the pandemic.

- I listen carefully to the advice from medical experts on what to do and what not to do during the COVID-19 pandemic.

In addition, three items measured self-reported attitudes towards getting tested (GT) for COVID-19 as a second health recommendation.

- It would be good for me to get tested to see if I had the Coronavirus.

- I plan to get a test for the Coronavirus in the future.

- I am likely to get tested multiple times for Coronavirus in the future.

Vaccine attitudes. Attitudes toward the new COVID-19 vaccine (VA) were measured with three items:

- When a vaccine is available to me, I want to get it.

- I did not trust a vaccine that came during the Trump administration (reverse coded).

- I do not trust a vaccine coming out during the Biden administration (reverse coded).

Anti-science beliefs. Eleven items were borrowed from Morgan et al. [2018] to assess anti-science beliefs (ASB):

- Humans are not responsible for global warming/climate change.

- The earth is only a few thousand years old.

- Vaccines can cause autism.

- Humans do not share common ancestors with other species.

- Genetically modified organisms (GMOs) are harmful.

- The moon landing was a hoax.

- A person's astrological (Zodiac) sign influences their behavior.

- Homeopathy can help cure many common diseases.

- Cures for cancer have been suppressed by those with a financial stake in cancer treatment.

- Water should not be fluoridated because of its harmful effects.

- Some people have extra sensory perception.

These items obtained a sufficiently high Cronbach's alpha ($\alpha = .82$).

Results

To test our hypotheses with the resulting data, we first performed a factor analysis to assess our instruments and then ran a two-step hierarchical multiple regression. The first step in the regression model assessed the basic constructs as predictors of anti-science beliefs. In order to possibly increase the variance explained by adding additional variables, the second model included the same factors along with religion, politics, and gender as control variables. These analyses were performed with SPSS version 26.

Our initial exploratory factor analysis included three items not reported above. One item asked about the responsibility of state governors, and two items asked

Table 1. Pattern matrix for the confirmatory factor analysis of independent variables.

	TA	GT	VA	DB	PR	MIE
TA 1	0.78					
TA 2	0.53					
TA 3	0.71					
TA 4	0.75					
TA 5	0.60					
GT 1		0.65				
GT 2		1.01				
GT 3		0.87				
VA 1			0.77			
VA 2			0.78			
VA 3			0.71			
DB 1				−0.61		
DB 2				−0.83		
DB 3				−0.85		
PR 1					0.74	
PR 2					0.78	
MIE 1						−0.54
MIE 2						−0.52
MIE 3						−0.92
MIE 4						−0.96

Note: Extraction method: principal axis factoring.
Rotation method: oblimin with Kaiser normalization.

about accuracy of death counts as reported by experts. These three items did not load well onto any particular factor and were removed from the analysis for a confirmatory factor analysis. In this exploratory factor analysis, four items that we had not originally conceptualized as being together ended up holding as a single factor. These items are those listed in the medical information and experts index. The first two items of the measure ask about the virus itself in terms of severity, and the last two items explicitly address the information coming from experts ("medical experts" or "experts on infectious disease"). The items statistically held together as measuring a single construct, so we took this collective set of four measures as an assessment of people's trust in the information they are receiving from experts of diseases about the severity of the pandemic and in the experts themselves, even though the first two items do not mention experts explicitly like the last two. The confirmatory factor analysis used principal axis factoring and direct oblimin rotation to identify six distinct constructs in the item set. The pattern matrix for the factor analysis is shown in Table 1. As can be seen, most items loaded sufficiently well onto six different factors, although a couple of items loaded slightly below .6. We opted to keep these items in the model, as they did not load strongly onto other factors.

Table 2 shows the zero-order correlations among the main variables of the study, along with their means and standard deviations. Descriptively, in comparison to the center of the scale "neither agree nor disagree", our sample was favorable

Table 2. Means, standard deviations, and correlations among the main variables.

Variable	M	SD	1	2	3	4	5	6
1. Trump's actions	1.86	1.10	—					
2. Getting tested	2.96	1.19	−.39**	—				
3. Vaccine attitude	3.71	1.26	−.30**	.28**	—			
4. Daily behavior	4.53	.81	−.56**	.42**	.45**	—		
5. Pandemic risk	3.48	1.11	−.39**	.43**	.28**	.38**	—	
6. Medical information and experts	4.04	1.19	−.67**	.33**	.53**	.65**	.38**	—
7. Anti-science beliefs	2.21	.74	.39**	−.10	−.58**	−.25**	−.19**	−.48**

Note: This table shows descriptive statistics for the study's main variables.
** $p < .01$, * $p < .05$

toward medical information and experts ($M = 4.04$, SD $= 1.19$, $t(399) = 17.46$, $p < .001$), vaccines ($M = 3.71$, SD $= 1.26$, $t(399) = 11.28$, $p < .001$), recommended behaviors ($M = 4.53$, SD $= .81$, $t(399) = 37.75$, $p < .001$), and believed there was significant risk of catching the virus ($M = 3.48$, SD $= 1.11$, $t(399) = 8.67$, $p < .001$). In contrast, the sample was negative toward Trump ($M = 1.87$, SD $= 1.09$, $t(399) = -20.66$, $p < .001$), rejected, on average, most of the anti-science beliefs ($M = 2.21$, SD $= .75$, $t(399) = -21.26$, $p < .001$), but did not lean either way on whether it was good to get tested for the virus ($M = 2.96$, SD $= 1.19$, $t(399) = -.71$, $p = .447$). The zero-order correlations between the independent variables and the outcome variable are consistent with the hypotheses. Anti-scientific attitudes were positively related to favorable views of Trump's actions, while negatively related to trust in medical information and experts, following recommended health guidelines, perceptions about the seriousness of the virus, and intentions to get a COVID-19 vaccine. However, one of the variables, intentions to get tested, was not significantly correlated with anti-science beliefs.

The first block of the regression model (Model 1) entered perceptions of Trump's actions, trust in medical information and experts, following of health guidelines, perceptions about the seriousness of the virus, intentions to get a vaccine, and intentions to get tested together to predict anti-science beliefs. The model was a significant predictor of anti-science beliefs ($r^2 = .442$, $F(6, 387) = 51.16$, $p < .001$). Outside of perceptions of risk of catching the virus ($b = .004$, $t(393) = .142$, $p = .887$), all variables were significant and unique predictors of anti-science beliefs, as shown in Table 3.

The second block of the regression model (Model 2) added measurements of politics, religion, and gender as additional predictors. This model also was a significant predictor of anti-science beliefs ($r^2 = .509$, $F(9, 384) = 44.2$, $p < .001$), a significant increase over the predictive ability of the first model ($F(3, 384) = 17.33$, $p < .001$). The second model now explained 50.9% of the variance, in comparison to 44.2%. In this model, perceptions of risk of catching the virus were still not a significant predictor ($b = -.036$, $t(393) = -1.26$, $p = .208$), and in addition, political identity was not significantly related to anti-science beliefs, $b = .023$, $t(393) = .793$, $p = .429$. The relationship between these beliefs and gender, from

Table 3. Results of the two-step regression model.

	Model 1		Model 2	
Variable	*b*	*t*	*b*	*t*
Trump's actions	0.268**	5.008	0.163**	2.757
Getting tested	0.140**	3.138	0.154**	3.621
Vaccine attitudes	−0.523**	−11.308	−0.457**	−10.205
Daily behavior	0.195**	3.681	0.127*	2.498
Pandemic risk	0.006	0.142	−0.054	−1.260
Medical information and experts	−0.198**	−3.251	−0.189**	−3.287
Religion			0.163**	4.091
Politics			0.040	0.793
Gender			−0.200**	−5.346

Note: Table shows standardized coefficients of the beta weights and the t-statistic for the two regression models used in the main analysis.
** $p < .01$, * $p < .05$

the beta weight, suggests that females are more likely to adhere to these beliefs, as compared with males.

These two models indicate support for the first, fourth, and fifth hypotheses, which suggested negative relationships between anti-science beliefs and trust in medical information and experts and trust in the vaccine, and a positive relationship between anti-science beliefs and trust in Donald Trump. The models also found significant relationships between anti-science beliefs and following recommendations as seen by getting tested and following social distancing recommendations. However, these relationships were the opposite of the predicted direction, even though the zero-order correlations were consistent with the hypotheses. The models showed no support for the second hypothesis, which predicted that the anti-science beliefs would also be related to the risk of becoming ill during the pandemic. The full results of the hierarchical model are presented in Table 3.

Discussion

We set out to examine how anti-scientific beliefs could impact behavior during the COVID-19 pandemic. In our sample, people tended to reject anti-scientific beliefs and held that medical experts were giving us good information and guiding us well on how to navigate the pandemic. However, through our regression analysis, we were able to find significant relationships between these anti-science beliefs and pandemic-related behaviors, such as rejection or acceptance of medical experts' advice, in terms of vaccines, daily preventative measures, and getting tested for COVID-19. We also observed that adherence to these beliefs was also associated with the belief that President Trump's behavior was appropriate, behavior which was often seen standing opposite of the dominant scientific narrative. In a second step of our regression model, we found that women and people who are more religious are also more likely to hold to these beliefs. Notably, the second model did not find a significant difference between those who identify as liberal and those who identify as conservative.

One curious, unanticipated finding of the regression model was that, in contrast to the direction of the zero-order correlations, there was a positive relationship between anti-science beliefs and both daily behavior and interest in getting tested. With further examination and study of the data, we believe this phenomenon may be a result of classical suppression, in which one of the variables in the regression equation correlates highly with other variables, but relatively weakly with the outcome variable. This situation can suppress irrelevant variation or errors in other predictors and increase the power of the model, even though the suppressor variable itself may not be a strong predictor of the outcome variable [Pandey and Elliott, 2010]. Cramer [2003] demonstrates how regression predictors may even change direction from positive to negative (or the reverse) in a regression model from their zero-order correlation if the product of the correlation between the two predictors and the correlation between the stronger predictor and the outcome variable is greater than the correlation between the suppressor variable and the outcome variable (if $r_{xc} * r_{cy} > r_{xy}$). Pandey and Elliott [2010] explain how to identify suppressor variables in a model, saying that suppressors will increase the beta coefficient of the variables that they are suppressing, while if those same beta weights decrease, then the variable in question is not a suppressor but a mediator.

To test this, we ran another two-step hierarchical regression model with the Getting Tested and Daily Behavior indexes included in only the second step. From this we observed that these two variables actually increased the absolute value of the beta coefficient of each of three other variables: Trump's Actions, Medical Information and Experts, and Vaccine Attitudes. Risk of catching COVID-19, which was non-significant in the model, did not show this effect. Based on these results and on Pandey and Elliott's [2010] standard for the detection of suppression, we conclude that these two variables are acting as suppressors in the model for three other variables due to higher correlation with those three independent variables than with the dependent variable. It can be seen in Table 2 that the Daily Behavior and Getting Tested indexes are both more strongly correlated with all other variables than the actual outcome variable of anti-science beliefs. We thus do not see these results as an indication that adherence to behavioral guidelines or interest in getting tested is positively related to anti-science beliefs, but instead we see it as an artifact of collinearity. Cramer [2003] suggests that in the presence of a substantial change like this, it may be prudent to make more of the zero-order correlations for the suppressor variables in terms of their basic relationships, compared to the partialized coefficient.

Previous research has demonstrated a variety of ways in which distrust in science is a significant part of our modern world, from general vaccine distrust [Latkin et al., 2021] to believing in the mysterious writings of QAnon. Our research gives some additional grounding and explanation to several very specific ways that people may act on their beliefs that science is confusing, corrupt, heretical, and limited in its ability to explain the world [Morgan et al., 2018].

Overall, our results indicate that beliefs about science may play an important role in determining attitudes and behaviors in the area of health. Generally speaking for those interested in promoting public health, campaigns designed to promote stronger belief in the efficacy of science and to reduce anti-science beliefs may be important campaigns that could contribute to positive public health outcomes.

Our study has several limitations that are important to consider in interpreting the results. First, we neglected to gather information about our respondents' country of origin, so there's a question about the extent to which the findings should be generalized to a population from the United States. Additionally, MTurk workers were limiting this generalization already, being the population studied in this case, so the sample already would not necessarily generalize to the population. Regardless of the exact geographic location of the participants, people outside the U.S. had and continue to have opinions and attitudes about COVID-19 and American policies and handling of the pandemic. It is important to bear this population in mind, though, when considering the implications of the study. Furthermore, this study only contained a snapshot view of people's opinions during the pandemic. This may be limiting, as people's understanding of the pandemic would most likely be developing as the pandemic progressed, and we as a society learned more about COVID-19. Finally, our measurement of religiosity was very broad. We asked only how religious people are, rather than digging into what sort of religious beliefs they held, so this measure is relatively blunt.

Future research in this area could see how these findings may have changed in the post-Trump presidency or further down the proverbial road, after the pandemic hopefully comes to an end. Future research could also examine these hypotheses in other types of samples other than convenience samples from MTurk, to increase the overall generalizability of the field's knowledge in this area.

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