

# How Do Religious and Political Beliefs Predict COVID-19 Vaccination Behavior Among U.S. College Students? A Study Using the Health Belief Model

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## Abstract

**Purpose:** Predicting COVID-19 vaccination behavior among U.S. college students using the Health Belief Model (HBM).

**Design:** Cross-sectional survey.

**Setting:** Online.

**Sample:** A convenience sample of students in a public university in the U.S. (N = 411).

**Measures:** Demographics; COVID-19 vaccination behavior as outcome variable; HBM variables (perceived threat of COVID-19, perceived individual benefit of vaccination, perceived community benefit of vaccination, perceived vaccine-safety barrier, perceived vaccination-cost barrier [time and effort], self-efficacy), and fear of COVID-19 as proximal predictors; religious beliefs and political beliefs as distal predictors. Questions/items measuring all variables in the survey data collection were taken from relevant and peer-reviewed publications and were modified to reflect the context of COVID-19.

**Analysis:** Structural equation modeling (SEM).

**Results:** The model fit the data very well ( $\chi^2/df = 2.27/5 = .45, p = .810$ ; RMSEA = .000). Perceived individual benefit ( $\beta = .489, p < .001$ ), perceived vaccine-safety barrier ( $\beta = -.151, p = .001$ ), perceived vaccination-cost barrier ( $\beta = -.152, p < .001$ ), and political beliefs ( $\beta = -.094, p = .029$ ) are significant predictors of vaccination behavior. Effects of religious beliefs are completely, and effects of political beliefs are partially mediated by perceived individual benefit and the two barrier variables.

**Conclusion:** Perceived individual benefit, the two barrier variables, and political beliefs are direct predictors, while religious beliefs are an indirect predictor, of COVID-19 vaccination behavior, suggesting that the HBM can effectively inform strategies to promote vaccination. Political beliefs are a much stronger predictor than religious beliefs. Students who are more religious or conservative tend to perceive less individual benefit and greater barriers to vaccination, making them less likely to get vaccinated. A limitation of this study is the disproportionate number of female participants (77.9%).

## Keywords

religious beliefs, political beliefs, COVID-19, vaccination, health belief model

## Purpose

On May 4, 2022, the U.S. reached the tragic milestone of more than 1 million deaths due to the COVID-19 pandemic.<sup>1</sup> Although the best defense against COVID-19 is vaccination, as of this writing (May 9), only 66.82% of the U.S. population has been fully vaccinated—falling short of the 70% needed to reach herd immunity.<sup>2</sup>

Numerous studies have been done on COVID-19 vaccination, but most have focused on intentions to receive a COVID-19 vaccine<sup>3-5</sup> or similar decision-related constructs such as COVID-19 vaccine hesitancy<sup>6</sup> or COVID-19 vaccine

acceptance.<sup>7</sup> Although vaccine intention/hesitancy/acceptance are commonly used as proxies for the actual vaccine-intake behavior, these constructs do not always translate into action. Additionally, many studies predicting COVID-19 vaccine

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decisions are not guided by health behavior theories, which makes them likely to miss important predictors identified by those theories.<sup>5,6</sup> Finally, since the start of vaccination in the U.S., there has been an intense debate over whether vaccination is safe or even necessary.<sup>8</sup> Polarized views toward vaccination have spread rapidly, especially among those who are very religious or politically conservative.<sup>9</sup> However, the influence of religious or political beliefs on vaccination behavior is still in need of more rigorous investigation guided by theories.

College students in the U.S. remain an important target to mitigate the COVID-19 pandemic in the U.S. College classrooms, dormitories, and dining rooms are all places where large crowds may congregate, and are very likely to increase transmission of the virus. Surprisingly, few studies have explored factors influencing U.S. college students' COVID-19 vaccination behavior/intention/decision-making. For example, Moye et al.<sup>10</sup> reported that, among a sample of HBCU students, concern about the safety of the vaccine was the strongest predictor of vaccine hesitancy, while perceived vulnerability to COVID-19 was not a significant predictor. Xu et al.<sup>11</sup> found that vaccine safety measures and perceptions toward vaccination were positively related to vaccine intention among a sample of U.S. college students. Lasher et al.<sup>12</sup> found that college students in Central New York with conservative political ideology tend to have more consumption of right-wing news which, in turn, leads to their increased vaccine hesitancy. None of those studies have examined students' actual vaccination behavior. Thus, there is a need to systematically study factors associated with students' actual vaccination behavior.

To address the above literature gaps, the present study aims to examine factors predicting COVID-19 vaccination behavior through the theoretical framework of the health belief model (HBM), one of the most widely-used models for health-protective behaviors.<sup>13</sup> Specifically, this study will investigate whether HBM constructs, along with religious and political beliefs, each directly predict vaccination behavior; it will also explore whether the model explains the influences of religious and political beliefs on vaccination behavior.

### *HBM Constructs and the Fear Construct*

The following HBM constructs were included in the theoretical modeling: Perceived threat of COVID-19, perceived benefit of vaccination, perceived barrier of vaccination, and self-efficacy of vaccination.<sup>13</sup> Because the benefits of COVID-19 vaccination include benefits to individuals and to the community, this construct was divided into two separate constructs: Perceived individual benefit of vaccination and perceived community benefit of vaccination. Perceived barrier of vaccination was also divided into two separate constructs: perceived vaccine-safety barrier and perceived vaccination-cost barrier (time and effort), as barriers related to vaccination include concerns about vaccine-safety and concerns related to time-and-effort cost. Monetary cost was not considered as a

barrier construct in the present study, since each of the available vaccines were offered free of charge in the U.S.

Fear of COVID-19 was included in the present study, as previous studies had demonstrated the importance of affective constructs, in addition to cognitive constructs, in predicting intentions/behaviors.<sup>14,15</sup> Cues to action was not included in the model for three reasons: (1) Cues to action has not been defined clearly in research, and neither its conceptual definition nor its operational definition is clear; (2) Cues to action has not been systematically studied; (3) it is difficult to study cues to action in survey research, because "a cue can be as fleeting as a sneeze or the barely conscious perception of a poster"<sup>16</sup>; p. 49). Several researchers have agreed with this appraisal of cues to action. For example, Carpenter,<sup>17</sup> in a meta-analysis of the effectiveness of HBM variables in predicting behavior, noted that cues to action is the most underdeveloped construct of the HBM and has seldom been measured or studied. Jones et al.<sup>18</sup> also argued that cues to action is an underdeveloped construct in the HBM model, in their study exploring the health belief model as an explanatory framework in communication research. Chen and Liu<sup>19</sup> excluded cues to action in their study applying the health belief model to examine protective behavioral intentions against smog, citing its unclear definition and lack of systematic study.

### *Religious Beliefs, Political Beliefs, and COVID-19 Vaccination*

The phenomenon of vaccine hesitancy goes far beyond the COVID-19 pandemic. People who express a general vaccine hesitancy often cite religious reasons.<sup>20</sup> There is evidence supporting that religiosity predicts *general* vaccination skepticism, even after controlling for political conservatism, based on studies conducted by Rutjens et al.<sup>21</sup> using samples of Amazon Mechanical Turk (MTurk) Workers. In terms of COVID-19 vaccine hesitancy, a national survey conducted by the Pew Research Center<sup>22</sup> between Aug 23 and Aug 29, 2021 reported that, among all religious groups in the U.S., White evangelical Protestants had the lowest vaccination rate: only 57% of them said they have received at least 1 shot of a COVID-19 vaccine, which was much lower than other religious groups, including White non-evangelical Protestant (73%), Black Protestant (70%), and Catholic (82%), as well as the religiously unaffiliated (75%). A cross-national comparison study on the effects of religiosity on COVID-19 vaccination rates also confirmed that Christian religious identity was a negative predictor of vaccination rate ( $\beta = -.24, p = .022$ ).<sup>23</sup>

In addition to their religious beliefs, another critical factor which leads many Americans to forego COVID-19 vaccination is their political beliefs. Political conservatism was found to have *no* additional influence on *general* vaccination skepticism after controlling for religiosity, in Rutjens et al.'s<sup>21</sup> studies. However, a national survey conducted in July 2020

(before the COVID-19 vaccines were available) reported that respondents who identified themselves as Republican had a lower likelihood (odds ratio = .47) to vaccinate themselves than those who identified themselves as Democrat (odds ratio = 1.6) or Independent (odds ratio = 1.0).<sup>5</sup>

Since COVID-19 vaccines became available, there have been consistent findings supporting that political conservatives tend to be more resistant toward vaccination against COVID-19. For example, Sun and Monnat<sup>24</sup> found that, as of August 11, 2021, rural counties had much lower rates of full COVID-19 vaccination than urban counties, and that these lower rates could be explained by both higher Trump vote share and lower educational attainment. Albrecht<sup>25</sup> reported that, as of September 1, 2021, in U.S. counties with a high percentage of Republican voters (where Trump received 75% or more of the vote), the COVID-19 full vaccination rate was significantly lower (34.7%) than the vaccination rate (55.3%) in U.S. counties with a low percentage of Republican voters (where Trump received less than 25% of the vote).

Unfortunately, few studies have examined the joint impact of religious and political beliefs on COVID-19 vaccination. Among those studies, Milligan et al.<sup>26</sup> reported that both reduced religiosity and Democratic Party membership predicted COVID-19 vaccine acceptance, in a sample of participants recruited from Amazon's MTurk. Levin and Bradshaw<sup>6</sup> found that, after adjusting for effects of sociodemographic variables, Republican party identity and conservative political orientation remained significantly associated with COVID-19 vaccine hesitancy, but conservative religious beliefs became non-significant, using data from the Values and Beliefs of the American Public Survey conducted in 2021.

### *Hypotheses and Research Question*

The above studies indicate that religious and political beliefs can both be significant predictors of COVID-19 vaccination behavior. However, it's not clear how and why those beliefs influence the behavior. This study would apply the HBM to investigate how religious and political beliefs influence COVID-19 vaccination behavior using a young adult college sample.

To the best of my knowledge, few studies have applied the HBM to investigate U.S. college students' COVID-19 preventive behaviors. For example, Alsulaiman and Rentner<sup>27</sup> found that, among a sample of college students at a large Midwestern university in the U.S., those with higher scores in Health Belief Model constructs were more likely than those with lower scores to practice COVID-19 preventive measures, including washing hands and wearing a mask, but they did not examine COVID-19 vaccination in their study. Ross et al.<sup>28</sup> incorporated HBM into their study by exploring perceived susceptibility and perceived severity along with race, income, gender, and avoidance behaviors as predictors of COVID-19 vaccination intention (other HBM constructs were not examined); they reported that perceived

susceptibility was the only significant variable and positively predicted likelihood of getting a COVID-19 vaccine among a sample of college students at a public western U.S. university. Similarly, although Qiao et al.'s<sup>7</sup> study was guided by the HBM, they included only two HBM constructs (perceived susceptibility and perceived severity of COVID-19) among their hypothesized predictors of COVID-19 vaccine acceptance; of those two, only perceived severity was found to be positively related to vaccine acceptance among college students in South Carolina. A more comprehensive test of the HBM in the context of students' COVID-19 vaccination is needed.

The present study posits that religious and political beliefs serve as distal predictors, and that they affect vaccination through HBM constructs and fear, which are proximal predictors. The following hypotheses and research questions are posed:

**H1:** A. Perceived threat of COVID-19 and B. Fear of COVID-19 positively predict vaccination behavior.

**H2:** A. Perceived individual benefit of vaccination and B. Perceived community benefit of vaccination positively predict vaccination behavior.

**H3:** A. Perceived vaccine-safety barrier and B. Perceived vaccination-cost barrier negatively predict vaccination behavior.

**H4:** Self-efficacy of vaccination positively predicts vaccination behavior.

**RQ1:** Is the relationship between A. religious beliefs or B. political beliefs and vaccination behavior mediated by any HBM construct or fear of COVID-19?

Figure 1 shows the hypothesized model predicting vaccination behavior.

## **Methods**

### *Design and Sample*

An online survey was conducted from Sept 1 to Oct 1, 2021 measuring all variables in the hypothesized model and demographic factors, after the study received IRB approval. Several instructors at a public university in the U.S. agreed to post the survey link on their class websites, after being contacted by the present author. The Psychology Students Participation pool was also used to collect data. Before beginning the survey, participants read a consent letter online and indicated "I agree to participate" to provide informed consent. The university which the participants were attending does not require COVID-19 vaccination.

A total of 422 undergraduate student participants completed the survey. Each participant received extra credit at their instructor's discretion. A total of 11 students did not answer the attention-checking questions correctly and were excluded

from the analyses. This resulted in a total of 411 participants as the final sample for the analyses.

## Measures

Perceived threat of COVID-19, fear of COVID-19, perceived individual benefit of vaccination, perceived community benefit of vaccination, perceived vaccine-safety barrier, perceived vaccination-cost barrier (time and effort), self-efficacy of vaccination, religious beliefs, political beliefs, and vaccination behavior, along with demographic factors were measured in the survey. Questions/items measuring all variables in the survey data collection were taken from relevant and peer-reviewed publications and were modified to reflect the context of COVID-19.

Measuring items, means, standard deviations (SDs), and reliabilities (when applicable) of major variables were presented in Table 1.

As shown in Table 1, perceived susceptibility and perceived severity were measured by the 0-100% scales, which is a typical practice in studies measuring perceived susceptibility and perceived severity (e.g.,<sup>32,33</sup>). Using the 0-100% scale improves greater precision of measure, as participants are given finer gradations to express their estimations of susceptibility to and severity of a specific harm/hazard. As shown in Table 1, fear, the two perceived benefit variables, the two perceived barrier variables, and self-efficacy were measured by the 1-7 scales, which is also a general practice in studies measuring those variables (e.g.,<sup>4</sup>).

## Analysis

To test the hypothesized model, AMOS 21.0 was used to conduct structural equation modeling (SEM) analyses. Bootstrapping procedures were performed with the number of bootstrap samples set to 2000 to test the significance of mediational paths. The bias-corrected 95% confidence intervals for each mediational path were obtained, and statistical inferences were made based on those confidence intervals.<sup>34</sup>

Although variables in the hypothesized model were measured by different response scales (e.g., perceived susceptibility and perceived severity were measured by the 0-100% scales; fear and the two perceived benefit variables were measured by the 1-7 scales), this does not influence the present findings, because changing the scale or units of variables will not change the model, nor will it affect their correlations with the outcome variable.<sup>35,36</sup> It is common for a study to use various scales to measure different variables (e.g.,<sup>32,33</sup>).

## Results

### Demographics of Participants

Participants' ages ranged from 18 to 45 ( $M = 21.72$ ;  $SD = 4.82$ ); 86 (20.9%) participants were male, 320 (77.9%) were

female, 5 (1.2%) indicated they preferred not to say their gender; 187 (45.5%) participants were White, 78 (19.0%) were Black/African American, 105 (25.5%) were Hispanic/Latino, 14 (3.4%) were Asian, 2 (.5%) were American Indian/Alaska Native, 23 (5.6%) were mixed race, and 2 (.5%) were other ethnicities. A total of 274 (66.7%) participants received at least 1 shot of a COVID-19 vaccine; 137 (33.3%) participants did not.

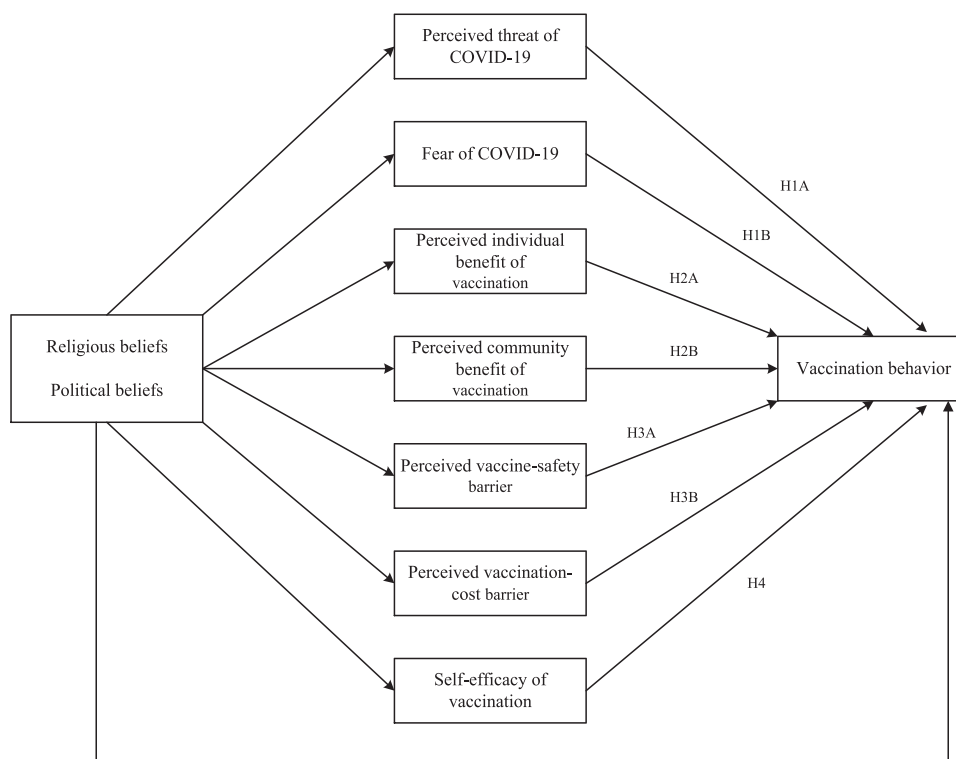
### Model Testing

SEM analyses found that Chi-square was non-significant:  $\chi^2/df = 2.27/5 = .45$ ,  $p = .810$ ; CFI = 1.000, TLI = 1.000, and RMSEA = .000. These results indicated that the hypothesized model provided an excellent fit to the data.<sup>37,38</sup> The model accounted for 44.4% of the variance in the vaccination behavior ( $R^2 = .444$ ), SEM analyses also found that perceived individual benefit ( $\beta = .489$ ,  $p < .001$ ), perceived vaccine-safety barrier ( $\beta = -.151$ ,  $p = .001$ ), perceived vaccination-cost barrier ( $\beta = -.152$ ,  $p < .001$ ), and political beliefs ( $\beta = -.094$ ,  $p = .029$ ) are significant and direct predictors of vaccination behavior. Perceived threat ( $\beta = .059$ ,  $p = .143$ ), fear ( $\beta = .023$ ,  $p = .587$ ), perceived community benefit ( $\beta = -.072$ ,  $p = .309$ ), self-efficacy ( $\beta = .021$ ,  $p = .617$ ), and religious beliefs ( $\beta = .026$ ,  $p = .506$ ) do not directly predict vaccination behavior. Thus, H2A, H3A, and H3B are supported; other hypotheses are not supported.

Because perceived threat, fear, perceived community benefit, and self-efficacy are not significantly associated with vaccination behavior, the mediation paths from religious beliefs/political beliefs through these 4 mediators are non-significant. The bootstrap mediation analyses found that the mediation paths from religious beliefs to vaccination behavior through perceived individual benefit ( $B = -.032$ , 95% CI =  $[-.062, -.009]$ ,  $p = .007$ ), through perceived vaccine-safety barrier ( $B = -.011$ , 95% CI =  $[-.025, -.003]$ ,  $p = .004$ ), and through perceived vaccination-cost barrier ( $B = -.008$ , 95% CI =  $[-.023, -.001]$ ,  $p = .033$ ) are significant; the mediation paths from political beliefs to vaccination behavior through perceived individual benefit ( $B = -.079$ , 95% CI =  $[-.118, -.053]$ ,  $p < .001$ ), through perceived vaccine-safety barrier ( $B = -.023$ , 95% CI =  $[-.041, -.010]$ ,  $p = .001$ ), and through perceived vaccination-cost barrier ( $B = -.020$ , 95% CI =  $[-.038, -.008]$ ,  $p = .001$ ) are significant. Thus, RQ1 was answered. Effects of religious beliefs are completely, and effects of political beliefs are partially mediated by perceived individual benefit and the two barrier variables.

## Discussion

This study applied the HBM to investigate how religious and political beliefs influence COVID-19 vaccination behavior. The proposed model, along with the addition of fear, religious beliefs, and political beliefs fits the data very well, which indicates that the HBM is a powerful theoretical model in



**Figure 1.** Proposed model predicting vaccination behavior. *Note.* Religious beliefs and political beliefs are two separate variables in the SEM analyses. Each of them individually predicts all mediators and the outcome variable. To improve readability of the model, they are placed inside the same box.

explaining COVID-19 vaccination behavior. Perceived individual benefit, perceived vaccine-safety barrier, perceived vaccination-cost barrier, and political beliefs are significant and direct predictors of vaccination behavior; other HBM constructs (perceived threat of COVID-19, perceived community benefit, and self-efficacy) and fear are non-significant. Effects of religious beliefs on COVID-19 vaccination behavior are completely, and effects of political beliefs on COVID-19 vaccination behavior are partially, mediated by perceived individual benefit and the two barrier variables. Findings are discussed and interpreted below.

### *Perceived Threat of COVID-19 and Fear of COVID-19*

Neither perceived threat of COVID-19 nor fear of COVID-19 is significantly related to vaccination behavior. This finding is inconsistent with Viswanath et al.'s<sup>5</sup> study, which found that risk perceptions (severity of and susceptibility to COVID-19) were significantly associated with intention of vaccine uptake, and inconsistent with Chu and Liu's<sup>15</sup> study, which found that fear was positively associated with COVID-19 vaccine intention. One possible reason is that their surveys were conducted before COVID-19 vaccines were available (July 2020 for Viswanath et al.'s study and September 2020 for Chu and Liu's study). The present study's survey was conducted

one year later (Sept 1 to Oct 1, 2021), a time when many people started to experience fatigue toward the pandemic.<sup>39</sup> Also, by that time, wearing a facemask when in close proximity to others had become a much more socially-acceptable behavior than in early 2020, when the pandemic had just begun. Both of these factors may tend to make COVID-19 seem less threatening and fearsome. Another possible reason is that participants in the present study were relatively young with an average age of 21.72. There is evidence showing that younger people often have a perception of their own invincibility,<sup>40</sup> and thus may be likely to underestimate the severity of the threat or their susceptibility to it.

### *Individual Benefit Perception and Community Benefit Perception*

The present study found that individual benefit perception of vaccination is a significant and positive predictor of vaccination behavior and the *strongest* predictor (ie, stronger than the two barrier variables). This justifies that COVID-19 vaccination behavior is probably driven by the cognitive process of cost-benefit analysis: when benefits are perceived to surpass costs (ie, barriers), the behavior is likely to happen. However, community benefit perception of vaccination is *non-significant*. This may be due to the fact that the U.S. has a

**Table 1.** Measuring items, ranges, means, standard deviations (SDs), and reliabilities (when applicable) of major variables.

Variables	Measuring items	Range	Mean	SD	Reliability ( $\alpha$ )
Perceived threat of COVID-19 = Square root of (perceived susceptibility $\times$ perceived severity) <sup>19</sup>	(1) What do you think is the chance that you would contract COVID-19 sometime in the future? Please use a scale from 0 to 100%, where 0 means zero chance and 100% means 100% chance (measuring perceived susceptibility); (2) If you contracted COVID-19 sometime in the future, how severe do you think your illness would be? Please use a scale from 0 to 100%, where 0 means not severe at all and 100% means extremely severe" (measuring perceived severity). <sup>19</sup>	0-100	31.19	20.54	Not applicable (N/A)
Fear of COVID-19	During the past month, how often have you felt ..... about contracting COVID-19 sometime in the future? (1) frightened; (2) scared; (3) Anxious. <sup>15</sup> Response scales ranged from 1 = never to 7 = always.	1-7	3.08	1.64	.975
Perceived individual benefit of vaccination	Getting myself vaccinated will.....(1) keep me from getting COVID-19 or a variant; (2) Prevent me from getting seriously ill even if I do get COVID-19 or a variant; (3) Help me get back to my normal life. <sup>19</sup> Response scales ranged from 1 = strongly disagree to 7 = strongly agree.	1-7	4.57	1.75	.887
Perceived community benefit of vaccination	Getting myself vaccinated will..... (1) keep other people from getting COVID-19 or a variant; (2) Prevent other people from getting seriously ill even if they do get COVID-19 or a variant; (3) help other people get back to their normal lives. <sup>19</sup> Response scales ranged from 1 = strongly disagree to 7 = strongly agree.	1-7	4.50	1.88	.925
Perceived vaccine-safety barrier	(1) COVID-19 vaccines will cause serious side effects; (2) COVID-19 vaccines will cause long-term health problems. <sup>15</sup> Response scales ranged from 1 = strongly disagree to 7 = strongly agree.	1-7	3.90	1.38	.901
Perceived vaccination-cost barrier	Getting myself vaccinated against COVID-19.....(1) will be time-consuming; (2) Will take a lot of effort. <sup>19</sup> Response scales ranged from 1 = strongly disagree to 7 = strongly agree.	1-7	2.26	1.52	.946
Self-efficacy of vaccination	(1) I know how to get myself vaccinated against COVID-19; (2) I know what I need to do to get myself vaccinated against COVID-19; (3) I am confident in my ability to get myself vaccinated against COVID-19. <sup>19</sup> Response scales ranged from 1 = strongly disagree to 7 = strongly agree.	1-7	6.25	1.12	.902
Religious beliefs	How would you describe your religious beliefs? Response scales are: 1 = I don't believe in any religion; 2 = I am not very religious; 3 = I am religious; 4 = I am very religious; 5 = I am extremely religious. <sup>29</sup>	1-5	2.73	.92	N/A
Political beliefs	How would you describe your political belief? Response scales are: 1 = progressive; 2 = liberal; 3 = moderate; 4 = conservative; 5 = very conservative. <sup>30</sup>	1-5	2.88	.98	N/A
Vaccination behavior	I have received _____ COVID-19 vaccine. Response scales are: 0 = 0 shot of any; 1 = 1 shot of any. <sup>31</sup>	0-1	.67	.47	N/A

highly individualistic culture,<sup>41</sup> causing many Americans to value individual benefits more than community (i.e., collectivistic) benefits. In contrast to the present findings, Hayashi et al.<sup>3</sup> reported that perceived community benefit was a significant and positive predictor of intention to take a COVID-19 vaccine. This discrepancy may be because the present study examined both individual benefit perception and community benefit perception, while Hayashi et al.'s<sup>3</sup> study only included community benefit perception. It's possible that, when both individual benefit perception and community benefit perception are included in the model, the influence of community benefit perception becomes negligible.

### *Perceived Vaccine-Safety Barrier and Perceived Vaccination-Cost Barrier*

Perceived vaccine-safety barrier is a significant and negative predictor of vaccination. There is evidence showing that people in wealthier countries are more suspicious toward vaccines in general, including concerns about vaccines' safety, efficacy, and importance.<sup>42</sup> When it comes to COVID-19 vaccines, those concerns have been exacerbated by conspiracy theories.<sup>43</sup> This probably explains why concerns related to vaccine safety impede vaccination behavior. That perceived vaccine-safety barrier is a negative predictor is also supported by Wang et al.'s<sup>44</sup> systematic review and meta-analysis, which found that COVID-19 vaccination unwillingness is mainly predicted by concerns about side effects and safety.

Perceived vaccination-cost barrier is also a significant and negative predictor of vaccination. Although COVID-19 vaccines were widely available for free in the U.S. when the present survey was administered, getting vaccinated may involve making an appointment beforehand, taking time off from work, getting a ride to the vaccination site, and being able to spend a couple of days recovering from any side effects. Thus, while COVID-19 vaccines are free of monetary cost, there is still a *time-and-effort* cost, which becomes a barrier to vaccination. Comparing the present study with Chu and Liu's<sup>15</sup> study, which found that perceived vaccine-monetary-cost barrier is *not* a significant predictor of vaccination intention, it looks like concerns related to time-and-effort cost is a much more important predictor than concerns related to monetary cost.

### *Self-Efficacy*

Surprisingly, self-efficacy about vaccination is not related to vaccination behavior. One possible reason is that the current study's data collection was done from September to October of 2021, a period during which vaccines had become widely (and freely) available in the U.S. Many U.S. colleges have a student health center, where COVID-19 vaccines are also offered to enrolled students for free. It's likely that those college-student participants in the present study were generally very confident in their ability to get vaccinated, if they wanted. Indeed, participants' mean self-efficacy

is very high: 6.25 in the range of 1 to 7. This ceiling effect may have resulted in the failure of this measure to capture any effect of self-efficacy on vaccination behavior.

### *Religious Beliefs and Political Beliefs*

Political beliefs are a direct and negative predictor of vaccination behavior, while the direct effect of religious beliefs on vaccination behavior is *non-significant*. A similar finding was also reported in Levin and Bradshaw's<sup>6</sup> study which found that, after adjusting for effects of sociodemographic variables, conservative political beliefs are still a significant predictor of COVID-19 vaccine hesitancy, while conservative religious beliefs are not. The present study corroborated that political beliefs have a much stronger impact than religious beliefs on COVID-19 vaccination, indicating that COVID-19 vaccination has indeed been politicized.

Effects of religious beliefs on vaccination are completely mediated by, and effects of political beliefs on vaccination are partially mediated by, perceived individual benefit and the two barrier variables. Participants who are more religious or more conservative are likely to perceive less individual benefit of vaccination and perceive greater barriers related to vaccine safety and vaccination costs (time and effort), all of which lead to a reduced likelihood of vaccination behavior.

### *Practical Implications*

The present findings have some implications for promoting COVID-19 vaccination in the U.S. First, as perceived threat of COVID-19 and fear of COVID-19 are not significantly related to vaccination behavior, vaccination campaigns emphasizing the threat of COVID-19 or using fear appeals are unlikely to generate fruitful outcomes for young adults at the present stage, given the effects of pandemic fatigue and their perceived invincibility. Second, to promote vaccination behavior among young adults, the most important effort in designing campaign messages should be highlighting the individual benefits of vaccination, as that is the strongest predictor of vaccination behavior. It's also important to clearly communicate the vaccines' possible side effects and alleviate people's concerns related to vaccine safety. Third, additional strategies should be considered to reduce vaccination barriers related to time and effort such as: that vaccination sites remove requirements for vaccination appointments or set up walk-in hours, so people can just walk in to get vaccinated; that local non-profit organizations arrange free rides to vaccination sites; and that employers offer paid leave days/recovery days for employees planning to get vaccinated. Of course, implementing those strategies may require the collaborations and coordination of multiple agencies and organizations.

Finally, vaccination campaigns should especially target those who are more religious or politically conservative, as they are the population which are less likely to already have been persuaded to get vaccinated. It might be a wise strategy to offer COVID-19 vaccination opportunities for the general public right outside or close to local churches, so that it would be much more convenient

for the church-goers to get vaccinated. Conservative opinion leaders (those who are also religious leaders and those who are not) have had a massive influence on their followers' acceptance or rejection of COVID-19 vaccines. Unfortunately, many of these leaders have engaged in fear-mongering, spreading or even originating conspiracy theories about the pandemic and the vaccines; but it is still possible for these leaders to change their minds and choose to be a part of the solution.<sup>45</sup> Thus, it is vital to continue to reach out to them, attempting to provide them with correct information about vaccine safety and effectiveness. There is evidence that, when an opinion leader endorses COVID-19 vaccines, it has a significant effect on the opinions of their followers who are suspicious of vaccines (regardless of the actual trustworthiness of that opinion leader). This was seen in significant increases in COVID-19 vaccine uptake in U.S. counties with low vaccination rates, following a Public Service Announcement which includes a Fox News interview featuring former President Donald Trump recommending COVID-19 vaccines.<sup>46</sup> Such ripple effect can be profound in penetrating the information bubbles in which many Americans find themselves today, boosting local communities' vaccination rates, and moving the U.S. population closer to herd immunity.

### *Limitations and Future Research Directions*

This study has several limitations. First, the sample in the present study is a group of young adult college students. Also, the sample has a disproportionate number of female participants (77.9%), perhaps due to the fact that most of the instructors who agreed to help distribute the survey are in the fields of humanities and social sciences, where there are more female students than male students. These two sample characteristics limit the generalizability of the present findings to the general public. Future research may want to collect a more diversified sample from the general population and re-test the proposed model. Second, all measures are based on self-reports, which may be subject to social desirability. However, questions in the current survey are not sensitive and "N/A" or "prefer not to say" are included in response choices. Therefore, it's likely that most participants would provide truthful answers to survey questions. Third, although all measures used in the present study were taken and modified from relevant and peer-reviewed publications, the COVID-19-related measures have not yet been validated by previous studies. Fourth, because of the correlational nature of the study design, readers should be cautious when interpreting causal directions of predictor-outcome relationships. Future research may want to use a longitudinal design to reexamine the model proposed here. Finally, it should be noted that college students' political/religious beliefs can be influenced, not only by their parents, friends, and instructors, but also by the media which they use or are exposed to. Factors which influenced the formation of those political/religious beliefs are beyond the scope of the present study, but they could be a direction for future research. College administrators/instructors may want to encourage students to use multiple sources/

resources to cross-check information/messages they receive from their social networks and media which they use or are exposed to, as well as educating students on critical thinking/analysis skills. This may mitigate the influences of political and religious extremism on students' beliefs.

## **Conclusion**

To the best of my knowledge, the current study serves as the first attempt to examine whether HBM constructs and fear account for the relationships between religious/political beliefs and COVID-19 vaccination behavior. Findings suggest that perceived individual benefit is a positive predictor (and the strongest predictor), while perceived vaccine-safety barrier, perceived vaccination-cost barrier, and political beliefs are negative predictors of vaccination behavior. Political beliefs are a much stronger predictor than religious beliefs. Participants who are more religious or more politically conservative tend to perceive less individual benefit and greater barriers to vaccination, making them less likely to get vaccinated.

## **SO WHAT**

### *What Is Already Known on This Topic?*

Many demographic and psychosocial factors have been reported to be associated with COVID-19 vaccination intention, vaccine hesitance, or vaccine acceptance. Religious variables and political variables have largely been examined *separately*: each of them predicted a lower COVID-19 vaccination intention.

### *What Does This Article Add?*

This study tested a SEM model predicting COVID-19 vaccination *behavior* based on the HBM. The proposed model was more comprehensive, and the predictors were also more carefully categorized (there are two benefit variables and two barrier variables). The study also examined HBM constructs and fear as mediating pathways linking religious/political beliefs to vaccination behavior.

### *What Are the Implications for Health Promotion Research or Practice?*

Identifying the potential predictors of COVID-19 vaccination behavior may inform the design of effective vaccination campaigns and strategies that could promote vaccination behavior and increase vaccination rates.

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### Author Contributions

The author met the core 4 ICMJE requirements for authorship. The author designed the study, collected and analyzed the data, and drafted and revised the manuscript. The author approved the manuscript as submitted.

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### Ethical Approval

This study was reviewed and approved (deemed exempt) by the institutional review board (IRB) at Sam Houston State University (PROTOCOL #: IRB-2021-197).

### Informed Consent

Before beginning the survey, participants read a consent letter online and indicated “I agree to participate” to provide informed consent.

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