Received: 29 May 2021 | Revised: 14 September 2021 | Accepted: 25 September 2021

DOI: 10.1002/wmh3.485

ORIGINAL ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Face coverings during the pandemic?

Rachael M. Moyer[1] | **Geoboo Song**[1] | **Natalie Jackson**[2]

[1]Department of Political Science, J. William Fulbright College of Arts and Science, The University of Arkansas, Fayetteville, Arkansas, USA

[2]Public Religion Research Institute (PRRI), Washington, District of Columbia, USA

Correspondence

Rachael M. Moyer, Department of Political Science, J. William Fulbright College of Arts and Sciences, The University of Arkansas, 437 Old Main, Fayetteville, AR 72701, USA.
Email: rmoyer@uark.edu and rachael.m.moyer@gmail.com

Abstract

The Health Belief Model (HBM), a value-expectancy model, is a leading framework in health behavior and communication research. The model is intended to inform targeted communication strategies that promote positive health behaviors. Individual beliefs associated with health risks such as perceived susceptibility and perceived severity are often incorporated into HBM as predictors of health behavior. However, recent studies point to limitations of the current model. At the same time, researchers have successfully used Cultural Theory (CT) to conceptualize, measure, and predict the cultural influences on health risk management. This study applies OLS regression and graphical analysis to examine the relationship between more intrinsic cultural value-based beliefs and HBM beliefs so as to understand behavioral intentions associated with COVID-19 among the general public in the United States while statistically controlling for the effects of partisanship and demographic factors.

KEYWORDS

COVID-19, cultural theory, public behavioral intentions, health communications

Key points

- Age, education, and perceived threats attributable to COVID-19 are significant predictors of behavioral intentions to wear a face covering in public.
- Additionally, broader socially constructed beliefs specified by Cultural Theory shape behavioral intentions to wear public face coverings.
- Health specific beliefs as identified by the Health Belief Model may mediate the influence of broader, more intrinsic beliefs which hold important implications for communications aimed at health behaviors meant to reduce the transmission of COVID-19.

BACKGROUND

The COVID-19 pandemic has presented an unprecedented challenge to public health on a global scale. In the United States, the Centers for Disease Control and Prevention (CDC) responded quite early by urging communities to practice social distancing and wear masks in public to slow the migration of the virus across populations. By November of 2020, 37 states and many local governments began instituting mandates requiring masks to be worn in public spaces (Harring, 2020). In a CDC analysis of county-level public health data, states with mask mandates experienced a drop in COVID-19 cases and related deaths while states without a mandate reported increased COVID-related cases and death rates (Guy, 2021). Despite evidence that the policies had a significant impact on virus transmission, some individuals refused to comply with mandates and leading up to the presidential election, the presence of "never-maskers" emerged to highlight how politicized public face coverings had become (Achenbach & Rozsa, 2020). Investigating public intentions to comply with COVID-19 reducing behaviors, the most effective behaviors, were actually ranked the lowest (Lennon et al., 2020). It seems that the politicization of this issue occupies an important role in understanding public responses to the pandemic.

From the beginning, states have played a primary role in policymaking around this issue and there is a body of evidence to indicate the influential power of political ideology in this process. Early state policy responses in the form of stay-at-home orders followed the political ideology of state leadership (Gusmano et al., 2020) and ideological differences influenced compliance with recommendations for social distancing policies impacting mortality rates (Gao & Benjamin, 2021). Partisan influence was even present in early communications regarding emerging treatments for COVID-19 infections (Brunell & Sarah, 2020). There is a large body of work connecting individually-held political ideologies with policy preferences (Converse, 1964; Jacoby & Sniderman, 2006; Zaller, 1992) but the strength with which one holds such ideologies or partisan preferences matter. Culturally oriented beliefs exhibit effects on policy preferences among the public that are distinct from political ideology (Jackson, 2015). The authors intend to contribute further understanding of what drives individual intentions to comply with recommended behaviors meant to slow the transmission of a disease during an emerging pandemic crisis. To do this, we investigate multidimensional beliefs among the US public to understand how various beliefs might inform behavioral intentions toward public mask wearing.

The Health Belief Model (HBM) has been used extensively to predict other health behaviors and is a relevant tool for crafting and evaluating health communications (Carpenter, 2010). During the emergence of the COVID-19 pandemic before communication toolkits were available, HBM was specifically used to guide healthcare worker-patient communications (Carico et al., 2021). The model has also proven useful for measuring the effectiveness of communication campaigns around vaccination behaviors (Jones et al., 2015). While the model has proven practically useful, it suffers from some important limitations, namely in its inability to account well for cultural differences (Glanz et al., 2008; Jones et al., 2015). An emerging area of research in policy studies have begun to employ Cultural Theory (CT) to conceptualize, measure, and predict the cultural influences on health risk management (Tansey & O'riordan, 1999). HBM and CT each identify beliefs as important. This study examines the relationship between HBM's health-centered beliefs and more intrinsic value-based beliefs specified by CT to understand what drives health-oriented behavioral intentions associated with COVID-19. In addition, the study accounts for other theoretically relevant factors such as demographics and political party identification. A brief review of HBM and CT will inform the analysis.

BELIEF CONSTRUCTS UNDER HBM AND CT

The HBM and the extended HBM (Bylund et al., 2011) share the basic assumptions attributed to value expectancy models (Miner, 2005), identifying beliefs as primary predictor of intentions/actions that will be taken to prevent, treat, or screen for serious illnesses (Glanz et al., 2008). Beliefs about the threats, benefits, and barriers associated with COVID transmission are acknowledged to be susceptible to an individual's background and experiences and play an important role in patient communications (Carico et al., 2021). Key constructs within the HBM include *perceived susceptibility* of an adverse health outcome and the *perceived severity* of that outcome (Jones et al., 2015). Together, these comprise the perceived *threat* of an illness. There is evidence that the model performs well under some conditions but, the model's ability to account for social or cultural influences (Glanz et al., 2008) has been identified as a primary limitation of the framework. Other approaches to assessing health-oriented risks within a social context have emerged in recent years.

An emerging theoretical framework in risk and public policy studies conceives of risk as socially constructed and subject to culturally-biased beliefs. Adapted from an anthropological framework, Grid Group CT argues that behavioral patterns are driven by value-based beliefs and concepts of risk. Under this framework, value-based beliefs about what constitutes risk results in four distinct and mutually exclusive behavioral patterns that are reinforced through two primary modes of social control (grid and group). The grid dimension represents the degree to which social relations are prescribed by rules and institutions while the group dimension represents the degree of bounded social relations. As represented in Figure 1, CT's unique contribution applies these two dimensions to specify four typologies representing four distinct worldviews: egalitarianism (low grid, high group), individualism (low grid, low group), hierarchism (high grid, high group), and fatalism (high grid, low group) (Dake, 1992; Douglas & Wildavsky, 1982; Wildavsky & Dake, 1990). Each worldview reflects a particular set of values and perspectives of nature and risk which are shared through social interactions and function to bind groups and define group identities. Both egalitarianism and hierarchism have strong group dimensions and value social relations resulting in strong social networks. Variations in the grid dimension among these two worldviews result in distinct organizational patterns. Egalitarianism (low grid, high group) organizes social networks through values of equality and solidarity while hierarchism (high grid, high group) tends to rely on specialization and hierarchical ordering. Contrastingly, weak group affinity characterizes individualism and fatalism. Low grid tendencies characterized by individualism (low grid, low group) values competitiveness, opportunity, and libertarianism. Finally, fatalism (high grid, low group) perceived lack of social connection combined with subjugation to

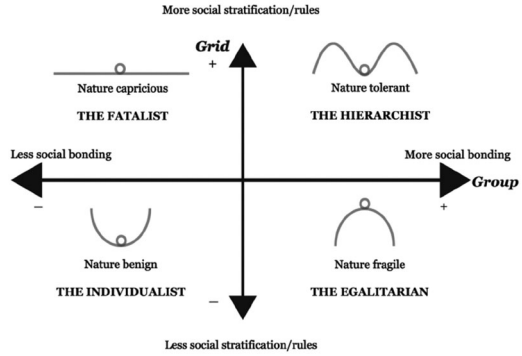

FIGURE 1 Grid group cultural theory worldview typologies[1]

strong social prescription tends to emphasize situations of isolation and directs attention toward the role of fate. Recent application of this framework reveals that cultural biases like those specified by CT and psychological mechanisms may interact to strengthen the effect of culturally-biased beliefs in ways that work to protect self-identifying characteristics (Kahan, 2008, 2013; Kahan et al., 2007, 2010). CT has been applied across substantive policy domains including health (Kahan et al., 2010; Song, 2014; Song, Geoboo, et al., 2014; Tansey & O'riordan, 1999) and energy policy (Moyer & Geoboo, 2016, 2019; Tumlison & Song, 2019; Tumlison et al., 2017) and promises to offer some insight into understanding what drives health-relevant behavioral responses.

To better understand what drives individual-level intentions to wear face coverings in public to decrease the transmission of COVID-19 among the US public, HBM and CT point to multi-dimensional beliefs as factors of behavioral intentions. It is expected in addition to beliefs about the threat of COVID, more intrinsic CT specified beliefs will guide behavioral intentions to avoid COVID-19 by wearing face coverings in public. More detailed information regarding the data and analytical methods used in this study are followed by analytical results and discussion.

DATA AND METHODS

OLS regression modeling is utilized to explore the relationships between HBM identified beliefs, CT specified beliefs, and the public's behavioral intentions toward mask-wearing using original survey data.

Survey participant selection and data

An original survey was conducted by the nonpartisan research organization PRRI (Public Religion Research Institute) with data collected by the nonpartisan and objective research organization NORC[2] at the University of Chicago. The survey sample consists of 2538 randomly selected adults residing in the US across all 50 states plus the District of Columbia. Interviews were conducted both online using a self-administered design and by telephone using live interviewers. All interviews were conducted among participants in AmeriSpeak, a probability-based panel designed to be representative of the national US adult population run by NORC at the University of Chicago. Panel participants without Internet access, which included 42 respondents, were interviewed via telephone by professional interviewers under the direction of NORC. Interviewing was conducted in both Spanish and English between September 9 and September 22, 2020[3] and focused on a variety of policy issues.

Variables and measures

All measures used in the study are displayed in Table 1. The goal of this study is to estimate the effect of beliefs on the public's intention to avoid COVID-19 transmission by wearing a face covering in public. Therefore, the primary dependent variable was operationalized with the survey question, “When you are in public places, how often do you personally wear a mask to protect against COVID-19 transmission?” (0 = Never, 1 = Sometimes, 2 = Always).

This study estimates the effects of multidimensional beliefs on behavioral intentions. Functioning as the primary variable of interest, this study operationalizes culturally-biased beliefs using measures defined by CT. A panel of 12 questions, three questions corresponding to each of the 4 grid-group typologies, were randomly ordered in the survey. Respondents were asked to indicate their level of agreement with these statements on a

TABLE 1 Variables and measures

Variable	Measure
Intention to Wear Face Covering	When you are in public places, how often do you personally wear a mask to protect against COVID-19 transmission? (0 = Never, 1 = Sometimes, 2 = Always)
Egalitarianism	Society works best if power is shared equally (1 = Completely disagree to 4 = Completely agree)
	It is our responsibility to reduce differences in income between the rich and the poor (1 = Completely disagree to 4 = Completely agree)
	What society needs is a fairness revolution to make the distribution of goods more equal (1 = Completely disagree to 4 = Completely agree)
Egalitarianism Index	Index using factor score of above three items ($\alpha = 0.74$)
Individualism	We are all better off when we compete as individuals (1 = Completely disagree to 4 = Completely agree)
	Rewards in life should be based on initiative, skill, and hard work, even if that results in inequality (1 = Completely disagree to 4 = Completely agree)
	Even if some people are at a disadvantage, it is best for society to let people succeed or fail on their own (1 = Completely disagree to 4 = Completely agree)
Individualism Index	Index using factor score of above three items ($\alpha = 0.70$)
Hierarchism	Society is in trouble because people do not obey those in authority (1 = Completely disagree to 4 = Completely agree)
	The best way to get ahead in life is to work hard and do what you are told to do (1 = Completely disagree to 4 = Completely agree)
	Society would be much better off if we imposed strict and swift punishment on those who break the rules (1 = Completely disagree to 4 = Completely agree)
Hierarchism Index	Index using factor score of above three items ($\alpha = 0.72$)
Fatalism	The most important things that happen occur by chance (1 = Completely disagree to 4 = Completely agree)
	The course of our lives is largely determined by forces outside of our control (1 = Completely disagree to 4 = Completely agree)
	Succeeding in life is mostly a matter of luck (1 = Completely disagree to 4 = Completely agree)
Fatalism Index	Index using factor score of above three items ($\alpha = 0.69$)
Multidimensional Perceived Threat	
Financial Threat Dimension	You or someone in your family *lost a job* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes)
	You or someone in your family *had hours or pay cut* in 2020 due to the coronavirus pandemic. (0 = No; 1 = Yes)
Personal Threat Dimension	You or someone in your household *tested positive for COVID-19* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes)

TABLE 1 (Continued)

Variable	Measure
	You or someone in your household was *sick with COVID-19 symptoms* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes) You or someone in your household has been *hospitalized for COVID-19* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes)
Other Threat Dimension	You or someone in your household has *known someone who has been hospitalized* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes)
	You or someone in your household has *known someone who has died* in 2020 due to the coronavirus pandemic (0 = No; 1 = Yes)
Perceived Multidimensional Threat Index	Index with 0 = No threat and 7 = Extreme threat
Party ID	Do you consider yourself a Democrat, a Republican, an Independent or none of these? (0 = Independent; 1 = Republican; 2 = Democrat)
Age	Age in years
Gender	0 = Female 1 = Male
Race	0 = Nonwhite 1 = White/Non-Hispanic
Education	1 = Less than High School to 5 = Postgraduate degree
Income	1 = Less than $5000 to 18 = $200,000+

4-point scale (1 = completely disagree, 2 = mostly disagree, 3 = mostly agree, 4 = completely agree). Factor analysis (with the *varimax* rotation method) was performed to extract four latent factors representing the four CT dimensions. These factors parallel the orthogonally distinct typologies in that consistently high factor loadings aligned with each of the three related CT measures (i.e., factor loading greater than 0.5) while loadings were low on remaining unrelated factors. Based upon this factor structure, factor scores were calculated for each of four latent dimensions (representing each of four cultural orientations with scores ranging from –3.08 to 3.36) and are used as an index for measuring each cultural orientation. Cronbach's α scores for the three survey items (constituting each CT index) range from 0.69 to 0.74 indicating that the related survey measures are reasonably reliable.

The analysis incorporates other multidimensional beliefs found to be relevant to health behaviors. *HBM* defines *perceived threat* as a combination of *perceived severity* and *perceived susceptibility*. Perceived threat is operationalized in this study using a multi-dimensional scale that captures the perceived personal and financial threat as well as perceived threat to others known by someone in their household. Respondents were asked to indicate any and all of the following experiences that they or someone in their household encountered in 2020 due to the coronavirus pandemic reasoning that the more personal experiences an individual has, the more likely they are to perceive the experience as a threat. The full measures of multidimensional threat variable are shown in Table 1. Respondents were asked to indicate whether they attributed a recent loss of job or wages (financial threat), a recent illness or hospitalization of someone in their household (personal threat), or someone known to their household (other threat) to COVID-19 (yes = 1 or no = 0). An additive index was then calculated to measure perceived threat where 0 indicates that the respondent answered no to all indicating no threat and 7 indicates that respondent answered yes to all questions indicating extreme perceived threat of COVID-19.

Measures for demographic factors and political party identification are also operationalized to statistically control for these factors in an attempt to isolate the effects of

beliefs on behavioral intentions. Age was recorded as a continuous variable. Respondents indicated their gender as 0 for female and 1 for male. Race was recorded as 0 for non-White and 1 as White/non-Hispanic. Respondents' education was recorded with a scale ranging from 1 (less than high school) to 5 (postgraduate degree) and income was recorded with a scale ranging from 1 (indicating an annual household income of less than $5000) to 18 (indicating a household income of $200,000 or more).

Methods

First, a comprehensive estimation of the effects of perceived threat associated with COVID-19 and more intrinsic beliefs on behavioral intentions are estimated using OLS regression ($n = 2395$). Further investigation into the conceptual moderation effect of multidimensional threat variable on the relationship between culturally biased beliefs and behavioral intentions is accomplished by dividing the data set into two subsets based on the threat level, fitting the said OLS regression model to these two subsets of data, and comparing main effects (i.e., the effects of culturally-biased beliefs on behavioral intention) in the estimated models. One subset represents members of the general public who indicated some perceived threat associated with COVID in at least one but perhaps more dimensions ($n = 1723$) while the other subset represents members of the public who indicated no perceived threat ($n = 672$) at all.

ANALYTICAL RESULTS

Sequential OLS regression

The data used in this step of the analysis consists of 2395 observations. The typical survey respondent may be characterized as a 49-year-old White/non-Hispanic female who reports an annual household income of between $40,000-60,000 and some education beyond high school (see Tables 2 and 3).

OLS regression estimates the effects of demographics on behavioral intentions (Model 1) before adding political party identification (Model 2), perceived threats (Model 3), and culturally-biased beliefs (Model 4) to the regression model (see Table 4). The base model (Model 1) results indicate that respondents who are older (+0.004, or an increase of 0.2% on

TABLE 2 Descriptive statistics for full sample

Statistic	*n*	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Intention	2389	1.750	0.496	0.000	2.000	2.000	2.000
Egalitarianism	2395	0.000	1.000	−3.047	−0.632	0.636	2.862
Individualism	2395	0.000	1.000	−3.426	−0.648	0.601	2.862
Hierarchism	2395	0.000	1.000	−3.174	−0.670	0.652	3.100
Fatalism	2395	0.000	1.000	−2.440	−0.540	0.671	3.377
Threat	2395	1.321	1.232	0	0	2	7
Age	2395	48.603	16.972	18	33	63	97
Education	2395	3.240	1.042	1	3	4	5
Income	2395	9.986	4.189	1	7	13	18

TABLE 3 Frequency table

Sample	Variable	*n*	Category (%)		
Full	Race	2395	Non-White (36.2%)	White/Non-Hispanic (63.8%)	
No threat subsample		672	(21.9%)	(78.1%)	
Threat subsample		1723	(44.2%)	(55.8%)	
Full	Gender	2395	Female (50.9%)	Male (49.1%)	
No threat subsample		672	(53.7%)	(46.3%)	
Threat subsample		1723	(47.4%)	(52.6%)	
Full	Political party identification	2395	Independent (30.6%)	Republican (30%)	Democrat (39.4%)
No threat subsample		672	(34.4%)	(29.8%)	(35.8%)
Threat subsample		1723	(27.0%)	(31.8%)	(41.2%)

the dependent variable scale for each additional year of age, $p < 0.05$) and more educated (+0.041, or an increase of 2.05% on the dependent variable scale for each additional year of age, $p < 0.05$) report stronger intentions to wear a mask in public. White males are the least likely to report public mask-wearing (–0.097, or a 4.85% reduction on the dependent variable scale for non-Hispanic whites, $p < 0.05$ and –0.061, or a 3.05% reduction on the dependent variable scale for males, $p < 0.05$ respectively). Controlling for demographics, those who identify as Republican are less likely (Model 2, –0.174, or a decrease of 8.7% on the dependent variable scale for Republicans, $p < 0.05$) to wear masks in public while Democrats are more likely to do so (+0.133, or an increase of 6.65% on the dependent variable scale for Democrats, $p < 0.05$). Model 3 incorporates perceived threat of COVID transmission into the regression showing that the higher the perceived threat, the more likely one is to wear a mask in public (+0.028, or an increase of 1.4% on the dependent variable scale for each unit increase in threat perception, $p < 0.05$). Results of the final model (Model 4) indicate a positive relationship between egalitarian beliefs and public mask-wearing (+0.094, or an increase of 4.7% on the dependent variable scale for each unit increase in egalitarianism, $p < 0.05$).

Beliefs incorporating strong individualism (–0.060, or a decrease of 3% on the dependent variable scale for each unit increase in individualism, $p < 0.05$) and hierarchism (–0.027, or a decrease of 1.35% on the dependent variable scale for each unit increase in hierarchism, $p < 0.05$) exhibit negative effects on mask-wearing intentions. While explanatory power for gender, age, and political party hold, the focus of this study is to examine how multi-dimensional beliefs impact behavioral intentions. This modeling approach indicates that, in addition to beliefs regarding the threat of COVID-19, culturally-biased beliefs exhibit distinct explanatory power for behavioral intentions as the adjusted R^2 value increases from 0.098 in Model 3 to 0.139 in Model 4.[4] A decrease in the coefficient for threat when incorporating CT measures (decrease from 0.028 in Model 3 to 0.025 in Model 4) might indicate some potential multicollinearity issues. However, the variance inflation factor (VIF) values for variables used in Model 4 indicate that any multicollinearity is unlikely to have a substantial impact on our regression model estimations. Studies investigating the impact of perceived threat and in particular, perceived susceptibility on health behaviors have found mixed

TABLE 4 OLS regression analysis results

	Regression results			
	Dependent variable: Intention to wear face covering in public			
	(1)	(2)	(3)	(4)
Egalitarianism				0.094***
				(0.011)
Individualism				−0.060***
				(0.010)
Hierarchism				−0.027***
				(0.010)
Fatalism				0.008
				(0.010)
Threat			0.028***	0.025***
			(0.008)	(0.008)
Republican		−0.174***	−0.172***	−0.104***
		(0.026)	(0.026)	(0.026)
Democrat		0.133***	0.132***	0.063***
		(0.024)	(0.024)	(0.024)
Race (white)	−0.097***	−0.047**	−0.034	−0.032
	(0.022)	(0.022)	(0.022)	(0.022)
Gender (male)	−0.061***	−0.045**	−0.042**	−0.036*
	(0.020)	(0.020)	(0.020)	(0.020)
Age	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.041***	0.016	0.018*	0.012
	(0.010)	(0.010)	(0.010)	(0.010)
Income	0.002	0.003	0.003	0.006**
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	1.510***	1.538***	1.482***	1.454***
	(0.044)	(0.047)	(0.050)	(0.050)
Observations	2389	2145	2145	2145
Adjusted R^2	0.031	0.093	0.098	0.139
F Statistic	16.379***	32.541***	30.073***	29.792***

Note: Standard errors in parentheses.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

results (Jones et al., 2015) with some suggesting that perceived threat may function as a moderator of other predictors in HBM (Glanz et al., 2008). The next step of analysis explores the effects of culturally-biased beliefs when perceptions of threat vary.

Subsample analysis

To examine the conceptual moderation effects of perceived threat, we subset the same data used in the previous analysis. Respondents were asked to indicate any and all experiences that they or someone in their household encountered in 2020 due to the coronavirus pandemic. Responses ranged from 0 experiences to as many as 7. The data was subset into respondents reporting no threat (threat = 0) ($n = 672$) and respondents who experienced at least 1 threat and as many as 7 (threat > 0) ($n = 1718$). Frequencies for subsamples are displayed in Table 3 and descriptive statistics are displayed in Table 5.

The effects of CT specified beliefs on behavioral intentions are estimated using OLS regression, but this time by group (no threat vs. threat). For comparison, regression results are displayed in Table 6. Model 1 displays the regression coefficients for demographics, party identification, and CT measures. To aid interpretation and comparison, we applied visualization of the effects using the *jtools* package in R. The effect plot shown in Figure 2 allows us to view and compare regression coefficients for each CT variable in different subsets of observations more easily based on standardized regression coefficients. Confidence intervals of 90% (thick line) and 95% (thin line) are shown. Egalitarianism maintains a positive association with behavioral intention for respondents with no perceived threat (+0.104, $p < 0.05$ in Model 2) and for those with some perceived threat (+0.089, $p < 0.05$ in Model 3). When compared to the full sample model, confidence intervals—the thin and thick lines visualizing the 95% and 90% confidence intervals, respectively—overlap; therefore, the regression coefficients for egalitarianism in each subgroup are not interpreted as statistically significantly different from the full sample model or from each other. From this, we can conclude that there are no moderation effects of threat variable on the positive relationship between egalitarianism and face covering behavior. Individualism maintains a negative association for the no threat (–0.052, $p < 0.05$ in Model 2) and threat group (–0.056, $p < 0.05$ in Model 3) but again, confidence intervals for those coefficient estimates overlap, so no statistically significant threat moderation effect is found for the negative relationship between individualism and face covering behavior. Hierarchism exhibits a statistically significant negative relationship with behavioral intentions in the full model (–0.027, $p < 0.05$ in Model 1) however, the coefficients for both the threat (–0.022, $p < 0.1$ in Model 3) and no threat group (–0.034) are not statistically significant at the $p < 0.05$ level. Fatalism exhibits a positive relationship to intention for the no threat group only (+0.080, $p < 0.05$ in Model 2) showing a notable increased coefficient when comparing to the full sample (+0.007 in Model 1). There are some potential moderating effects of threat for fatalism.

DISCUSSION

Broadly stated, this study examines the effects of multidimensional beliefs on intentions toward positive health behaviors. More specifically, it applies an emerging theoretical framework known as CT to estimate the effects of culturally-biased beliefs on intentions to avoid transmission of COVID-19 by wearing public face coverings. The research question addressed in this study is whether culturally-biased beliefs, as specified by CT, explain some of the variation in the public's intention to wear face coverings and whether these beliefs offer distinct

TABLE 5 Descriptive statistics for subset reporting no threat and threat

Statistic	*N*	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
No Threat Subgroup							
Intention	671	1.720	0.520	0.000	2.000	2.000	2.000
Egalitarianism	672	−0.134	1.023	−2.729	−0.823	0.471	2.862
Individualism	672	0.052	1.035	−3.325	−0.615	0.716	2.708
Hierarchism	672	−0.001	0.998	−2.884	−0.660	0.664	2.740
Fatalism	672	−0.025	0.983	−2.223	−0.507	0.507	3.190
Threat	672	0.000	0.000	0	0	0	0
Age	672	50.717	17.480	18	34	66	97
Education	672	3.372	1.031	1	3	4	5
Income	672	10.470	4.122	1	7	14	18
Threat Subgroup							
Intention	1,718	1.761	0.485	0.000	2.000	2.000	2.000
Egalitarianism	1,723	0.052	0.986	−3.047	−0.543	0.700	2.529
Individualism	1,723	−0.020	0.986	−3.426	−0.659	0.585	2.862
Hierarchism	1,723	0.000	1.001	−3.174	−0.675	0.648	3.100
Fatalism	1,723	0.010	1.007	−2.440	−0.555	0.684	3.377
Threat	1,723	1.836	1.079	1	1	2	7
Age	1,723	47.778	16.702	18	33	61	93
Education	1,723	3.189	1.043	1	3	4	5
Income	1,723	9.797	4.201	1	7	13	18

explanatory power over the beliefs addressed by HBM. Empirical results suggest that culturally-biased beliefs as specified by CT exhibit distinct effects on behavioral intentions.

Exploring socio-demographic and political effects, study results indicate that older, more educated individuals are more likely to wear a face covering in public. This is consistent with other findings connecting age and education to health behaviors (Jones et al., 2015). In contrast, white males are less likely to report strong intentions to wear face coverings which may be explained by a commonly documented phenomenon in risk studies known as the "white male" effect (Finucane et al., 2000; Kahan et al., 2007). Due to polarization around policies like mask mandates (Achenbach & Rozsa, 2020), the study incorporated political party identification into the analysis finding results consistent with normative assumptions. Self-identified Republicans are less likely than Democrats to wear a face covering in public.

Examining multi-dimensional beliefs, empirical results indicate that perceived threats are significant predictors of behavioral intentions to wear a face covering in public, producing results that are consistent with what HBM would predict. Given the amount of uncertainty surrounding modes of transmission in the early response stages of the pandemic, financial impacts due to COVID and personal experiences with COVID-related illness appear to have a positive impact on individuals' intentions to wear a face covering in public. These findings are consistent with earlier studies highlighting the effects of health-oriented specific beliefs on health behaviors (Glanz et al., 2008).

TABLE 6 Conceptual moderating effects of multidimensional threat

Regression results			
	Dependent variable: Intention to wear face covering in public		
	(1) Full sample	(2) No threat group	(3) Threat group
Egalitarianism	0.096***	0.104***	0.089***
	(0.011)	(0.020)	(0.013)
Individualism	−0.060***	−0.052***	−0.056***
	(0.010)	(0.019)	(0.012)
Hierarchism	−0.027***	−0.034	−0.022*
	(0.010)	(0.021)	(0.012)
Fatalism	0.007	0.080***	−0.018
	(0.010)	(0.020)	(0.012)
Republican	−0.106***	−0.119**	−0.096***
	(0.026)	(0.049)	(0.031)
Democrat	0.063***	0.120**	0.050*
	(0.024)	(0.049)	(0.028)
Race (white)	−0.044**	−0.072	−0.040
	(0.022)	(0.047)	(0.025)
Gender (male)	−0.039**	0.007	−0.051**
	(0.020)	(0.038)	(0.023)
Age	0.004***	0.005***	0.004***
	(0.001)	(0.001)	(0.001)
Education	0.011	0.009	0.010
	(0.010)	(0.020)	(0.012)
Income	0.006**	0.003	0.007**
	(0.003)	(0.005)	(0.003)
Constant	1.504***	1.500***	1.515***
	(0.048)	(0.103)	(0.054)
Observations	2,145	603	1,542
Adjusted R^2	0.135	0.201	0.116
F Statistic	31.536***	14.750***	19.379***

Note: Standard errors in parentheses.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Turning attention to the primary variable of interest for this study, findings indicate that CT specified beliefs exhibit distinct effects on intentions to adopt positive health behaviors. Individuals indicating worldviews that are aligned with egalitarian values have the strongest motivational intentions to wear a face covering in public. Egalitarians are likely to view wearing

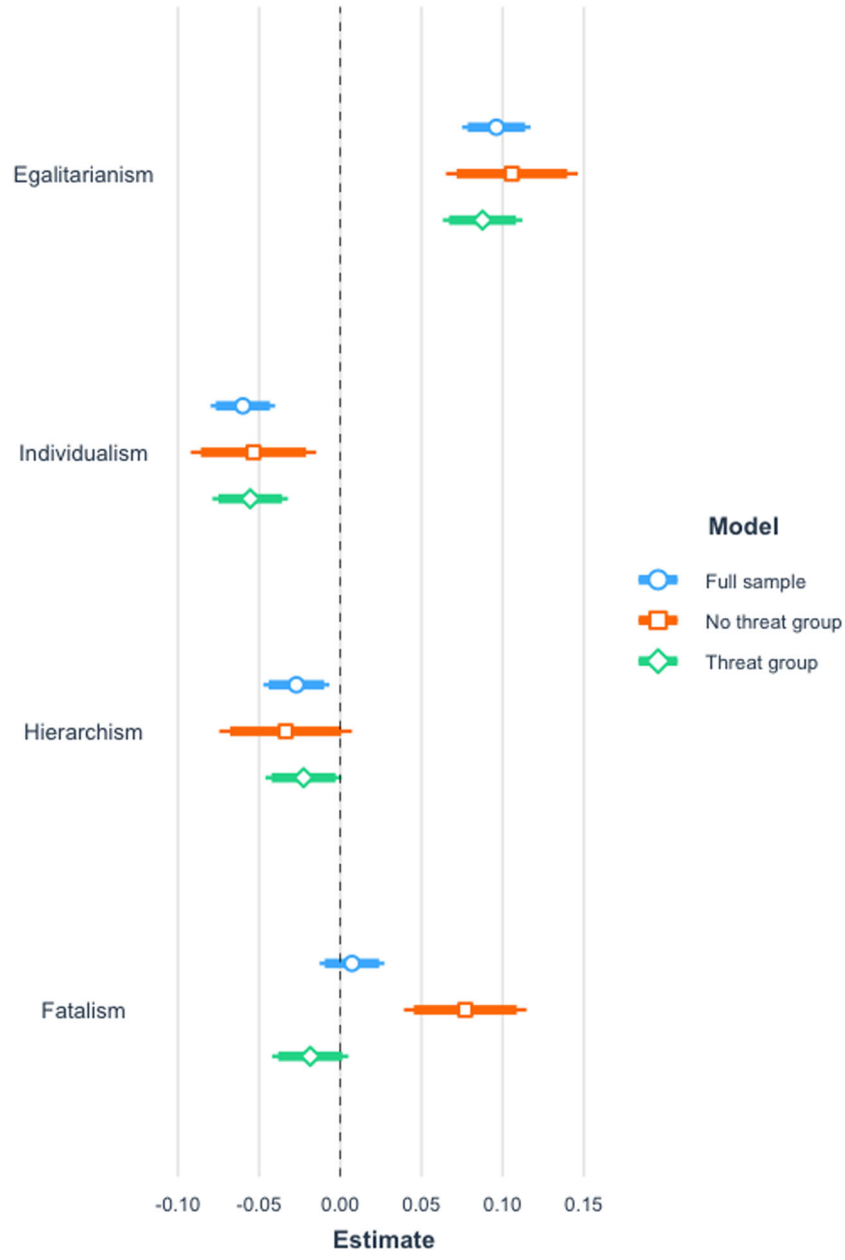

FIGURE 2 Effect plot: moderation effects of perceived threat

face coverings as a promotion of equity in health outcomes through collective (high group) public action (low grid) which aligns with their strong commitment to the value of equity. Those with an affinity for individualism are the least likely to wear a mask. They are unlikely to be motivated by feelings of responsibility toward or accountability for the health of others. This is consistent with their value of individual action (low group). Individualists may also be less inclined to allow institutional guidance to dictate their own behavior as they do not typically feel bound by institutionally created rules (low grid). Somewhat unexpected, hierarchism is negatively correlated with intention to wear a face covering in public. This is an unexpected finding because of

hierarchism's deference to experts and tendencies to follow authority (high grid). Even in the absence of mask mandates, the CDC's recommendation to wear masks in public is clear. Perhaps the inconsistency in communications at various levels of government factor into this result with trust functioning as an important factor. Unfortunately, trust not considered in this analysis and is, therefore, a limitation of this study.

Finally, a closer examination of the relationship between perceived threat and culturally-biased beliefs reveal some unexpected results that indicate a future research direction. Results suggest that perceived threat may moderate the effects of specific culturally-biased beliefs. In the full regression model, effects attributable to fatalism do not appear statistically significant (Model 4, Table 6) but after dividing the data into subgroups representing those who indicated a perceived threat and those who did not, we find some evidence to suggest that perceived threat of COVID moderates the effects of fatalism on behavioral intentions. A lack of anticipation or personal experience with COVID-19 among those with strong fatalist values results in a stronger likelihood of intentions to wear a face covering in public. Perhaps this finding can be explained through cultural identity affirmation (Cohen et al., 2007; Kahan et al., 2010). That is to say that individuals with strong fatalism tendencies are likely to act in ways that affirm their own worldview. This explanation would rely on the assumption that mask-wearing behaviors are cognitively tied to policy mandates for those with tendencies toward fatalism. Absent any actual experience with COVID, these individuals focus on the mandates because it affirms their belief of social isolation (low group) and lack of choice in a world where their options are dictated to them by others (high grid). A denial of intention to wear a mask would demonstrate incongruence with their belief that wearing a mask in public is their only option; one that is imposed on them. Experiencing consequences of the virus (personal health or financial impacts) may function to shift their perspective such that mask wearing is now conceived of as arbitrary given that fate is controlling the ultimate health outcome. Low group attributes would make it unlikely that they would choose to wear a mask to protect others from exposure. Future analysis could consider incorporating factors that represent the presence of mask mandates to further explore this finding.

It is less clear how beliefs about the threat of COVID-19 may function as a moderator of hierarch type values. Our analysis does not provide clear evidence for moderation even though the negative coefficient for hierarchism is statistically significant in Model 3 (Table 6). The confidence intervals for threat among hierarchism approach zero (no effect) as seen in Figure 2 therefore, we must use caution with interpreting the corresponding coefficient.

CONCLUSIONS

In the context of a global pandemic, we find evidence to suggest that multidimensional beliefs influence intentions to adopt health behaviors aimed at reducing disease transmission. Incorporating multidimensional beliefs that account for more culturally oriented beliefs offer a nuanced approach to examine health-related behavioral intentions. These findings hold important practical implications for public health policies generally. Acknowledgment of limitations to this study point to future research directions.

Policy implications

Policymakers, government officials, and healthcare providers might rely on well-established models like the HBM to anticipate public reactions to policies and craft important health communications. This study points to other important considerations for public health communications. With regard to the COVID-19 pandemic, this study offers practically oriented insights. Despite the release of effective COVID vaccinations, communications aimed

at wearing public face coverings in the US to avoid COVID-19 transmission have once again been prioritized by the CDC due to the emergence of the Delta variant (CDC, 2021). The continued need for this behavioral approach is particularly high in areas of the country where vaccination rates are particularly low (CDC, 2021). Current public health communications continue to address the threats posed by the virus and the results of this study show that these types of beliefs are likely to inform individual decision making about whether to wear a face covering in public, however; the results of this study also stress the importance of incorporating broader, culturally-biased beliefs or worldviews into communications given their influence of health-related behavioral intentions among the US public.

By incorporating demographics and political affiliation, this study identified very distinct effects of worldviews on such intentions. Continued reliance on mental models that fail to account for the multidimensionality of beliefs may result in a less nuanced understanding of the motivations behind behavioral intentions. It is this understanding that informs the development of *effective* policies and communications. Concerns regarding the absence of culturally relevant factors in currently employed models have already been expressed (Glanz et al., 2008). This study offers one approach to incorporating broader beliefs that account for cultural influences. More specifically, the incorporation of CT specified beliefs offers a path to measure socially and culturally defined risk and may offer some insight into the various possible interpretations of the uncertainties enveloping public health concerns.

Limitations and future research directions

Of course, there are some notable limitations of this study that point to future research of interest. Do these effects hold over time? Do they hold for measurable behaviors as opposed to behavioral intentions? Are there similar effects for other health-related behaviors addressing COVID-19 transmission like vaccinations? At the writing of this article effective vaccines have been developed and distributed in the United States, however; an in increase in vaccination rates have been accompanied by an increase in variants of the virus (CDC, 2020; Suliman & Pietsch, 2021) highlighting the relevance of this study. While culturally-biased beliefs do appear to impact the public's willingness to wear face coverings, it is unclear whether these beliefs impinge on their willingness to receive COVID-19 vaccinations. There is evidence that CT-specified worldviews influence vaccination policy preferences in other contexts (Song, 2014) suggesting that further research is needed to fully understand the effect of multi-dimensional beliefs on health behaviors, both in terms of direction and magnitude. Additionally, further analysis is needed to explicate how health-specific beliefs and broader worldviews work together to shape behavioral intentions. Other factors like trust in government or other sources of information on COVID-19 are likely to provide additional insights. Further research in these areas is critical not only for effective health-oriented and policy communications but for effective policy development.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ENDNOTES

[1]Graphic Source: Lazrus, Heather. 2015. Risk perception and climate adaptation in Tuvalu and Swedlow, Brendon. 2014. Advancing policy theory with cultural theory. *Policy Studies Journal* 42(4):465-483.

[2]NORC was previously an acronym for National Opinion Research Center, but the company guidance notes that is no longer accurate. As of 2010, NORC is the company's name; it is not an acronym.

[3]For more information about the panel, sampling, and weighting, please see the appendix.

[4]Ordered logistic regression analysis was also conducted to estimate the effects of threat and culturally-biased beliefs on behavioral intentions, and the results confirmed the findings from our OLS regression analysis. It is noteworthy that we utilize the OLS regression as the primary analytical approach in this study mainly because the OLS coefficient interpretations more concretely and straightforwardly show the relationships related to differing mask wearing intentions than the ordered logit. Furthermore, results of nested F test indicate that culturally-biased beliefs as specified by CT (in model 4) add significant explanatory power to the simpler model (Model 3) at the level of $p < 0.01$. VIF calculations were run to check for any potential multicollinearity issues and VIF values for predictor variables range between 1.02 and 1.12.

REFERENCES

Achenbach, J., & Rozsa, L. (2020). Some Americans refuse to wear masks even as their hometowns become Covid-19 hot spots. *Washington Post*. https://www.washingtonpost.com/health/mask-wearing-coronavirus-hot-spots/2020/10/27/71001546-1883-11eb-82db-60b15c874105_story.html

Brunell, T. L., & Sarah, P. M. (2020). How partisanship affected public reaction to potential treatments for COVID-19. *World Medical & Health Policy*, *12*(4), 482–486.

Bylund, C. L., Galvin, K. M., Dunet, D. O., & Reyes, M. (2011). Using the extended health belief model to understand siblings' perceptions of risk for hereditary hemochromatosis. *Patient Education and Counseling*, *82*(1), 36–41.

Carico, R., Ron, J., Sheppard, & Thomas, C. B. (2021). Community pharmacists and communication in the time of COVID-19: Applying the Health Belief Model. *Research in Social & Administrative Pharmacy*, *17*(1), 1984–1987.

Carpenter, C. J. (2010). A meta-analysis of the effectiveness of Health Belief Model variables in predicting behavior. *Health Communication*, *25*(8), 661–669.

CDC. (2020). *COVID-19 vaccination*. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/distributing/demographics-vaccination-data.html

CDC. (2021). *Interim public health recommendations for fully vaccinated people*. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html

Cohen, G. L., Sherman, D. K., Bastardi, A., Hsu, L., McGoey, M., & Ross, L. (2007). Bridging the partisan divide: Self-affirmation reduces ideological closed-mindedness and inflexibility in negotiation. *Journal of Personality and Social Psychology*, *93*(3), 415–430.

Converse, P. E. (1964). The nature of belief systems in mass publics. In D. Apter (Ed.), *Ideology and discontent*. Free Press.

Dake, K. (1992). Myths of nature: Culture and the social construction of risk. *Journal of Social Issues*, *48*(4), 21–37.

Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. University of California Press.

Finucane, M. L., Slovic, P., Mertz, C. K., Flynn, J., & Satterfield, T. A. (2000). Gender, race, and perceived risk: The 'white Male' effect. *Health, Risk & Society*, *2*(2), 159–172.

Gao, J., & Benjamin, J. R. (2021). Death by political party: The relationship between COVID-19 deaths and political party affiliation in the United States. *World Medical & Health Policy*. *13*(2), 224–249. https://onlinelibrary.wiley.com/doi/abs/10.1002/wmh3.435

Geoboo, S., Silva, C. L., & Jenkins-Smith, H. C. (2014). Cultural worldview and preference for childhood vaccination policy. *Policy Studies Journal*, *42*(4), 528–554.

Glanz, K., Barbara, K. R. & Viswanath, K. (Eds.). (2008). The Health Belief Model. In Health Behavior and Health Education Theory, Research, and Practice (pp. 45–62). Jossey-Bass. http://ssu.ac.ir/cms/fileadmin/user_upload/Daneshkadaha/dbehdasht/Asadeghi/kar_dar_khane/1._Karen_Glanz__Barbara_K._Rimer__K._Viswanath__Heal_BookFi.org__.pdf

Gusmano, M. K., Edward Alan Miller, P., Nadash, & Elizabeth, J. S. (2020). Partisanship in initial state responses to the COVID-19 pandemic. *World Medical & Health Policy*, *12*(4), 380–389.

Guy, G. P. (2021). Association of state-issued mask mandates and allowing on-premises restaurant dining with county-level COVID-19 case and death growth rates—United States, March 1–December 31, 2020. *MMWR Morbidity and Mortality Weekly Report*, *70*, 350–354. https://www.cdc.gov/mmwr/volumes/70/wr/mm7010e3.htm

Harring, A. (2020). More than half of U.S. States have statewide mask mandates. *CNBC*. https://www.cnbc.com/2020/07/20/more-than-half-of-us-states-have-statewide-mask-mandates.html

Jackson, N. M. (2015). A theory of preference formation among ideologues and nonideologues*: Theory of preference formation. *Social Science Quarterly*, *96*(1), 1–18.

Jacoby, W. G., & Sniderman, P. M. (2006). The structure of value choices in the american public. In Annual Meeting of the Southern Political Science Association, Atlanta, GA, January, 5–7. https://www.researchgate.net/profile/Paul_Sniderman/publication/267566327_The_Structure_of_Value_Choices_in_the_American_Public/links/552441a10cf2b123c5173902.pdf

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in communication research: Exploring parallel, serial, and moderated mediation. *Health Communication*, *30*(6), 566–576.

Kahan, D. M., Braman, D., Gastil, J., Slovic, P., & Mertz, C. K. (2007). Culture and identity-protective cognition: Explaining the white-male effect in risk perception. *Journal of Empirical Legal Studies*, *4*(3), 465–505.

Kahan, D. M. (2008). Two conceptions of emotion in risk regulation. *University of Pennsylvania Law Review*, *156*(3), 741–766.

Kahan, D. M. (2013). Ideology, motivated reasoning, and cognitive reflection. *Judgment and Decision Making*, *8*(4), 18.

Kahan, D. M., Braman, D., Cohen, G. L., Gastil, J., & Slovic, P. (2010). Who fears the HPV vaccine, who doesn't, and why? An experimental study of the mechanisms of cultural cognition. *Law and Human Behavior*, *34*(6), 501–516.

Lennon, R. P., Sakya, S. M., Miller, E. L., Snyder, B., Yaman, T., Zgierska, A. E., Ruffin, M. T., & Van Scoy, L. J. (2020). Public intent to comply with COVID-19 public health recommendations. *Health Literacy Research and Practice*, *4*(3), 6.

Miner, J. B. (2005). *Organizational behavior: Essential theories of motivation and leadership*. M.E. Sharpe.

Moyer, R. M., & Geoboo, S. (2016). Understanding local policy elites' perceptions on the benefits and risks associated with high-voltage power line installations in the state of Arkansas. *Risk Analysis*, *36*(10), 1983–1999.

Moyer, R. M., & Geoboo, S. (2019). Cultural predispositions, specific affective feelings, and benefit–risk perceptions: explicating local policy elites' perceived utility of high voltage power line installations. *Journal of Risk Research*, *22*(4), 416–431.

Song, G. (2014). Understanding public perceptions of benefits and risks of childhood vaccinations in the United States. *Risk Analysis*, *34*(3), 541–555.

Suliman, A., & Pietsch, B. (2021). Covid-19 latest updates: Coronavirus vaccinations are increasing. So are U.S. cases. *Washington Post*. https://www.washingtonpost.com/nation/2021/08/02/coronavirus-covid-live-updates-us/

Tansey, J., & O'riordan, T. (1999). Cultural theory and risk: A review. *Health, Risk & Society*, *1*(1), 71–90.

Tumlison, C., & Song, G. (2019). Cultural values, trust, and benefit-risk perceptions of hydraulic fracturing: A comparative analysis of policy elites and the general public. *Risk Analysis*, *39*(3), 511–534.

Tumlison, C., Moyer, R. M., & Song, G. (2017). The origin and role of trust in local policy elites' perceptions of high-voltage power line installations in the state of Arkansas. *Risk Analysis*, *37*(5), 1018–1036.

Wildavsky, A., & Dake, K. (1990). Theories of risk perception: Who fears what and why? *Daedalus*, *119*(4), 44–60.

Zaller, J. (1992). *The nature and origins of mass opinion*. Cambridge University Press.

AUTHOR BIOGRAPHIES

Rachael M. Moyer is a Visiting Assistant Professor in the Department of Political Science at the University of Arkansas. Her research examines the psycho-social foundations of risk and policy decision-making.

Geoboo Song is an Associate Professor of Political Science (PLSC), Public Policy (PUBP), and Statistics and Analytics (STAN) at the University of Arkansas. He has been involved in scholarly research that holds theoretical, practical, and methodological implications for advancing public policy studies.

Natalie Jackson, PhD, is Director of Research at the Public Religion Research Institute (PRRI).

How to cite this article: Moyer, R. M., Song, G., & Jackson, N. (2021). Face coverings during the pandemic? *World Med. & Health Policy*, 13, 616–633. https://doi.org/10.1002/wmh3.485

APPENDIX

Additional survey methodology information

NORC's AmeriSpeak Panel provides a representative panel of civilian, noninstitutional adults (age 18 and over) living in the United States. The sample frame was developed using a two-stage probability sample design to create a representative sample of households in the United States. The first stage uses National Frame Areas (NFAs), geographic areas that have a population of at least 10,000 people. The National Sample Frame contains almost three million households and includes 80,000 rural households. Additionally, NORC oversampled housing units in segments (Census tracts or block groups) that include hard-to-reach populations, including young adults, Hispanics, and African Americans. Panel recruitment proceeded in two stages. First, a mail solicitation is sent to a randomly selected household along with follow-up telephone calls and email solicitations if necessary. In the second stage, households that have not responded to the initial inquiry or follow-ups receive an enhanced incentive offer and a personal visit from NORC field interviewers. Members typically participate in panel surveys two or three times a month.

The weighting is accomplished in two separate stages. First, panel base weights are calculated for every household based on the probability of selection from the NORC National Frame, the sampling frame that is used to sample housing units for AmeriSpeak. Household-level weights are then assigned to each eligible adult in every recruited household. In the second stage, sample demographics are balanced to match target population parameters for gender, age, education, race and Hispanic ethnicity, and division (U.S. Census definitions), housing type, and telephone usage. The telephone usage parameter came from an analysis of the National Health Interview Survey. All other weighting parameters are derived from an analysis of the U.S. Census Bureau's Current Population Survey.

The sample weighting is accomplished using an iterative proportional fitting (IFP) process that simultaneously balances the distributions of all variables. Weights were trimmed to prevent individual interviews from having too much influence on the final results. The use of these weights in statistical analysis ensures that the demographic characteristics of the sample closely approximate the demographic characteristics of the target populations.

The margin of error for the survey is ±2.6 percentage points at the 95% level of confidence, which includes the design effect for the survey of 1.83. In addition to sampling error, surveys may also be subject to error or bias due to question wording, context and order effects.