TBM

Prevalence and predictors of early COVID-19 behavioral intentions in the United States

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Abstract

Despite early warnings and calls for action, COVID-19 infection rates continue to climb in many areas of the United States. The current study examined participants' reported likelihood of engaging in eight behaviors designated by the Centers for Disease Control and Prevention as critical for the prevention of COVID-19 at the outset of the epidemic. Self-efficacy, perceived threat, and internal and external health locus of control were explored as potential predictors of those behaviors. In addition, demographic and contextual factors, such as age, gender, political identity, and whether or not participants were currently living under a quarantine advisory, were recorded for analysis. Overall, participants reported high engagement with the prevention behaviors. Higher levels of self-efficacy, perceived severity of the illness, and external locus of control in regard to medical professionals were all positively associated with plans to take the recommended precautions. Based on the results, it appears that messaging regarding COVID-19 prevention may be particularly effective when it focuses on the high risk of the illness, the ease with which the prevention behaviors can be taken, and a reassurance that the medical establishment has individuals' best health in mind when it makes its specific recommendations.

While numerous countries have succeeded in reducing the spread of COVID-19, the number of new cases in the United States remains high, even relative to other populations also heavily impacted by the disease [1]. Although it would be difficult to pinpoint a single cause or explanation for the epidemic's course in the USA, at the heart of its spread, like the spread of all infectious diseases, is noncompliance with preventative measures. The current research served as a preliminary exploration of the prevalence and predictors of eight COVID-19 prevention behaviors. A brief survey was sent out at the end of March 2020 to 350 U.S. residents in order to assess the likelihood of their engaging in various prevention behaviors recommended at that time and several related psychosocial factors. The psychological factors assessed included health locus of control (HLOC) beliefs, self-efficacy, and perceived threat. In addition, a handful of demographic and contextual factors, such as age, gender, political identity, and whether or not they were working outside the home or were currently living under a quarantine advisory, were recorded for examination.

Keywords

COVID-19, Coronavirus, Face masks, Social distancing, Prevention

PSYCHOSOCIAL PREDICTORS

Numerous complimentary models have been established to explain people's health behavior. These

Implications

Practice: Intervention messaging should focus on the severity of COVID-19 and the relative ease of engaging in preventative methods.

Policy: Policymakers who want to increase compliance with COVID-19 prevention methods should take note that the epidemic's effect on public schooling may be a particularly pronounced signal toward the need for prevention efforts.

Research: The roles of self-efficacy, perceived threat, and locus of control beliefs on prevention behavior are worthy of consideration for further exploration as the epidemic evolves.

frameworks propose a structure for the relationship between various health beliefs and allow researchers to test the strength of their individual and combined predictive power. For example, the Health Belief Model [2] illustrates the influence of perceived threats, presumed benefits, and expected benefits of the behavior. Such models provide a valuable starting point for identifying how perceptions influence health behavior, including actions known to prevent the spread of an infectious disease.

One conceptual model that has been shown to be predictive of health behavior is self-efficacy, which refers to a person's belief about their ability to regulate a given action to achieve a specific behavioral outcome [3]. For example, someone with high self-efficacy about face mask use would be highly confident that they could successfully and confidently wear a face mask in public. Self-efficacy was chosen for the current study because of its well-established relationship with intentions to engage in disease prevention (e.g., condom use and receiving vaccinations) for infectious illnesses, such as HIV/AIDS [3, 4], Human papillomavirus (HPV) [5], Middle East respiratory syndrome (MERS) [6], parasitic disease [7], Severe acute respiratory syndrome (SARS) [8], and Zika [9]. Notably relevant in a pre-COVID-19 simulation of the spread of a generic respiratory

illness, self-efficacy was a key predictor of intentions to engage in social distancing [10].

Perceived threat has similarly been found to be positively associated with infectious disease prevention efforts, including COVID-19 behaviors [11−13]. Also known as perceived risk, perceived threat includes the concepts of perceived susceptibility (how likely people feel that they will become infected) and perceived severity (the belief of how harmful the effects of infection will be) [2]. In studies of both adolescents and older adults, perceived threat of SARS has been linked to increased prevention behaviors, such as washing hands and covering one's nose and mouth when sneezing and coughing [8, 14]. Perceived susceptibility has also been shown to predict acceptability of an HPV vaccine [5], and receiving MERS-related health information was shown to increase perceived threat of MERS, which, in turn, increased intentions toward hand washing and covering coughs [6].

HLOC theory was selected as the third factor potentially applicable to engagement in the COVID-19 prevention behavior. Locus of control beliefs focus on the specific internal (i.e., the role of one's own actions) and external (fate, powerful others, and God) determinants of one's health. Generally, having a high internal locus of control has been shown to be positively related to engaging in health-enhancing behaviors, whereas high external locus of control fate has been associated with reduced participation in such actions [15]. In regard to infectious disease, higher internal locus of control and a lower external locus of control has both been shown to predict lower risk taking both among tourists during an avian influenza epidemic [16] and gay men engaging in unprotected anal sex [17] and greater compliance with recommended childhood vaccinations [18]. Of particular interest, the external powerful others subcomponent includes the role of doctors and other medical professionals in one's health. Previous research has shown that trust in science was correlated with compliance with COVID-19 guidelines [19], though believing that medical professionals have an important role in reduced COVID-19 exposure has yet to be examined specifically.

THE CURRENT STUDY

The current study assessed participants' likelihood of engaging in eight COVID-19 prevention behaviors, as well as a number of psychological and social predictors selected for an early investigation of COVID-19 attitudes and behaviors, with a deliberate focus on keeping the survey brief and participants' attention focused. Although this survey was exploratory in nature, there were a few a priori hypotheses that guided the design of the study and subsequent analyses. We predicted positive associations between both self-efficacy and perceived threat with likely participation in the COVID-19 behaviors. In addition, in

parallel with previous research [19], it was expected that having a stronger external powerful others locus of control would be associated with prevention behavior. There were no specific hypotheses in regard to demographic variables and risk management behavior, though some studies have shown a positive relationship between holding a more politically conservative ideology and reduced participation in social distancing efforts [20, 21].

METHODS

Participants

On the date of recruitment, March 31, 2020, there were 163,539 reported cases of COVID-19 and a total of 2,860 COVID-19-related deaths in the United States [22]. COVID-19 was present in each of the 50 U.S. states and nearly all of its territories. Over a 1 h period (5:40 to 6:38 pm EST), 354 respondents of U.S. nationality were recruited through the online participant-gathering outfit Prolific [23]. Of the original total, 15 (4.2%) participants failed the attention check item "As an attention check, please select the option 'not very likely' below," which was placed toward the end of the survey (the 32nd out of 46 total items) and were removed from the study. Of the remaining 339 participants, 50.4% reported their gender as cisfemale, 45.7% as cismale, 0.6% as transgender female, 1.2% as transgender male, 1.8% as nonbinary, and 0.3% as "other." Participants' ages ranged from 18 to 72 with a mean age of 31.89 (standard deviation [SD] = 11.93). The most frequent education level was holding a college degree (46.9%) with 0.6% reporting being an elementary graduate, 0.3% reporting schooling up to the 10th grade, 35.7% being a high school graduate, and 16.5% holding a postgraduate or professional degree. The sample tended to be somewhat liberal (M = 3.54, SD = 2.07 on a scale from 1 = "extremely liberal" to 10 = "extremely conservative") and self-identified as less religious (M = 3.04, SD = 2.51 on a scale from 1 = "not at all religious" to 10 = "extremely religious").

In regard to their relationship with the COVID-19 virus, 7.1% reported that they had been officially tested and diagnosed with COVID-19 with 10.0% stating that they recently or currently were experiencing symptoms. Only 4.7% stated that they had recently been in close proximity to someone who was recently diagnosed with COVID-19. Only a handful of participants (7.4%) were actively working as health care providers or staff. There were 17.7% that labeled themselves as working in an "essential" field that required work outside the home. The large majority were living in an area of the United States where a "shelter in place" or "quarantine order or advisory" had been issued (79.6%) and lived in towns where the public schools were closed due to COVID-19 (97.3%). Including themselves, the number of people living in the participant's residences ranged from 1 to 10 (M = 2.99, SD = 1.41).

Materials

Health locus of control

Two separate scales were used to assess participants' HLOC beliefs. The first set of items measured a general form of multidimensional HLOC (MHLOC) using shortened subscales that represented its four dimensions: internal (e.g., "I am directly responsible for my health"), external chance (e.g., "It seems that my health is greatly influences by accidental happenings"), external powerful others (e.g., "Other people play a big part in whether I stay healthy or become sick"), and external God (e.g., "Most things that affect my health happen because of God") [24–26].

In addition, a COVID-19-specific HLOC scale was developed for the study. Following a previously established model, each dimension of MHLOC was mapped onto the disease itself [17]. For each subscale, two items each assessed locus of control as internal (e.g., "If I take the right steps, I can avoid becoming infected with the coronavirus"), external chance, (e.g., "Even if I take care to avoid the coronavirus, it's easy to get it"), external powerful others, (e.g., "Other people play are big part in whether I get the coronavirus"), and external God (e.g., "Whether or not I become sick with the coronavirus is up to God").

COVID-19 behaviors

Eight behaviors that could be used to reduce one's susceptibility to and the spread of COVID-19 were selected based on the existing recommendations from the Centers for Disease Control and Prevention (CDC) [27]. Participants were asked to rate the likelihood that they would participate in these actions over the current week from 1 = "very unlikely" to 5 = "very likely." The behaviors included: avoiding crowded areas, washing hands with soap and water for at least 20 s, using hand sanitizer, staying home if feeling sick, cleaning frequently touched surfaces, covering their coughs and sneezes with a tissue or elbow, limiting close contact with others who they do not currently reside with as much as possible by about 6 ft, and wearing a face mask. It is important to note, however, that the specific recommendation to wear a face covering by the CDC was not widely publicized until 3 days after the current data collection [28].

Self-efficacy and perceived threat

After rating their likelihood of engaging in the eight preventative behaviors described above, participants were asked to respond to a series of single-item measures that represented their self-efficacy, "How confident are you that you will be able to engage in the preventative behaviors listed in the previous question (e.g., wash hands, avoid crowded areas)?" and their perceived threat, including both their perceived susceptibility, "How likely do you think it is that you will eventually become infected with the coronavirus?" and the perceived severity of the illness "If you do become infected with the coronavirus, how damaging do you believe it will be to your health?" Each of these items was rated on a five-point Likert-type scale where lower numbers represented less of that belief (e.g., "not at all likely") and higher numbers corresponded to a stronger belief (e.g., "extremely likely").

COVID-19 experiences

Single items assessed whether participants had been tested and diagnosed with COVID-19 and if they had recently been experiencing symptoms. Other questions inquired as to whether or not they worked as a health care provider (including support staff), if they were working in an "essential profession," if they were living under a shelter-in-place or quarantine advisory, and if the public schools were closed due to COVID-19 in the town or city where they lived. All questions were followed by a "No/Yes" response option.

Demographics

The survey ended by asking participants about their age, gender identity, the number of people in their place of residence, their education level, their political leanings, and religiosity. Due to an oversight, information on race and ethnicity were not collected, therefore, we cannot ensure that the sample was representative along that dimension.

Procedure

After receiving the institutional review board approval, the online survey "Beliefs about the coronavirus and staying healthy" designed using Qualtrics was posted to the Prolific.co website. Prescreening required all participants to be of U.S. nationality and to agree to complete the survey on a computer or tablet device but not a mobile phone. After the informed consent process, participants took an average of 5.29 min (SD = 4.21) to complete the survey. At the end of the survey, participants were given a more detailed description of the study's goals and were directed to the CDC "Protect Yourself" website [27] for additional information on preventing COVID-19. Respondents were then paid U.S. $1.50 for their participation.

Analyses

All analyses were performed using SPSS 24 statistical software. Descriptive statistics were calculated for all variables and a one-way repeated measures analysis of variance (ANOVA) was used to examine potential differences in the prevalence of the eight COVID-19 behaviors. Next, a Pearson correlation was conducted between the participants' health beliefs and the prevention behaviors in order to examine the relationship between the various health

beliefs and participants' estimates of engaging in the prevention behaviors. The variables that were significantly correlated with prevention behavior were significantly intercorrelated. Therefore, we conducted a linear regression analysis in which all four variables were entered into the regression equation on the same step predicting prevention behaviors in order to determine which variables were most strongly predictive. Demographic covariates were not included in this regression because there were no significant relationships found for demographic variables. Separately, in order to determine whether there were significant differences in the likelihood of engaging in prevention behaviors based on COVID-19 experiences, an independent samples t-test was run. Finally, in order to explore whether demographic variables were related to prevention behaviors, a one-way ANOVA comparing gender identity was conducted, and a Pearson correlation was conducted between all other demographic variables.

RESULTS

Prevalence

Average ratings for participants' likelihood of participating in each of the eight COVID-19 prevention behaviors are depicted in Table 1. Generally, ratings were very high, with an overall average ($M = 4.56$, $SD = 0.45$) close to the top of the five-point scale. The sole exception was wearing a face mask ($M = 2.28$, $SD = 1.53$), which, as noted earlier, was not yet a clear and specific recommendation by the CDC at the time of the data collection. A one-way repeated measures ANOVA confirmed that wearing a face mask was reported as significantly less likely than each of the other seven behaviors (F (1, 334) = 495.80, $p < .001$).

Psychosocial predictors

Table 2 displays the associations between the various participants' health beliefs and their average reported likelihood of engaging in the prevention behaviors. Of the 11 factors recorded,

Table 1 | Mean and standard deviations (SDs) for the likelihood of participating in the eight COVID-19 prevention behaviors

	M	SD
Avoiding crowded areas	4.86	0.55
Washing hands	4.82	0.54
Using hand sanitizer	4.26	1.21
Staying home if sick	4.86	0.49
Cleaning surfaces	4.39	0.92
Covering coughs and sneezes	4.87	0.44
Limiting close contact	4.75	0.59
Wearing a face mask	2.28	1.53
Overall average	4.46	0.45

Each behavior was rated on a five-point scale from 1 = "very unlikely" to 5 = "very likely."

Table 2 | Pearson correlations between behavioral intentions and health beliefs

Variable	M (SD)	1	2	3	4	5	6	7	8	9	10	11
1. Preventative behaviors	4.46 (0.45)	–										
2. HLOC internal	3.33 (0.66)	.08	–									
3. HLOC ext-chance	2.86 (0.72)	-.05	-.06	–								
4. HLOC ext-powerful others	3.12 (0.79)	.15**	.09	.07	–							
5. HLOC ext-God	1.82 (1.11)	.06	.10	.15**	.00	–						
6. C-HLOC internal	3.51 (0.83)	.09	.30***	-.17**	.15**	-.01	–					
7. C-HLOC ext-chance	2.84 (0.81)	.08	-.01	.32***	.07	.29***	-.17**	–				
8. C-HLOC ext-pow. others	3.53 (0.83)	.11*	.14**	.15**	.47***	.00	.17**	.16**	–			
9. C-HLOC ext-God	1.68 (1.05)	.07	.14*	.15**	.04	.92***	-.01	.31***	.06	–		
10. Self-efficacy	4.64 (0.54)	.24***	.09	-.18***	-.03	-.08	.16**	-.10	.09	-.08	–	
11. Perceived susceptibility	2.72 (0.83)	.12*	-.07	.11*	.14*	-.03	-.12*	.31***	.13*	-.01	.03	–
12. Perceived severity	2.96 (0.94)	.22***	-.05	.01	.18**	.11*	.00	.15**	.06	.13*	-.04	.21***

C-HLOC health locus of control scale; HLOC health locus of control.
*$p < .05$, **$p < .01$, ***$p < .001$.

4 were significantly correlated with those planning to partake in the behaviors. These factors included MHLOC external powerful others ($r = .15$, $p = .007$), self-efficacy ($r = .24$, $p < .001$), perceived susceptibility ($r = .12$, $p = .029$), and perceived severity ($r = .22$, $p < .001$). As these four concepts were intercorrelated, a regression analysis was conducted to determine the unique contributions of each variable. Combined, the four factors significantly predicted average likelihood of participating in the behaviors, $R^2 = .13$, $F(333) = 11.98$, $p < .001$. More specifically, MHLOC external others ($\beta = .11$, $t(333) = 2.04$, $p = .042$), self-efficacy ($\beta = .25$, $t(333) = 4.82$, $p < .001$), and perceived severity ($\beta = .20$, $t(333) = 3.81$, $p < .001$) remained statistically significant predictors, while perceived susceptibility ($\beta = .06$, $t(333) = 1.09$, $p = .275$) became no longer significant.

COVID-19 experiences and demographics

Of the various COVID-19 social experiences, the only significant difference in likelihood of engaging in the prevention behaviors was whether public schools where the participants lived were closed ($M = 4.46$, $SD = 0.44$) or not ($M = 4.10$, $SD = 0.44$; $t(336) = 2.46$, $p = .015$). However, it should be noted that only nine participants reported schools open, compared to 329 that reported them closed. All other potential factors, including having been officially diagnosed with COVID-19 ($t(336) = 0.45$, $p = .653$), recently experiencing symptoms ($t(336) = 1.05$, $p = .296$), having been in close proximity with someone who was diagnosed ($t(336) = 0.62$, $p = .533$), being a health care provider ($t(336) = 0.57$, $p = .569$), being an essential worker ($t(336) = 0.57$, $p = .568$), and having a quarantine advisory ($t(336) = 0.62$, $p = .537$), showed no significant differences in behavior.

No demographic factors were significantly associated with the degree to which participants anticipated performing the prevention behaviors. There was no effect of gender identity $F(332) = 0.61$, $p = .691$. Nor were there any significant correlations between behavior and age ($r = .06$, $p = .281$), education level ($r = .01$, $p = .868$), number of people in the shared household ($r = .10$, $p = .068$), political ideology ($r = -.01$, $p = .858$), or religiosity ($r = .07$, $p = .225$).

DISCUSSION

Overall, our findings revealed high engagement with seven of the eight recorded prevention behaviors and strong support for a relationship between health beliefs and likelihood of engaging in COVID-19 risk management. Although mask wearing was significantly less likely than the other behaviors, it must be noted again that this behavior was not widely recommended at the specific time of the data collection [28]. Of the various health beliefs, self-efficacy,

perceived severity, and external locus of control (powerful others) were each distinctly able to predict compliance with prevention guidelines despite the relatively high anticipated compliance with the behavior guidelines. These results are consistent with previous research that has shown both self-efficacy and perceived threat as key predictors of taking actions, such as wearing face masks, to prevent SARS [8]. Previous research has generally shown an ambiguous relationship with external locus of control-powerful others and health behavior. Although no previous research could be found that established a specific relationship between locus of control-powerful others and infectious disease prevention behavior, our findings correspond with the earlier findings that trust in medical and scientific communities can lead individuals to follow prevention guidelines more closely [15,19].

Only one of the selected demographic and contextual factors chosen for the study was significantly associated with COVID-19 behavior. Although the overall prevalence was very low, those who did not live in places where public schools were canceled were, not surprisingly, less likely to take precautionary actions. Interestingly, other variables, such as being a medical professional or working outside the home as an essential worker, were not associated with differences in behavior. Our findings also did not verify the relationship between preventing behavior and political views or degree of religiosity that had been shown previously [20, 21]. However, it should be noted that preventative behaviors, such as social distancing and wearing face masks, were not as hotly politicized at the time of the data collection compared to the months that followed [29, 30] and at least one other study has found no such relationship [13].

Limitations

Given the exploratory nature of this research, these findings must be viewed within the context of its limitations. The behaviors recorded here were self-reported likelihoods of engaging in each action. It is most likely that actual compliance with the COVID-19 guidelines was much lower. To that point, while a previous simulation of an infectious disease did establish a relationship between health beliefs and intention to engage in social distancing, it did not significantly predict actual social distancing behavior itself [10]. While intentions remain highly useful for understanding prevention behavior, their relationship with actual behavior can vary widely depending on other factors, such as self-efficacy beliefs [31].

Other limitations included the specific timing and brevity of the survey. While an examination of early compliance behavior can be viewed as highly valuable for stemming the spread of an infectious disease, it is clear that people's behavioral intentions

will vary over the course of an epidemic. Therefore, it is likely that these results are only representative of people's behavior as the epidemic unfolded in the USA. For example, at the time of the data collection, restrictive policies, such as school closures, were widespread. As such, the number of respondents who were *not* living under these orders was minimal ($n = 9$) and any generalizations based off of the comparisons reported here should be made cautiously. Given the short, focused nature of the survey, other likely predictors of health behavior were not researched. While factors such as beliefs about the efficacy of the behavior or differences or social norms likely also contribute to preventative behavior, they were left unexplored by this research. Similarly, no race/ethnicity data were collected and, therefore, we cannot conclude that our sample was representative of all American beliefs and behavior. Consequently, race was not able to be examined as a potential predictor here. With the disproportionate effects of COVID-19 on African Americans, Latinx Americans, Native Americans, and rural populations, future research must specifically address the experiences of these groups to better understand their potentially unique patterns of health beliefs and behavioral intentions.

CONCLUSIONS

Through a brief but efficient survey, we were able to establish that, in late March 2020, residents of the United States believed that they were highly likely to participate in most of the COVID-19 behavioral guidelines. More so, we were able to establish that the health beliefs examined here each played a role in determining the likelihood of engaging with those behaviors. We believe that this research provides a helpful snapshot of health beliefs and behavioral perceptions at the outset of the epidemic and hope that it will serve as a valuable comparison point moving forward. Future research should further investigate these health beliefs as the course of the epidemic changes and as behavioral guidelines evolve. Nevertheless, these preliminary findings suggest that health officials may want to emphasize the potential severity of COVID-19 followed by messaging that demonstrates the relative ease of participating in these preventative behaviors. It may also be that public school closings are a clearer signal of epidemic severity than general quarantine and shelter-in-place advisories. As behavior change remains the only existing method to stem the spread of COVID-19, increasing our understanding of its causes and how to shape them remains vital.

Compliance with Ethical Standards

Authors' Contributions:

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. These procedures were approved by M.B.B.'s college institutional review board before any data collection took place. This article does not contain any studies with animals performed by any of the authors.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

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