




Assessing Attitudes Toward COVID-19 Prevention: Defining Two Attitudes Crucial for Understanding Systemic and Social Variables Associated with Disparities

Alannah Shelby Rivers¹ · Mona Clifton¹ · Alexandra E. Pizzuto¹ · Ashley Buchanan¹ · Keith Sanford¹ 

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Abstract

This study tested a conceptual model identifying two distinct types of attitudes people may have toward following recommendations to prevent COVID-19. These attitudes were expected to be important for understanding types of systemic and social variables associated with health disparities such as racial discrimination, residential environment, lack of healthcare access, and negative healthcare experiences. The conceptual model was drawn from previous work examining adherence to medical recommendations that identified two distinct and consequential attitudes that influence behavior: perceived benefit (believing recommendations are effective and necessary) and perceived burden (experiencing recommendations as unpleasant or difficult). Approximately equal proportions of Black and White individuals living in the USA ($N = 194$) were recruited to complete an online survey. A psychometric analysis indicated that perceived benefit and burden attitudes were two distinct and meaningful dimensions that could be assessed with high validity, and scales demonstrated measurement invariance across Black and White groups. In correlation analyses, benefit and burden attitudes were robustly associated with neighborhood violence, healthcare access, and healthcare experiences (but not with experiences of discrimination), and all these associations remained significant after accounting for subjective stress and political affiliation. These findings have implications for increasing compliance to public health recommendations and addressing health disparities.

Keywords Adherence · Attitudes · COVID-19 · Health disparities

Introduction

Although healthcare authorities like the Center for Disease Control have issued recommendations to reduce the risk of infection and spread of COVID-19, many people fail to follow these recommendations [1–3]. Because attitudes often shape behavior, a crucial first step in addressing this issue to understand peoples' attitudes toward public health recommendations. Drawing from research investigating adherence to medical treatments [4], there may be two essential, distinct types of attitudes that can be measured with high precision: perceived benefit (belief that following recommendations is beneficial, essential, or worthwhile) and perceived burden (belief that following recommendations is burdensome, unpleasant, or difficult). An important characteristic of these attitudes is that

they may be influenced by life experience and therefore associated with systemic and social factors that are predictive of health disparities, including race and exposure to discrimination [5, 6], living in disenfranchised communities [7, 8], poor access to healthcare [9–11], and negative healthcare experiences [10–13].

There is growing evidence of substantial racial and socio-economic disparities in rates of COVID infection and death [14–18], and as noted in a recent editorial published by a large panel of health psychology researchers [19], there is a pressing need for studies clarifying ways that these disparities may be associated with psychosocial variables. In this regard, research on attitudes may be especially important. First, attitudes are likely to be shaped by systemic and social variables related to racism, community quality, healthcare access, and healthcare experience. Second, attitudes could be important targets for intervention. It may be essential to isolate key types of attitudes, to develop valid measures of those attitudes, and to delineate the antecedents of those attitudes to develop effective public policy for improving behavior related to COVID-19 prevention and to reduce disparities. The first steps are to

✉ Keith Sanford
Keith_Sanford@baylor.edu

¹ Department of Psychology and Neuroscience, Baylor University, Waco, TX, USA

determine how to assess attitudes, to establish whether perceived benefit and burden are two crucial and distinct attitudes that can be measured precisely, and if so, to clarify the extent to which they are correlated with key systemic and social variables.

Previous research investigating attitudes that people hold toward adherence to medical treatment plans provides a useful framework for identifying key attitudes toward compliance with public health recommendations. Generally, attitudes are important because they are predictive of adherence behavior and they provide insight on why individuals may or may not be motivated to adhere to medical recommendations [20, 21]. Although researchers have investigated a wide range of different variables regarding adherence attitudes, including different types of beliefs, perceptions, and affective responses [21–24], a recent study found that these variables can be reduced to just two basic attitude dimensions regarding the perceived benefit and perceived burden of treatment [4]. These two dimensions are consistent with theoretical models of adherence attitudes [21, 25], and preliminary evidence suggests that such attitudes shape behavioral responses to COVID-19 [26–28].

Attitudes of perceived benefit and burden are especially valuable in treatment adherence research because they have a clear factor structure and can be measured with high precision. In a line of psychometric research, Sanford and Rivers [4] tested pools of items over several studies to identify items that were distinct, that loaded strongly and uniquely on expected factors, and that precisely discriminated between different levels of experience. This led to the development of an instrument called the Treatment Adherence Perception Questionnaire (TAPQ) [4]. Results from both confirmatory factor analysis and item response theory analysis with the TAPQ suggest that attitudes of perceived benefit and burden are distinct and non-combinable, that items are discriminative and reliable indicators of underlying attitudes, and that scales assessing these attitudes provide a high degree of precise information across a wide range of possible experiences. This psychometric work advances research by providing scales that have clear theoretical meaning and that are maximally sensitive to detecting important effects.

In a similar way, assessing attitudes of benefit and burden may provide a parsimonious and meaningful way to capture attitudes toward complying with public health recommendations. To gain a full picture of a person's attitudes toward following recommendations for reducing risk of COVID-19, it may be necessary and meaningful to assess both the extent to which a person believes recommendations are beneficial (effective and necessary) and the extent to which a person believes recommendations are burdensome (unpleasant, intrusive, or noxious). This possibility could be supported if the TAPQ [4] is first modified to assess attitudes toward complying with recommendations to reduce COVID-19 risk, and then

if research using this modified instrument replicates previous psychometric results. Specifically, items should produce two distinct, non-combinable factors (benefit and burden) with strong item loadings, scales should produce a high level of information across a wide range of responses, and individual items should have strong discrimination. Moreover, because there are important research questions regarding attitudinal differences or similarities across racial groups, the instrument needs to demonstrate measurement invariance across people identifying with different race groups. This will ensure that scores on the instrument can be meaningfully interpreted, that any observed group differences are not an artifact of differences in the ways that participants interpret items, and that any observed group similarities are not merely a consequence of poor scale sensitivity. As such, these results would clarify how best to assess attitudes toward public health recommendations and thereby provide a crucial foundation for research investigating ways that attitudes may contribute to health disparities.

If a valid measure of attitudes can be established, a key question is whether attitudes are associated with types of systemic and social variables related to racism, community quality, healthcare access, and healthcare experience. Emerging evidence suggests that responses to COVID-19 recommendations vary across racial and socioeconomic groups [1, 3, 29], and therefore, attitudes may vary across groups as well. Presumably, attitudes are shaped by life experiences and socialization processes; disadvantaged individuals may be more likely to be exposed to experiences and social situations that engender negative attitudes toward compliance with COVID-19 recommendations. This issue is important because understanding ways that systemic and social variables are (or are not) associated with attitudes toward health behavior could be a crucial component of understanding and addressing health disparities.

For example, it is possible that people will have more negative attitudes (perceiving less benefit and more burden) when they are exposed to systemic racism or racial discrimination. This is consistent with the fact that race and the experience of racism are associated with other negative health-related attitudes and behaviors, including a lack of trust in healthcare authorities and a lack of engagement in the healthcare system, and notably, these effects have been especially well documented for Black/African-American individuals [5, 6, 30–36]. However, it is not clear if this pattern will generalize to attitudes toward COVID-19 prevention, especially in light of recent studies finding that, compared to White individuals, Black individuals are more likely to report wearing a mask in response to the COVID-19 pandemic [37, 38], which is something that could suggest having more positive attitudes toward following recommendations and less susceptibility to anti-mask political views. Taken together, this raises questions regarding the ways in which variables involving race and exposure to racism are associated with attitudes.

Beyond variables involving race and racism, it is also possible that other types of systemic and social variables may be equally important, or more important, in predicting attitudes toward compliance with healthcare recommendations. First, people living in disenfranchised communities may be likely to develop negative attitudes; research on health disparities suggests that two especially important dimensions of community quality include the extent of violence occurring in the community and the extent of community cohesion [7, 8, 39, 40]. Second, the extent to which people lack access to healthcare is related to health behavior and attitudes [9, 41, 42], and thus, barriers to healthcare may also be associated with attitudes toward complying with public health recommendations. Third, negative healthcare experiences may be associated with attitudes; drawing from research on adherence to medical treatment plans, there is reason to expect that people will have more positive attitudes when they (a) experience better interpersonal alliances with practitioners and (b) experience less confusion over medical information after healthcare appointments [4, 43, 44].

In investigating the association between attitudes and these systemic and social variables, it is important to control for other individual-level variables that may also be associated with attitudes. For example, attitudes are likely to be correlated with feelings of general psychological stress. When people feel stressed, they make negative appraisals across many areas of perception and evaluation [45], and assessments of perceived stress are often correlated with assessments of response bias [46, 47]. Thus, it is important to demonstrate that associations between attitudes and systemic/social variables cannot be explained merely by a negative response bias produced by feelings of general stress. Attitudes are also likely to be correlated with political affiliation. A recent study suggested that political positioning is the single most consistent factor predicting adherence to public health policies to prevent spread of COVID-19 [48], with individuals identifying with the Republican party being uniquely non-adherent [49]. However, attitudes and their associations with systemic and social variables are expected to represent effects beyond solely political affiliation.

In sum, we expect perceived benefit and perceived burden to be two essential and meaningful dimensions of attitudes toward recommendations for reducing risk of COVID-19. Specifically, a factor analysis model should demonstrate two distinct, non-combinable factors with high loadings, with a good fit and invariance across racial groups, and scales should have excellent discrimination across a wide range of responses in item response theory analyses. Assuming this psychometric foundation can be established, we expect these two attitudes to be correlated with systemic and social variables related to racism, community quality, healthcare barriers, and healthcare experience, and we expect these associations to remain significant after controlling for perceived stress and Republican

political affiliation. Notably, to address questions regarding racial groups, it is necessary to obtain a sufficiently large sample for each included group. Because racial disparities regarding Black/African-American individuals have been well established in previous research, an efficient research strategy is first to compare Black/African-American individuals with White individuals.

Method

Participants and Procedure

Participants included 194 people recruited using services provided by CloudResearch [50] for screening workers seeking crowdsourced tasks to complete at Amazon Mechanical Turk. Procedures were used to include approximately equal numbers of people who identified as Black/African-American and non-Hispanic White. All participants completed an online survey and were compensated \$2.00. Data were collected between May and July 2020. Based on tables provided by Wolf and colleagues [51], this sample size is sufficient for providing adequate power, protection against bias, and solution propriety in 2-factor confirmatory factor analysis models when each factor has 5 indicators with an average loading of .65. Participants were included if they met inclusion criteria (located in the USA and identifying as either Black/African-American or non-Hispanic White/Caucasian), passed validity checks, and provided informed consent. Questions regarding inclusion criteria were embedded in a list of impossible foil items (e.g., “I enrolled in the Ball-Rexham Group medical insurance program then lost coverage when they went bankrupt”) and distractor filler items to draw attention from the true inclusion criteria. Participants were excluded if they endorsed any foil items (indicating dishonest responding), attempted to complete the screener more than once based on Mechanical Turk ID (indicating duplicate or dishonest responding), or failed validity check items (indicating inattentive responding). This study was declared exempt by the Baylor University Institutional Review Board due to the online survey methodology.

Measures

Attitudes Toward Recommendations to Reduce COVID-19 Risk Attitudes regarding perceived benefit and burden were assessed using a version of the TAPQ [4], adapted to focus on COVID-19 recommendations. Participants were first asked to consider a list of currently recommended actions for reducing COVID-19 risk and then respond to questions about those actions (a list of items is provided in Table 1). Items on each scale were summed to produce total scores. A 5-item Perceived Benefit scale had a possible score range of 5 to

Table 1 Confirmatory factor analysis loadings and discrimination values for items assessing perceived benefit and burden

Item	Item discrimination	Standardized factor loadings	
		Benefit	Burden
Compared to what an average person is likely to believe, how strong is your belief that the recommended actions for reducing COVID-19 risk will be beneficial if you do them? ¹	1.45	.65	
How much would you agree that doing the recommended actions can feel like a weight on your life? ²	1.56		.61
How much would you agree that doing the recommended actions for reducing COVID-19 risk can be annoying or bothersome for you? ²	2.77		.81
Thinking of the benefits for your health and the health of other people, what is the difference between doing all or none of the recommended actions? ³	2.34	.77	
Assuming you do the recommended actions for reducing COVID-19 risk, how effective do you think these actions are in accomplishing the things they are supposed to accomplish? ⁴	2.06	.72	
Can you think of things that you do not like about following the recommended actions for reducing COVID-19 risk? ⁵	1.22		.56
Pick the item that best describes how much you think the recommended actions for reducing COVID-19 risk are beneficial for your health or the health of other people. ⁶	2.43	.79	
Do you feel like the recommended actions for reducing COVID-19 risk are a hassle or a burden? ⁷	2.28		.73
How confident are you that the recommended actions are things that reduce the risk of COVID-19 when you do them? ⁸	2.14	.77	
Do you hate doing the recommended actions for reducing COVID-19 risk? ⁷	1.88		.78

¹ Rating scale: 1 = belief is weaker than average, 2 = belief is average, 3 = belief is slightly stronger than average, 4 = belief is stronger than average, 5 = belief is much stronger than average, 6 = belief is incredibly stronger than average

² Rating scale: 7 = strongly agree, 6 = agree, 5 = somewhat agree, 4 = neither agree nor disagree, 3 = somewhat disagree, 2 = disagree, 1 = strongly disagree

³ Rating scale: 1 = it makes no difference, 2 = it makes an incredibly small difference, 3 = it makes a small difference, 4 = it makes a moderate difference, 5 = it makes a large difference, 6 = it makes an incredibly large difference

⁴ Rating scale: 5 = tremendously effective, 4 = highly effective, 3 = moderately effective, 2 = a little bit effective, 1 = not effective

⁵ Rating scale: 1 = I can think of many things I do not like, 2 = I can think of a few things I do not like, 3 = I can think of one or two things I do not like, 4 = the only thing I might think of would be something very small, 5 = no, I cannot think of anything I do not like

⁶ Rating scale: 1 = not beneficial, 2 = somewhat beneficial, 3 = beneficial, 4 = highly beneficial, 5 = tremendously beneficial

⁷ Rating scale: 1 = completely feel this way, 2 = somewhat feel this way, 3 = might slightly feel this way, 4 = do not feel this way, 5 = definitely do not feel this way

⁸ Rating scale: 6 = 100%—absolutely certain, 5 = 90%—extremely confident, 4 = 75%—mostly confident, 3 = 50%—moderately confident, 2 = 25%—a little bit confident, 1 = 0%—not confident at all

28, with higher scores indicating more perceived benefit, and a Cronbach’s alpha of .81. A 5-item Perceived Burden scale had a possible score range of 5 to 29, with higher scores indicating more perceived burden, and a Cronbach’s alpha of .78.

Community Quality Community quality was assessed with the Neighborhood Violence and Neighborhood Cohesion subscales from the residential environment instrument by Echeverria and colleagues [52]. On the 4-item Neighborhood Violence scale, participants rated items like “During the past 6 months, was there a fight in your neighborhood in which a weapon was used?” on a scale ranging from 1 (never) to 4 (often). Total scores ranged from 4 to 16, with higher scores indicating more frequent violence. Cronbach’s alpha was .87. On the 4-item Neighborhood Cohesion scale, participants rated items like “People around here are willing to help their neighbors” on a scale ranging

from 1 (strongly disagree) to 5 (strongly agree). Total possible scores ranged from 4 to 20, with higher scores indicating greater cohesion. Cronbach’s alpha was .87.

Barriers to Healthcare Access Barriers to healthcare access were assessed using a scale created for this study. It included 14 items describing different barriers that may stop people from visiting a doctor when they are sick or due for a checkup (e.g., money, insurance, not having a doctor, transportation, work, childcare, wait times), and respondents rated the extent to which they experienced each barrier on a scale ranging from 1 (not true) to 4 (completely true). Total possible scores ranged from 14 to 56, with higher scores indicating more barriers to healthcare access. Cronbach’s alpha for this scale was .94.

Healthcare Experience The Alliance and Medical Confusion scales from the Medical Consultation Experience

Questionnaire [44] were used to assess healthcare experience. Participants were asked to recall a specific medical appointment they had during the previous year (i.e., during 2019) and rate their experience during that appointment, or if they did not have (or could not recall) an appointment, to rate what they would have expected to have experienced during an appointment. The 7-item Alliance scale included items regarding the extent to which respondents felt like part of a team with their practitioners and had good relationships with their practitioners, and it included reverse-scored items regarding the extent to which respondents experienced practitioners who were in a hurry or cool and distant. Total possible scores ranged from 7 to 39, with higher scores indicating greater alliance perceptions. The 5-item Medical Confusion scale included items regarding the extent to which people experienced confusion, had lingering questions, and felt poorly informed after medical appointments. Total possible scores ranged from 5 to 25, with higher possible scores indicating greater medical confusion. Preliminary analyses with this instrument found no significant interaction effects based on whether participants were rating actual experiences during specific medical appointments, or merely rating their expected experiences. Therefore, no distinctions were made between these groups in subsequent analyses with this instrument. Cronbach's alphas were .77 and .86 for Alliance and Medical Confusion, respectively.

Racial Discrimination The 9-item Everyday Discrimination Scale [53] was used to assess experiences with racial discrimination. Participants first rated the frequency of discrimination experiences, such as “You are treated with less courtesy than other people are” on a scale ranging from 0 (never) to 5 (almost every day). Then, for each endorsed experience, participants indicated whether they believed it was due to their race, and all items for which race was a believed cause for discrimination were summed to produce a total score. Total possible scores ranged from 0 to 45, with higher scores indicating more racial discrimination. Cronbach's alpha for this scale was .94.

General Perceived Stress The 10-item Perceived Stress Scale [54] was used to assess general stress. Participants rated items such as “In the last month, how often have you been upset because of something that happened unexpectedly?” on a scale ranging from 1 (never) to 5 (very often). Total possible scores ranged from 10 to 50, with higher scores indicating higher general distress. Cronbach's alpha for this scale was .89.

Demographics Participants answered questions regarding gender, age, race/ethnicity, education, income, and political views. Education and income were Likert-style items transformed into years and dollars, respectively. Republican political affiliation was measured with a single item, “Do you

identify yourself as a Republican?” coded “1” for “yes” and “0” for “no.”

Results

Sample Characteristics

The sample consisted of 194 individuals (56.7% male, 42.8% female, 0.5% non-binary), 51.5% Black/African-American and 48.5% non-Hispanic White. The average age was 37.78 years ($SD = 11.28$). The median income was \$55,000 and the median years of education were 16 years (equivalent to a four-year college degree).

Confirmatory Factor Analyses

To test the hypothesis that the perceived benefit and burden scales would form two distinct and meaningful factors, a two-factor confirmatory factor analysis was tested in the R package “lavaan” [55] using the diagonally weighted least squares estimator. Benefit and burden items were specified as loading on two separate factors, and factors were allowed to correlate. The model was expected to fit well according to a two-index criterion, $CFI > .95$, $SRMR < .09$ [56], and all item loadings were expected to be at least .55 (a level classified as “good” by Comrey and Lee [57]). The model fit well, $\chi^2(34) = 58.80$, $p = .005$, $CFI > .99$, $SRMR = .06$. As expected, all factor loadings were greater than .55, and they are listed in Table 1. Although benefit and burden shared a medium negative correlation ($r = -.43$, $p < .001$), the two factors were clearly not combinable. Specifically, an alternate unidimensional model fits both poorly, chi-square (35) = 195.63, $p < .001$, $CFI = .92$, $SRMR = .13$, and was significantly worse than the two-factor model, chi-square difference (1) = 67.45, $p < .001$.

Then, in accordance with recommendations for assessing measurement invariance with ordered-categorical data [58], the following measurement invariance models were tested between the Black and White participants: configural invariance (constraining only the factor structure to be the same across groups), metric invariance (constraining the loadings), and scalar invariance (constraining the loadings and thresholds). Because no Black participants endorsed the highest response options on two items (items 1 and 9 from Table 1), the top two response categories were combined for these items. All models fit well, including scalar model which provided the most stringent test of invariance ($\chi^2(91) = 76.59$, $p = .86$, $CFI > .99$, $SRMR = .08$). Consistent with the criteria suggested by Putnick and Bornstein [59], the decrease in CFI was negligible between models ($< .01$). Taken together, these results support the two-factor structure, suggest that factors are distinct, and support strict measurement invariance across Black and White participants.

Item Response Theory Analyses

To test the hypothesis that scales would have good discrimination across a wide range of responses, item response theory analyses were conducted using the R package “lrm” [60] with a graded response model for ordinal data [61]. Benefit and burden were tested separately, with the assumption that all items loading on each factor represent a single latent trait. Each scale was expected to provide a high level of information (at least 5, a value corresponding to .8 or “good” reliability) for a range of responses spanning one standard deviation below to one standard deviation above the mean [4]. Moreover, all items were expected to have discrimination of at least .65, a level defined as “moderate” by Baker [62].

Test information curves are found in Fig. 1. Benefit and burden both met the information criterion, with “good” information spanning standardized ranges of approximately -3 to 1.5 for benefit, and -2 to 2 for burden. Discrimination values are in Table 1. Using cutoffs suggested by Baker [62], all items had at least “moderate” discrimination, all but one item had “high” discrimination (above 1.35), and most items had “very high” discrimination (above 1.7). In sum, the two attitude scales provided good discrimination across a wide range of attitude levels, and this further suggests these scales are capturing meaningful constructs.

Associations with Systemic and Social Variables

To test hypothesized associations between variables, correlations were calculated between the two attitudes and a set of criterion variables that included race and racial discrimination, two types of community quality (neighborhood violence and cohesion), barriers to healthcare access, and two types of healthcare experience (patient-practitioner alliance, and medical confusion). Then, all correlations were re-estimated as partial correlations controlling for general stress and Republican party affiliation. These results are listed in Table 2. As might be expected, the two control variables

(i.e., general stress and Republican affiliation) were both associated with more negative attitudes (perceiving less benefit and more burden). None of the hypotheses regarding race and discrimination were supported, as all effects for these variables were non-significant. Similarly, results regarding neighborhood cohesion were mostly unsupported, with only one significant bivariate correlation and no significant partial correlations.

In contrast, results were quite robust for the remaining variables: neighborhood violence, barriers to healthcare access, alliance, and medical confusion. All these variables were correlated in expected directions with both the attitude variables (with correlations ranging from .23 to .43 in absolute magnitude), and all these effects remained significant in partial correlations controlling for general stress and Republican affiliation. Follow-up analyses with additional control variables of age, gender, income, and education were also tested, and all these effects remained significant in those analyses as well. In sum, the strongest correlates of attitudes included neighborhood violence and all the variables specifically relating to healthcare.

Discussion

The current study demonstrated that perceived benefit and perceived burden are two meaningful and distinct dimensions of attitude toward compliance with recommendations to reduce COVID-19 risk. It determined a brief, self-report instrument that demonstrates good validity and high discrimination for assessing these attitudes in samples of Black and White individuals. In addition, it demonstrated that these attitudes are strongly associated with social and systemic variables related to aspects of healthcare (such as barriers to healthcare, patient-practitioner alliance, and medical confusion) and also to neighborhood violence, but it found no evidence they are related to variables regarding race and exposure to racism. These results are important for future research and public

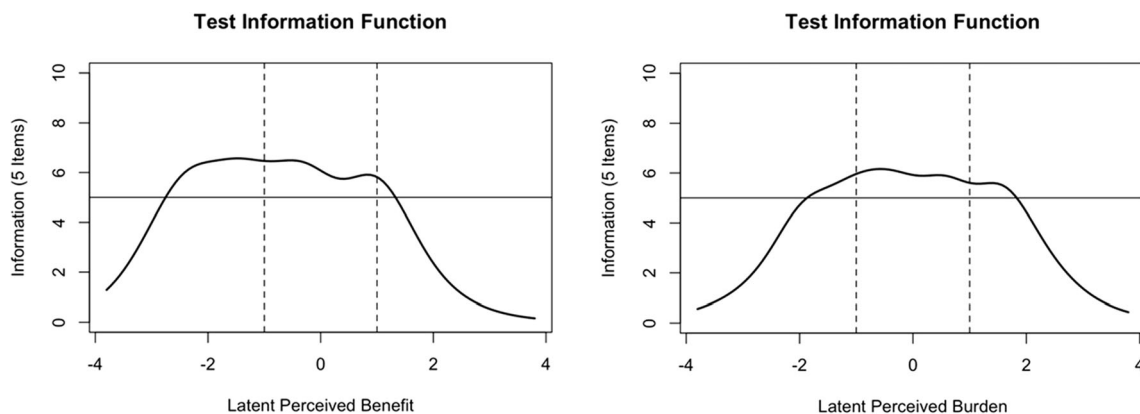


Fig. 1 Test information curves. Horizontal, solid lines indicate the point at which information equals 5 (equivalent to a reliability of .8). Vertical dashed lines indicate the range within which information was expected to exceed 5, spanning from -1 to 1 in standard deviation units

Table 2 Correlations and partial correlations

Variable	Correlations		Partial correlations	
	Perceived benefit	Perceived burden	Perceived benefit	Perceived burden
Key predictors				
Race	.00	.01	-.04	.02
Racial discrimination	-.01	.11	.02	.07
Neighborhood violence	-.33***	.31***	-.19*	.17*
Neighborhood cohesion	.22**	-.09	.15	-.05
Barriers to healthcare access	-.43***	.36***	-.30***	.17*
Alliance with a physician	.40***	-.23**	.30***	-.21*
Medical confusion	-.38***	.33***	-.31***	.24**
Control variables				
General stress	-.32***	.36***	—	—
Republican affiliation	-.18*	.29***	—	—

Partial correlations represent associations controlling for general stress and Republican affiliation

* $p < .05$, ** $p < .01$, *** $p < .001$

policy seeking to reduce COVID-19 risk and reduce disparities because they highlight the importance of attitudes regarding perceived benefit and burden, provide a method for assessing these attitudes, and provide clues about the types of variables that may shape them.

This study provided especially strong psychometric results supporting the use of an instrument for assessing attitudes of perceived benefit and burden. These two attitudes were derived from a line of research distilling key attitudes that medical patients have toward treatment plans [4], and the present study demonstrated that this model provides a parsimonious and valid framework for assessing and understanding attitudes toward public health recommendations. In line with previous research with medical patients [4], the present study demonstrated that the two attitudes formed two distinct, non-combinable factors, that all items were good indicators of their intended factors, and in item response theory analyses, that scales assessing both attitudes provide high discrimination across a wide range of attitude levels. The current study also extended previous findings by demonstrating strict measurement invariance between Black and White individuals. This type of psychometric foundation is crucial for progress in research investigating ways that attitudes may contribute to poor health outcomes in disadvantaged populations, because it demonstrates that the targeted attitudinal constructs are parsimonious and meaningful, it maximizes researchers' ability to detect effects, and it provides a method for obtaining valid information across diverse groups.

Despite collecting a sample that included nearly equal numbers of Black and White people, the current study failed to find evidence that variables regarding race or racial discrimination were related to attitudes. On the one hand, these results

seem to contradict a body of research showing differences between Black and White individuals in health-relevant attitudes [31–33, 35, 36], including attitudes toward COVID-19 [1, 3, 29], as well as research showing that racial discrimination, particularly for Black individuals, is associated with poor adherence to medical advice [5, 6, 30, 32, 34] and negative attitudes toward healthcare systems [33, 35, 36]. On the other hand, these null findings could make sense in light of other recent studies showing that Black individuals are more likely than White individuals to report wearing a mask [37, 38]. It is notable that both the present study and the studies regarding mask wearing were conducted before vaccines were available, and thus, they pertain to a set of recommendations that did not require engaging in any medical procedures and did not require overt trust in the healthcare system. This general pattern of results could suggest that this distinction is important; effects involving discrimination may tend to be strongest for attitudes toward behaviors that involve direct interaction with the healthcare system. Because the instrument used in this study demonstrated measurement invariance across race groups, and because it can be used to test any selected set of public health recommendations, it is an ideal instrument for use in future research investigating this possibility.

In contrast to the non-significant results for discrimination, other findings from this study were robust and they suggest a possibility that healthcare experience could be a key mechanism for explaining differences between privileged and disadvantaged groups in their attitudes toward following public health recommendations. First, results were consistent with a basic possibility that people in disadvantaged groups tend to have more negative attitudes. Specifically, this study found that living in neighborhoods with high violence was

associated with less perceived benefit and more perceived burden, which is similar to other research showing that disadvantaged individuals are more likely to have negative attitudes about medical recommendations [42] and specifically to report lower benefit for COVID-19 recommendations [63]. Second, and more importantly, this study produced especially robust results showing that variables involving aspects of healthcare experience were associated with the two attitudes. Both types of attitude correlated with experiencing barriers to healthcare, with patient-practitioner alliance, and with experiencing confusion after medical appointments, and all effects remained significant after controlling for perceived stress and Republican affiliation. These findings are in line with previous work regarding people with chronic medical conditions [4, 43, 44] as well as emerging research on COVID-19 [3]. Given previous research suggesting that disadvantaged groups tend to experience barriers to accessing necessary healthcare [9, 64, 65] and to report negative experiences with medical practitioners [10–13], it is possible that healthcare experience is a key factor shaping attitudes in disadvantaged groups. The especially robust results for the healthcare experience variables suggest that these variables are important, which in turn, raises a possibility that they may prove essential for understanding disparities.

An important limitation of this study involved the fact that, although it identified two essential and meaningful attitude dimensions, it did not rule out the possibility of other important dimensions, and it did not specifically test attitudes toward vaccines. Theoretically, perceived burden should capture concerns about vaccine side effects, whereas perceived benefit should capture concerns about vaccine safety [66] as well as beliefs in vaccine efficacy. This will be important to test as vaccines become a key component in fighting COVID-19. Also, we do not know the extent to which the self-reported variables in this study correspond with more objective measures of systemic and social variables or with actual compliance with recommendations. Additionally, direction of effects cannot be determined from this cross-sectional and correlational study, and the sample size was small and may not be representative of all White and Black individuals living in the USA. Lastly, although this study used stringent filtering procedures to increase data quality, the identity of the participants could not be verified in this online study.

This study provides a crucial foundation for future research on psychosocial predictors of disparities in COVID-19 outcomes, which is a pressing issue giving the evident racial and socioeconomic disparities in rates of COVID-19 infection and death [14–18]. The success of life-saving efforts to fight COVID-19 and to reduce disparities will depend on peoples' compliance with public health recommendations, and there is reason to expect that this compliance will be partially determined by peoples' attitudes [20, 25]. Drawing from theory of adherence to medical treatment plans [4], this study validated

a model of two key attitudes regarding perceived benefit and perceived burden. It produced promising psychometric results for an instrument used to measure these attitudes, and it highlighted the extent to which these attitudes may be associated with barriers to healthcare and healthcare experiences. This sets a foundation for future research investigating ways that attitudes might be influenced by healthcare variables and might prove essential for promoting behavior that serves to reduce disparities.

Author Contribution All authors contributed to the study conception and design. Material preparation, data collection, and data analysis were performed by Alannah Shelby Rivers, Mona Clifton, Alexandra Pizzuto, and Ashley Nguyen. All authors contributed to writing and revising the manuscript, and all read and approved the final version.

Data Availability Data and materials available on <https://osf.io/835je/>

Code Availability R code used for primary analyses available on <https://osf.io/835je/>

Declarations

Ethics Approval This study was declared exempt by the Baylor University Institutional Review Board due to the online survey methodology.

Consent to Participate All participants provided informed consent.

Consent for Publication All participants consented for their deidentified responses to be included in research publications.

Competing Interests The authors declare no competing interests.

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