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Self-reported influences on willingness to receive COVID-19 vaccines among physically ill, mentally ill, and healthy individuals

Laura Weiss Roberts^{*}, Jane Paik Kim, Maryam Rostami, Max Kasun, Bohye Kim

Stanford University School of Medicine, Department of Psychiatry and Behavioral Sciences, 401 Quarry Road, Palo Alto, CA, USA

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ABSTRACT

Objective: Individuals with mental and physical disorders have been disproportionately affected by adverse health outcomes due to the COVID-19 pandemic, and yet vaccine hesitancy persists despite clear evidence of health benefits. Therefore, our study explored factors influencing willingness to receive a COVID-19 vaccine. **Methods.** Individuals with mental illness (n = 332), physical illness (n = 331), and no health issues (n = 328) were recruited via Amazon Mechanical Turk. Participants rated willingness to obtain a fully approved COVID-19 vaccine or a vaccine approved only for experimental/emergency use and influences in six domains upon their views. We examined differences by health status. **Results.** Participants across groups were moderately willing to receive a COVID-19 vaccine. Perceived risk was negatively associated with willingness. Participants differentiated between vaccine risk by approval stage and were less willing to receive an experimental vaccine. Individuals with mental illness rated risk of both vaccines similarly to healthy individuals. Individuals with physical illness expressed less willingness to receive an experimental vaccine. Domain influences differently affected willingness by health status as well as by vaccine approval status. **Conclusions.** Our findings are reassuring regarding the ability of people with mental disorders to appreciate risk in medical decision-making and the ability of people of varied health backgrounds to distinguish between the benefits and risks of clinical care and research, refuting the prevailing notions of psychiatric exceptionalism and therapeutic misconception. Our findings shine a light on potential paths forward to support vaccine acceptance.

1. Introduction

COVID-19 conditions caused by SARS-CoV-2 virus have caused a global crisis, yielding immense disease burden across the world and worsening physical and mental health outcomes in the United States (Taquet et al., 2021; COVID-19 Mental Disorders Collaborators, 2021; Phillips and Williams, 2021). Despite widespread availability of several COVID-19 vaccines, vaccination rates in the United States remain relatively low: as of September 12, 2022, roughly one-fifth of adults have not received a vaccine for COVID-19, one-third are not considered fully vaccinated (Our World in Data, 2022). In the early days of the pandemic, many individuals in the U.S. expressed hesitancy to receive a vaccine against the virus (Khubchandani et al., 2021). Presently, despite clear evidence of COVID-19 vaccine and booster effectiveness, hesitancy persists, even among individuals at heightened risk of death and disability (Tsai et al., 2022).

Vaccine acceptance is important to ensuring the health of the public and protecting people with underlying health conditions who have

experienced disproportionate burdens associated with COVID-19 (Datta et al., 2022; Hampshire et al., 2022), including higher rates of mortality, new onset neuroinflammatory syndromes, and serious cognitive, psychological, and behavioral sequelae (Ali et al., 2020; Fonseca et al., 2020; Garg, 2020; Hariyanto et al., 2021; Kim et al., 2021; Kim and Bostwick, 2020; Nemani et al., 2021; Raifman and Raifman,). Infection with SARS-CoV-2 virus, moreover, may increase the size of the total population affected by psychiatric and neurological disorders, as one-third of COVID-19 survivors who sought treatment have since been diagnosed with such conditions, according to a large-scale analysis of electronic health records (Taquet et al., 2021).

Few studies to date have systematically examined influences on willingness to receive a COVID-19 vaccine across ill and healthy populations (Al-Amer et al., 2022). Early work suggests that health status (Ruiz and Bell, 2021) and stage of vaccine development (Guidry et al., 2021) appear to be salient factors. In a recent study of individuals in the United States, those with moderate or greater depressive symptoms were more likely than those without such symptoms to endorse

^{*} Corresponding author.

E-mail address: lwroberts.author@gmail.com (L.W. Roberts).

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misinformation statements about the risks of COVID-19 vaccines and were less likely to be vaccinated, although the study did not examine any causal link (Perlis et al., 2022). Signs and symptoms of some mental disorders, including cognitive issues, diminished sense of trust, and psychological distress, have been tied to hesitancy to engage in COVID-19 self-protective behaviors, but such interpretations remain speculative and anecdotal (Chang et al., 2020).

To address these gaps in our understanding, we undertook a novel study to 1) evaluate willingness to receive a COVID-19 vaccine by individuals with self-reported mental illness or physical illness or good health, and 2) evaluate influences on willingness to receive a vaccine that has been fully approved for routine care or a vaccine approved only for experimental or emergency use. We also sought to assess the association between perceived risk and willingness to receive the vaccine and to examine how the associations between influences and willingness to receive the vaccine vary by stage of vaccine approval (i.e., fully approved for routine clinical care or approved only for experimental or emergency use).

2. Methods

This study was approved by the IRB at Stanford University and was funded by the National Institutes of Health (R01MH114856). This study was part of a larger project examining attitudes toward biomedical innovation and influences on research decision-making.

2.1. Recruitment

Screening survey. Participants were recruited through Amazon Mechanical Turk (MTurk), an online crowdsourcing platform that enables data collection (Gillan and Daw, 2016). An advertisement was posted on the MTurk platform for a Human Intelligence Task (HIT) entitled “Health Information Survey”; the advertisement for this screening survey was generic and did not reference the eligibility criteria for the follow up survey. MTurk “Workers” living in the United States who were at least 18 years of age and had an approval rating of at least 95% were eligible to view this HIT and complete our 9-item screening survey, which consisted of demographic questions and the following health questions: 1) Have you been diagnosed with, or do you believe that you have a mental illness? [Yes/No; If ‘Yes’, please describe]; 2) Have you been diagnosed with, or do you believe that you have a substance use disorder? [Yes/No; If ‘Yes’, please describe]; 3) Have you been diagnosed with, or do you believe that you have a chronic physical illness? [Yes/No; If ‘Yes’, please describe]; 4) In general, how would you describe your overall health? [1 = Poor, 2 = Fair, 3 = Good, 4 = Very good, 5 = Excellent]. MTurk Workers were paid \$0.30 upon completion of the screening survey. In total, 8276 unique MTurk Workers completed the screening survey. Screening was completed between June 3, 2020 and September 9, 2020.

Main study survey. Following the screening survey, MTurk Workers were invited to complete the main study survey if they met the criteria for one of the following three groups: a) no self-reported illness (i.e., no mental illness, substance use disorder, or physical illness) and self-reported being in very good or excellent overall health (i.e., a response of 4 or greater to the question “In general, would you say your health is: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent); b) self-reported mental illness or substance use disorder; or c) a self-reported physical illness. Based on their responses to the screening survey, 5606 MTurk Workers were identified as eligible to participate in the main study survey. An advertisement for the main study survey was posted on MTurk on July 16, 2020 and closed on September 17, 2020 and was only visible to those who met the screening criteria. The health-related screening questions were repeated at the start of the main study survey; survey completers who provided inconsistent answers were excluded from the analytic cohort.

Analytic cohort. Eligible MTurk workers who opted to continue were

given a brief description of the survey and a weblink to the survey on the confidential and secure RedCap platform. Prior to taking the survey, MTurk workers read and provided (electronic) consent. Of the 1464 MTurk workers who consented to participate and completed the survey, 991 submitted consistent responses (i.e., self-reported health status was consistent between screening and full survey) and were included in the analysis. Our target recruitment was 333 individuals in each health status group. Survey completers were compensated \$8.

2.2. Survey instrument

The full survey was developed based on prior empirical ethics work (Roberts and Kim, 2014, 2017a, 2017b) and included items examining a number of health and research attitudes, as well as validated questionnaires that assessed general health, health literacy, cognitive functioning, and optimism/pessimism. The survey consisted of 475 items in total.

For this report, we analyzed the set of questions that examined participants’ responses to items regarding willingness to receive, and perceived risk of receiving, an FDA-approved COVID-19 vaccine in two separately described vaccine approval stages: i.e., 1) administered as part of routine clinical care (i.e., “a vaccine for COVID-19 if one became available”; i.e., “Routine care” stage); and 2) a COVID-19 vaccine approved by the FDA for emergency use and still under evaluation in experimental trials (i.e., “an experimental vaccine for COVID-19 that is being tested for effectiveness”; i.e., “Experimental/Emergency Use” stage). Participants were asked to rate on 7-point Likert scales: a) “How willing would you be to receive a vaccine [in stage]” (1 = “Not at all willing”; 4 = “Somewhat willing”; 7 = “Extremely willing”); and b) perceived risk of receiving the vaccine, i.e., “How risky would it be to receive a vaccine [in context]?” (1 = “Not at all risky”; 4 = “Somewhat risky”; 7 = “Extremely risky”).

Based on team consensus, we grouped 16 items into six major categories or domains: “likelihood of effectiveness”, “financial considerations”, “recommendations of physicians and public health officials”, “salience of personal risk”, “recommendations of loved ones”, and “employer considerations.” Participants were asked to rate, for each of a range of factors, how the factor would influence their willingness to receive the vaccine for COVID-19 (i.e., “Would you be more or less willing ... if ...” (1 = “Much less willing”; 4 = “Somewhat willing”; 7 = “Much more willing”).

2.3. Statistical analysis

Statistical analyses were performed using SPSS (version 26) and R (version 4.0.3). Descriptive statistics such as means and standard deviations were generated for continuous variables, and proportions were generated for categorical variables as appropriate. Differences regarding vaccine willingness and perceived risk among the three health status groups were analyzed using ANOVA and those between the two vaccine stages were evaluated using paired t-tests. Tukey’s honest significant difference tests were performed for post-hoc tests. For differences regarding influences across health status groups, repeated measures ANOVA were utilized. To compare influences on willingness between two stages of approval, one-way ANOVA was performed for each domain. The Holm-Bonferroni method was applied to p values from ANOVA to account for multiple testing.

For the secondary aim, covariate adjustment was performed to examine the relationship between willingness to receive a vaccine (primary outcomes) and perceived risk. We used Generalized Estimating Equations (GEE), a regression model for multivariate outcomes, with an exchangeable correlation structure and Gaussian link function. Covariates included perceived risk, vaccine approval status, health status, education level, and gender. Health status was a categorical variable across the three groups. Vaccine stage was coded as a binary variable (i.e., “Routine care” or “Experimental/Emergency Use”). To evaluate

associations between willingness to receive a vaccine and each influence by vaccine stage, we fit GEEs for each influence with interactions between each influence and the two stages, adjusting for gender and health status. The Holm-Bonferroni method was applied to p values for interaction terms to account for multiple testing.

3. Results

3.1. Participant characteristics

Of the 991 participants, 328 self-reported as having no illness, 332 self-reported as having a mental illness or substance use disorder, and 331 self-reported as having a physical illness. Half (49.8%) of the participants identified as women, and 49.6% identified as men. The majority of participants identified as white (81.4%) and not Hispanic or Latino (91.9%), and 8% identified as Black or African American and 5.8% as Asian. Many participants had obtained some college (32.2%) or a Bachelor's degree (41.8%) Participant groups defined by self-reported health status were imbalanced in terms of age, gender, race and ethnicity, and education, as shown in Table 1.

A comparative analysis of MTurk Workers who completed the main study survey (n = 1464) and those who were eligible but who did not access the survey in a timely fashion (n = 4090) was performed (see Fig. 1). The comparison revealed that the two groups were balanced with respect to ethnicity and gender and most racial categories, except there was a slightly larger proportion of Asian participants in the full study (responders were 9.6% Asian, non-responders were 6.9% Asian, p = 0.001).

3.2. COVID-19 vaccine willingness

Overall. Participants reported being somewhat willing to accept the COVID-19 vaccine [mean = 3.91 (SD = 1.63); range of means = (3.75–4.06)] (see Table 2).

By approval stage. Willingness was significantly greater for a COVID-19 vaccine that had been fully approved for routine care [overall mean = 4.95 (SD = 2.04)] compared with a COVID-19 vaccine approved only for experimental or emergency use (4.95 vs 2.87 mean; p < 0.001). More participants strongly endorsed willingness (rating = 5 or greater) for the COVID-19 vaccine if fully approved for routine use (60.2%) than for experimental or emergency use (18.1%).

Table 1

Characteristics of participants (n = 991), by health status.

	Health Status			Overall (N = 991)	p value*
	No Illness (n = 328)	Mental Illness (n = 332)	Physical Illness (n = 331)		
Age					
Years, Mean (SD)	37.35 (10.16)	35.56 (9.3)	51.49 (13.43)	41.48 (13.19)	<0.001
Gender					<0.001
Female	117 (35.7%)	172 (51.8%)	205 (61.9%)	494 (49.8%)	
Male	210 (64%)	156 (47%)	126 (38.1%)	492 (49.6%)	
Other	1 (0.3%)	4 (1.2%)	–	5 (0.5%)	
Ethnicity					0.013
Hispanic or Latino	34 (10.4%)	31 (9.5%)	15 (4.5%)	80 (8.1%)	
Not Hispanic or Latino	292 (89.6%)	297 (90.5%)	315 (95.5%)	904 (91.9%)	
Race					<0.001
Asian	28 (8.6%)	16 (4.8%)	13 (3.9%)	57 (5.8%)	
Black/African American	40 (14%)	25 (7.6%)	14 (4.2%)	79 (8%)	
White	243 (74.3%)	268 (81.2%)	292 (88.5%)	803 (81.4%)	
More than one	11 (3.4%)	15 (4.5%)	10 (3%)	36 (3.6%)	
Other	5 (1.5%)	6 (1.8%)	1 (0.3%)	12 (1.2%)	
Education					0.001
Less than high school/high school diploma	32 (9.8%)	36 (10.8%)	26 (7.9%)	94 (9.5%)	
Some college/college degree	76 (23.2%)	119 (35.8%)	124 (37.5%)	319 (32.2%)	
Bachelor's degree (e.g., BA, BS)	163 (49.7%)	130 (39.2%)	121 (36.6%)	414 (41.8%)	
Graduate degree	57 (17.4%)	47 (14.2%)	60 (18.1%)	164 (16.5%)	

*p values are results of Chi-square tests and ANOVA tests.

By health status. Willingness differed by illness group (p = 0.047). Participants with mental illness [mean = 4.06 (SD = 1.64)] and no illness [mean = 3.93 (SD = 1.66)] responded similarly; participants with physical illness [mean = 3.75 (SD = 1.59)] were less willing than those with mental illness [mean = 4.06 (SD = 1.64); Tukey 95% CI for mean difference = (–0.610, –0.015), p = 0.037]. Willingness to receive a COVID-19 vaccine that had been fully approved for routine care did not differ by health group (p = 0.176). In contrast, for the COVID-19 vaccine approved only for experimental or emergency use, willingness differed by health status (p = 0.001); physically ill participants were less willing than the other two participant groups (i.e., physical [mean = 2.56 (SD = 1.74)] vs. no illness [mean = 3.05 (SD = 1.85)]: Tukey 95% CI = [–0.814, –0.160], p = 0.001; physical [mean = 2.56 (SD = 1.74)] vs. mental illness [mean = 3.00 (SD = 1.78)]: Tukey 95% CI = [–0.770, –0.118], p = 0.004).

3.3. Perceptions of risk associated with the COVID-19 vaccine

Overall. Participants considered receiving a COVID-19 vaccine to be somewhat risky [overall mean = 4.16 (SD = 1.45)], with 37% of participants rating the level of risk as 5 or greater (see Table 3).

By approval stage. Participants differentiated risk by stage of approval (p < 0.001). The COVID-19 vaccine that was fully approved for routine use was perceived to be moderately to less risky [overall mean = 3.20 (SD = 1.84)], with 22.5% of participants rating the risk as 5 or greater. The COVID-19 vaccine that was approved only for experimental or emergency use was rated as more than moderately risky [overall mean = 5.13 (SD = 1.53)], with 59.3% of participants rating the level of risk as 5 or greater.

By health status. Risk perception differed by health status group (p = 0.034). Participants with mental illness responded [mean = 4.10 (SD = 1.43)] similarly to the other two groups; participants with physical illness [mean = 4.33 (SD = 1.43)] perceived greater risk in receiving a COVID-19 vaccine than did those without illness [mean = 4.06 (SD = 1.49); Tukey 95% CI for mean difference = (0.005, 0.535), p = 0.045]. Perceptions of risk did not differ by health status group for receiving the COVID-19 vaccine approved for routine care, but they differed by health status for receiving the COVID-19 vaccine approved only for experimental or emergency use (p = 0.006). Physically ill participants [mean = 5.31 (SD = 1.48)] perceived receiving the vaccine at the experimental/emergency use stage to be more risky when compared to the

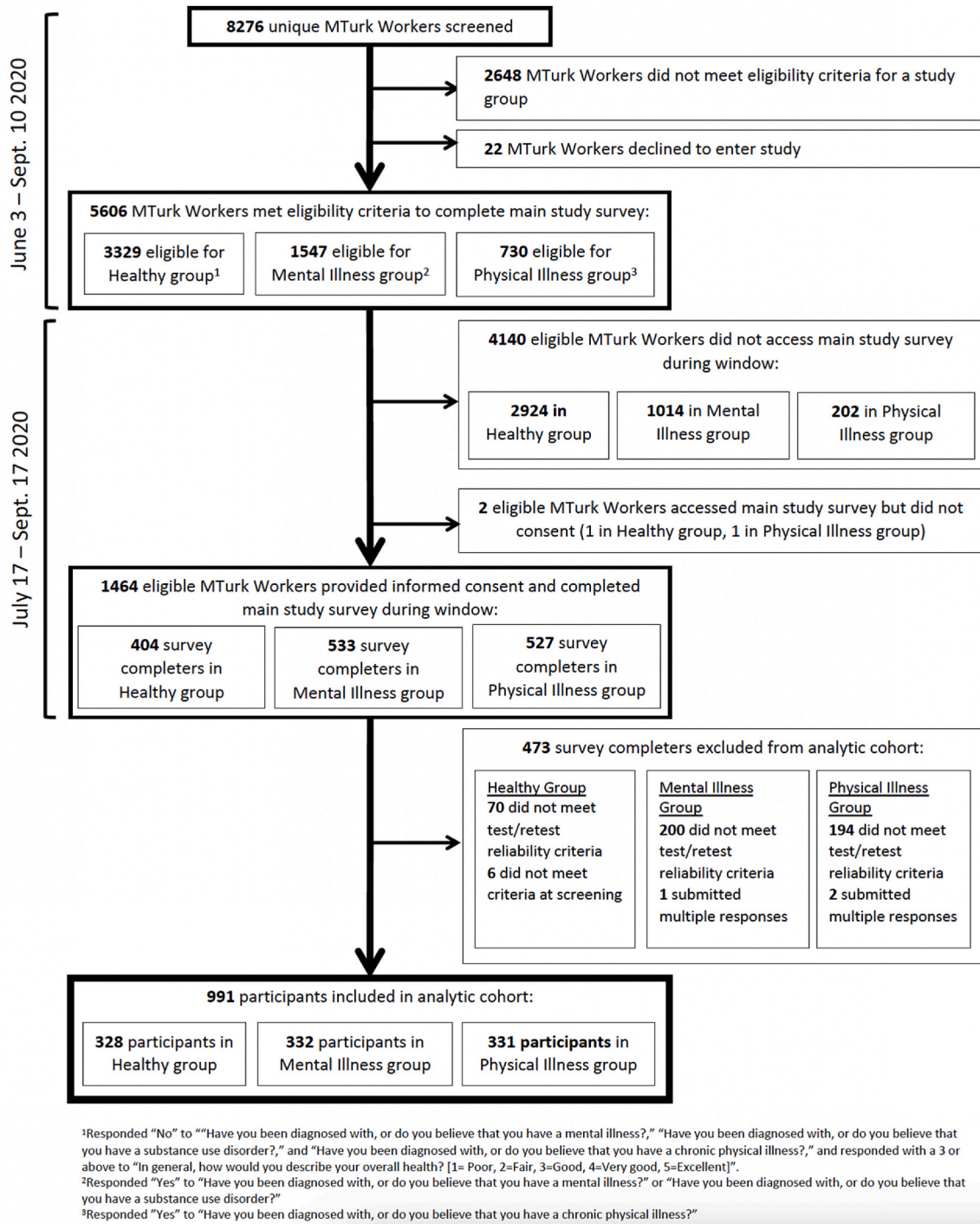


Fig. 1. Overview of participant recruitment process.

group without illness [mean = 4.93 (SD = 1.63); Tukey 95% CI = (0.097,0.653), p = 0.005]. Risk perceptions for the vaccine at the experimental/emergency use stage were similar between the physical and mental illness [mean = 5.15 (SD = 1.45)] groups.

3.4. Influences on participants' willingness to receive a COVID-19 vaccine

Overall. Participants expressed different levels of agreement across the six domains of influences, namely, salience of personal risk, likelihood of effectiveness, financial considerations, recommendations of physicians and public health officials, employer considerations, and

recommendations of loved ones [p < 0.001, range of means = (4.67–5.42)]. Salience of personal risk, likelihood of effectiveness, financial considerations, and recommendations of physicians and public health officials were rated as moderately high in terms of influence on willingness to receive a vaccine, while employer considerations and recommendations of loved ones were rated slightly lower, as shown in Fig. 2.

Across influence domains, participants endorsed higher levels of agreement for influences regarding willingness to receive the COVID-19 vaccine fully approved for routine care than the COVID-19 vaccine approved only for experimental or emergency use [range of means for

Table 2
Expressed willingness to receive COVID-19 vaccine at two stages of approval, by health status.

Vaccine Approval Stage	Health Status			Overall (N = 991)	p value*
	No Illness (n = 328)	Mental Illness (n = 332)	Physical Illness (n = 331)		
Mean (SD)					
Vaccine fully approved for routine use	4.81 (2.05)	5.11 (2.02)	4.93 (2.06)	4.95 (2.04)	0.176
Vaccine approved for experimental or emergency use	3.05 ^a (1.85)	3.00 ^b (1.78)	2.56 ^{ab} (1.74)	2.87 (1.80)	0.001
Overall	3.93 (1.66)	4.06 ^c (1.64)	3.75 ^c (1.59)	3.91 (1.63)	0.047
p value**	<.001	<.001	<.001	<.001	–

Participants were asked: (1) how willing would you be to receive an experimental vaccine for COVID-19 that is being tested for effectiveness? (2) how willing would you be to receive an approved vaccine for COVID-19 if one became available? Answer options were 1 = Not at all willing - 7 = Extremely willing.

*p values derived from 1-way ANOVA.

**p values derived from paired t-test.

^a Shared superscript *a* denotes significantly different means based on Tukey's HSD-adjusted p value

^b Shared superscript *b* denotes significantly different means based on Tukey's HSD-adjusted p value

^c Shared superscript *c* denotes significantly different means based on Tukey's HSD-adjusted p value

Table 3
Perceived Risk in receiving COVID-19 vaccine at two stages of approval, by health status.

Vaccine Approval Stage	Health Status			Overall (N = 991)	p value*
	No Illness (n = 328)	Mental Illness (n = 332)	Physical Illness (n = 331)		
Mean (SD)					
Vaccine fully approved for routine use	3.19 (1.88)	3.05 (1.83)	3.35 (1.80)	3.20 (1.84)	0.097
Vaccine approved for experimental or emergency use	4.93 ^a (1.63)	5.15 (1.45)	5.31 ^a (1.48)	5.13 (1.53)	0.006
Overall	4.06 ^b (1.49)	4.10 (1.43)	4.33 ^b (1.43)	4.16 (1.45)	0.034
p value**	<.001	<.001	<.001	<.001	–

Participants were asked: (1) How risky would it be to receive an experimental 1 (Not at all risky)vaccine for COVID-19 that is being tested for its effectiveness? (2) How risky would it be to receive an approved vaccine for COVID-19 if one became available? Answer options were 1 = Not at all risky - 7 = Extremely risky.

*p values derived from 1-way ANOVA.

**p values derived from paired t-test.

^a Shared superscript *a* denotes significantly different means based on Tukey's HSD-adjusted p value.

^b Shared superscript *b* denotes significantly different means based on Tukey's HSD-adjusted p value.

routine care (4.70–5.56) vs. experimental or emergency use (4.55–5.38)], as shown in Table 4(A) and 4(B). Influences were more strongly endorsed for routine care compared with experimental or emergency use for the following domains: salience of personal risk (mean = 5.56 vs. 4.86, $p < 0.001$), financial considerations (5.33 vs. 5.13, $p < 0.001$), recommendations of physicians and public health officials (5.08 vs. 4.95, $p = 0.002$), and employer considerations (4.79 vs. 4.55, $p < 0.001$). There was no significant difference in responses overall by approval stage for two influence domains: high likelihood of effectiveness ($p = 0.07$) or recommendations of loved ones ($p = 0.25$).

By approval stage. Participants differentiated among the six domains influencing willingness to receive a COVID-19 vaccine approved for routine care ($p < 0.001$), as shown in Table 4(A). Participants expressed highest levels of agreement with the domains “salience of personal risk” [mean = 5.56 (SD = 1.41)] and “likelihood of effectiveness” [mean = 5.47 (SD = 1.14)], and lowest levels of agreement with the “recommendations of loved ones” [mean = 4.70 (SD = 0.88)] and “employer considerations” [mean = 4.79 (SD = 0.89)]. Ratings of influences regarding willingness to receive a COVID-19 vaccine only approved for experimental or emergency use differed across domains ($p < 0.001$), as shown in Table 4(B). “Likelihood of effectiveness” [overall mean = 5.38 (SD = 1.10)] received the highest endorsement and “employer considerations” [overall mean = 4.55 (SD = 0.90)] the lowest.

By health status. Similar trends also held across health groups regarding influences on willingness to receive a COVID-19 vaccine fully approved for routine care, with all groups differentiating across influence domains (domain comparisons $p < 0.001$). However, levels of agreement for four out of the six domains differed by health status. Participants in the physical illness group expressed higher levels of agreement with the influence domains “salience of personal risk” and “likelihood of effectiveness” compared to the participant group without illness (5.72 vs. 5.34, $p = 0.002$, 5.60 vs. 5.25, $p < 0.001$ respectively). Similarly, participants who self-reported mental illness reported higher

levels of agreement with the influence domains “financial considerations” and “recommendations of physicians and public health officials” for a fully approved vaccine, compared to participants with no illness (5.51 vs. 5.13, $p < 0.001$, 5.19 vs. 4.94, $p = 0.002$).

Similar trends held across health groups regarding influences on willingness to receive a COVID-19 vaccine approved only for experimental or emergency use (domain comparisons $p < 0.001$). However, ratings for three domains differed by health status: “likelihood of effectiveness”, “financial considerations”, and “recommendations of physicians and public health officials.” Participants with mental illness rated “likelihood of effectiveness” as the greatest influence [overall domain mean = 5.47 (SD = 1.09)] on willingness to receive a COVID-19 vaccine at this approval stage. Participants with mental illness rated “likelihood of effectiveness” as more influential than those who self-reported having no illness (mean = 5.23 for the no illness group, 5.47 for the group with mental illness). Participants with mental illness also rated the domains “financial considerations” and “recommendations of physicians and public health officials” higher than participants with physical illness or no illness. On average, participants with mental illness rated “financial considerations” and “recommendations of physicians and public health officials” as influential on their willingness to receive the experimental/emergency use vaccine (means = 5.34, 5.07, $p < 0.001$, $p = 0.001$; for financial consideration and recommendations of physicians, respectively).

3.5. Associations of participant willingness to receive a vaccine

Controlling for all other confounders (vaccine approval status, health status, education level, and gender), perceived risk was negatively associated with willingness to receive a vaccine ($b = -0.667$, $p < 0.001$). Willingness to receive a vaccine was associated with demographic characteristics such as education level and gender. Participants who self-reported as having attained a bachelor's or higher-level

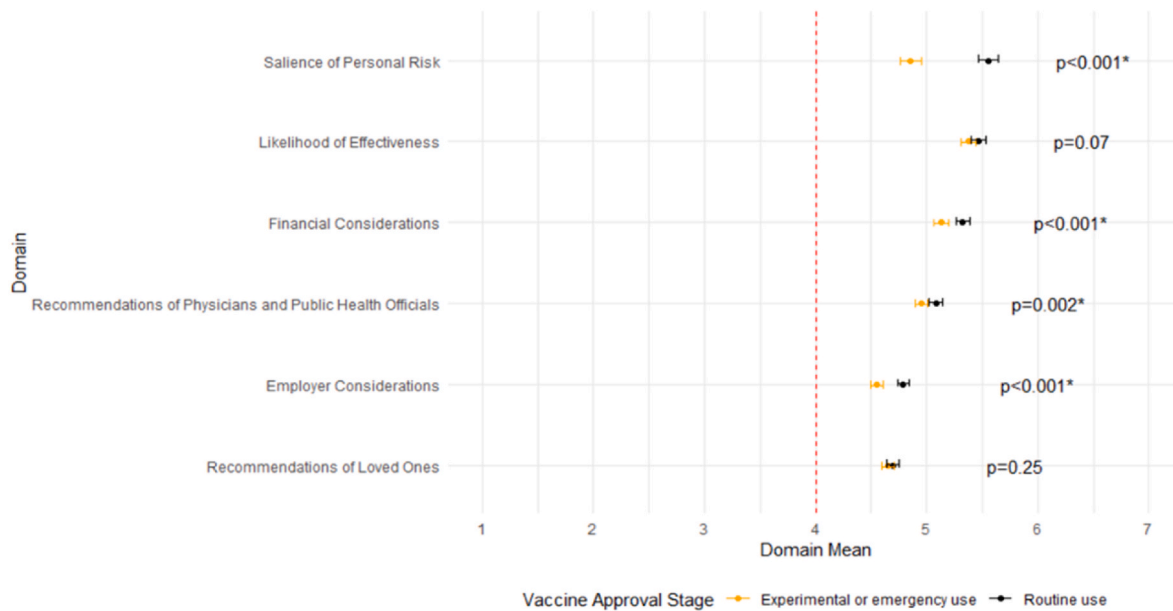


Fig. 2. Comparison of influences on willingness to receive COVID-19 vaccine at two stages of approval. Bars denote 95% Confidence Interval. The red line denotes “Somewhat willing to receive a vaccine” * indicates a significant p value at the 0.05 level of significance. p values are from ANOVA tests for mean differences between willingness by stage of approval. The Holm-Bonferroni method was applied to p values from ANOVA for multiple testing.

Table 4a

Influences on participants’ willingness to receive COVID-19 vaccine that has been fully approved for routine use, by health status.

Influence Domain Mean Mean (SD)	Health Status			Overall (N = 991)	p value*
	No Illness (n = 328)	Mental Illness (n = 332)	Physical Illness (n = 331)		
Saliency of Personal Risk (2 items)	5.34 (1.50)	5.61 (1.40)	5.72 (1.31)	5.56 (1.41)	0.002
Likelihood of Effectiveness (2 items)	5.25 (1.18)	5.55 (1.10)	5.60 (1.11)	5.47 (1.14)	<0.001
Financial Considerations (3 items)	5.13 (1.03)	5.51 (0.98)	5.33 (0.99)	5.33 (1.01)	<0.001
Recommendations of Physicians and Public Health Officials (4 items)	4.94 (1.00)	5.19 (0.92)	5.12 (0.95)	5.08 (0.96)	0.002
Employer Considerations (3 items)	4.76 (0.93)	4.80 (0.88)	4.81 (0.85)	4.79 (0.89)	0.728
Recommendations of Loved Ones (2 items)	4.67 (0.92)	4.76 (0.86)	4.67 (0.85)	4.70 (0.88)	0.298
p value**	<0.001	<0.001	<0.001	<0.001	–

Rating scale: 1 = “Much less willing”; 4 = “No change in willingness”; 7 = “Much more willing”.

*p values derived from 1-way ANOVA.

**p values derived from repeated measures ANOVA.

Table 4b

Influences on participants’ willingness to receive COVID-19 vaccine approved for experimental or emergency use, by health status.

Influence Domain Mean (SD)	Health Status			Overall (N = 991)	p value*
	No Illness (n = 328)	Mental Illness (n = 332)	Physical Illness (n = 331)		
Likelihood of Effectiveness (2 items)	5.23 (1.15)	5.47 (1.09)	5.42 (1.06)	5.38 (1.10)	0.013
Financial Considerations (3 items)	4.89 (1.03)	5.34 (1.07)	5.16 (1.06)	5.13 (1.07)	<0.001
Recommendations of Physicians and Public Health Officials (4 items)	4.81 (0.94)	5.07 (0.95)	4.97 (0.93)	4.95 (0.95)	0.001
Saliency of Personal Risk (2 items)	4.82 (1.45)	4.87 (1.57)	4.89 (1.57)	4.86 (1.53)	0.846
Recommendations of Loved Ones (2 items)	4.62 (0.91)	4.72 (0.83)	4.63 (0.87)	4.65 (0.87)	0.269
Employer Considerations (3 items)	4.52 (0.91)	4.53 (0.87)	4.59 (0.91)	4.55 (0.90)	0.576
p value**	<0.001	<0.001	<0.001	<0.001	–

Rating scale: 1 = “Much less willing”; 4 = “No change in willingness”; 7 = “Much more willing”.

*p values derived from 1-way ANOVA.

**p values derived from repeated measures ANOVA.

degree (compared to no attainment of bachelor’s degree) reported greater levels of willingness, on average, than participants who reported less education (b = 0.320, p < 0.001). Men also reported greater willingness to receive a vaccine than did women (b = 0.177, p = 0.036).

Participants expressed greater willingness to receive a COVID-19 vaccine fully approved for routine care compared to a vaccine approved only for experimental or emergency use (b = 0.796, p < 0.001).

As shown in Fig. 3, participants showed greater willingness to

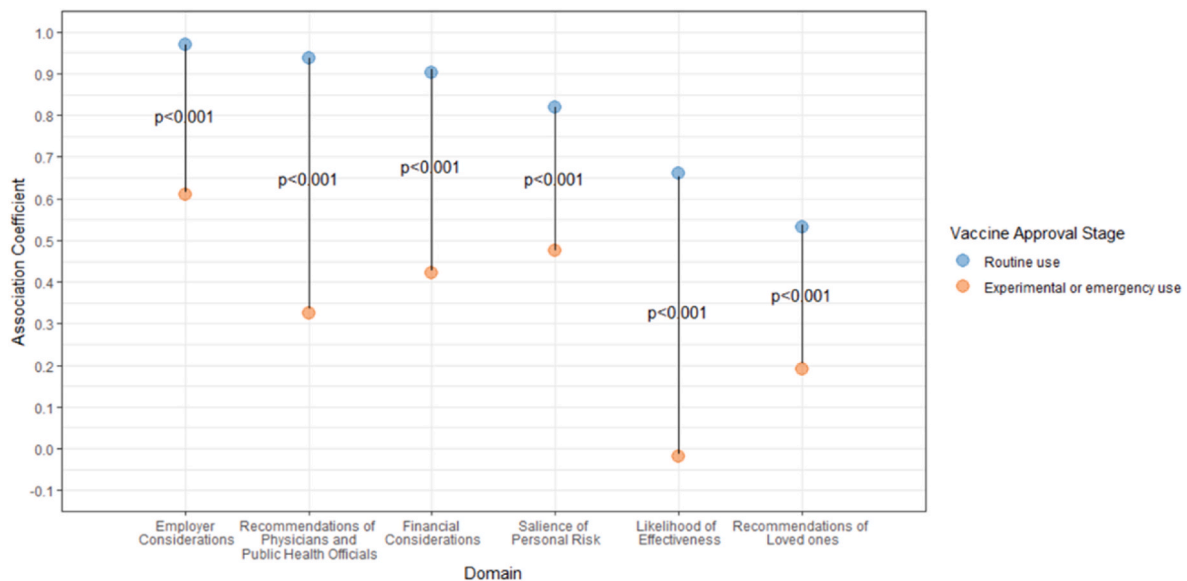


Fig. 3. Association between willingness to receive a COVID-19 vaccine and each influence, by approval stage

We fit a model for each influence where willingness to receive the vaccine was the dependent variable, and vaccine approval stage, influence, interaction, health status, and gender were covariates. p values are from Wald tests of significance for interactions between vaccine approval stage and each influence. All p values are significant at the 0.05 level of significance. The Holm-Bonferroni method was applied to p values from ANOVA for multiple testing.

receive a vaccine when influences on willingness to receive a vaccine were stronger, especially for influences such as employer considerations (approved for routine care vs. approved only for experimental or emergency use: $b = 0.969$ vs. $b = 0.610$), recommendations of physicians and public health officials ($b = 0.937$ vs. $b = 0.326$), financial considerations ($b = 0.903$ vs. $b = 0.421$), and salience of personal risk ($b = 0.819$ vs. $b = 0.475$). The associations between willingness to receive a COVID-19 vaccine approved for routine care and each influence were significantly stronger than associations between willingness to receive a COVID-19 vaccine approved only for experimental or emergency use and each influence ($p < 0.001$ for all influences).

4. Discussion

The COVID-19 vaccine is widely available in the United States and has been demonstrated to be effective, and yet many people have not been vaccinated, including some who have significant health concerns. At the time of this writing, two COVID-19 vaccines have recently been approved by the FDA for routine care; however, many COVID-19 vaccines remain unapproved or are approved only for emergency use in children and adolescents. People with mental disorders, including substance-related conditions and co-occurring disorders, carry disproportionate risk for negative health outcomes from infection with SARS-CoV-2. Unfortunately, people with mental disorders were not prioritized clearly or early for vaccination (Barocas, 2021; Shim and Starks, 2021). To promote the health of the public and to protect the health of those with greater health burdens, it is vital that we gain a more complete understanding of factors influencing vaccine willingness.

This novel study documents different perspectives held by people with self-reported good health, mental disorders, and physical conditions regarding vaccine acceptance, and shows how the stages of vaccine approval and other influences affect vaccine willingness and hesitancy. Our results shine a light on potential paths forward to support greater vaccine acceptance, especially amongst those for whom the vaccine may bring greatest health benefit. Continued, intensive investigation to assess the effectiveness of the COVID-19 vaccine and boosters, and vibrant and accurate communication efforts regarding study results, may allay worries of some who are hesitant (Cai et al., 2021; Woodworth et al., 2021). Information for the public regarding governmental

processes may also be helpful, as approval decisions – even for experimental or emergency use – are rigorous and diligent.

4.1. Major findings regarding vaccine willingness

Overall, people with mental disorders in our study expressed openness to receiving the COVID-19 vaccine. This finding aligns with the results of a cohort study recently conducted by Batty et al. (2022) which found that living with a mental disorder did not predict increased vaccine hesitancy; in contrast to the cohort study, the present study utilized health data collected during the pandemic and at the same time as the rest of the survey, and was limited to participants from the United States. Similar to those with physical disorders and those in good health, individuals with mental disorders were more willing to receive the vaccine if fully approved for routine use and were more hesitant if the vaccine was approved only for experimental or emergency use. This finding of greater hesitancy for the experimental/emergency use vaccine is consistent with the results of prior work by Guidry et al. (2021), in which over half of participants were at least somewhat unwilling to receive a COVID-19 vaccine approved under FDA Emergency Use Authorization. Looking to the future, greater availability of approved COVID-19 vaccines may help to allay vaccine hesitancy among people with mental health concerns.

The pattern of greater hesitancy to receive an experimental/emergency use vaccine still under clinical study may suggest that ill and healthy individuals adequately differentiate between the benefits and risks associated with clinical care compared with research activities, countering the prevailing notion of the “therapeutic misconception.” The therapeutic misconception describes the possibility that study volunteers do not adequately grasp the primary objective of clinical investigation, which is to answer a scientific question of medical significance, and may assume they will receive benefits similar to those in usual clinical care (Appelbaum and Lidz, 2008; Lidz et al., 2004).

Interestingly, physically ill individuals in our study expressed less willingness to receive a vaccine approved for experimental or emergency use than those with mental illness or good health. In contrast, prior studies examining health status and vaccine willingness found that physically ill individuals were either more willing or no more or less willing to receive a COVID-19 vaccine, though these studies did not

specify a vaccine context (e.g., experimental/emergency use vs. approved) (Batty et al., 2022; Margraf et al., 2020). Physically ill individuals' greater hesitancy to receive a vaccine in the earlier stage of approval is thus deserving of further inquiry, given that those with physical illness are at greatest risk of severe symptoms and therefore stand to benefit most from receiving a COVID-19 vaccine. The results of our study have important implications for individuals with co-occurring physical and mental disorders, a topic we have not investigated in this work.

More than one-third of the people in our study rated the COVID-19 vaccine as at least somewhat risky, and the degree of perceived riskiness of the vaccine was linked with vaccine hesitancy. We found a negative association between perceived risk and vaccine willingness regardless of context of vaccine administration, health status, gender, and education. This negative association resembles our past findings related to interest, willingness, and intention to participate in clinical research of different kinds (Dunn et al., 2009; Roberts et al., 2002; Tsungmeyer et al., 2019). Moreover, our finding that people with mental illness rated the risk of both the experimental/emergency use and approved vaccines similarly to healthy individuals aligns with our prior work on risk perceptions of innovative psychiatric research protocols (Kim et al., 2021; Tsungmeyer et al., 2019). These findings refute the notion of psychiatric exceptionalism, which presumes differences in ability (e.g., the capacity to appreciate risk or the constraints and intention of clinical research) or attitudes among individuals with mental disorders. Developing ways to communicate accurately and effectively regarding health risks of vaccines and other interventions aimed toward the health of the public requires our attention, especially now in the global setting of health disparities and the COVID-19 pandemic.

4.2. Additional influences on vaccine willingness and hesitancy

Our study also provides some valuable insights on other factors that may shape individuals' decisions to move forward with a COVID-19 vaccine. All six domains of influences in our study were associated with openness to receive a vaccine. People expressed relatively greater openness to being vaccinated if they or a loved one were at high personal risk for virus exposure, if they experienced no financial burden associated with vaccination, if physicians and public health officials recommended the vaccine, and if employers recommended or required the vaccine. Participants were similarly more willing to receive a fully approved vaccine and an experimental/emergency use vaccine if there was high likelihood of effectiveness or if loved ones recommended the vaccine.

In our study, individuals with lived experience of illness put considerable weight on vaccine effectiveness and their assessment of risks – not only riskiness of the vaccine, but their assessment of personal risk of virus exposure and salience of risk to their decision. The consideration given risk is congruent with our past work focused on how healthy and ill people make decisions about enrolling in research and think about innovative research in the biomedical sciences (Roberts et al., 2002; Roberts and Kim, 2014; Tsungmeyer et al., 2019). These findings, taken together, indicate that information regarding vaccination should be tailored to the distinct concerns of special or unique populations. For example, more study findings regarding the safety and efficacy of vaccines for individuals with a variety of backgrounds and health statuses may help to assuage hesitancy and encourage vaccine acceptance.

Of some concern were the endorsement of financial considerations as significant influences, particularly by the mental and physical illness participants we surveyed. Although vaccine approval of any kind is conducted with great diligence and caution, undue financial incentives are nonetheless a problematic influence on any research participation decision or medical decision given their potential to make such decisions feel less voluntary (Dunn and Gordon, 2005). Past work found that, for

individuals with schizophrenia, perceptions of risk and personal benefit of participation in schizophrenia research influenced compensation thresholds for research participation (Dunn et al., 2009).

Our participants with mental illness put relatively greater weight on financial considerations and the recommendations of public health officials and physicians when considering willingness to receive both an experimental/emergency use and a fully approved vaccine. The weight assigned to public health officials' and physicians' recommendations by individuals with mental health issues underscores the beneficial impact of fostering trust in health professionals and the public health system. Further research might examine other potential social influences on willingness, including influences of family members and loved ones who have comorbidities and recommendations of community members.

4.3. Strengths and limitations

One strength of this study is the fact that we were able to collect empirical evidence and cross-cutting comparisons across three groups: people with mental illness, physical illness, and no illness, by self-report. Another particular strength of this study is the inclusion of a range of factors examined simultaneously: salience of personal risk, likelihood of effectiveness, financial considerations, recommendations of public health officials and physicians, employer considerations, and recommendations of loved ones.

One limitation of this study is our use of self-reported health status. We did not confirm health status beyond verifying that participants provided consistent responses across the screening and full surveys. The survey took place between July and September 2020, approximately a year before the first COVID-19 vaccine was approved by the FDA (August 23, 2021). The approved vaccine context was thus hypothetical at the time of the survey. In addition, a larger proportion of participants identified as white, and it has been shown that white individuals may have higher acceptance rates of vaccines than some racial/ethnic minority populations (Nguyen et al., 2021). We conducted this survey via the MTurk platform. The use of paid volunteers may introduce bias. However, we took steps to minimize bias and ensure high quality responses: volunteers in our study were paid according to the standard of MTurk, which is very modest and unlikely to distort participant opinions in our view and only experienced MTurk workers with a high approval rating were eligible to access our study. The screening survey on MTurk was advertised as a "Health Information Survey," and did not specify inclusion criteria for the larger research project and did not characterize the health conditions under study (e.g., psychiatric). Finally, the survey included attention check questions so that participants who failed the attention checks were filtered out of the final analytic cohort.

5. Conclusion

Understanding influences on willingness to receive a COVID-19 vaccination is critical to our efforts to address the pandemic and to lessen the greater risks shouldered by many in our society, including people living with mental disorders. Our findings suggest that the recent availability of fully approved vaccines in the context of routine care, combined with continued public health knowledge-sharing and education efforts, such as public health officials' recommendations, may prove useful in increasing receptiveness to the COVID-19 vaccine. Our findings also suggest that people with mental health conditions approach vaccine decision-making similarly to people in good health or with physical health conditions, in that they showed attentiveness to key considerations such as phase of approval, perceived risk, likelihood of effectiveness, and recommendations of physicians and public health officials.

Disparities in COVID-19-related illness and mortality have already disproportionately affected people with mental illness and co-occurring conditions (Ali et al., 2020; Fonseca et al., 2020; Garg, 2020; Hariyanto et al., 2021; Kim et al., 2021; Kim and Bostwick, 2020; Nemani et al., 2021; Raifman and Raifman,). Given existing disparities in access to

health care and health-related information in the United States, ethical vaccine development and distribution entail a commitment to understanding how population-level attitudes, traits, beliefs, and ethically salient contextual factors influence COVID-19 treatment and prevention behaviors.

Additional inquiry is also needed to explore how other considerations such as gender and race, ethnicity, and cultural backgrounds affect vaccine willingness. Another suggestion for further inquiry is to examine populations who remain unvaccinated at this stage in time, as well as those who experience more severe symptoms of mental and physical illness. Studying views of people with societal disadvantages is particularly crucial for populations who face multiple overlapping socioeconomic, structural, and health-related sources of vulnerability (Bogart et al., 2021; Hert et al., 2020). If those who are most at risk for poor health outcomes due to COVID-19 also experience the lowest levels of willingness to get vaccinated, such correlations would represent sources of extreme health inequity.

This study's findings may help facilitate the ethical deployment of vaccines and other public health resources that aim to reduce the disease burden of the pandemic, as well as help sustain the public's trust, by providing evidence on the factors that are valued by individuals with varied lived experiences and medical vulnerabilities (American Public Health Association, 2019; National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978). A clearer understanding of factors that influence willingness can also serve to tailor public health messaging strategies to individuals with illness and their family members.

Author statement

Laura Weiss Roberts: Writing – Original Draft, Writing – Review and Editing, Conceptualization, Methodology, Supervision, Jane Paik Kim: Writing – Review and Editing, Conceptualization, Methodology, Supervision, Funding Acquisition, Validation, Formal Analysis, Investigation, Visualization, Data Curation, Maryam Rostami: Writing – Original Draft, Writing – Review and Editing, Conceptualization, Methodology, Validation, Formal Analysis, Max Kasun: Writing – Original Draft, Writing – Review and Editing, Conceptualization, Bohye Kim: Writing – Review and Editing, Visualization.

Declaration of competing interest

Dr. Roberts serves as the Editor-in-Chief, books, for the American Psychiatric Association Publishing Division and as Editor-In-Chief of the journal Academic Medicine. Dr. Roberts serves as an advisor for the Bucksbaum Institute of the University of Chicago Pritzker School of Medicine and she owns the small business Terra Nova Learning Systems. The other authors have no interests to disclose.

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References

Al-Amer, R., Maneze, D., Everett, B., Montayre, J., Villarosa, A.R., Dwekat, E., Salamonson, Y., 2022. COVID-19 vaccination intention in the first year of the pandemic: a systematic review. *J. Clin. Nurs.* 31 (1–2), 62–86.

Ali, S., Asaria, M., Stranges, S., 2020. COVID-19 and inequality: are we all in this together? *Can J Public Health Rev. Can. Sante Publique.* 111 (3), 415–416.

American Public Health Association, 2019. Public Health Code of Ethics, 8 Mar 2022. https://www.apha.org/-/media/files/pdf/membergroups/ethics/code_of_ethics.ashx.

Appelbaum, P.S., Lidz, C.W., 2008. Twenty-five years of therapeutic misconception. *Hastings Cent. Rep.* 38 (2), 5–7.

Barocas, J.A., 2021. Business not as usual—Covid-19 vaccination in persons with substance use disorders. *NEJM* 384 (2), e6.

Batty, G.D., Deary, I.J., Altschul, D., 2022. Pre-pandemic mental and physical health as predictors of COVID-19 vaccine hesitancy: evidence from a UK-wide cohort study. *Ann. Med.* 54 (1), 274–282.

Bogart, L.M., Ojikutu, B.O., Tyagi, K., Klein, D.J., Mutchler, M.G., Dong, L., Lawrence, S. J., Thomas, D.R., Kellman, S., 2021. COVID-19 related medical mistrust, health impacts, and potential vaccine hesitancy among Black Americans living with HIV. *J. Acquir. Immune Defic. Syndr.* 86 (2), 200–207.

Cai, C., Peng, Y., Shen, E., Huang, Q., Chen, Y., Liu, P., Guo, C., Feng, Z., Gao, L., Zhang, X., Gao, Y., Liu, Y., Han, Y., Zeng, S., Shen, H., 2021. A comprehensive analysis of the efficacy and safety of COVID-19 vaccines. *Mol. Ther.* 29 (9), 2794–2805.

Chang, K.C., Strong, C., Pakpour, A.H., Griffiths, M.D., Lin, C.Y., 2020. Factors related to preventive COVID-19 infection behaviors among people with mental illness. *J. Formos. Med. Assoc.* 119 (12), 1772–1780.

COVID-19 Mental Disorders Collaborators, 2021. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet* 398, P1700–P1712, 10312.

Datta, B.K., Ansa, B.E., George, V., 2022. An analytical model of population level chronic conditions and COVID-19 related hospitalization in the United States. *BMC Publ. Health* 22 (1), 1–10.

Dunn, L.B., Gordon, N.E., 2005. Improving informed consent and enhancing recruitment for research by understanding economic behavior. *JAMA* 293, 609, 6.

Dunn, L.B., Kim, D.S., Fellows, I.E., Palmer, B.W., 2009. Worth the risk? Relationship of incentives to risk and benefit perceptions and willingness to participate in schizophrenia research. *Schizophr. Bull.* 35 (4), 730–737.

Fonseca, L., Diniz, E., Mendonça, G., Malinowski, F., Mari, J., Gadelha, A., 2020. Schizophrenia and COVID-19: risks and recommendations. *Br. J. Psychiatr.* 42 (3), 236–238.

Garg, S., 2020. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019 — COVID-NET, 14 States, March 1–30, 2020. *MMWR Morb. Mortal. Wkly. Rep.* 69.

Gillan, C.M., Daw, N.D., 2016. Taking psychiatry research online. *Neuron* 91 (1), 19–23.

Guidry, J.P.D., Laestadius, L.I., Vraga, E.K., Miller, C.A., Perrin, P.B., Burton, C.W., Ryan, M., Fuemmeler, B.F., Carlyle, K.E., 2021. Willingness to get the COVID-19 vaccine with and without emergency use authorization. *Am. J. Infect. Control* 49 (2), 137–142.

Hampshire, A., Trender, W., Grant, J.E., Mirza, M.B., Moran, R., Hellyer, P.J., Chamberlain, S.R., 2022. Item-level analysis of mental health symptom trajectories during the COVID-19 pandemic in the UK: associations with age, sex and pre-existing psychiatric conditions. *Compr. Psychiatr.* 152298.

Hariyanto, T.I., Putri, C., Situmeang, R.F.V., Kurniawan, A., 2021. Dementia is a predictor for mortality outcome from coronavirus disease 2019 (COVID-19) infection. *Eur. Arch. Psychiatr. Clin. Neurosci.* 271 (2), 393–395.

Hert, M.D., Mazereel, V., Detraux, J., Van Assche, K., 2020. Prioritizing COVID-19 vaccination for people with severe mental illness. *World Psychiatr.* 20 (1), 54–55.

Khubchandani, J., Sharma, S., Price, J.H., Wiblehauser, M.J., Sharma, M., Webb, F.J., 2021. COVID-19 vaccination hesitancy in the United States: a rapid national assessment. *J. Community Health* 46 (2), 270–277.

Kim, J.P., Tsungmeyer, T., Rostami, M., Mondal, S., Kasun, M., Roberts, L.W., 2021. [Forthcoming]. Factors influencing perceived helpfulness and participation in innovative research: a pilot study of individuals with and without mood symptoms. *Ethics Behav.* 1–17.

Kim, L., Garg, S., O'Halloran, A., Whitaker, M., Pham, H., Anderson, E.J., Armistead, I., Bennett, N.M., Billing, L., Como-Sabetti, K., Hill, M., 2021. Risk factors for intensive care unit admission and in-hospital mortality among hospitalized adults identified through the US coronavirus disease 2019 (COVID-19)-Associated hospitalization surveillance network (COVID-NET). *Clin. Infect. Dis. Off. Publ. Infect. Dis. Soc.* 72 (9), e206–e214.

Kim, S.J., Bostwick, W., 2020. Social vulnerability and racial inequality in COVID-19 deaths in Chicago. *Health Educ. Behav. Off. Publ. Soc. Public Health Educ.* 47 (4), 509–513.

Lidz, C.W., Appelbaum, P.S., Grisso, T., Renaud, M., 2004. Therapeutic misconception and the appreciation of risks in clinical trials. *Soc. Sci. Med.* 58 (9), 1689–1697.

Margraf, J., Brailovskaia, J., Schneider, S., 2020 Dec 7. Behavioral measures to fight COVID-19: an 8-country study of perceived usefulness, adherence and their predictors. *PLoS One* 15 (12), e0243523.

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978. The Belmont Report: ethical principles and guidelines for the protection of human subjects of research. In: [Bethesda, Md.]: the Commission.

Nemani, K., Li, C., Olsson, M., Blessing, E.M., Razavian, N., Chen, J., Petkova, E., Goff, D. C., 2021. Association of psychiatric disorders with mortality among patients with COVID-19. *JAMA Psychiatr.* 78 (4), 380–386.

Nguyen, L.H., Joshi, A.D., Drew, D.A., Merino, J., Ma, W., Lo, C.H., Kwon, S., Wang, K., Graham, M.S., Polidori, L., Menni, C., 2021 Feb 28. Racial and ethnic differences in COVID-19 vaccine hesitancy and uptake. *medRxiv Preprint.* <https://doi.org/10.1101/2021.02.25.21252402>.

Our World in Data, 2022. Coronavirus (COVID-19) Vaccinations - Statistics and Research, 12 September 2022. <https://ourworldindata.org/covid-vaccinations?country=USA>.

Perlis, R.H., Ognyanova, K., Santillana, M., Lin, J., Druckman, J., Lazer, D., Green, J., Simonson, M., Baum, M.A., Della Volpe, J., 2022. Association of major depressive symptoms with endorsement of COVID-19 vaccine misinformation among US adults. *JAMA Netw. Open* 5 (1), e2145697.

Phillips, S., Williams, M.A., 2021. Confronting our next national health disaster. *N. Engl. J. Med.* 385, 577–579.

- Raifman, M.A., Raifman, J.R. Disparities in the population at risk of severe illness from COVID-19 by race/ethnicity and income. *Am. J. Prev. Med.* 59(1), 137–139.
- Roberts, L.W., Kim, J.P., 2014. Giving voice to study volunteers: comparing views of mentally ill, physically ill, and healthy protocol participants on ethical aspects of clinical research. *J. Psychiatr. Res.* 56 (1), 90–97.
- Roberts, L.W., Kim, J.P., 2017a. Healthy individuals' perspectives on clinical research protocols and influences on enrollment decisions. *AJOB Empir. Bioeth.* 8 (2), 89–98.
- Roberts, L.W., Kim, J.P., 2017b. Receptiveness to participation in genetic research: a pilot study comparing views of people with depression, diabetes, or no illness. *J. Psychiatr. Res.* 94, 156–162.
- Roberts, L.W., Warner, T.D., Brody, J.L., Roberts, B., Lauriello, J., Lyketsos, C., 2002. Patient and psychiatrist ratings of hypothetical schizophrenia research protocols: assessment of harm potential and factors influencing participation decisions. *Am. J. Psychiatr.* 159 (4), 573–584.
- Ruiz, J.B., Bell, R.A., 2021. Predictors of intention to vaccinate against COVID-19: results of a nationwide survey. *Vaccine* 39 (7), 1080–1086.
- Shim, R.S., Starks, S.M., 2021. COVID-19, structural racism, and mental health inequities: policy implications for an emerging syndemic. *Psychiatr. Serv.* 72 (10), 1193–1198.
- Taquet, M., Geddes, J.R., Husain, M., Luciano, S., Harrison, P.J., 2021. 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: a retrospective cohort study using electronic health records. *Lancet Psychiatr.* 8 (5), 416–427.
- Tsai, R., Hervey, J., Hoffman, K., Wood, J., Johnson, J., Deighton, D., Clermont, D., Loew, B., Goldberg, S.L., 2022. COVID-19 vaccine hesitancy and acceptance among individuals with cancer, autoimmune diseases, or other serious comorbid conditions: cross-sectional, internet-based survey. *JMIR Public Health Surveill* 8 (1), e29872.
- Tsungmey, T., Kim, J.P., Dunn, L.B., Ryan, K., Lane-McKinley, K., Roberts, L.W., 2019. Negative association of perceived risk and willingness to participate in innovative psychiatric research protocols. *J. Psychiatr. Res.* 122, 9–16.
- Woodworth, K.R., Mouliá, D., Collins, J.P., Hadler, S.C., Jones, J.M., Reddy, S.C., Chamberland, M., Campos-Outcalt, D., Megan, R.L., Brooks, O., Talbot, H.K., Lee, G. M., Bell, B.P., Daley, M.F., Mbaeyi, S., Dooling, K., Oliver, S.E., 2021. The advisory committee on immunization practices' interim recommendation for use of Pfizer-BioNTech COVID-19 vaccine in children aged 5-11 Years – United States, November 2021. *MMWR Morb. Mortal. Wkly. Rep.* 70 (45), 1579–1583.