Short Communication

Factors associated with reported likelihood to get vaccinated for COVID-19 in a nationally representative US survey

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ABSTRACT

Objectives: Although general principles related to vaccination hesitancy have been well researched, reports on reluctance to be vaccinated for coronavirus disease 2019 (COVID-19) in the United States are somewhat surprising, given the disease's substantive disruption of everyday life. However, the landscape in which people are making COVID-19 vaccination decisions has recently evolved with releases of encouraging vaccine-related data and changes to official messaging about the virus. Therefore, this study sought to identify factors associated with reported likelihood to get vaccinated for COVID-19 among US adults in late January 2021.
Study design: We used the Prolific online research panel to survey a nationally representative sample of 1017 US adults.
Methods: Respondents were asked about their behavioral intentions toward COVID-19 vaccination, trust in science, perceptions related to COVID-19, and selected sociodemographic factors. We computed associations between those 11 independent variables and likelihood to get vaccinated for COVID-19 using multiple linear regression.
Results: Around 73.9% of respondents indicated at least some likelihood to get vaccinated for COVID-19. Trust in science and perceived seriousness of COVID-19 were positively associated with intention to get vaccinated, and identifying as Black or African American was negatively associated with intention to get vaccinated. Other factors were moderately, weakly, or not at all associated with intention.
Conclusions: Building trust in science and truthfully emphasizing the seriousness of catching COVID-19 should be further researched for their potential to support campaigns to encourage COVID-19 vaccination. Data continue to suggest the importance of dialogue with Black communities about COVID-19 vaccination.

Introduction

Although much remains to be learned, early data on vaccines for severe acute respiratory syndrome coronavirus 2, the virus that causes coronavirus disease 2019 (COVID-19), are extremely promising,[1] and vaccines will likely play an important role in supporting a return to 'normalcy' in the United States (US). At the same time, reluctance to become vaccinated against COVID-19 in the US is surprisingly prevalent, including among current healthcare professionals[2] and those in training.[3]

Multiple robust studies of COVID-19 vaccination hesitancy were conducted early in the pandemic. A national US survey conducted in April 2020 identified several factors associated with COVID-19 vaccination hesitancy, including education, race, prior receipt of an influenza vaccination, and, from qualitative data, trust.[4] The latter finding is consistent with both a recent systematic review of

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the intersection of trust and vaccination more generally[5] and other studies about COVID-19 vaccination specifically.[6] Another large US study from May 2020 found associations between COVID-19 vaccination hesitancy and political orientation, perceived likelihood of infection, and perceived severity of infection.[7]

At the same time, and consistent with the review by Larson et al.,[5] vaccination studies have varied widely in who or what entity they ask about trusting (e.g. government, doctors, vaccines, or others). Furthermore, many such studies have used only a single-item measure of trust,[5] although Nadelson et al.[8] made a compelling case that trust is a complex construct with multiple interlinked layers. Our own research on COVID-19 misinformation,[9] which used Nadelson's conceptualization of trust in science and scientists, suggested the possibility that such trust, as measured using the 21-item scale of Nadelson et al.,[8] was associated with belief in misinformation about the disease. On that basis, we now postulate a potential association between trust in science and intention to get vaccinated for COVID-19.

Objective

As part of the effort to reduce the impact of COVID-19, it is critical to ensure that researchers and other experts have multiple robust sources identifying the factors associated with intention to get vaccinated for COVID-19. Thus, we conducted a nationally representative US survey of COVID-19 vaccination hesitancy, trust in science, and 10 theoretically selected covariates. Our approach specifically addresses two important issues with the field's current understanding: (a) recency: the COVID-19 vaccination landscape is in flux, so analyses with newer data are important, and (b) emphasis on nuanced trust: studies of vaccine hesitancy rarely use complex assessments of trust, and even fewer specifically examine trust in science (the 'origin' of the vaccine). Using a composite value for trust based on the work by Nadelson et al.[8] enables insight into how one might intervene on such a variable because at least 21 component parts are known, in contrast to a broader but more amorphous concept of 'addressing mistrust.'

Methods

A nationally representative US sample by gender, race, and age was recruited on January 22 to 24, 2021, using the Prolific online research panel service as part of a preregistered randomized trial[10] focused on COVID-19 misinformation.

Measures

For this study, a question measuring intention to get vaccinated for COVID-19 (from 1 [unlikely] to 7 [likely]) was added to the questionnaire after preregistration. Participants also provided information about their gender, race, ethnicity, and age, as well as responded to questions about whether they had been diagnosed with COVID-19, their trust in science (composite score from 1 [low] to 5 [high]), religious commitment (1 [low] to 10 [high]), political orientation (1 [liberal] to 10 [conservative]), perceived seriousness of contracting COVID-19 (1 [not at all] to 10 [very]), perceived ability to avoid COVID-19 in case of an outbreak (1 [not at all confident] to 5 [very confident]), and agreement that their family/friends avoided crowded areas (1 [strongly disagree] to 7 [strongly agree]) (see Supplement 1 for question wording and sources).

Analyses

Associations between those 11 independent variables and likelihood to get vaccinated for COVID-19 were computed using multiple linear regression via the generalized linear model. Normal distribution of the residuals was confirmed using the '/save resid' command. No problematic multicollinearity was observed. Categories with cell sizes <10 were collapsed for race, gender, and COVID-19 diagnosis. All analyses were conducted using SPSS version 26 (IBM).

Sample

A total of 1077 panel members accepted the survey. As prespecified in the protocol, the study incorporated checks to avoid inattentiveness, dishonesty, and virtual private network/bot use. Individuals who were screened out in this manner were replaced by individuals within the same race, gender, and age cross section. Twenty-three individuals were rejected and resampled for inattentiveness, likelihood of using a VPN or bot, or dishonesty. An additional two declined to participate after reading the study information sheets. Of the remaining 1052 members, 35 exited the survey without completing the required components and were resampled. Most often, those individuals reached a quality control question but did not finalize submission after being informed of being screened out. The remaining 1017 panel members included 1000 who were paid for their work and an additional 17 who fully completed the survey but did not submit a request to Prolific for compensation.

Of those 1017 participants, 49 (4.8%) reported having already received at least one shot of a COVID-19 vaccine (the national US vaccination estimate for January 22, the day most data were collected, was 5.3%; see source in Supplement 1). Because the dependent variable was likelihood to get vaccinated, those individuals were excluded. Missing data were rare (1.2% of all cases), so listwise deletion was used. The final sample was composed of 953 participants.

Results

Approximately 73.9% of respondents were at least somewhat likely to get vaccinated for COVID-19 ($\geq$5 of 7). The mean trust in science was 3.89 (standard deviation [SD] = 0.66), and each 1-point increase in trust in science was associated with a 1.03-point increase in likelihood to get vaccinated for COVID-19. Similarly, the mean perception of the seriousness of COVID-19 was 6.46 (SD = 2.67), and each 1-point increase in perceived seriousness of contracting COVID-19 was associated with a 0.21-point increase in vaccination likelihood. Respondents generally agreed that their family/friends avoided crowded areas (mean [m] = 5.62, SD = 1.47); each 1-point increase in agreement was associated with a 0.10-point increase in vaccination likelihood. Identifying as Black or African American was associated with a 1.08-point decrease in vaccination likelihood compared with those identifying as White. Finally, each 1-point movement toward 'conservative' was associated with a 0.13-point decrease in vaccination likelihood. Other associations were non-significant and generally weak; complete results are presented in Table 1, and descriptive statistics are available in Supplement 1.

Discussion

In a nationally representative US sample of adults, nearly three-quarters indicated they were at least somewhat likely to get vaccinated for COVID-19, mirroring recent national data from the Kaiser Family Foundation (see source in Supplement 1). Our data suggest two factors that might not be ideal vaccination intervention targets (i.e. those that were weak and non-significant): having a prior COVID-19 diagnosis and confidence in avoiding COVID-19 in case of an outbreak (e.g. perceived susceptibility). In addition, although family's/friends' avoidance of crowds was

Table 1
Parameter estimates.

Variable	β	SE	95% LL	95% UL	Wald χ²	p
(Intercept)	0.790	0.609	−0.403	1.982	1.684	0.19
COVID-19 diagnosis from professionals						
Yes (reference)	−	−	−	−	−	−
No/unsure	−0.282	0.273	−0.818	0.254	1.066	0.30
Gender						
Male (reference)	−	−	−	−	−	−
Female	0.014	0.116	−0.213	0.241	0.015	0.90
Non-binary or transgender	0.193	0.294	−0.383	0.770	0.433	0.51
Race						
White (reference)	−	−	−	−	−	−
Black or African American	−1.078	0.205	−1.479	−0.676	27.708	<0.001
Asian	0.378	0.205	−0.024	0.781	3.403	0.07
Other	−0.267	0.347	−0.947	0.413	0.594	0.44
Hispanic or Latino/A						
Yes (reference)	−	−	−	−	−	−
No	−0.163	0.230	−0.614	0.288	0.503	0.48
Age	0.001	0.004	−0.006	0.009	0.103	0.75
Trust in science	1.026	0.106	0.818	1.234	93.173	<0.001
Religious commitment	0.006	0.020	−0.032	0.045	0.102	0.75
Political orientation	−0.134	0.292	−0.192	−0.077	21.195	<0.001
Seriousness of contracting COVID-19	0.207	0.025	0.159	0.255	71.338	<0.001
Confidence in avoiding COVID-19	−0.058	0.067	−0.188	0.073	0.752	0.39
Friends'/family's avoidance of crowded areas	0.103	0.045	0.014	0.191	5.137	0.02

COVID-19 = coronavirus disease 2019; LL = lower level; UL = upper level; SE = standard error.

significant, it contributed comparatively less explanatory power than other variables.

As reported in other studies,[4] Black or African American respondents reported lower likelihood than White respondents to get vaccinated for COVID-19. However, that finding should not be taken to mean that Black or African American communities uniformly resist COVID-19 vaccination. Rather, it is plausible that there are a number of unmeasured and interlinked factors that served to produce such a statistical association, such as concerns about access, the need for vaccinating authorities to foster community engagement, and authorities' need to foster, and be worthy of, institutional trust.

In addition, as expected,[7] perceived seriousness of contracting COVID-19 was markedly associated with vaccination likelihood, although, again, the same did not hold true for perceived susceptibility, highlighting an important distinction. Finally, trust in science was strongly and significantly associated with likelihood to get vaccinated for COVID-19. Although multiple types of trust are likely important for vaccination uptake (e.g. community trust in authorities, as discussed previously), this variable distinctly addresses trust in the broader scientific approach.

Limitations

Importantly, this was a cross-sectional exploratory study and was limited by non-random, online sampling and potential omitted variable bias. The findings were not causal. We specifically do not encourage any decisions to be made solely based on this study but suggest our findings might be incorporated into the evidence basis for COVID-19 vaccination hesitancy.

Conclusions

Interventions and public health campaigns should be driven by holistic review of all available evidence. Adding to that body of evidence, our work suggests several potential leverage points to boost vaccination (perceived seriousness and trust in science), reaffirms the need to meaningfully engage in vaccination dialog with Black communities, and identifies other factors that might plausibly be associated with vaccination uptake but that may not be effective intervention targets.

Author statements

Ethical approval

This study was approved by the Indiana University IRB, #2008571490. All participants provided digital informed consent.

Competing interests

J.A. owns a small amount (<1 share) of stock in Johnson & Johnson, which has produced a vaccine for COVID-19. No other financial relationships exist that are relevant to this manuscript.

Access to data

Data used for this study are part of an ongoing randomized trial and will be released in full alongside publication of that study. Data were provided to reviewers and editors during the review process.

Author contributions

J.A. conceptualized and designed this study. All researchers were involved in acquisition, analysis, and/or interpretation of data. J.A. drafted the first draft of the manuscript, and all authors revised the manuscript for important intellectual content. J.A., Y.X., and L.G.-A. conducted statistical analyses. J.A., Y.X., and E.E.T. obtained funding for the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2021.05.009.

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