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Characterization of COVID-19 Vaccine Hesitancy Among Essential Workforce Members of a Large Safety Net Urban Medical Center

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Abstract

Objectives: Vaccine hesitancy among essential workers remains a significant public health challenge. We examined psychological constructs of perceived susceptibility, threat, and self-efficacy and their associations with COVID-19 vaccine hesitancy among a racially and ethnically diverse essential workforce population.

Methods: We performed a cross-sectional survey of essential workers from September-December 2020 at a large Los Angeles safety-net medical center as part of a program offering free COVID-19 serology testing. Program participants completed a standardized survey at the time of phlebotomy. Hierarchical logistic regression was utilized to determine factors independently associated with vaccine hesitancy.

Results: Among 1327 persons who had serology testing, 1235 (93%) completed the survey. Of these, 958 (78%) were healthcare workers. Based on expressed intent, 22% were vaccine-hesitant 78% were vaccine acceptors. In our multivariate model, vaccine hesitancy was associated with female gender [aOR = 2.09; 95% CI (1.44-3.05)], African American race [aOR = 4.32; (2.16-8.62)], LatinX ethnicity [aOR = 2.47; 95% CI (1.51-4.05)] and history of not/sometimes receiving influenza vaccination [aOR = 4.39; 95% CI (2.98-6.48)]. Compared to nurses, vaccine hesitancy was lower among physicians [aOR = 0.09; 95% CI (0.04-0.23)], non-nursing/non-physician healthcare workers [aOR = 0.55; 95% CI (0.33-0.92)], and non-healthcare care workers [aOR = 0.53; 95% CI (0.36-0.78)].

Conclusions: Among a racially/ethnically diverse group of safety net medical center essential workers, COVID-19 vaccine hesitancy was associated with racial/ethnic minority groups, employment type, and prior influenza vaccination hesitancy. Interestingly, we found no association with the Health Belief Model construct measures of perceived susceptibility, threat, and self-efficacy. Psychological constructs not assessed may be drivers of vaccine hesitancy in our population.

Keywords

vaccine hesitancy, behavioral health, prevention, community health, COVID-19

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Introduction

Vaccination is one of the most successful Public Health interventions for reducing the health burden associated with vaccine-preventable diseases.[1-3] The World Health Organization has identified vaccine hesitancy among the top 10 Global Health threats.[4] Vaccination against severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the etiological agent of Coronavirus Disease 2019 (COVID-19), has the potential to attenuate morbidity, mortality, and potentially end the pandemic.[5,6] However, acceptance of the COVID-19 vaccine has been far from complete.[7] A recent systematic review of COVID-19 vaccine hesitancy studies among persons living in the United States showed that overall COVID-19 vaccine acceptance rates ranged from 28% to 93%.[8] Therefore, to increase acceptance of a COVID-19 vaccine, a detailed understanding of the drivers associated with COVID-19 vaccine hesitancy remains essential.

Of particular concern is vaccine hesitancy among essential workforce members who have a higher risk of COVID-19 exposure due to their job duties. Workforce members classified as "essential" are those who perform essential duties enabling the continued operation of social services, providing food products and healthcare services. Vaccine hesitancy rates assessed pre-vaccine rollout in healthcare and non-healthcare settings have been concerningly high, 53% and 39% respectively.[9-11]

An important group of community-level variables, the Social Determinants of Health (SDOH), have been shown to influence vaccine hesitancy.[12] SDOH variables include measures of economic, education, transportation, neighborhood (park access, retail density), housing, clean environment, and healthcare access.[13] Moreover, several studies suggest that the SDOH have a role in more severe COVID-19 health outcomes of minority populations.[14-16] For example, housing density and housing occupancy are SDOH factors, and communicable diseases spread more easily for people who live in crowed, densely packed areas.[17] Driven by a need for a standardized community wellness measures grounded on the SDOH, the Public Health Alliance of Southern California, and the Center on Society and Health developed the California based Healthy Places Index (HPI).[13,18] This measure includes 23 SDOH associated community characteristics such as education, housing, and healthcare access.[13] Several studies on COVID-19 vaccine hesitancy have included singular SDOH variables such as level of education, income level, and employment status.[12,19,20] However, to our knowledge, assessment of whether there is an association between a composite SDOH measure, such as the HPI and vaccine hesitancy, has not been undertaken. Communities with high HPI scores expect to have good health outcomes.

Methods

We conducted a cross-sectional study to evaluate vaccine hesitancy to a hypothetical, soon-to-be-released COVID-19 vaccine among an essential workforce population located in an urban medical center, Los Angeles County-USC Medical Center (LAC + USC). LAC + USC is a 600-bed safety-net medical center with affiliated campus clinics. We hypothesized that unique health behavior-based factors would be associated with a person's intention to receive a novel COVID-19 vaccine. Additionally, we hypothesized that the relationship between a person's perceived susceptibility, threat and self-efficacy to COVID-19 infection, and vaccine hesitancy would be varied by HPI score. We assessed the constructs of perceived susceptibly, threat, and self-efficacy. To this end, we developed a questionnaire to evaluate vaccine hesitancy that utilized the Health Belief Model (HBM) as a guide to composing questions relevant to vaccine hesitancy and amended items from previously surveys.[7,21-23] Questions related to COVID-19 used 7-point Likert-type questions from strongly disagree to strongly agree.

The questionnaire was administered as part of a program offering free SARS CoV-2 antibody testing in Fall 2020. This program was advertised via email and flyers to LAC + USC employees. Serology was offered on selected days and times from September 1, 2020, through December 1, 2020 (prior to availability of SARS CoV-2 vaccination) by appointment or walk-in. All medical center employees were eligible for the program, including employees with patient care duties and those without, such employees in administration, finance, and facility management. Our study time frame encompasses a significant period during the COVID-19 pandemic as Los Angeles County was heading into a winter surge of COVID-19 infections and prior to vaccine rollout.[24] Hospitals were seeing an increase in hospitalizations due to COVID-19 infections as early September, 2020 approximately 1000 confirmed hospitalized cases were reported and increased to approximately 3000 cases by December, 2020.[24] Prior to phlebotomy, employees were asked to complete a standardized survey. The survey was administered electronically. The survey portal was accessed via a QR code scanned by a smartphone. Paper surveys were available for those who preferred this method. Our survey consisted of 7 sections with 44 total questions. Analysis of findings from this program was reviewed by the Institution Review Board of the Lundquist Institute at Harbor-UCLA and considered exempt, therefore program participants were not required to provide informed consent.

Items measuring perceived susceptibility, threat, and self-efficacy was derived from the HBM. To assess HBM construct questions for internal consistency, Cronbach alpha coefficient was calculated. If there was good reliability (Cronbach's alpha $\geq .7$), a composite (ie, mean) score of

Table 1. Baseline Demographics.

Demographic	Total N (%)	Vaccine hesitant N (%)	Vaccine acceptors N (%)	*P* value
	1235	267 (21.7)	968 (78.4)	
Age (mean)		36.3	37.5	.28
Standard deviation		16.9	16.9	
Gender				<.001
Male	368 (30.1)	48 (18.1)	320 (33.4)	
Female	856 (69.9)	217 (81.9)	639 (66.6)	
Race/ethnicity				<.001
Asian or Asian American	354 (29.5)	46 (18.0)	308 (32.5)	
African American	70 (5.8)	29 (11.4)	41 (4.3)	
Caucasian	242 (20.1)	28 (11.0)	214 (22.6)	
LatinX	447 (37.2)	133 (52.1)	314 (33.2)	
Native Hawaiian or another pacific islander	26 (2.2)	3 (1.2)	23 (2.4)	
Mixed/other	63 (5.2)	16 (6.3)	47 (5.0)	
Employment type				.003
Healthcare worker	958 (78.0)	207 (78.1)	751 (78.1)	
Physician	221 (18.0)	6 (2.3)	215 (22.3)	
Nurse	597 (48.6)	173 (65.3)	424 (44.1)	
Non-nursing/non-physician healthcare worker	140 (11.4)	28 (10.5)	112 (11.6)	
Non-healthcare worker	270 (22.0)	58 (21.9)	212 (22.0)	
Influenza history				<.001
Always	1059 (86.0)	182 (68.4)	877 (90.8)	
Sometimes or never	173 (14.0)	84 (31.6)	89 (90.2)	
Healthy Places Index* (mean, standard deviation)		0.46 (0.24)	0.37 (0.23)	<.001

Note: not all persons responded to all questions, so totals may not add up to 1235.
*See reference (13).

individual items was used for analysis. Otherwise, individual survey items were used as variables in the analysis. California HPI survey items were obtained from the public domain.[13] Zip codes with low HPI values represent communities more disadvantaged than those with higher HPI values.

Students *t*-test and Chi-square tests, as appropriate, were used to test for distribution differences between vaccine hesitancy groups and covariates and predictor variables. To determine which independent variables, predict vaccine hesitancy, we first performed bivariate analyses. Hierarchical regression was then performed with the baseline model of sociodemographic variables and history of influenza vaccination, followed by a series of models with additional inclusions of HPI and HBM constructs separately. We then performed an analysis on whether an interaction occurs between the community level factor, HPI score, and individual level factors including perceived susceptibility, perceived threat, and perceived self-efficacy, with adjustment for other socio-demographic variables and history of influenza vaccination as covariates. Taking the interaction of perceived susceptibility and HPI as an example, we hypothesized that the relationship between a person's perceived susceptibility to COVID-19 and vaccine hesitancy would vary by HPI score.

Results

Among the approximately 10 500 workforce members at LAC + USC, 1327 participated in the phlebotomy program and, among these, 1235 (93%) submitted survey responses. Of these, 958 (78%) were healthcare workers. Full demographic and hypothesized vaccine hesitancy variables are presented in Table 1. COVID-19 vaccine hesitancy and vaccine acceptance were found in 267 (22%) and 968 (78%) respectively. Mean HPI score was significantly higher in the vaccine-acceptor group *versus* vaccine-hesitant group (0.46 vs 0.37: $P=<.001$). The proportion of vaccine-hesitant persons was low among Native Hawaiian/Pacific Islanders (1%), Caucasians (11%), African Americans (11%), and Asian Americans (18%) compared to persons with LatinX ethnicity (52%). In bivariate analysis (Table 2), vaccine hesitancy was not associated with age, but was associated with female gender [OR 2.26: 95% CI (1.61-3.18)], African American race [OR = 5.41; 95% CI (2.92-10.02)], LatinX ethnicity [OR = 3.24; 95% CI (2.08-5.04)], mixed/other race/ethnicity [OR = 2.60; 95% CI (1.34-5.19)], and history of not/sometimes receiving influenza vaccination [OR = 4.55; 95% CI (3.24-6.38)]. Higher HPI (ie, those from less disadvantaged communities) was inversely associated with vaccine hesitancy [OR = 0.23; 95% CI (0.13-0.41)].

Several mean scores among the HBM response items differed (Figure 1). Mean score of the perceived susceptibility item ("I am worried about being infected by COVID-19" was significantly different between vaccine-acceptors and vaccine-hesitant, [5.43 vs 5.09 ($P=<.001$)]. Mean response scores for 2 HBM construct of perceived

Table 2. Bivariate Regression of Vaccine Hesitancy, Demographic, and Other Factors.

Variable	Odds ratio & 95% confidence interval	*P*-value
Age	1.00 [0.99-1.00]	.28
Gender		
Male	Ref.	
Female	2.26 [1.61-3.18]	<.001
Race		
Asian American	1.14 [0.69-1.88]	.61
African American	5.41 [2.92-10.02]	<.001
Caucasian	Ref.	
LatinX	3.24 [2.08-5.04]	<.001
Native Hawaiian or another pacific islander	1.00 [0.28-3.54]	1.00
Mixed/other	2.60 [1.34-5.19]	.01
Employment type		
Physician	0.07 [0.03-0.16]	<.001
Nursing	Ref.	
Patient care, non-nursing or non-physician	0.61 [0.39-0.96]	.02
Non-patient care role	0.67 [0.48-0.94]	.03
History of influenza vaccine		
Always	Ref.	
Sometimes & never	4.55 [3.24-6.38]	<.001
Healthy Places Index*	0.23 [0.13-0.41]	<.001

Abbreviations: Ref., Referent group.
*See reference (13).

self-efficacy "Outside of my home, keeping more than 6 feet away from others is important to protect me from getting a COVID-19 infection" and "Wearing a mask is important to protect me from COVID-19" differed between vaccinate intention groups ([6.41 vs 6.23, (P=.03)] and [6.45 vs 6.74, (P=.01)], respectively), as was mean response score for one HBM item construct of perceived threat, "COVID-19 affects me emotionally, such as making me feel furious, afraid, angry or depressed," [4.48 vs 4.13: (P=.003)].

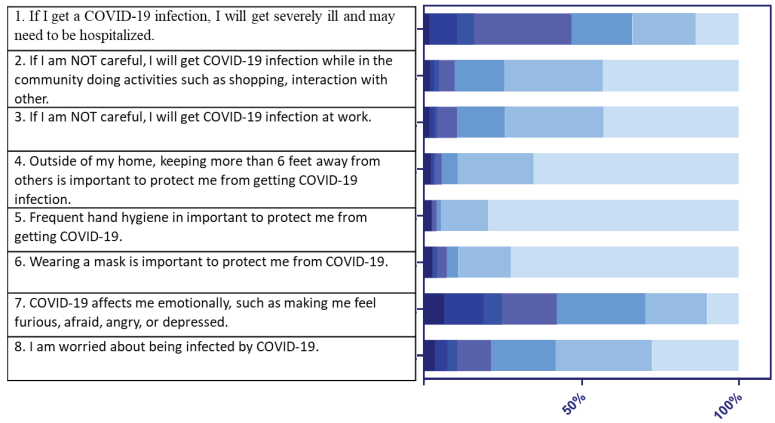
Internal consistency of HBM-derived construct of perceived susceptibility was fair (Cronbach's alpha=.69). (Table 3) Response Item "I am worried about being infected by COVID-19" was removed from the composite perceived susceptibility variable according to results of correlation analysis (data not shown). After removal of this item, internal consistency for perceived susceptibility was good (Cronbach's alpha=.78) (data not shown). Items for perceived threat showed poor internal consistency (Cronbach's alpha=.40), and were therefore left as individual items in our models. Perceived self-efficacy showed good internal consistency (Cronbach's alpha=.85). A composite variable was constructed from the calculated mean scores for perceived self-efficacy.

Table 4 summarizes results of multivariable hierarchical regression models performed to address drivers of vaccine hesitancy. These include Model 1 (reduced model), Model 2 (inclusion of HBM constructs), and Model 3 (inclusion of interaction variables). The most parsimonious model was Model 1, as determined by the Likelihood Ratio Test [Model 1 and Model 2=9.54 (P=.09)] and [Model 2 and Model 3=2.57 (P=.77)]. The HBM constructs assessed in our research study did not add predictive power beyond demographic variables and prior influenza vaccination. In Model 1, vaccine hesitancy was independently associated with female gender [aOR 2.09; 95% CI (1.44-3.05)], African American race [aOR 4.32; CI (2.16-8.62)], LatinX ethnicity [aOR 2.47; 95% CI (1.51-4.05)], and mixed/other race [aOR 2.30; 95% CI (1.09-4.82)], and history of not/sometimes receiving influenza vaccination [aOR 4.39; 95% CI (2.98-6.48)]. Physicians [aOR 0.09; 95% CI (0.04-0.23)], non-nursing/non-physician healthcare workers [aOR 0.55; 95% CI (0.33-0.92)] and healthcare workers [aOR 0.53; 95% CI (0.36-0.78)], showed lower odds of vaccine hesitancy compared to nurses. The interaction terms of perceived susceptibility and HPI, threat and HPI, and self-efficacy and HPI were not found to be statistically significant.

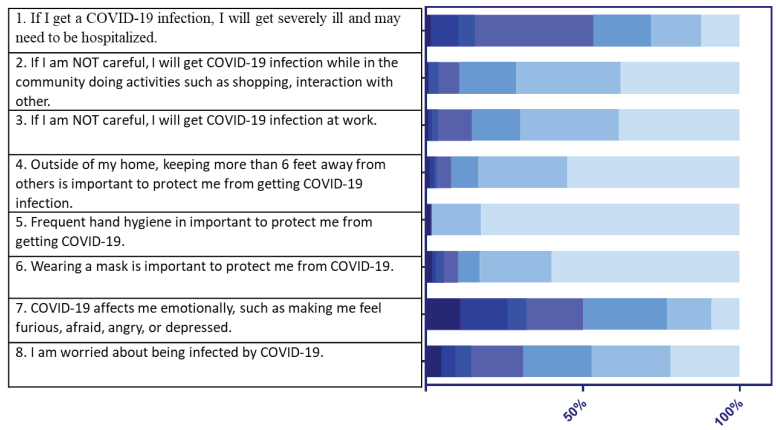
Discussion

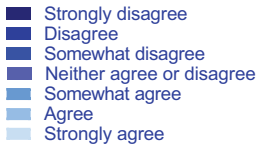
We performed a cross-sectional study that examined behavior-based physiological factors associated with COVID-19 vaccine hesitancy in an essential workforce population, including healthcare workers, with a large proportion of racial/ethnic minorities from a large urban safety-net hospital in Los Angeles pre-COVID-19 vaccine availability. We found that 22% were vaccine-hesitant and several demographic factors and prior influenza vaccine hesitancy were associated with COVID-19 vaccine hesitancy. However, interestingly our study found no association between

A Panel A: Vaccine-acceptors



B Panel B: Vaccine-hesitant





C Mean response scores for vaccine-acceptors and vaccine-hesitant persons.

Group/Question	1	2		4	5	6	7	8
Vaccine acceptors	4.67	5.98	5.98	6.41	6.33	6.45	4.48	5.43
Vaccine hesitant	4.59	5.92	5.88	6.23	6.74	6.74	4.13	5.09
P value	0.45	0.51	0.24	**0.03**	0.12	**0.01**	**0.003**	**<0.001**

Figure 1. Distribution of Likert-type response items for health belief model based vaccine hesitancy questions. (A) Panel A: vaccine-acceptors, (B) Panel B: vaccine-hesitant, and (C) Mean response scores for vaccine-acceptors and vaccine-hesitant persons.

vaccine hesitancy and the Social Determinant of Health variable, HPI, or HBM-based constructs of perceived susceptibility, threat, and self-efficacy, as measured using established survey items.

Vaccine hesitant persons in our heavily healthcare-worker population (22%) was consistent with other investigations in healthcare workers conducted prior to COVID-19 vaccine availability (16%-21%).[10,19,20] For comparison,

Table 3. Health Belief Model Constructs of COVID Vaccination Intention.

	Cronbach alpha
Perceived susceptibility	.69
I am worried about being infected by COVID-19.	
If I am NOT careful, I will get COVID-19 infection at work.	
If I am NOT careful, I will get COVID-19 infection while in the community doing activities such as shopping, and interacting with others.	
Perceived threat	.40
COVID-19 affects me emotionally, such as making me feel furious, afraid, angry or depressed.	
If I get COVID-19, I will get severely ill and may need to be hospitalized.	
Perceived self-efficacy	.85
Outside of my home, keeping more than 6 feet away from others is important to protect me from getting COVID-19 infection.	
Frequent hand hygiene is important to protect me from getting COVID-19.	
Wearing a mask is important to protect me from COVID-19.	

among other essential workforce members, a study of grocery store workers showed high vaccine hesitancy (39%).[9]

Our regression model identified several characteristics in our study population independently associated with vaccine hesitancy. These included females, nurses, and certain minority populations (African American, LatinX). Those who stated they sometimes or never received annual influenza vaccinations showed increased odds of COVID-19 vaccine hesitancy compared to employees who get the annual influenza vaccine. Vaccine hesitancy among females is consistent with previous studies conducted on essential workforce members.[7,19,25] An explanation for the higher likelihood of vaccine hesitancy among females has been attributed to the lack of inclusion of pregnant women in the initial COVID-19 vaccine clinical trials, concerns over reproductive function, and the vaccine's potential affect among those trying to conceive.[26]

Vaccine hesitancy among minority populations can hinder community resiliency. Those among our study population who identify as African Americans or LatinX had more vaccine hesitancy. A study conducted during a similar time frame and on a similar population, albeit heavily (77%) Caucasian, similarly showed minority populations having a higher odds of vaccine hesitancy.[27] Minority communities have been disproportionately affected by COVID-19 infections and hospitalizations.[28] COVID-19 vaccine hesitancy among African Americans has been attributed to healthcare system mistreatment and mistrust.[29] The effects of the Tuskegee Syphilis Study and Henrietta Lacks' unconsented use of her cancer cells continue to hurt the African American community, still cause lingering mistrust of the medical system.[30] Among the LatinX population, misinformation, safety, and efficacy concerns has been suggested to contribute to vaccine hesitancy.[31]

Similar to several previous vaccine hesitancy studies, we found that nurses are more likely to be vaccine-hesitant than their other coworkers such as physicians, and hospital employees with either patient care rolls or nonpatient care roles.[19] Nurses have been shown to be more vaccine-hesitant than other health care workers and is attributed to vaccine safety concerns.[3] Greater vaccine-hesitancy among nurses *versus* other employment types may be due to a high proportion of females employed as nurses (81% female vs 19.0% male, data not shown). As noted above, females have greater concern about safety and reproductive implications associated with vaccination. Perhaps professional educational requirements for physicians and pharmacists contributes to lower vaccine hesitancy compared to nurses as a previous study found that the education level is associated with vaccine hesitancy.[19] Consistent with previous findings, we found that annual influenza vaccine hesitancy was associated with lower odds of COVID-19 vaccination.[19,32] Further studies designed to assess whether influenza vaccine attitudes and beliefs changed after the COVID-19 vaccines became available would be beneficial for continued vaccination messaging campaigns.

Surprisingly, none of the HBM constructs of, perceived susceptibility, threat, or self-efficacy were associated with vaccine hesitancy in our regression models. In contrast, others have found some HBM constructs associated with vaccine hesitancy. Shmueli[33] showed that among the general population, higher levels of perceived severity was associated with greater odds of accepting the COVID-19 vaccine [OR 2.36; 95% CI (1.58-3.51)] after adjusting for demographics. Additionally, among a healthcare worker population, Wang et al[34] showed greater cues to action through acceptance of workplace COVID-19 vaccine messaging and perceived benefit were associated with higher likelihood to get the COVID-19 vaccine. Differences in our results could be explained by our population consisting of a greater number of minorities. Attitudes about the COVID-19 vaccine have been shown to vary by race with African American and LatinX populations more likely to lack vaccine trust, think the vaccine is dangerous, and believe the

Table 4. Multivariable Hierarchal Regression.

	Model 1			Model 2			Model 3		
Variables	aOR	95% CI	*P*-value	aOR	95% CI	*P*-value	aOR	95% CI	*P*-value
Age	1.00	[0.99-1.01]	.33	1.00	[0.99-1.01]	.44	1.00	[0.97-1.01]	.44
Gender									
Male	Ref.			Ref.			Ref.		
Female	2.09	[1.44-3.05]	<.001	2.24	[0.04-0.23]	<.001	2.22	[1.51-3.26]	<.001
Race									
Asian American	1.03	[0.61-1.75]	.91	1.06	[0.62-1.83]	.83	1.04	[0.60-1.79]	.83
African American	4.32	[2.16-8.62]	<.01	4.31	[2.14-8.68]	<.001	4.17	[2.06-8.46]	<.001
Caucasian	Ref.			Ref.			Ref.		
LatinX	2.47	[1.51-4.05]	.01	2.39	[1.45-3.93]	.01	2.39	[1.48-3.95]	.01
Native Hawaiian or other Pacific Islander	0.73	[0.20-2.30]	.64	0.67	[0.18-2.50]	.59	0.67	[0.18-2.50]	.55
Mixed/other	2.30	[1.09-4.82]	.02	2.30	[1.09-4.85]	.03	2.28	[1.07-4.83]	.03
Employment type									
Physicians	0.09	[0.04-0.23]	<.001	0.09	[1.52-3.28]	<.001	0.09	[0.04-0.23]	<.001
Nurses	Ref.			Ref.			Ref.		
Non-nursing/non-physician healthcare worker	0.55	[0.33-0.92]	.02	0.54	[0.32-0.92]	.02	0.55	[0.33-0.93]	.03
Non- healthcare worker	0.53	[0.36-0.78]	<.001	0.55	[0.37-0.82]	.003	0.57	[0.38-0.82]	.003
Healthy places Index	0.56	[0.29-1.11]	.10	0.54	[0.27-1.06]	.07	0.68		.87
History of influenza vaccination	4.39	[2.98-6.48]	<.001	4.25	[2.89-6.29]	<.001	4.27	[2.88-6.34]	<.001
Perceived susceptibility composite variable				1.12	[0.95-1.33]	.17	1.02		.89
I am worried about being infected by COVID-19.				0.91	[0.83-1.01]	.09	1.01		.90
COVID-19 affects me emotionally, such as making me feel furious, afraid, angry or depressed.				0.92	[0.89-1.01]	.09	0.86		.11
If I get COVID, I will get severely ill and may need to be hospitalized.				01.00	[0.89-1.11]	.94	0.95		.67
Perceived self-efficacy composite variable				0.96	[0.81-1.13]	.60	1.06		.75
Interaction terms								Odds ratio	*P*-value
Perceived susceptibility composite variable*HPI								1.26	.53
I am worried about being infected by COVID-19*HPI								0.75	.21
COVID-19 affects me emotionally, such as making me feel furious, afraid, angry, or depressed* HPI								1.50	.39
If I get COVID, I will get severely ill and may need to be hospitalized* HPI								1.13	.66
Perceived self-efficacy composite variable*HPI								0.80	.53

Abbreviations: aOR, adjusted odds ratio; HPI, healthy places index.
*See reference (13).

vaccine was rushed out too quickly.[29] Vaccine hesitancy in minorities populations may be more associated with phycological attitudes of mistrust, fear, benefit, and lack of information or other factors not evaluated in our study.[33,35] Of note our study was conducted on a population that was exempt from the California government order to shelter in place (issued March 19, 2020). This exemption may have impacted the phycological stress experienced in our study population, thus influencing COVID-19 vaccine attitudes.

Our study has limitations. First, it was conducted pre-vaccine rollout and findings represents intent, not action. Our results suggest that the majority of essential workforce members are not vaccine-hesitant, however, we are unable to assess alignment with a person's response and vaccination when the COVID-19 vaccine became available. Nevertheless, the survey response data capture an important moment in the COVID-19 pandemic, measuring vaccine hesitancy toward a hypothetical COVID-19 vaccine soon to be available. Thus, findings may be applicable to future vaccines that are developed in response to new or pandemic-level threats. Furthermore, vaccine intent and vaccine receipt for other vaccines are highly correlated.[36,37] Second, we did not utilize a validated vaccine hesitancy instrument such as the Vaccine Hesitancy scale modified to assess the adult population as done in other studies.[19,38,39] However, our instrument was developed based on surveys used in prior vaccine hesitancy studies and of our many response items have previously been associated with vaccine hesitancy.[21,23,35,40]

There are strengths to our study. First, we utilize a unique community based SDOH variable, the HPI, to assess drivers of COVID-19 vaccine hesitancy. Secondly, our study population consists of a large proportion of minority essential workforce members that were typically not surveyed in other similar studies. Lastly, our study included essential workforce members with clinical and nonclinical roles.

Our findings suggest that vaccine hesitancy may be influenced by external factors beyond perceived susceptibility, threat, and self-efficacy or that different paradigms of vaccine hesitancy not explored in this study these latter forces may be more relevant to minority populations. Addressing vaccine hesitancy through culturally sensitive initiatives that target minority essential workforce populations may minimize vaccine hesitancy, improve the health of essential workers, and enhance their ability to provide key services in challenging pandemic milieus.

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Declaration of Conflicting Interests

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