



Short communication

Characteristics associated with COVID-19 vaccination status among staff and faculty of a large, diverse University in Los Angeles: The Trojan Pandemic Response Initiative

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ABSTRACT

Objective: This study examined characteristics associated with being unvaccinated among a sample of university staff and faculty prior to university campus reopening for in-person learning in 2021.

Methods: Staff and faculty responded to an email invitation to complete an online survey. Survey questions included demographic data (race/ethnicity, age, sex), COVID-19 knowledge and behaviors, employment specific data including division and subdivision (healthcare vs. non-healthcare related division); and self-reported vaccination status. A multivariable logistic regression analysis was performed to determine significant characteristics associated with the likelihood of being unvaccinated for COVID-19.

Results: Participants identifying as Asian and Asian American (aOR = 1.44, 95% CI: 1.06, 1.96), Hispanic/Latinx (aOR = 1.73, 95% CI: 1.21, 2.49) or Multicultural/Other (aOR = 1.72, 95% CI: 1.24, 2.38) had greater odds of being unvaccinated compared to Non-Hispanic White participants. Other characteristics associated with greater likelihood of being unvaccinated included working as a university staff member (vs. faculty) (aOR = 1.69, 95% CI: 1.24, 2.30), decrease in income (aOR = 1.34, 95% CI: 1.05, 1.71), inability to work remotely (aOR = 1.48, 95% CI: 1.13, 1.93) and not traveling outside of the Los Angeles area (aOR = 1.46, 95% CI: 1.16, 1.83). Political affiliation as an Independent (aOR = 1.39, 95% CI: 1.04, 1.85) or as something else (aOR = 3.84, 95% CI: 2.72, 5.41) were more likely to be unvaccinated compared to participants identifying as Democrat.

Conclusions: Several factors associated with racial and social disparities may delay the uptake of COVID-19 vaccination. This study highlights the need for targeted educational interventions to promote vaccination among university staff and faculty.

1. Background

COVID-19 vaccination is the best method for reducing COVID-19 morbidity and mortality (Adams et al., 2021). Despite the efficacy of vaccination and the increased infectivity of new COVID-19 variants, ~30–50% of vaccine eligible individuals in the U.S. remain unvaccinated (Riemersma, et al., 2021; Kupferschmidt and Wadman, 2021; Sah, 2021; Moline et al., 2021; Trends, 2021). Health disparities, mistrust of

government and medical institutions, misinformation, political beliefs, and trepidation over unknown long-term side-effects are often cited reasons for vaccine hesitancy (Thompson et al., 2021; Willis et al., 2021; Momplaisir, 2021; Tram, 2021; Safrai, et al., 2021; Christensen et al., 2020; Romer and Jamieson, 2020; Ruiz and Bell, 2021).

As higher education institutions resume in-person learning and on-campus activities, the likelihood of COVID-19 outbreaks will continue to be a concern for college and university communities (Wilson et al.,

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2020). Successful campaigns encouraging vaccination will depend on understanding vaccine hesitancy. To identify subgroups of the university population that might need targeted health communications to achieve optimal vaccination rates (defined as 100% compliance with being fully vaccinated) among university employees, the current study examined characteristics associated with the likelihood of not receiving the COVID-19 vaccine among university staff and faculty during the spring and summer (April-July) of 2021, before the campus reopened.

2. Methods

2.1. Participants

Participants were staff and faculty at the University of Southern California (USC) in Los Angeles, California. Participants were eligible if they were currently employed at USC (including instructors, healthcare workers of all grades, and all campus staff), were at least 18 years of age, and provided informed consent.

2.2. Procedure

The USC Institutional Review Board approved the study. Emails were sent to all staff and faculty inviting them to participate in a brief COVID-19 survey and the study was advertised on university websites. Participants provided informed consent electronically and completed the on-line surveys by clicking on a hyperlink link sent via email. Survey responses were collected between April 29, 2021 and July 21, 2021. A sample size of 4000 was calculated to achieve a detectable odds ratio for a factor at 50% frequency and an outcome with a prevalence of 30%. Participants received \$10 gift cards at the completion of each wave of the study.

2.3. Measures

Demographic variables included self-identified race and ethnicity (White; Asian/Asian American; Black/African American; Hispanic/Latinx; multicultural; or other), sex, age, and political affiliation (Democrat, Independent, Republican, something else). Employment related characteristics included division (staff, faculty, student employee) and sub-division (healthcare related position vs. all other university divisions), change in income during the pandemic (decreased or no change/increased) and work-from home (yes or no). Staff included employees of the university and university affiliate departments not including faculty members. COVID-19 history was self-reported and categorized as “yes” or “no”. Additional survey questions focused on housing situations, recent travel outside of Los Angeles, COVID-19 knowledge and attitudes and compliance with prevention behaviors including masking and social distancing (developed for this study or adapted from published measures on similar topics). The outcome variable for this study was self-reported vaccination status at the time of the survey defined as receiving 2 doses of Pfizer or Moderna or 1 dose of Johnson and Johnson vaccine.

2.4. Data analysis

Logistic regression models were used to estimate associations and adjust for potential confounders. Variables that were significantly associated with vaccination status at $p < 0.05$ were included in a final multivariable model along with variables deemed as *a priori* potential confounders based on previous research (age, sex, and ethnicity). Adjusted odds ratios and 95% confidence interval associated with vaccination status are reported.

3. Results

Among the 2817 staff and faculty who were sent invitation emails,

2125 (75.4%) completed the survey and were included in the analysis. Demographic characteristics of the sample are shown in Table 1. Mean age was 42.2 years (± 12.3). Most respondents identified as white (40.2%) or Asian / Asian American (23.8%). Participants were mostly female (68.3%) and more than half the sample reported their political affiliation as Democrat (65.6%). Participants were mostly employed as staff (70.5%), worked in a non-healthcare related division (55.7%), had no change in income during the pandemic (72.9%) and currently worked from home because the campus was closed and only essential workers were on campus (79%). Most participants reported no history of COVID-19 (82.2%) and self-reported that they had received a COVID-19 vaccination [(78.4%) Table 1]. Overall, responses suggest greater intention for receiving the vaccine compared to not intending to be vaccinated [(98.5% vs. 1.5%) Table 1].

Adjusted odds ratios and 95% confidence intervals from the multi-variable analysis for characteristics associated with the likelihood of being unvaccinated are shown in Table 2. Compared to Non-Hispanic White participants, Asian/Asian Americans (aOR = 1.44, 95% CI: 1.06, 1.96), Hispanic/Latinx (aOR = 1.73, 95% CI: 1.21, 2.49) and Multicultural/Other (aOR = 1.72, 95% CI: 1.24, 2.38) employees had higher odds of being unvaccinated. African American/Black participants

Table 1
Demographic and self-reported characteristics of a sample of staff and faculty at a large University in Los Angeles (N = 2125).

Characteristic	N %
<i>Race/ethnicity</i>	
Asian or Asian American	501 (23.8)
Black or African American	118 (5.6)
Hispanic/Mexican/Spanish/Latinx	300 (14.2)
Multicultural or other	342 (16.1)
White	846 (40.2)
<i>Age group</i>	
20–32 years	534 (25.1)
33–40 years	561 (26.4)
41–51 years	527 (24.8)
52–85 years	503 (23.7)
<i>Sex</i>	
Female	1450 (68.2)
Male	674 (31.7)
Undefined	1 (0.01)
<i>Division Status</i>	
Staff	1498 (70.5)
Faculty	469 (22.1)
Student employee	158 (7.4)
<i>Subdivision</i>	
Healthcare related division	941 (44.3)
Non-healthcare related division	1184 (55.7)
<i>Change in income</i>	
No change/increased	1540 (72.5)
Decreased	572 (26.9)
Not specified	13 (0.6)
<i>Worked from home</i>	
Yes	1666 (78.4)
No	443 (20.8)
No specified	16 (0.8)
<i>Traveled in/out of Los Angeles</i>	
No	798 (37.6)
Yes	1327 (62.4)
<i>Political Affiliation</i>	
Democrat	1394 (65.6)
Independent	388 (18.3)
Republican	152 (7.2)
Something else	191 (9)
<i>Had COVID-19</i>	
No	1747 (82.2)
Yes	378 (17.8)
<i>Self-reported responses to receiving COVID-19 vaccine</i>	
Already received the vaccine	1665 (78.4)
Yes, as soon as possible	342 (16.1)
Probably, yes	34 (1.6)
Probably, no	20 (0.9)
No, definitely will not	12 (0.6)

Table 2

Characteristics associated with the likelihood of not receiving the COVID-19 vaccine among university staff and faculty using an adjusted multivariate logistic regression model. (N = 2125).

Characteristics	Adjusted Odds Ratio	95% Confidence Interval
Race/ethnicity		
White	Reference	Reference
Asian or Asian American	1.44	1.06, 1.96
Black or African American	1.16	0.69, 1.95
Hispanic/Latinx	1.73	1.21, 2.49
Multicultural or other	1.72	1.24, 2.38
Age group		
20-32 years	Reference	Reference
33-40 years	2.15	1.52, 3.05
41-51 years	2.9	2.04, 4.12
52-85 years	3.44	2.37, 4.99
Assigned sex		
Female	Reference	Reference
Male	1.02	0.79, 1.30
Division Status		
Faculty	Reference	Reference
Staff	1.69	1.24, 2.30
Student employee	1.71	0.98, 2.99
Subdivision		
Non-healthcare related	Reference	Reference
Healthcare related	1.51	1.19, 1.93
Income change		
No change/increased	Reference	Reference
Decreased	1.34	1.05, 1.71
Worked from home		
Yes	Reference	Reference
No	1.48	1.13, 1.93
Travel in/out of L.A.		
Yes	Reference	Reference
No	1.46	1.16, 1.83
Political Affiliation		
Democrat	Reference	Reference
Independent	1.39	1.04, 1.85
Republican	1.42	0.94, 2.31
Something else	3.84	2.72, 5.41
Had COVID-19		
No	Reference	Reference
Yes	1.27	0.96, 1.68

(Adams et al., 2021). Sallam M; Al-Sanafi M, Sallam M. A Global Map of COVID-19 Vaccine Acceptance Rates per Country: An Updated Concise Narrative Review. *Journal of Multidisciplinary Healthcare* 2022;15:21.

were not significantly different than Non-Hispanic Whites. Participants who were older than 32 years had greater odds of being unvaccinated compared to participants in the youngest age quartile (Table 2). Assigned sex and having COVID-19 were not associated with vaccination status. Reporting political affiliation as Independent (aOR = 1.39, 95% CI:1.04, 1.85) or as something else (aOR = 3.84, 95% CI: 2.72, 5.41) were associated with greater odds of being unvaccinated compared to those who self-identified as Democrats. University staff (aOR = 1.69, 95% CI: 1.24, 2.30) had higher odds of being unvaccinated when compared to faculty members. Additionally, respondents working in healthcare related divisions were more likely to be unvaccinated (aOR = 1.51, 95% CI:1.19, 1.93) compared to employees in non-healthcare divisions. Participants who were unable to work remotely (aOR = 1.48, 95% CI:1.13, 1.93) and reported a decrease in their income (aOR = 1.34, 95% CI:1.05, 1.71) also had higher odds of being unvaccinated. Participants who did not travel were more likely to be unvaccinated (aOR = 1.46, 95% CI: 1.16, 1.83) compared to those who traveled outside of Los Angeles area.

4. Discussion

This study identified characteristics associated with being unvaccinated against COVID-19 among a large, diverse sample of university staff and faculty during the spring and summer (April-June) of 2021, when COVID-19 vaccines had been available to adults 18 years and

older for several months, but before the university implemented a vaccine mandate and reopened the campus (Adams et al., 2021). We identified several significant characteristics associated with being unvaccinated including race/ethnicity (Asian and Asian American, Hispanic/Latinx and as multicultural), were older than 32 years, unable to work remotely, and political affiliation (independent and as something else).

Results from previous studies have shown differences in vaccination rates among racial and ethnic groups, predominantly among African American and Black participants (Thompson et al., 2021; Momplaisir, 2021). Although African American and Black participants in the present study were not more likely to be unvaccinated compared to whites (aOR = 1.16, 95% CI: 0.69, 1.95), this nonsignificant finding may be due to small sample size (N = 118). Our results suggest delayed vaccination is prevalent among many other races and ethnicities especially among participants identifying as Asian/Asian American, Hispanic/Latinx and as Multicultural/Other compared to Non-Hispanic White participants. Participants who have experienced racial discrimination are more likely to be vaccine hesitant, emphasizing the need to address racial disparities as a barrier to COVID-19 vaccination (Savoia et al., 2021; Raja, et al., 2021; Latkin, 1982).

Low vaccine uptake has been identified among socially vulnerable populations, especially among those who suffered a loss in employment and/or income (Hughes et al., 2021). Financial and employment loss was an unforeseeable consequence due to the need to mitigate the spread of COVID-19 resulting in business closures (Wilson et al., 2020). Reduced or loss of income among populations who were already vulnerable further lowers the likelihood of vaccination (Hughes et al., 2021). Furthermore, individuals who were unable to take time off of work have cited fear of loss of income or employment as reasons for not being vaccinated (Patel, 2021). Similar results were observed in the present study where participants reporting decreased income were more likely to be unvaccinated compared to those who had no change or increase in income. Culturally resonant health communications, convenient vaccination locations, and paid sick leave to recover from vaccination side effects could be effective strategies to increase vaccination in vulnerable populations.

The pace at which the COVID-19 vaccine was developed and approved has been associated with delayed vaccination even among healthcare workers (Gadoth, 2020; Shekhar et al., 2021). Although healthcare workers with direct patient contact were prioritized for early receipt of the COVID-19 vaccine after emergency authorization use by the Food and Drug Association, (Biswas et al., 2021) and despite having potentially greater exposure to COVID-19, many healthcare workers deferred COVID-19 vaccination until more data regarding long-term side effects were available. Our results corroborate this with participants in the present study working in a healthcare associated division of the university had a greater likelihood of being unvaccinated. Although most healthcare workers have greater health related knowledge, it is important to acknowledge and address reasons for vaccine hesitation among healthcare staff.

Political partisanship has been associated with vaccine mistrust and hesitancy among adults in the U.S. (Tram, 2021; Malina et al., 2021; Greer et al., 2020; Lalot et al., 2022). In the present study, participants identifying as Independent or something else had greater odds of not receiving the COVID-19 vaccine compared to Democrats. Like other characteristics related to vaccine hesitancy previously discussed in this paper, the influence of political beliefs, and misinformation and mistrust of science and government on vaccination hesitancy needs to be further explored.

The current study adds to the literature in several ways. Survey responses were obtained from a large, diverse sample of staff and faculty including healthcare workers. Furthermore, our findings suggest participants who are most likely to be unvaccinated may also have greater risk for exposure such as healthcare workers and those unable to work remotely. Although these results concur with other published literature,

to our knowledge this is the first study to investigate behaviors and attitudes towards COVID-19 vaccination among university staff and faculty.

5. Limitations

This analysis was based on a non-random sample of university staff and faculty who responded to an online survey, and results may not generalize to the larger population or other employees of another university. Future studies are needed to identify correlates of vaccination and vaccine hesitancy among staff and faculty who chose not to participate. Another limitation is self-reported data including COVID-19 vaccination status.

6. Conclusions

This study identifies subgroups of university staff and faculty who were unvaccinated for COVID-19 prior to the start of the 2021–2022 academic year. Furthermore, this study provides insight into characteristics associated with vaccine hesitancy and identify populations that may benefit from targeted education and outreach vaccination campaigns. Additionally, these findings may help generate university policies and programs to address future pandemics.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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