

OBSERVATION: BRIEF RESEARCH REPORT

Cross-sectional Assessment of COVID-19 Vaccine Acceptance Among Health Care Workers in Los Angeles

**Background:** The rise of vaccine hesitancy poses real and existential threats to the prevention and control of vaccine-preventable diseases and will hinder efforts to mitigate the coronavirus disease 2019 (COVID-19) pandemic (1, 2). In the context of a highly publicized coronavirus vaccine rollout, initial uptake by health care workers (HCWs) is critical for safety, health system functioning, and public opinion.

**Objective:** To understand general vaccine acceptance and specific attitudes toward forthcoming coronavirus vaccines among HCWs in Los Angeles, California.

**Methods:** Using volunteer sampling, we obtained consent from and enrolled a cohort of 1069 asymptomatic HCWs employed by University of California, Los Angeles (UCLA) Health to track incidence and risk factors of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection (3). As an addendum to this study, a cross-sectional survey designed to assess attitudes toward vaccines, including prospective acceptance of novel coronavirus vaccines, was distributed to participants on 24 September 2020 and completed online through 16 October 2020.

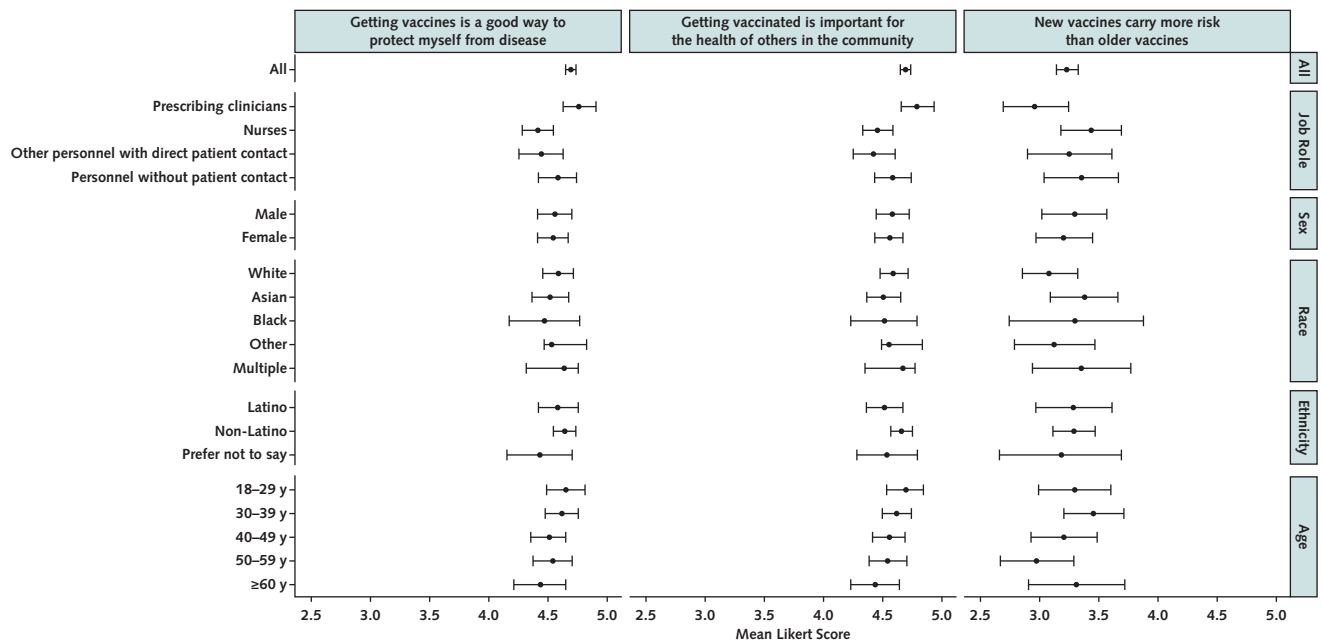
Descriptive statistics on survey respondents and reported attitudes toward novel coronavirus vaccines were tabulated.

Answers to 3 Likert scale questions assessing thoughts on general vaccine utility and risk were assigned a point value from 1 (“strongly disagree”) to 5 (“strongly agree”) and modeled using linear regression to determine marginally adjusted mean responses stratified by sex, race, ethnicity, age, and job role. We then calculated marginally adjusted proportions of COVID-19 vaccine uptake intent, controlling for participant demographic characteristics using multinomial regression with bootstrap postestimation. Analyses were performed using SAS, version 9.4 (SAS Institute), and Stata 16 (StataCorp); the figure was produced using the ggplot2 package in R (R Foundation for Statistical Computing). Ethical approval for this study was obtained from the UCLA Institutional Review Board (IRB #20-000478).

**Findings:** In total, 609 enrollees (57.0%) completed the optional questionnaire; complete-case analysis resulted in an analytical sample of 540 survey participants. Similar to the larger study cohort, a majority of participants were female (71.7%), were White (57.0%), were aged 30 to 49 years (63.0%), and had an advanced degree (62.8%). Almost all respondents held jobs with direct patient contact (85.4%).

Respondents overwhelmingly agreed on the utility of vaccines at large, including the protection they offer to recipients (mean Likert score, 4.69 [95% CI, 4.64 to 4.73]) and their positive externalities to the community (mean Likert score, 4.69 [CI, 4.65 to 4.74]), although distinct variation existed across job roles, with prescribing clinicians showing significantly higher

Figure. Marginally adjusted mean Likert scores for key vaccine acceptance indicators, by demographic group.



Answers to Likert scale questions were assigned a point value from 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). Multivariable linear regression was run to determine marginally adjusted mean responses stratified by sex, race, ethnicity, age, and job role. “All” indicates the overall, unadjusted mean Likert score.

**Table.** Marginally Adjusted Proportions of SARS-CoV-2 Vaccine Uptake Intentions, by Demographic Factor

Variable	Survey Sample (n = 540), n (%)	COVID-19 Vaccine Intention: Marginally Adjusted Proportion (95% CI)*			
		Accept Immediately	Delay 1†	Delay 2‡	Decline
<b>Job role</b>					
Prescribing clinicians§	201 (37.2)	0.51 (0.43–0.58)	0.42 (0.35–0.49)	0.06 (0.03–0.10)	0.01 (0.00–0.03)
Nurses	207 (38.3)	0.19 (0.13–0.25)	0.52 (0.46–0.60)	0.28 (0.22–0.34)	0.01 (0.00–0.04)
Other personnel with direct patient contact	53 (9.8)	0.27 (0.16–0.41)	0.54 (0.41–0.70)	0.15 (0.07–0.25)	0.04 (0.00–0.14)
Personnel without patient contact	79 (14.6)	0.29 (0.20–0.41)	0.59 (0.47–0.71)	0.11 (0.05–0.19)	0.01 (0.00–0.04)
<b>Sex</b>					
Male	153 (28.3)	0.36 (0.29–0.44)	0.48 (0.40–0.58)	0.15 (0.09–0.22)	0.01 (0.00–0.04)
Female	387 (71.7)	0.32 (0.27–0.37)	0.50 (0.45–0.55)	0.16 (0.13–0.20)	0.02 (0.00–0.03)
<b>Race</b>					
White	308 (57.0)	0.37 (0.32–0.42)	0.48 (0.42–0.54)	0.14 (0.10–0.18)	0.02 (0.00–0.03)
Asian	139 (25.7)	0.24 (0.17–0.31)	0.54 (0.46–0.63)	0.21 (0.14–0.28)	0.01 (0.00–0.05)
Black	15 (2.8)	0.32 (0.08–0.57)	0.37 (0.12–0.65)	0.31 (0.11–0.57)	0.00 (0.00–0.05)
Other	30 (5.6)	0.36 (0.20–0.54)	0.53 (0.36–0.71)	0.09 (0.00–0.23)	0.03 (0.00–0.15)
Multiple	48 (8.9)	0.33 (0.17–0.47)	0.50 (0.37–0.68)	0.16 (0.08–0.29)	0.00 (0.00–0.01)
<b>Ethnicity</b>					
Latino	62 (11.5)	0.26 (0.15–0.38)	0.50 (0.36–0.64)	0.22 (0.13–0.35)	0.02 (0.00–0.12)
Non-Latino	461 (85.4)	0.34 (0.30–0.39)	0.49 (0.44–0.54)	0.16 (0.13–0.19)	0.01 (0.00–0.03)
Prefer not to say	17 (3.2)	0.29 (0.08–0.52)	0.65 (0.41–0.90)	0.07 (0.00–0.20)	0.00 (0.00–0.08)
<b>Age</b>					
18–29 y	87 (16.1)	0.34 (0.25–0.44)	0.55 (0.43–0.64)	0.12 (0.06–0.20)	0.00 (0.00–0.01)
30–39 y	216 (40.0)	0.29 (0.24–0.35)	0.52 (0.45–0.58)	0.18 (0.13–0.24)	0.01 (0.00–0.03)
40–49 y	124 (23.0)	0.32 (0.24–0.41)	0.52 (0.44–0.61)	0.14 (0.09–0.21)	0.01 (0.00–0.04)
50–59 y	75 (13.9)	0.39 (0.29–0.50)	0.37 (0.27–0.50)	0.22 (0.14–0.31)	0.02 (0.00–0.09)
≥60 y	38 (7.0)	0.46 (0.31–0.60)	0.38 (0.24–0.55)	0.10 (0.00–0.24)	0.05 (0.00–0.17)

COVID-19 = coronavirus disease 2019; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

\* Marginally adjusted proportions were modeled via bootstrap postestimation using a polytomous regression to estimate COVID-19 vaccine intention, controlling for job role, sex, race, ethnicity, and age.

† "I intend to wait to see how the vaccine affects others before I get it."

‡ "I do not intend on getting the vaccine soon but might sometime in the future."

§ Includes clinicians with prescriptive authority (physicians, nurse practitioners, physician assistants, and certified registered nurse anesthetists).

average scores than nurses (Figure). A stepwise trend was observed for age, with younger participants showing greater agreement on the importance of vaccination to community health. General consensus was split on the relative risks of new versus established vaccines (mean Likert score, 3.23 [CI, 3.14 to 3.32]), although on average, respondents across demographic variables agreed that newer vaccines carry greater risk.

Unlike for vaccines at large, fewer than half of participants (46.9%) felt that a novel coronavirus vaccine would protect them against COVID-19. Just over one third (34.8%) of participants expressed confidence in the scientific vetting process for SARS-CoV-2 vaccines, with almost half (47.8%) reporting they would not be willing to participate in vaccine trials.

Most participants (65.5%) indicated they would delay vaccination once coronavirus vaccines became available for distribution (49.4% would prefer to wait and see how the vaccine affects others first, and 16.1% would not get it soon but indicated they might in the future), and 1.30% never intend to get vaccinated. Compared with prescribing clinicians, other HCWs were about 20% to 30% more likely to delay or decline a coronavirus vaccine when all other demographic factors were held equal (Table). Participants identifying as Asian (23.9%) or Latino (26.2%) were less likely to accept vaccination immediately upon availability compared with those in other racial and ethnic groups. Health care workers aged 50 years or older were more

likely than their younger coworkers to accept vaccination right away.

Respondents were most heavily influenced by the fast-tracked development timeline (83.5%), the novel and unfolding science of SARS-CoV-2 (75.7%), and the political climate in which the research and regulatory process were playing out at the time of survey distribution (58.5%) in shaping their vaccination intent. Those planning to delay or decline vaccination cited concerns about fast-tracking regulatory procedures (21.9%) and a lack of transparency and/or publicly available information on newly developed vaccines (19.7%) as their primary rationale.

**Discussion:** Health care workers serve on the frontlines of pandemic response efforts, are at high risk for occupational SARS-CoV-2 exposure and transmission, and act as ambassadors for evidence-based medical interventions. As the first recipients of coronavirus vaccines, their buy-in and participation in vaccination are critical in promoting uptake to a broader population (4, 5).

Although participants overwhelmingly acknowledged the importance and utility of general vaccination to public health practice in our survey, they were widely hesitant about partaking in COVID-19 vaccination in trial or postmarket settings and expressed uncertainties about the regulatory approval and protective capabilities of novel SARS-CoV-2 vaccines. Given the 57% survey response rate, selection bias is possible and may limit the generalizability of our findings.

Now that vaccine rollout has begun in several countries, continued assessment of vaccine uptake and attitudes—especially efforts that include targeted sampling of persons from diverse socioeconomic, geographic, labor, and ethnopolitical backgrounds and those excluded from vaccine trials, such as pregnant women—will be critical to addressing the root causes of vaccine hesitancy in both HCWs and the general public, paving the way for an end to the COVID-19 pandemic.

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**Disclosures:** Disclosures can be viewed at [www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M20-7580](http://www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M20-7580).

**Reproducible Research Statement:** *Study protocol, statistical code, and data set:* Available on request from Dr. Rimoin.

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## References

1. Phadke VK, Bednarczyk RA, Salmon DA, et al. Association between vaccine refusal and vaccine-preventable diseases in the United States: a review of measles and pertussis. *JAMA*. 2016;315:1149-58. [PMID: 26978210] doi:10.1001/jama.2016.1353
2. MacDonald NE; SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: definition, scope and determinants. *Vaccine*. 2015;33:4161-4. [PMID: 25896383] doi:10.1016/j.vaccine.2015.04.036
3. Halbrook M, Gadoth A, Martin-Blais R, et al. Incidence of SARS-CoV-2 infection among asymptomatic frontline health workers in Los Angeles County, California. medRxiv. Preprint posted online 21 November 2020. doi:10.1101/2020.11.18.20234211
4. Leask J, Willaby HW, Kaufman J. The big picture in addressing vaccine hesitancy. *Hum Vaccin Immunother*. 2014;10:2600-2. [PMID: 25483479] doi:10.4161/hv.29725
5. Huang P. First COVID-19 Vaccine Doses To Go To Health Workers, Say CDC Advisers. Shots: Health News from NPR. 5 November 2020. Accessed at [www.npr.org/sections/health-shots/2020/11/05/931844298/first-covid-19-vaccine-doses-to-go-to-health-workers-say-cdc-advisers](http://www.npr.org/sections/health-shots/2020/11/05/931844298/first-covid-19-vaccine-doses-to-go-to-health-workers-say-cdc-advisers) on 11 November 2020.