Assessment of U.S. health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system.

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Summary: Health care providers' (HCP) willingness to receive COVID-19 vaccine differs by their hospital role, race and age. These findings highlight important heterogeneity in personal attitudes among HCPs around COVID-19 vaccines and highlight a need for tailored communication strategies

Abstract:

Background: As a priority group, healthcare personnel (HCP) will be key to success of COVID-19 vaccination programs. The purpose of this study was to assess HCP willingness to get vaccinated and identify specific concerns that would undermine vaccination efforts.

Methods: We conducted a cross-sectional survey of HCP, including clinical and non-clinical staff, researchers, and trainees between November 23 rd ,2020 and December 5 th ,2020. The survey evaluated attitudes, beliefs and willingness to get vaccinated.

Results: A total of 5287 respondents had a mean age of 42.5 years (SD=13.56), and were 72.8% female (n=3842). Overall 57.5 % of individuals expressed intent to receive COVID-19 vaccine. 80.4% were physicians and scientists representing the largest group. 33.6% of registered nurses, 31.6% of allied health professionals, and 32% of master's level clinicians were unsure they would take the vaccine (p<.001). Respondents who were older, males, White, or Asian were more likely to get vaccinated compared to other groups. Vaccine safety, potential adverse events, efficacy and speed of vaccine development dominated concerns listed by participants. Fewer (54.0%) providers of direct care vs. non-care providers (62.4%), and 52.0% of those who had provided care for COVID-19 patients (vs. 60.6% of those who had not) indicated they would take the vaccine if offered (p<.001).

Conclusions: We observed that self-reported willingness to receive vaccination against COVID-19 differs by hospital roles, with physicians and research scientists showing the highest acceptance. These findings highlight important heterogeneity in personal attitudes among HCPs around COVID-19 vaccines and highlight a need for tailored communication strategies.

Introduction

The COVID-19 pandemic has claimed 1,931,083 lives around the globe as of January 9th, 2021[1]. Scientific advancements, including identification and sequencing of the SARS-Cov-2 virus and vaccine development, have occurred at an unprecedented speed. As of December 12th, the U.S. Food and Drug Administration issued the first emergency use authorization for the Pfizer-BioNTech BNT162b2 mRNA vaccine. Given the scarcity of vaccine supply, the initial roll out has been restricted to priority groups such as healthcare personnel (HCP) and those living in long-term care facilities[2]. HCP will be key to the success of COVID-19 vaccination programs. First, they are considered a trusted source of vaccine information and their vaccination stances will influence others. Second, they sustain essential health care operations that are now heavily affected by COVID-19 due to HCP illness or need for quarantine because of exposures.

Unfortunately, there are many unknowns and unanswered questions at this time about HCP willingness to get vaccinated against COVID-19. In a recent, non-peer reviewed publication summarizing single institution survey of HCP (n=609), 66.5% intended to delay COVID-19 vaccination, with nurses, personnel with patient contact roles, and those without patient contact being more resistant to vaccination compared to doctors[3,4]. In a survey of U.S. adults (n=1971), researchers used 2 hypothetical vaccine models to study individual preferences for vaccination. The single most important attribute for respondent vaccine acceptance was perceived efficacy, followed by low levels of major and minor side effects, full FDA approval, development in the United Kingdom, and endorsement by the Centers for Disease Control and Prevention. As among the first target groups to receive emergency use authorization (EUA) vaccine and considered an extremely important source for vaccine information, initial uptake of COVID-19 vaccines among HCP is critical. Broad acceptance of the vaccine by HCP may set the tone for the public, who will have the vaccine made available to them. The launch of the vaccination program could be adversely impacted if there is a widespread refusal among HCP, particularly those with clinical training who are more likely to be impactful to public attitudes, beliefs and intentions. Therefore, it is critical that we understand HCP concerns and attitudes towards COVID-19 vaccination and prepare effective, evidence-driven and tailored communication strategies.

To fill the knowledge gap, we completed a large cross-sectional survey of HCP, health care support staff, trainees, research and teaching faculty and students to estimate COVID-19 vaccine acceptance one week before the first EUA was issued for BNT162b2 mRNA vaccine. The purpose of the study was to provide a snapshot of vaccination attitudes in order to identify areas of concern that would impinge on COVID-19 vaccination program planning and implementation.

Methods

Study Population setting

SUNY Upstate Medical University in Syracuse, NY, is the only academic medical center in Central New York and the region's largest employer with 9,565 employees. Its sphere of influence stretches from north to Canada and south to the Pennsylvania borders. The health system provides care for 1.8 million people, often the most seriously ill and injured. Since July 2020, the institution participated in the BNT162b2 mRNA vaccine trial with a great deal of information being shared with staff via institutional and media channels.

Survey Administration

We distributed the survey via an institution-wide email listserv which includes 9,565 recipients such as physicians, nurse practitioners, physician assistants, nurses, pharmacists, medical and nursing students, allied health professionals, and nonclinical ancillary staff. The survey was anonymous, voluntary and took place between November 23rd and December 5th, 2020. Responses were collected and managed using REDCap electronic data capture

tools hosted by the SUNY Upstate Medical University. The SUNY Upstate Institutional Review Board determined this project did not meet the definition of human subject research under the purview of the IRB according to federal regulations.

Survey Content
We developed a comprehensive survey to evaluate attitudes, beliefs and willingness to get vaccinated. We adopted a validated vaccine hesitancy survey developed by Opel et al[5]. The survey included 22 quantitative and qualitative questions. The survey included questions about basic demographic information, occupation, perceived risk and severity of COVID-19, history of prior influenza vaccination, intent to get vaccinated, who is most influential in decision to get vaccinated, and whether vaccination should be voluntary. Among subjects who expressed intent not to get vaccinated, we also inquired about their reasons. Two qualitative questions were included in the survey: QA) "Who do you think has the biggest influence on whether you will get the COVID-19 vaccine? If you chose "Someone else", tell us who has the biggest influence on whether you will get the vaccine?" and QB) "What concerns do you have?"

Data Analysis
The initial analytic plan assessed vaccine intent and barriers to uptake by respondents. The demographic distribution of the sample was assessed via descriptive statistics, to ascertain representativeness of the respondents compared to the overall population of the host institution. The distribution of several key variables pertaining to the perceived threat from COVID-19, and the intention to be vaccinated against COVID-10, were assessed across demographic and professional role indicators. For several variables, the five categories (Strongly Agree, Agree, Not Sure, Disagree, Strongly Disagree) were collapsed into three categories: Agree, Unsure, and Disagree. Differences in proportion were assessed via X^2 analysis, and differences in mean age across response categories were assessed via analysis of variance (ANOVA). All quantitative analyses were performed using SPSS vs 27.

Qualitative Variables
Data was downloaded from RedCap, exported into Microsoft Excel and uploaded into ATLAS.ti version 9. The two questions were analyzed using grounded theory, and were analyzed separately. First, the investigator (TS) independently reviewed a random sample of the data and openly coded the data. Once there was a strong sense of emerging theme, the investigator completed the rest of the coding using the machine learning features in ATLAS.ti. Once the machine learning was complete, the investigator randomly sampled the text with the codes to ensure the integrity of the machine learning coding. The preliminary coding scheme included 10 codes for question A, and included 9 codes for question B. For both questions, an "other" code was created to incorporate responses that were not identified by the machine learning coding, or did not fit with the current codes. The final high-level theme for was 11 for question A, and 10 for question B.

Results
Quantitative analysis: A total of 5,308 responses were collected in the survey, for an approximate response rate of 55%. Of those responses, 5,287 were available for the analyses as nominally complete at the time the survey closed. Missing variables resulted in the removal of cases from the analysis; Individual missing items affected fewer than 20 cases per question. Survey respondents had a mean age of 42.5 years (SD=13.56), and were 72.8% female (n=3842), 26.0% male (n=1374), 1.1% non-binary or non-disclosed by choice (n=61), and 0.2% missing (n=8). The sample was 85.1% (n=4482) self-reported White, 5.0% Black/African-American (n=263), 6.0% Asian (n=317), and 4.2% Native American, Native Hawaiian/Pacific Islander, Other, or missing (n=222). A total of 3,095 (58.5%) of respondents reported that they provided direct patient care, and 32.2% indicated

they provided care for patients with COVID-19. Additional demographic breakdown by role is presented in Table 1.

Vaccine intention by professional role and demographics are summarized in Table 2. An age gradient is apparent, with those who agree or strongly agree that they would accept a vaccine being older (mean=43.83 years) than those who were not sure (41.62 years) or who disagreed (38.67 years), with significant differences across all three answer categories (p<.001). Males agreed or strongly agreed (72.5%) that they would take the vaccine for more frequently (p<.001) than females (52.4%) or non-binary or non-disclosed individuals (41.0%). Although 80.4% of scientists and physicians agreed they would take the vaccine if offered, 33.6% of registered nurses, 31.6% of allied health professionals (physical, occupational, and respiratory therapists, radiology technicians), and 32% of Master's level clinicians (advanced practice nurses or physician assistants, registered dieticians, or Master's level social workers) were unsure whether they would take the vaccine. The observed difference across roles was significant (p<.001). These role differences, particularly at Bachelor's and Master's level roles, was manifested in fewer providers of direct care (54.0%) vs. non-care providers (62.4%), and 52.0% of those who had provided care for COVID-19 patients (vs. 60.6% of those who had not) indicated they would take the vaccine if offered.

Those agreeing that they were concerned about getting COVID-19 and who endorsed the safety of the vaccine when approved, tended to be older, whereas younger respondents were more concerned for household members or close contacts getting COVID-19. Individuals identifying as White were less concerned about their own (28.4%) safety from COVID-19 than Black/African-American (41.1%) or Asian (43.5%) respondents (p<.001), and this trend extended to concern for others (household or close contacts) as well. Conversely, White respondents more frequently agreed that a COVID-19 vaccine would be safe when approved (45.9%) than Black/African-American respondents (26.2%, p<.001). Additional comparisons are presented in Table 3.

A majority of respondents, n=3462 (65.5%) preferred vaccination to be voluntary or were unsure when asked: "Do you think COVID-19 vaccination should be voluntary or mandated for health care workers?" Scientists and physicians were the only group where majority preferred mandatory COVID-19 vaccination, n=570 (55.2%). All other respondents leaned towards voluntary vaccination or were unsure vaccination should be mandatory (see supplemental online table).

Qualitative Analysis: In total, 1,332 individual responses were analyzed for question A, and 3,431 responses for question B. In Question B, 13 responses were removed leaving a total of 3,418 responses.
Question A Analysis *"Who do you think has the biggest influence…"*
A total of 11 high level themes were identified (see Table 4). The majority of participants felt that they were the sole contributor influencing their decision (theme: Influence by Me, n=510). Participants used language such as "I am my own advocate", and "the only person who will influence me is myself". Some participants said that their decision could be influenced by research (n=250) with the presence of "medical literature on efficacy and potential side effects". Also noted was influence by family (n=221), where participants mentioned "immediate family", as influencing their decision. Participants identified experts (n=160), employers (n=137), and the government (n=119) as also having some influence on their decision making.
Question B Analysis "*What concerns do you have?"*
A total of 10 high level themes were identified (see Table 5). The majority of participants expressed concerns about an adverse event and/or side effect from the vaccine (theme: Concerns about Adverse Event/Side Effects, n=2307). Participants expressed this by saying things such as they were concerned "about rare adverse events" and "long term effects and problems or allergies", "new vaccine no idea about the side effect or anything long term".

Many participants were concerned with the efficacy of the vaccine (n=720) and expressed this concern by questioning, "how is the effective is it with it being brand new vaccine?". Participants also noted concerns with the vaccine being rushed (n=529), and expressed concerns about the safety of the vaccine (n=534) as well as the newness of the vaccine (n=324). These concepts were expressed in comments like, "rushed to get approved", "limited long term safety data", and "how new the vaccine is worries me… " respectively.

Discussion

To our knowledge, this is the largest survey of HCP attitudes towards COVID-19 vaccination. In our population, 57.5% of individuals expressed intent to receive COVID-19 vaccine, including 80.4% of physicians and scientists. These findings are consistent with a prior anecdotal report showing that 80% of New York State's community and hospital-based physicians plan to become immunized with the COVID-19 vaccine [6]. Contrary to our findings, 66.5% of HCP at UCLA intended to delay vaccination and similarly to our observations, the intent varied by hospital role with nurses having greater odds of delay compared to physicians[3]. Physicians' acceptance of COVID-19 vaccine is important as physicians often serve as a trusted source of vaccine information. Their vaccination may positively influence staff, who may be unsure and want to delay vaccination until others are vaccinated. Among all respondents, 920 (60%) listed themselves, research or expert as an influential source on vaccination guidance. Participants' feeling of influence as being "Me, myself, and I" was most significant in deciding about getting vaccinated. People in individualistic cultures like the U.S. perceive themselves as independent, and individual benefit is important in driving personal choices[7]. Therefore, health messages should target personal preferences, and stress risk of COVID-19 for the individual. In order to enhance vaccination, we must give people time to talk with experts (medical, public health, and other) to ensure they feel they made an informed decision that aligns with their religious, educational, philosophical or other views.

Nearly half or more of nurses, Master's level clinicians, allied health professionals, and ancillary service personnel were not sure whether the vaccine will work and protect them from COVID-19; slightly lower but similar levels of uncertainty were expressed by the same groups about vaccine safety, and nearly a third of each group was unsure whether they would take a vaccine for COVID-19 if offered for free. This high level of vaccination intent uncertainty raises concern about whether adequate vaccination coverage can be achieved through vaccination campaigns and education, without a state or federal mandate. Relevant research shows that influenza vaccination coverage is significantly higher among institutions that require influenza vaccine for employment[8]. Although prior vaccination behavior predicts a vaccine uptake, acceptance of the COVID-19 vaccine is likely to be different due to its rapid development, lack of long-term safety data, and its use under EUA, given those attributes were associated with lower vaccination intents among the U.S. public[4,9,10]. While we do not advocate for COVID-19 vaccine mandates, we recognize that our own high institutional vaccination influenza coverage (99.6%) is unlikely to be achieved with the COVID-19 vaccine in the absence of a mandate. Efforts to enhance vaccine acceptance among staff that is "*unsure*" will require careful, individually tailored communication strategies. They should specifically address concerns about a *perception* of a safety concerns due to speed of development, and potential for political influence on the review process. Communication, advocacy, and training should focus on concerns about "trials being rushed", safety, and efficacy, in a manner that builds trust with authorities and confidence in COVID-19 vaccines. Consideration should be given to interpersonal channels that deliver leadership by example, and leverage influencers in the institution to encourage wider adoption of vaccination.

Similarly to a recently published poll, we have observed gender differences based upon safety concerns; females were more concerned about the vaccine and the disease, compared to males[11]. This finding is not surprising as women tend to research more health-related information, make approximately 80 percent of health care decisions for their children, and become caregivers for family members[12]. Driving both clinical concerns and gender differences, nurses (86% female), other Master's and Bachelor's level clinicians, and allied health professionals, appear to manifest levels of concern about the vaccine that are likely due to expedited vaccine development, and limited vaccine information available at the time of the survey. The survey was conducted shortly before FDA hearing and public release of Pfizer-BioNTech data. Therefore, it is possible that this level of uncertainty is more reflective of a need for more information, rather than a resistance to vaccination that is exhibited along an educational gradient and by those with clinical roles.

Similar to prior report, we showed that older age was associated with intent to get vaccinated. Perceived risk of infection associated with increased age, or increased hesitancy among younger people, could explain this finding and deserves further research.

In our population, Black/African American respondents were least likely to want to get vaccinated. This is particularly concerning since African Americans are disproportionately affected by COVID-19. According to a recent survey, less than one-fifth of African Americans "mostly or completely trust" that a COVID-19 vaccine will be safe or effective[13]. Given medical mistrust in the Black community, culturally sensitive vaccination campaigns, coupled with individually tailored communication strategies, will be key to development of trust and vaccine acceptance.

We also found that direct patient care or care for COVID-19 patients is associated with lower vaccination intent. This interesting and counterintuitive observation should be explored further to provide insight into complex vaccination decisions among HCPs.

Limitations
This cross-sectional survey was conducted in a single health care system in the northeastern United States. Thus, generalizability to other regions of the U.S. and other countries may be limited. Nevertheless, we do believe that there are likely lessons learned which can be more broadly applied. This survey was also voluntary, raising the possibility of selection bias among respondents opting to participate. It is unclear whether those feeling positively, uncertain, or negatively would be more likely to respond. However, our response rate was rather high for this type of survey. The similar demographic profiles of respondents and the institution as a whole is somewhat reassuring. The baseline characteristics were comparable between respondents and non-respondents, except for African Americans and Asians who were under-represented, and Whites who were over-represented (<8 percentage point difference for each race). Finally, this survey was conducted at a single point in time amidst a dynamic pandemic, wherein information, options, and perceptions are rapidly changing and one's willingness to get vaccinated may change over time, as vaccine decisions are multifactorial. However, this was an incredibly important point in time, almost immediately preceding vaccine availability in this population. We envision this survey as a starting point for ongoing discussion and engagement within our institution and our community, in the months and years ahead.

Conclusions

In summary, we have shown that self-reported willingness to receive vaccination against COVID-19 differs by age, gender, race and hospital role, with physicians and research scientists showing the highest acceptance. Vaccine intent and concerns about safety were concern among nurses, pharmacists and other clinical staff. Vaccine safety, adverse events, efficacy and vaccine development time dominated respondents' concerns. Vaccine hesitancy was most prevalent among those at Master's, Bachelor's, and lower education levels. We believe our findings may help guide public health campaigns to enhance acceptance of COVID-19 vaccine.

Notes

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Table 1. Demographic characteristics and hospital roles among participating respondents.

Role	N (%)	N (%) Female	N (%) Male	Mean Age	N (%) White	N (%) Black	N (%) Asian	N (%) All Other*	% caring for COVID patient	% engaging in patient care
Total respondents	5287 (100%)	3842 (72.8)		42.5	4482 (85.1)	263 (5.0)	36 (3)	205 (3.9)	1916 (32.2)	3095 (58.5)
Registered Nurses	1198 (22.7)	1040 (86.8)	142 (11.9)	39.8	1103 (92.1)	26 (2.2)	52 (5)	36 (3)	690 (57.6)	1056 (88.1)
Scientists and Physicians[1]	1032 (19.5)	521 (50.5)	500 (48.4)	39.2	760 (73.6)	24(2.3)	31 (3)	52 (5)	500 (48.4)	756 (73.3)
Administration and Management[2]	1017 (19.2)	804 (79.1)	202(19.9)	46.2	919 (90.4)	40 (3.9)	60 (6.5)	31 (3)	117 (11.5)	243 (23.9)
Ancillary Services[3]	939 (17.8)	698 (74.6)	228 (24.4)	45.4	701 (75.5)	143 (15.4)	5 (1.6)	60 (6.5)	228 (24.3)	367 (39.2)
Technical Support[4]	442 (8.4)	258 (58.4)	129 (40.8)	45.0	407 (92.1)	8 (1.8)	9 (2.7)	5 (1.6)	3 (1)	12 (3.8)
Allied Health Professionals[5]	329 (6.2)	258 (78.4)	67 (20.4)	39.7	302(91.8)	10 (3.0)	9 (3.1)	9 (2.7)	219 (66.6)	321 (97.6)

Master's Level Clinicians[6]	294 (5.65)	254 (86.4)	38 (12.9)	43.5	267 (90.8)	10 (3.4)	1 (3.7)	9 (3.1)	123 (41.8)	275 (93.5)
Public Safety and Spiritual Care	27 (0.5)	9 (33.3)	17 (63.0)	52.7	23 (85.2)	2 (7.4)	2 (1.6)	1 (3.7)	7 (25.9)	14 (51.9)
Pharmacy	126 (2.4)	75 (59.5)	50 (39.7)	37.0	116 (92.1)	3 (2.4)	36 (3)	2 (1.6)	29 (23)	50 (39.7)

1 = includes research staff and medical students; 2 = includes educational support and other; 3 = includes clerical, dietary, phlebotomy, unit support, registration, clinical support, environmental services; 4 = includes laboratory, informational technology, and pharmacy services ; 5 = includes physical therapy, occupational therapy, radiology, and respiratory services ; 6 = includes nurse practitioners, physician's assistants, social workers, and registered dieticians

* = includes American Indian or Alaska Native, Hawaiian/Pacific Islander, or Other. Excludes missing.

Table 2. Agreement across demographic categories with statement, "If a vaccine were offered free of charge, I would take it"

Items	Agree/Strongly Agree (%)	Not Sure (%)	Disagree/Strongly Disagree (%)	p [a]
Total respondents	3032 (57.5)	1404 (26.4)	841 (15.9)	
Mean age	43.83 (57.5)	41.62 (26.6)	38.67 (15.9)	<.001
Gender (%)				
Male	992 (72.5)	242 (17.7)	134 (9.8)	
Female	2013 (52.4)	1146 (29.8)	684 (17.8)	<.001
Non-Binary/Not Disclosed	25 (41.0)	14 (23.0)	22 (36.1)	
Race				
White	2618 (58.4)	1185 (26.4)	678 (15.1)	
Black or African American	81 (30.8)	95 (36.1)	87 (33.1)	
Asian	234 (73.8)	59 (18.6)	24 (7.6)	<.001
American Indian or Alaska Native	11 (39.3)	9 (32.1)	8 (28.6)	
Other	80 (47.6)	50 (29.8)	38 (22.6)	
Role				
Registered Nurses	494 (41.2)	402 (33.6)	302 (25.2)	
Scientists and Physicians[1]	830 (80.4)	151 (14.6)	51 (4.9)	
Administration and Management[2]	639 (62.8)	247 (24.3)	131 (12.9)	
Ancillary Services[3]	433 (46.4)	292 (31.3)	208 (22.2)	
Technical Staff[4]	277 (62.8)	110 (24.9)	54 (12.2)	<.001
Allied Health Professionals[5]	169 (51.4)	104 (31.6)	56 (17.0)	
Master's Level Clinician[6]	165 (56.1)	94 (32.0)	35 (11.9)	
Public Safety and Spiritual Care	21 (77.8)	3 (11.1)	3 (11.1)	
Direct patient care				
Yes	1670 (54.0)	861 (27.8)	562 (18.2)	<.001
No	1359 (62.4)	543 (24.9)	277 (12.7)	
Care for COVID patients				
Yes	995 (52.0)	542 (28.3)	377 (19.7)	<.001
No	2033 (60.6)	861 (25.6)	463 (13.8)	

a = Chi-Square (categorical) or ANOVA (comparison of means) test p-value

1 = includes research staff and medical students; 2 = includes educational support and other; 3 = includes clerical, dietary, phlebotomy, unit support, registration, clinical support, environmental services; 4 = includes laboratory, informational technology, and pharmacy services; 5 = includes physical therapy, occupational therapy, radiology, and respiratory services ; 6 = includes nurse practitioners, physician's assistants, social workers, and registered dietician

Table 3. Distribution of respondents by demographic characteristics and role indicators, across three survey items related to COVID-19

	I am worried about getting COVID-19				I am worried about my household members or close contacts getting COVID-19 from me.				I think the COVID 19 vaccine will be safe for me when it is approved.			
	Agree	Unsure	Disagree	p	Agree	Unsure	Disagree	p	Agree	Unsure	Disagree	p
Total respondents	1594 (30.2)	2468 (46.7)	1219 (23.1)		2301 (43.6)	2026 (38.4)	952 (18)		2253 (42.7)	632 (12)	1594 (30.2)	
Age (mean)	43.25	42.22	41.86	.014	41.33	43.26	43.38	<.001	44.11	42.02	37.51	<.001
Gender												
Male	1173 (30.5)	1818 (47.3)	853 (22.2)		1652 (43)	1493 (38.9)	697 (18.1)		1550 (40.3)	1795 (46.7)	498 (13)	
Female	410 (29.9)	622 (45.3)	341 (24.8)	.002	633 (46.1)	504 (36.7)	236 (17.2)	.010	823 (60.1)	431 (31.5)	115 (8.4)	<.001
Non-Binary/Not Disclosed	10 (16.4)	26 (42.6)	25 (41)		16 (26.23)	27 (44.3)	18 (29.5)		19 (31.1)	24 (39.3)	18 (29.5)	
Race												
White	1273 (28.4)	2148 (47.9)	1063 (23.7)		1897 (42.3)	1777 (39.6)	809 (18)		2057 (45.9)	1916 (42.7)	509 (11.4)	
Black or African American	108 (41.1)	100 (38)	55 (20.9)		121 (45.8)	75 (28.4)	68 (25.8)		69 (26.2)	139 (52.9)	55 (20.9)	
Asian	138 (43.5)	132 (41.6)	47 (14.8)	<.001	175 (55.4)	104 (32.9)	37 (11.7)	<.001	187 (59)	108 (34.1)	22 (6.9)	<.001
American Indian or Alaska	8 (28.6)	10 (35.7)	10 (35.7)		11 (39.3)	8 (28.6)	9 (32.1)		7 (25)	13 (46.4)	8 (28.6)	

Native Hawaiian or Other PI	2 (25)	4 (50)	2 (25)		2 (25)	4 (50)	2 (25)		4 (50)	1 (12.5)	3 (37.5)	
Other	60 (35.5)	69 (40.8)	40 (23.7)		89 (52.7)	55 (32.5)	25 (14.8)		65 (38.7)	70 (41.7)	33 (19.6)	

Role												
Registered Nurses	327 (28.4)	554 (48.1)	270 (23.5)		516 (44.3)	472 (40.5)	177 (15.2)		375 (31.3)	595 (49.7)	228 (19.0)	
Scientists and Physicians[1]	396 (39.1)	489 (48.2)	129 (12.7)		563 (55.9)	351 (34.9)	93 (9.2)		701 (67.9)	281 (27.2)	50 (4.8)	
Administration and Management[2]	301 (30.7)	480 (48.9)	201 (20.5)		392 (39.8)	408 (41.5)	184 (18.7)		506 (49.8)	411 (40.4)	100 (9.8)	
Ancillary Services[3]	261 (29.1)	406 (45.3)	230 (25.6)		366 (40.6)	370 (41.0)	166 (18.4)		325 (34.8)	460 (49.3)	149 (16.0)	
Technical Staff[4]	114 (27.3)	213 (51.0)	91 (21.8)	<.001	160 (38.5)	176 (42.3)	80 (19.2)	<.001	95 (30.2)	134 (42.5)	86 (27.3)	<.001
Allied Health Professionals[5]	86 (26.6)	169 (52.3)	68 (21.1)		146 (44.5)	129 (39.3)	53 (16.2)		146 (44.4)	129 (39.2)	54 (16.4)	
Master's Level Clinicians[6]	105 (36.2)	138 (47.6)	47 (16.2)		149 (51.4)	105 (36.2)	36 (12.4)		149 (50.7)	105 (35.7)	40 (13.6)	
Public Safety and Spiritual Care	3 (12.0)	15 (60.0)	7 (28.0)		9 (36.0)	11 (44.0)	5 (20.0)		65 (51.6)	42 (33.3)	19 (15/1)	
Pharmacy	48 (38.1)	56 (44.4)	22 (17.5)		65 (51.6)	42 (33.3)	19 (15.1)		51 (40.5)	60 (47.6)	15 (11.9)	

Direct Patient care												
Yes	605 (27.7)	1039 (47.6)	540 (24.7)	.002	796 (36.5)	888 (40.7)	498 (22.8)	<.001	1086 (49.8)	891 (40.9)	203 (9.3)	<.001
No	986 (31.9)	1428 (46.2)	679 (22.0)		1504 (48.6)	1137 (36.8)	452 (14.6)		1304 (42.2)	1362 (44.0)	427 (13.8)	

Care for COVID patients												

Yes	946 (28.1)	1631 (48.5)	784 (23.3)	<.001	1320 (39.3)	1368 (40.7)	673 (20.0)	<.001	1631 (48.6)	1390 (41.4)	337 (10.0)	<.001
No	646 (33.7)	835 (43.6)	434 (22.7)		980 (51.2)	655 (34.2)	279 (14.6)		759 (39.7)	861 (45.0)	294 (15.4)	

"If a vaccine were offered free of charge, I would take it"

Agree	1038 (34.2)	1506 (49.7)	487 (16.1)		1472 (48.6)	1188 (39.2)	370 (12.2)		2283 (75.3)	734 (24.2)	15 (0.5)	
Unsure	395 (28.2)	674 (48.0)	334 (23.8)	<.001	585 (41.7)	554 (39.5)	264 (18.8)	<.001	101 (7.2)	1189 (84.7)	114 (8.1)	<.001
Disagree	158 (18.8)	285 (33.9)	397 (47.3)		240 (28.6)	282 (33.6)	318 (37.9)		9 (1.1)	330 (39.2)	502 (59.7)	

a = Chi-Square or ANOVA p-value

1 = includes research staff and medical students; 2 = includes educational support and other; 3 = includes clerical, dietary, phlebotomy, unit support, registration, clinical support, environmental services; 4 = includes laboratory, informational technology, and pharmacy services; 5 = includes physical therapy, occupational therapy, radiology, and respiratory services; 6 = includes nurse practitioners, physician's assistants, social workers, and registered dieticians

Table 4: Who Influences Their Decision Making

Themes	Definition	N (%)
Influenced by Me	Influence by me, myself, and I	510 (33.22%)
Influenced by Research	Influence by the science and research that is available	250 (16.29%)
Influenced by Family	Influenced by my family member including by not limited to spouse, children, parents, etc.	211 (14.40%)
Influenced by Experts	Influenced by experts in the field of vaccines	160 (10.41%)
Influenced by Employer	Influenced by my employer policies and/or employer leadership	137 (8.93%)
Influenced by Government	Influenced by governmental organization such as the CDC, WHO, and local health department	119 (7.75%)
Influenced by Vaccine Concerns	Influence by the vaccine safety, efficacy, and side effects	48 (3.13%)
Influenced by Colleagues	Influenced by people I work with (not experts)	26 (1.69%)
Influenced by Mandate	Influenced by a mandate to be vaccinated	20 (1.30%)
Influenced by Community	Influenced by people in the community where I live	9 (.59%)
Other		35 (2.28%)
Totals		1535

Table 5: Expressed Concerns

Themes	Definition	% (N=X)
Concern about Adverse Events/Side Effects	Concerns about adverse events or side effects after taking the vaccine	47% (N=2307)
Concern about Efficacy	Concerns about efficacy of the vaccine in the immediate and long term	14.67% (N=720)
Concern about Political Involvement	Concerns about the political influence of the vaccine development	0.90% (N=44)
Concern about Research and Authorization Process	Concerns about the research methodology and the emergency use authorization process	3.44% (N=169)
Concern about Rushed Release	Concerned about how fast/rushed the vaccine is being made available	10.78% (N=529)
Concern about Safety	Concerns about how safe the vaccine is	10.88% (N=534)
Concern with Immunity	Concerns about short and long-term immunity	1.45% (N=71)
Concern with Trust	Concerns about trusting the research, experts, and governmental organizations regarding the vaccine information	0.90 (N=44)
Concerned about Newness	Concerns about the newness of the vaccine	6.60 (N=324)
Other		3.38 (N=166)
Totals		4908