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RESEARCH ARTICLE



Qualitative assessment of COVID-19 vaccination acceptance among healthcare workers in Pima County

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ABSTRACT

In the Spring of 2021, the COVID-19 vaccination was authorized for emergency use by the Food and Drug Administration. Healthcare workers (HCWs) are one of the most trusted sources of information for vaccination choices. However, HCWs at this time appeared to continue to have lower rates of COVID-19 vaccination uptake than expected in Arizona. The objective of this study was to examine factors that play a role in the vaccination decision-making process among Arizona HCWs. Between January and April 2021, 18 semi-structured interviews were conducted among physicians, emergency medical technicians and long-term care nurses in Pima County. The informed consent process was completed for each participant. The interview guide was informed by the Increasing Vaccination model to collect information on vaccination decision-making. A codebook was developed using an inductive approach. Coding and analysis was conducted using the software MAXQDA. Participants were primarily male (11/18, 61%) and white (11/18, 61%). Three participants identified as Hispanic. Initial themes that emerged included: mixed opinions concerning the innovations in COVID-19 vaccine development, access-related barriers, issues related to distribution inequities, concerns about misinformation and conspiracy theories, and dialogue concerning the benefits of requiring mandatory vaccination. The results gathered from this study indicate that there continues to be hesitancy among some healthcare professionals in Pima County. These results will be used to help Arizonan Health Departments promote rollout of novel vaccines more effectively through targeting relevant vaccination decision-making factors among HCWs.

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Introduction

The first COVID-19 vaccine was authorized for emergency use authorization in the United States of America on December 11, 2020.¹ The emergency use authorization made the vaccine available for people 18 years and older and was rolled out in a phased approach. This process was overseen by each state, however the first phase in each state included allocating vaccines to health care workers (HCWs). While the rollout has expanded to include anyone 6 months and up, there are many people who still choose not to get vaccinated. The phenomenon of delaying or refusing to get a vaccine is known as vaccine hesitancy and has been recognized as one of the top ten threats to global health by the World Health Organization.²

HCWs consistently rank among peoples' most trusted sources of information regarding vaccination, and often have a large influence on whether their patients/clients receive a vaccine or not.³ However, some HCWs have opted not to receive their COVID-19 vaccine, despite possibly being responsible for administering vaccines to their clients and working in situations where they were susceptible to COVID-19 exposure.

Pima County, the second largest county in the state of Arizona, is located in the south, bordering Mexico. The county contains 1.05 M people, about a third of whom are Hispanic

(37.8% in 2019). With 12.7% of the population being immigrants, born outside of the USA.⁴ Tucson is the largest city in Pima County. COVID-19 vaccination rates in Pima County rose from less than 2% to 17% from February 24th to March 30th, 2021, as eligibility criteria expanded and vaccinations became available to different subgroups of people.^{5,6} In comparison, the world vaccination rates during that period rose from 3% to 8%, the USA from 24% to 50.7%, China from 4% to 8.4%, Germany from 7% to 17%, and South Africa from 0.1% to 0.4%.⁶

To better understand the phenomenon of decision making around COVID-19 vaccine uptake among HCWs in Pima County, we explored their COVID-19 vaccination intention, behaviors, and attitudes. We aimed to understand why HCWs themselves may not be getting vaccinated, what kind of advice HCWs give their patients regarding vaccination, and their awareness of reasons why some of their coworkers and patients were choosing not to be vaccinated.

Materials and methods

The present study was conducted as part of a mixed-methods investigation including focus group discussions, a survey and systematic review on COVID-19 and seasonal influenza vaccine intention.

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Study design

A semi-structured interview guide was developed (see [Appendix A](#)) based on the increasing vaccination model and past literature on factors related to vaccine acceptance and hesitancy.^{7–9} We recruited three different types of HCWs: physicians, long-term care workers (LTC), and emergency medical technicians (EMTs). Literature suggests that these groups differ in terms of general and COVID-19 vaccine acceptance, despite each group having high potential exposure to COVID-19.^{10–12} Thus, interviewing HCWs in these groups allowed us to compare across subdisciplines. These subdisciplines were chosen based on the contacts which were available to those involved in the research. The study was conducted in accordance with the ethical standards of the Institutional Review Board at University of Arizona (IRB Protocol number: 2007796226). All study participants underwent informed consent process before any data collection was done.

Recruitment

We leveraged personal and professional connections to recruit from the three groups of HCWs via e-mail. All interviews were conducted virtually over Zoom between February and March of 2021.¹³ This was just as the COVID vaccine was made available to HCWs, LTC patients, people 65 years of age and older, and other essential workers in Arizona.¹⁴ Interviewees read a consent form and provided verbal consent for participation and audio recording. Interviews lasted 20–60 minutes.

All interviews included the core questions from the semi-structured interview guide ([Appendix A](#)). We allowed for flexibility in the facilitation of the interviews so that interviewers could probe further into various topics that came up. At least two graduate student researchers (MB, HS, SM, SW, BR) were present at each interview, with one researcher leading the interview and the other taking notes.

Following recommendations from Kaiser,¹⁵ we employed a revised informed consent process which allowed participants to choose whether they wanted their names to be included in presentations of their responses ([Appendix B](#)). Those who chose not to be identified were given pseudonyms. Following interviews, researchers met to debrief on topics of interest and discuss field notes.

Analysis

Analysis was conducted using techniques suggested by Green et al.,¹⁶ including deep immersion in the data, several rounds of coding, creating categories, and identifying broader themes. The audio recording for each interview was transcribed verbatim and uploaded into the qualitative analysis software MAXQDA 2020.¹⁷ The coding scheme was developed iteratively by four researchers. This team met to establish a preliminary coding scheme based on *a priori* themes that stemmed from the semi-structured interview itself, as well various emerging themes that were identified during interview debriefing sessions. While *a priori* themes were drawn directly from the interview questions, the emerging themes were identified using common techniques such as repetition, insider

categories, metaphors and analogies, and similarities and differences across interviews.¹⁸ We sought to reach saturation based on what Saunders et al.¹⁹ refer to as “hybrid” forms of saturation. Specifically, as data collection was ongoing and initial phases of analysis were under way, we looked for saturation of both our *a priori* and emerging themes.

Once the preliminary coding scheme was developed, four researchers independently coded a set of three interviews and then met to compare coding, refine codes, and finalize the coding scheme. Using memos, we explicitly defined and gave prototypical examples for each code. Once the scheme was finalized, each interview was coded independently by two researchers who then met to compare and discuss coding until consensus was reached.

Results

Sample characteristics

The final sample included 18 HCWs. Of these, six were physicians, six were LTC, and six were EMTs. Physicians were recruited at the Banner Hospital Pulmonary department, LTC were recruited through the Arizona Hospital and Healthcare Association and the Pima County Congregate Care Settings group, and EMTs were recruited at the Drexel, Northwest, Tucson, and Golder Ranch Fire Departments. Three participants (17%) did not complete all demographic questions. Among participants who did complete items, 61% (11) identified as men. The gender distribution was not balanced within groups: all EMTs were male, four out of six physicians were male, and five out of six LTC were female. However, this roughly approximates the gender distribution of health occupations in the United States.²⁰ Out of the 15 participants who reported race and ethnicity, 73% (11) identified as white only and 20% (3) identified as Hispanic or Latino. Participants fell between the ages of 23 and over 60 years old.

The themes that we developed included: access, hesitancy, politics and misinformation, vaccine development, pandemic attitudes, and responsibility. See definitions and examples of each theme in [Table 1](#).

Access

Participants mentioned that they would have preferred to be vaccinated at the facilities where they were employed for instance, rather than being asked to leave work during the day to go to another site to get vaccinated. However, they also mentioned that coworkers would often step-up to help cover shifts to encourage others to get vaccinated. Others mentioned that while they might have had worries about the vaccine at first, the worry about possibly missing their chance to get the vaccine was an incentive to get it while they could:

If I snooze, I might lose and then who knows what’s going to go on with this vaccine, so yeah, so I didn’t. I went for it and got it (Abner, EMT).

Access to vaccines was also an issue to the patients that our participants would serve. Physician participants, for example, mentioned how distribution of vaccinations was not equitable.

Table 1. Themes derived from the health care worker interviews and their definitions.

Theme	Definition	Comparison to other findings
Barriers to Vaccination		
Access	<p>Summary: <i>Community access:</i> Statements discussing access issues for community, patients, colleagues, etc. in getting the COVID-19 vaccine <i>Distribution Inequities:</i> Statements discussing issues with the distribution of vaccines and inability to get a vaccine. Hierarchy of eligibility, social justice, and other inequity issues fall under this category. <i>1st Hand Access:</i> Statements discussing personal access issues in getting the COVID-19 vaccine</p> <p>Representative Quote: “[P]robably the primary barrier that I see right now is the interface for scheduling” - Jarrett, Physician</p>	<p>For HCWs in UK, a theme of “access and equity” was a factor of important consideration for vaccine decision making (Gogoi et al., 2022) For HCWs in Perth, Australia, “[s]ome were unable to access a clinic at a convenient location or time” (Carlson et al., 2022)</p>
Hesitancy	<p>Summary: Statements displaying hesitancy about getting the vaccine, anecdotes of people who are hesitant, do not get, or delay getting the vaccine.</p> <p>Representative Quote: “I’m not saying there’s going to be any long-term side effects. But what we don’t know, we know there’s short term side effects, but we don’t know if there’s any long-term side effects. It’s just that when it comes to pregnancy, there’s so many unknowns there and you really don’t know when you can give it a passing grade, right. That child needs to be born safe and have all its fingers and toes, right, and then cognitively reach their milestones until they’re five or eight years old. And then you can say it had no effect. Until then, it’s still a best guess and you can’t be sure.” - Sai, Physician</p>	<p>In the UK, “HCWs from ethnic minority communities and female HCWs were more likely to either decline (actively/passively) or passively accept vaccination – reflecting hesitancy” (Gogoi et al., 2022).</p>
Politics and Misinformation	<p>Summary: <i>Politics:</i> Discussions of political values that people hold (e.g., freedom of choice, individualism, American citizen, etc.), and discussions of how political forces have played a role in vaccination efforts. <i>Misinformation:</i> Statements about misinformation, Conspiracy Theories, and distrust of sources of information like Social Media; can include anecdotes about others who believe misinformation or do not have enough information about vaccination.</p> <p>Representative Quote: “Well, if some of those political actors, which I think, I mean like Trump actually this last week I saw he told his supporters, “you should get it,” but he’s, but he’s not, you know, he’s kind of lukewarm. I mean he’s gotten the vaccine himself so . . . but you know, he’s lukewarm. And then you got, you know, like Senator Ron Johnson, you know, from Wisconsin. There’s people out there that are still just stirring the pot, and that doesn’t help anybody. You know, still feeling like it’s a hoax, that it was, yo’ know it wasn’t as bad as they say it is, you know it wasn’t as bad, it’s, you know, no worse than the flu. You can go on and on with it, but people are being told, unless they have that personal experience, you know. It’s, and that’s unfortunate because you don’t want somebody to have that kind of personal experience, where they get really sick or they have someone they love get really sick or die.” – Richard, LTC</p>	<p>For HCWs in Turkey, important subthemes included: “negative emotions,” “social media,” “vaccine and vaccination process,” “political processes,” and “intention to be vaccinated” (Aci et al., 2022). HCWs in South Africa mentioned a lack of trust due to the political agendas related to the vaccines (Watermeyer et al., 2022).</p>
Vaccine Development	<p>Summary: Discussions of issues relevant to the development of the COVID-19 vaccine, discussions of new technology, speed of the process, attitudes toward process (e.g., “excited about how fast it went”).</p> <p>Representative Quote: “I think that’s what the difficulty is for people, is just knowing what the science is and saying oh it hasn’t been around enough to truly be tested. I think that’s the biggest barrier, from healthcare providers, that’s the fear that I hear.” -Nyquist, Physician</p>	<p>Most HCWs in a study in Canada “indicated a desire to learn more about the COVID-19 vaccines and mRNA technology” (Thaivalapil et al., 2022). HCWs in South Africa expressed “community concerns regarding the swift development of vaccines, particularly in comparison to more commonly understood viruses in this community such as HIV” (Watermeyer et al., 2022).</p>
Motivators for Vaccination		
Pandemic Attitudes	<p>Summary: Attitudes, feelings, emotions about COVID and the broader pandemic (Exclude if not about vaccines/vaccination)</p> <p>Representative Quote: “It’s like I can’t even go to church, because I sit there and in church, you know and it’s like ‘okay that person’s touching everything, and that person doesn’t have their mask, their nose is uncovered.’ To me it’s a peace of mind. I just would encourage anybody to get it, you know. And once again I saw the numbers . . . I see what it’s doing, my residents right now are eating in the dining room and they haven’t done that in a year, and that’s what we’re seeing now so . . . Okay it’s huge. -Laure, LTC</p>	<p>HCWs in Turkey mentioned “protection of family and society, prevention of loss of life and ending of the pandemic all depended on the vaccine” (Aci et al., 2022).</p>
Responsibility	<p>Summary: Mentions of collective responsibility, feelings of personal responsibility, responsibility toward patients/community/family, institutional responsibility, corporate responsibility.</p> <p>Representative Quote: “It’s for the better good of the community and, you know, the more people that get it, the better it is for society and then for themselves too. So, it’s not just about themselves, it’s about everyone.” -Jessica, LTC</p>	<p>HCWs in Canada mentioned “making informed health decisions with an added responsibility to protect oneself and patients” as a major theme related to decision making for vaccination (Thaivalapil et al., 2022).</p>

Elderly patients had challenges using the online scheduling system to make their vaccination appointments. Patients with lower health literacy and poor education were also more likely to be vaccine hesitant, probably due to not understanding how the vaccines worked, or being unable to identify reliable sources of information in comparison to misinformation or disinformation:

There's a lot of known and unknown scares people, especially when they're not fully educated on certain topics of what it takes to produce a vaccine (Abner, EMT).

Hesitancy

Hesitancy to receive a COVID-19 vaccine was one of the main barriers mentioned among participants. One major source of hesitancy that was reported was concern about side effects from the vaccine, particularly possible negative outcomes for those already pregnant or planning to get pregnant. The possibility of having to miss work the day(s) after receiving the vaccine was also seen as a potential burden and source of hesitancy.

Some participants mentioned political, cultural, and religious reasons for why people would refuse or delay getting the vaccine. These included mentions of general “religious reasons” (Andrew, EMT) for not getting vaccinated, “Christian Science” (Richard, LTC), “right wing thought” (Jim, EMT), and accounts of individuals (generally women) who had personal convictions to not use medications or put foreign things into their bodies.

Politics and misinformation

Political party affiliation, political figures and misinformation were mentioned as influencing agents of people's choice to get vaccinated. Considering legislative measures to promote the vaccine, most participants also struggled with the issue of personal freedom when discussing whether the vaccine should be mandated or not. One physician participant said that education should be mandated; according to them, with a better education program put in place, we would have a better medical system in return, thus helping us “[prevent] people from getting misinformed and running with it” (Sai, Physician).

Participants also stressed the need to provide quality education to the community for people to understand how vaccines work and why they are important for individual health as well as the community at large. They stressed the importance of breaking down the facts so that reasons for vaccination are easily understood, and that all concerns regarding the vaccine are clearly addressed:

There's a lot of unknown and unknown scares people, especially when they're not fully educated on certain topics of what it takes to produce a vaccine (Abner, EMT).

Our participants talked about those who delayed or did not get fully vaccinated due to being already protected by natural immunity. Delaying vaccination due to side effects after infection and 1st dose was also a common practice for some participants, but especially for those in their social network:

I've had another provider say that they got the vaccine and had such a horrible response to it that they didn't wanna get the second because again, they had COVID previously (Nyquist, Physician).

Despite this, questions remained over how long this type of protection lasts. Overall, acquiring immunity via vaccination was seen as a better and safer path by our participants compared to natural immunity:

I would tell them, 'Would you rather be sick for two weeks and almost have to get hospitalized or would you feel crummy for a day and a half.' (Mr. B, EMT)

Vaccine development

A major source of participants' worry during this time was the perception that the vaccine had been developed too fast, and that there were too many unknowns with the new mRNA technology. Overall, interviewees generally trusted scientific experts and the process of development. This was balanced with the knowledge that others do not trust the development, primarily due to “skipping steps” (Abner, EMT), feelings that the vaccine “hasn't been studied enough” (Steve, EMT) and that it was “rushed” (Mr. B, EMT). One LTC participant mentioned that she knew people who wanted a familiar vaccine that was familiar, quoting one patient who was concerned:

the new Pfizer, Moderna mRNA [vaccine], that it was different . . . she was like, 'I'd rather get the Johnson & Johnson because it's what we've been used to.' (Jessica, LTC)

While most of our interviewees stated that they were confident in the mRNA technology, Physicians often cited specific reasons for their trust in mRNA COVID-19 vaccines, e.g. because it stems from past research on diseases like SARS and MERS. LTC participants generally trusted that the process had been done well but could not always cite details about how the vaccine worked: “I feel really good about it” (Mary, LTC). A few EMT participants mentioned worries about the process, either from earlier before they got vaccinated or current concerns: “I would kind of hold my complete thoughts on the entire process of it until later because I don't know how well it's going to do, or how well it's not going to do” (Reign, EMT).

Motivators for vaccination

Pandemic attitudes

One factor that encouraged positive attitudes toward vaccination among HCWs was the sense that vaccination was the best way to end the pandemic. The pandemic was a source of fatigue from minor inconveniences (e.g., wearing masks), to major impacts such as seeing how the pandemic impacted their own and their patients' wellbeing, and feeling discouraged by others' negligence and dismissal of the pandemic's severity. In the face of such exhaustion, the vaccine was seen as a ticket “back to normalcy” (Abner, EMT), a way out of the pandemic to get “back to business as usual” (Jim, EMT), and “the only way . . . that they're going to get free and be saved” (Laure, LTC). One physician described the excitement they experienced while getting vaccinated:

The first shot. . . It was almost like going to Disneyland and pulling up the first time to get the vaccine. I was a little bit jittery and

a little bit elated because it just was like maybe this is the means to an end, or some sort of an approach to getting this whole thing out or behind us (Jarrett, Physician).

One LTC described how the vaccine gave her peace of mind and a restored sense of normalcy in personal and professional domains of life (see Table 1). For these HCWs, getting vaccinated could not be separated from the innumerable ways that the pandemic had changed their ways of being in the world.

Responsibility

Participants discussed how various kinds of responsibility played a role in both personal decisions to get vaccinated, and in broader campaigns to encourage vaccination among hesitant individuals. For some, getting vaccinated was seen as a *personal* responsibility, wherein one should get vaccinated to protect themselves and do their own, small part in ending the pandemic. For others, there was a sense of *institutional* responsibility that stemmed from being a frontline HCW. For these participants, getting vaccinated was seen as not just a personal responsibility, but also something that one had an institutional duty to do to protect vulnerable patients in healthcare settings. Particularly for LTC, ensuring that HCWs were vaccinated was a way to ensure that healthcare settings were as safe as possible for older, immunocompromised patients.

But I think if your job is to be exposed to COVID, just like if your job is at a construction site, you have to wear a hard hat, you know. I think, depending on your level of risk, it is no longer your choice to not protect yourself and the people around you (Gibbs, Physician).

In addition to the institutional responsibility of keeping patients safe, participants alluded to the positive financial implications for the institution. When an institution could boast a high vaccination rate among HCWs, patients may prefer to send their loved ones there over a different institution.

Along with personal and institutional responsibility, participants also discussed the importance of a broader *collective* responsibility to get vaccinated. Collective responsibility moved beyond getting vaccinated to protect one's own health or to benefit a given institution, toward a sense that getting vaccinated was a way to protect the broader community (see Table 1). Some also felt that their role as a HCW meant that they had a responsibility to be a role model for other HCWs and the broader community by getting vaccinated and by advising their patients to do so as well. This contributed to the kinds of vaccine advice that participants reported giving to patients.

While discussions of responsibility were brought up by physicians, LTC, and EMTs, there were notable differences in these discussions across the three groups. For some EMTs, getting vaccinated was seen as a primarily personal responsibility in which one had an individual choice to get vaccinated for the protection of oneself, one's patients, and one's community. EMTs acknowledged broader collective benefits but placed a primary emphasis on the individual right to choose and expressed that each individual assumes personal responsibility for any risks associated with not getting vaccinated.

Alternatively, for some physicians and LTCs, the primary focus was placed on the collective responsibility of getting vaccinated. These participants felt that the societal good of getting vaccinated was as important, if not more so, than the importance of maintaining individual freedoms of choices to not get vaccinated.

These group differences manifested in two primary ways: (1) in discussions of whether the vaccine should be mandatory or not for HCWs, and (2) in the kinds of vaccine advice that HCWs gave their patients. In terms of mandatory vaccination, five of six EMTs were not in favor of mandatory vaccination, citing convictions that everyone should be able to make their own choice about "*anything that's going into your body or coming out of your body*" (Reign, EMT), and that "*everyone is entitled to their own beliefs, their opinions*" (Steve, EMT). Alternatively, physicians and LTC tended to be more in favor of mandatory vaccination, citing how the pandemic has "*changed our world*" (Jessica, LTC), the benefits that such a policy would have when "*working with a population that has a high risk*" (Melody, LTC), and the broader collective good that would come from having "*hospitals becom[ing] sort of safe zones through herd immunity*" (Knox, Physician). Still, while physicians and LTC tended to support mandatory vaccination for HCWs more than the EMTs, many still acknowledged the logistical and political challenges of such a policy:

People don't like being forced to do things. I think most health care workers, if not all . . . should be willing and happy to get the vaccine. It doesn't make sense to me to be a healthcare worker and not be anticipating something that's going to be potentially helpful for not just yourself, your family, but also the community and the patients that you serve . . . (Jarrett, Physician)

While all participants described advice that they gave to patients, groups differed somewhat in the eagerness of their recommendations. Physicians were the most likely to give a pushful promotion of the vaccine, stressing its importance for keeping oneself and one's community safe. Some EMTs offered more tentative recommendations, again leaning into convictions about personal choice and freedom. EMTs also tended to focus on *personal* costs and benefits, rather than collective ones, compared to other groups. For example, one EMT focused on a personal desire to get back to normal in their advice:

I think herd immunity is going to be our best bet for us to get back to our normal life. . . I'm tired of wearing a mask everywhere we go (Abner, EMT).

In contrast, physicians and LTCs tended to bridge the personal and collective benefits when offering advice:

You are just protecting everyone that is around you (Mary, LTC).

Discussion

This study explored the attitudes among HCWs in Pima County, Arizona, regarding the COVID-19 vaccine, and identified themes that may contribute to hesitancy among HCWs and the public. The analysis explored a variety of opinions in three health care occupations (physicians, LTC workers, and EMTs) while most of the existing literature tends to focus on

just HCWs in general.^{21–25} Throughout the study, views on vaccines in general were very positive; all participants who were interviewed were vaccinated. As discussed, these positive attitudes toward the vaccine seemed to stem from a variety of different sources, from confidence in the development of the vaccine, to a sense of responsibility to get vaccinated as a HCW, to a sense that the vaccine was the only way that the pandemic and its associated stressors would be ended.

While HCWs expressed that responsibility (personal, institutional, collective) was a key motivating factor, we also saw that participants had mixed recommendations about mandatory vaccination due to conflicting values and concerns about litigation and logistics. Opposing attitudes among EMTs and conflicted attitudes among physicians and LTC concerning mandatory vaccination reflect broader cultural conflicts between the common good of reaching herd immunity through mass vaccination and the individualistic values of personal freedom and choice that characterize the United States.²⁶ HCWs saw trust in the vaccine's development as a major factor contributing to hesitancy, which is supported by the literature.⁷

Individualistic tendencies embedded in institutional, political, and social norms present serious challenges for the promotion of public health broadly, and for COVID-specific public health strategies.^{27,28} However, promising work has suggested that in the individualistic context of the United States, certain institutional mechanisms can be employed to encourage higher vaccination rates. For instance, Böhm et al. showed that instead of encouraging HCWs to *opt in* for vaccination, simply making vaccination the default requirement to which HCWs would have to *opt out of* increased vaccination intentions.²⁹

One strength of this analysis is that it builds on research done in Pima County, such as a population-based survey on vaccine intention during the emergence of the COVID-19 vaccine and focus group discussions assessing attitudes toward a potential COVID-19 vaccine before it was released.³⁰ This study also included different HCW groups to offer a variety of perspectives on this issue. Past literature has shown differences in vaccination rates and acceptance between these groups, but few vaccine hesitancy studies have included different fields of HCWs in the same study.^{11,12} Given that these groups all have direct contact with (potentially high risk) patients, it is important to understand factors that may promote acceptance and uptake of the COVID-19 vaccine in these groups. Finally, we were also able to capture a unique moment in time in the pandemic, a time when the vaccine roll out in the US was in the early stages.³¹

One limitation of this analysis is that we were unable to capture repeated measures over time, which would allow us to see how our participants' feelings regarding COVID-19 vaccination evolved throughout the pandemic. Another limitation was that certain groups were skewed toward certain genders (e.g., EMTs mostly male), which may confound the differences observed between groups. However, gender bias is characteristic of these groups nationally, and was not an anomaly of our sampling for this study.^{32,33}

Lastly, while we did see a variety of opinions in our data, our participants themselves were not among those HCWs who

reported major vaccine hesitancy. The only two studies that have documented this issue were among HCWs in France and in Palestine, which were both conducted in December 2020 to February 2021.^{34,35} While our findings are consistent with the emerging literature, it also points to the larger need for a greater understanding of the reasoning behind COVID-19 vaccine hesitancy among HCWs.

Future directions

Understanding the factors related to vaccination among HCWs can help frame our understanding of vaccination rates in the US. The recommendations that emerge from these data can be translated into informing programs and public health policies that help to increase vaccination rates to combat and protect against COVID-19.

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Appendices

Appendix A. Semi-Structured Interview Questions

This study is exploring how people, in this case health care workers in particular, make decisions about whether to get vaccinated against COVID-19 or not.

Have you received the COVID-19 vaccine?

- If NO: Do you have the intention to get a COVID-19 vaccination?
- If NO: Would you say that you have enough reliable information about the COVID-19 vaccine to make a decision about whether to get vaccinated? If not, what things would you most like to know? In your experience, have your healthcare colleagues mostly been positive or negative about the COVID-19 vaccine?
- If YES, How was the experience?

Have you ever had a negative previous experience with a vaccination?

- Probes: What type of vaccine? What type of experience?
- IF NO: Do you know anyone who has had a negative experience with a vaccine? Can you tell me about that?

From your experience as a healthcare worker, would you say that most people should get a COVID-19 vaccine? Why or why not?

- Probe Choices: Some health workers say they've had challenges (use probes as needed, see below). Does that describe how you feel (or might have felt) about the challenges of getting a COVID-19 vaccine?
 - been too busy
 - have had difficulty scheduling a time for the vaccination.
 - are concerned that serious side effects might interrupt their work schedule.
 - Have colleagues or friends that expressed such negative attitudes about the vaccine that they've decided to put it off.
 - Had a 'wait and see' attitude to getting a vaccine.
 - Felt their present precautions (PPE, hygiene, etc.) are already enough to prevent infection so you don't need a vaccination.
 - Will wait for the single dose COVID-19 vaccine.

Can you think of any other barriers that might prevent you from being vaccinated that we haven't talked about? What about things that might really help you make up your mind to get vaccinated?

- Probe: What kind of things have your patients or colleagues said about the COVID-19 vaccine? Can you describe the reasons why a lot of healthcare workers have been delaying getting the COVID-19 vaccine?

If a patient or family member asks you for advice about getting a COVID-19 vaccination, what would you tell them?

- Probes: Would you present the pluses or minuses (pros and cons) of getting a COVID-19 vaccine? Could you describe how you might do that? How do most patients respond when you give advice about getting vaccinated? Do you think most of your colleagues would give the same advice?

- How about if it were a family member asking you? Would your advice be any different?
- Probe: How does this affect your decisions about whether to get or recommend the COVID-19 vaccine?
- Optional question: As a healthcare worker, how would you compare the advantages and disadvantages of building natural immunity compared with getting a vaccine?

How do you feel (or what do you think or do you have any comments) about the way the vaccine has been developed and tested?

- Probe: Vaccine developers? Those who administer the vaccine?

As a healthcare worker, do you have any preferences for how or when you should be vaccinated?

- Probes: Do you prefer getting a vaccination at work? Would you rather go somewhere other than your workplace to receive the vaccine? If you were given time-off to get a vaccination would that motivate you to get vaccinated?
- Probe: Do you have any stories of healthcare workers you know who do not vaccinate? Can you tell me about their reasoning? Do they administer vaccines?
- Some policymakers say that vaccination of healthcare workers should be mandatory. What do you think about that?
- Is there anything else that didn't come up that you think might be important to talk about?

Appendix B. Debriefing and Confidentiality

HCW Interview Debrief

Finally, before we finish up, it is our goal and responsibility to use the information that you have shared responsibly. Now that you have completed the interview, we would like to give you the opportunity to provide us with additional feedback on how you prefer to have your data handled.

To remind you, this study is exploring how people, in this case health care workers in particular, make decisions about whether to get vaccinated against COVID-19 or not. This interview would help us to provide more information to the Pima County Health Department and Mel and Enid Zuckerman College of Public Health to inform their choices on how to promote vaccination in the safest and most effective way possible.

Please choose one of the following statements:

___ You may share the information just as I provided it. No details need to be changed and you may use my real name when using my data in publications or presentations.

___ You may share the information just as I provided it; however, please do not use my real name. I realize that others might identify me based on the data, even though my name will not be used.

___ You may share the information I provided; however, please do not use my real name and please change details that might make me identifiable to others. In particular, it is my wish that the following specific pieces of my data not be shared without first altering the data so as to make me unidentifiable (describe this data in the space below):
