Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

COVID-19 Vaccine Knowledge, Beliefs and Attitudes Among Oregon Healthcare Provider Types

Student Investigator's Name
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Date of Submission *(mm/dd/yyyy)*
03/17/2023

Graduation Year
2023

Project Course *(Indicate whether the project was conducted in the Scholarly Projects Curriculum; Physician Scientist Experience; Combined Degree Program [MD/MPH, MD/PhD]; or other course.)*
Scholarly Projects Curriculum

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Mentor's Department
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Concentration Lead's Name
Alex Foster

Project/Research Question

- What are the attitudes and knowledge among healthcare professionals in Oregon regarding the COVID-19 vaccine?
- Are there differences in attitudes or knowledge regarding the COVID-19 vaccine between healthcare provider roles (ie. Physician, nurse, PA, NP, ND)?

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*
Research Study

Key words *(4-10 words describing key aspects of your project)*
COVID-19, immunization, vaccination, vaccine hesitancy, attitudes, primary care provider

Meeting Presentations
If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

1. COVID-19 Vaccine Knowledge, Beliefs and Attitudes Among Oregon Healthcare Provider Types. **Osborn, J.,** Corley Stampke, L. (co-first author), and Guzman-Cottrill, J. Oral Presentation. Northwest Immunization Conference, August 22, 2022.
2. COVID-19 Vaccine Knowledge, Beliefs and Attitudes Among Oregon Healthcare Provider Types. Corley Stampke, L., **Osborn, J.**, (co-first author), and Guzman-Cottrill, J. Oral Presentation at Society of Healthcare Epidemiologists of America (SHEA) Conference, April 2022.

Publications *(Abstract, article, other)*
If your project was published, please provide reference(s) below in JAMA style.

Stampke LC, Osborn J, Guzman-Cottrill J. COVID-19 vaccine knowledge, beliefs and attitudes among Oregon healthcare provider types. Antimicrob Steward Healthc Epidemiol. 2022;2(S1):s76-s76. doi:10.1017/ash.2022.201

Submission to Archive
Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

None.

Next Steps

What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

Re-deploy the survey to other states that higher or lower vaccine hesitancy, in addition to re-deploying the survey in Oregon to assess for differences across states based on general vaccine hesitancy levels. Re-send the survey focusing on distributing to PA, NP and ND associations, email list servs and social media sites.

Please follow the link below and complete the archival process for your Project in addition to submitting your final report.

https://ohsu.ca1.qualtrics.com/jfe/form/SV_3ls2z8V0goKiHZP

Student's Signature/Date *(Electronic signatures on this form are acceptable.)*
This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.

X _____

Student's full name
Jessica Osborn

Mentor's Approval *(Signature/date)*

X _____ 3/13/2023

Mentor Name
Judith Guzman-Cottrill, DO

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Report*: Information in the report should be consistent with the poster, but could include additional material. Insert text in the following sections targeting 1500-3000 words overall; include key figures and tables. Use Calibri 11-point font, single spaced and 1-inch margin; follow JAMA style conventions as detailed in the full instructions.*

Introduction *(≥250 words)*

The COVID-19 pandemic has affected the entire globe, resulting in over 1 million deaths worldwide[1]. The approval of an effective vaccination has been long awaited since the onset of this pandemic. At the time this study was conducted there were myriad vaccine candidates in development; 48 in human trials according to the New York Times vaccine tracker, and none approved for full usage and distribution[2]. The response to this global pandemic resulted in the FDA modifying regulations for vaccine development in order to expedite the development and distribution of a vaccination[2]. Moreover, the FDA has repeatedly emphasized that the changes to regulations regarding COVID-19 vaccine development will not alter the safety and efficacy of an approved vaccine[2]. Nevertheless, these changes in protocol have contributed to hesitance regarding the safety and efficacy of a potential COVID-19 vaccine[3,4].

Healthcare workers play a large part in recommending and distributing the approved vaccination when it comes available. Historically, a majority of healthcare providers have supported vaccination for both their patients and themselves; however, there remain some healthcare providers that are vaccine hesitant[5,6]. Given the state of changing FDA standards for vaccine development and discordant available information, healthcare providers may not feel comfortable with the level of rigor applied to the development of such a COVID-19 vaccine, despite previous support for vaccinations. As such, healthcare providers may be hesitant to recommend the COVID-19 vaccination to their patients.

A significant percentage of patients defer to their primary care health provider for recommendations regarding vaccination[6,7,8]. Consequently, with the approval of a new COVID-19 vaccine, patients are likely to seek out the expertise and recommendation of their primary care provider. Therefore, this study aims to understand the attitudes of healthcare workers who will be administering the COVID-19 vaccine to their patients, in order to identify potential barriers and challenges that may hinder the success of a newly approved COVID-19 vaccine.

This study examines the attitudes, safety concerns and knowledge of healthcare providers regarding the potential COVID-19 vaccine. The knowledge and attitudes among healthcare workers will likely impact the willingness of these individuals to recommend the vaccine to their patients and their willingness to get the vaccine for themselves or their family. This study aims to benefit patients considering getting the COVID-19 vaccination because a significant percentage of patients look to their healthcare provider for advice and information regarding vaccinations[6,7,8]. Healthcare provider willingness to receive and administer the COVID-19 vaccine will likely impact their patients' willingness to receive the vaccine as well. Understanding the attitudes, concerns and knowledge of healthcare professionals during this critical time can help inform health authorities as to what information needs to be made clearer in addition to elucidating the concerns of those that are put in the position of recommending this COVID-19 vaccination.

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Methods *(≥250 words)*

This was a cross-sectional, descriptive study aimed to collect data regarding attitudes and knowledge of the COVID-19 vaccine. Participants in this study were healthcare providers including: nurse practitioners (NP), naturopathic doctors (ND), physician assistants (PA), doctors of medicine (MD), doctors of osteopathic medicine (DO) or bachelor of medicine, bachelor of surgery (MBBS) practicing in the state of Oregon. No participant was excluded on the basis of gender identity, sexuality, religion, race, ethnicity or age.

A 36-question survey was constructed using Qualtrics with consultation from a survey methodologist. Data was both collected and stored in the Qualtrics platform. The survey was reviewed and approved by OHSU IRB and distributed via listserv or social media posting to provider societies in Oregon, including NP, ND, PA, MD, DO or MBBS and via the Oregon Health Authority's (OHA) immunization practice listserv. The survey accepted responses from July 9 to August 12, 2021. Participants were volunteers and responses were anonymous.

The survey consisted of statements with a Likert scale, yes/no questions and questions requiring ranking of options provided. All questions related to the attitudes, knowledge and safety concerns of healthcare workers regarding the approved COVID-19 vaccine.

Predictor variables include provider age, years in practice, source of vaccine recommendation information, practice setting and type of provider (NP, PA, MD, DO). Outcome variables included, but were not limited to, willingness to recommend the vaccine to patients, provider's willingness to get the vaccine for themselves or their family (vaccine hesitance).

Statistical analysis was not performed due to insufficient response numbers in NP, PA and ND groups for comparison.

Results *(≥500 words)*

One-hundred and one responses were collected. Of those, 87 participants completed 100% of survey questions. Survey respondents were predominantly White/Caucasian females ages 41-50 with a MD/DO/MBBS (Table 1). Of NP respondents, 67% practiced rurally, versus 25.6% of MD/DO/MBBS, 25% of NDs and 28.6% of PAs (Figure 1, Table 1).

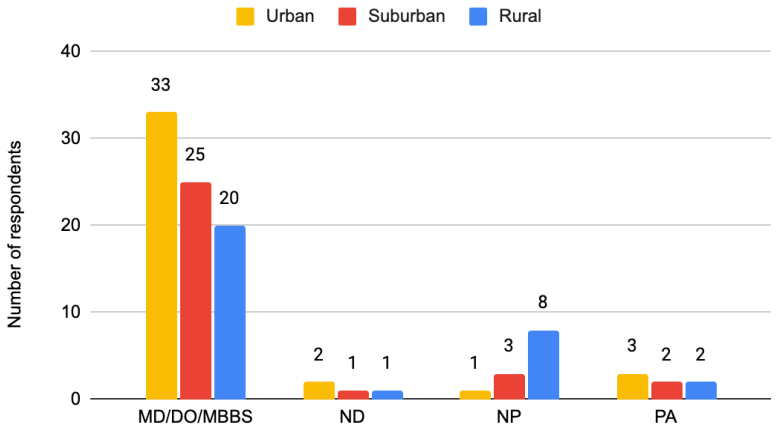


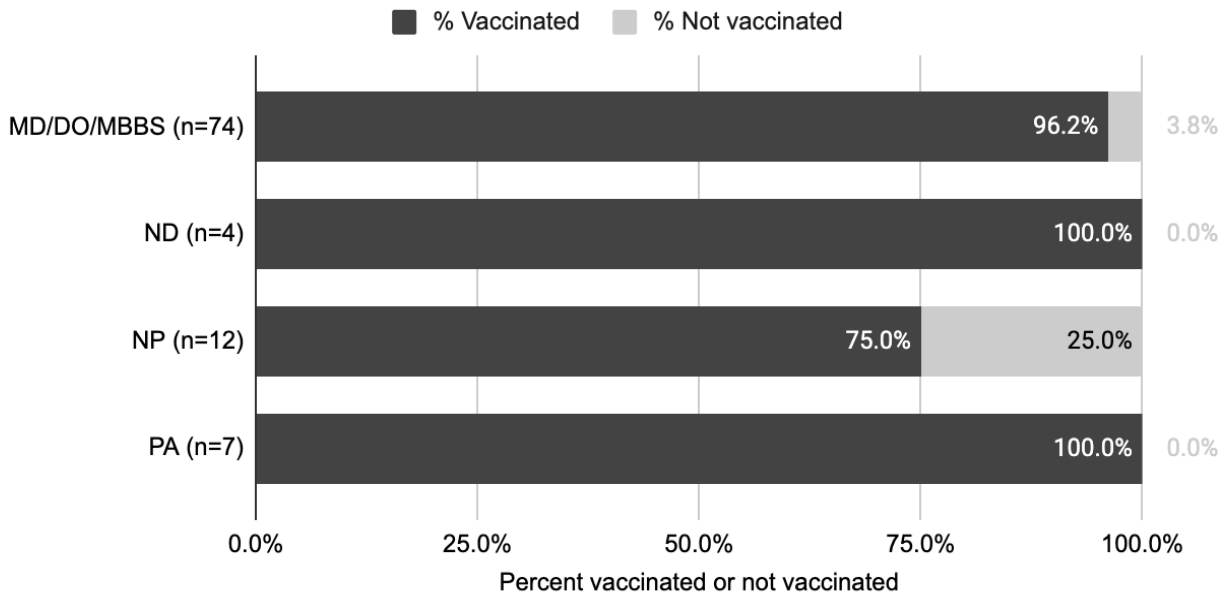
Figure 1: Number of respondents by provider type and region of practice

Table 1. Demographic Information (see next page)

	MD/DO/MBBS (n=78)	ND (n=4)	NP (n=12)	PA (n=7)	Total (n=101)
Age					
≤30	0.0%	0.0%	8.3%	14.3%	2.0%
31-40	24.4%	50.0%	25.0%	42.9%	26.7%
41-50	32.1%	50.0%	16.7%	42.9%	31.7%
51-60	26.9%	0.0%	25.0%	0.0%	23.8%
61-70	14.1%	0.0%	25.0%	0.0%	13.9%
71+	2.6%	0.0%	0.0%	0.0%	2.0%
Gender Identity					
Female	71.8%	100.0%	91.7%	71.4%	75.2%
Male	25.6%	0.0%	8.3%	14.3%	21.8%
Transgender Female	0.0%	0.0%	0.0%	0.0%	0.0%
Transgender Male	0.0%	0.0%	0.0%	0.0%	0.0%
Gender variant/non-conforming	0.0%	0.0%	0.0%	0.0%	0.0%
Prefer not to disclose	2.6%	0.0%	0.0%	14.3%	3.0%
Race/Ethnicity					
Asian or Pacific Islander	11.5%	0.0%	0.0%	0.0%	8.9%
Black or African American	1.3%	0.0%	0.0%	0.0%	1.0%
Hispanic or Latino	2.6%	0.0%	0.0%	14.3%	3.0%
Native American or Alaskan Native	0.0%	0.0%	8.3%	0.0%	1.0%
White or Caucasian	74.4%	100.0%	91.7%	71.4%	77.2%
Multiracial or Biracial	3.8%	0.0%	0.0%	0.0%	3.0%

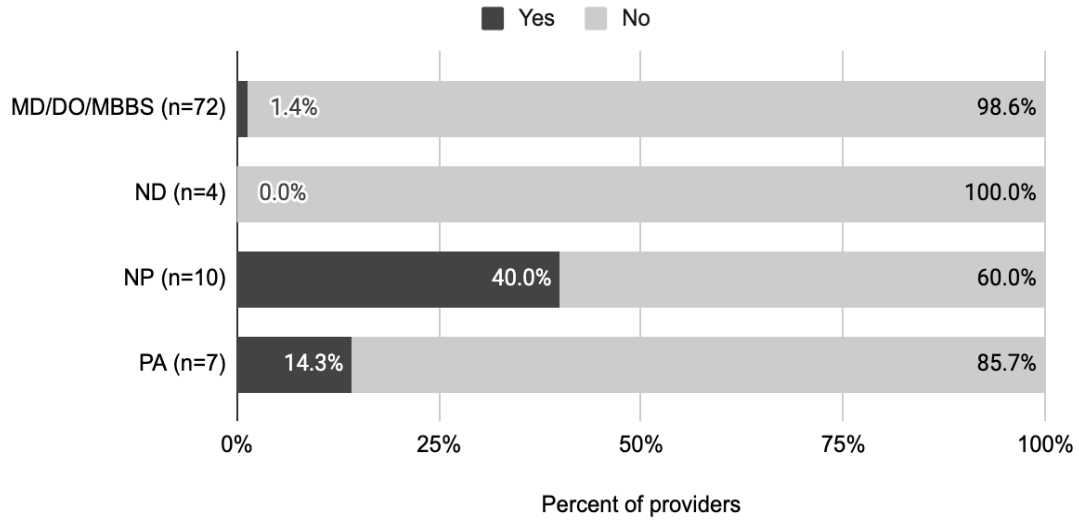
Prefer not to disclose	6.4%	0.0%	0.0%	14.3%	5.9%
Region/County of Practice					
Rural (n=31)	25.6%	25.0%	66.7%	28.6%	30.7%
Suburban (n=31)	32.1%	25.0%	25.0%	28.6%	30.7%
Urban (n=39)	42.3%	50.0%	8.3%	42.9%	38.6%
COVID-19 Vaccination Status					
Yes, mRNA vaccine, doses #1 and #2 received	94.9%	100.0%	75.0%	100.0%	93.1%
Yes, single dose vaccine received	1.3%	0.0%	0.0%	0.0%	1.0%
Total Yes	96.2%	100%	75%	100%	94.1%
No	3.8%	0.0%	25.0%	0.0%	5.9%

Figure 2a: Percent of respondents fully vaccinated by provider type



Overall COVID-19 vaccination rate of respondents was 94.6% (Table 1). Vaccination rate was highest among NDs (n=4) and PAs (n=7) at 100%, followed by MD/DO/MBBS (n=78) at 96.2% and NPs (n=12) at 75% (Figure 2a).

Figure 2b: Percent of respondents reporting history of refusal of vaccination recommended by primary care provider



NPs reported the highest percentage of respondents refusing a vaccine recommended by their primary care provider at 40% (14.3% of PAs, 1.4% of MD/DO/MBBS, 0% of NDs) and lowest percentage of respondents willing to recommend the COVID-19 vaccine to eligible family members at 70% (75% ND, 85.7% PA and 97.2% MD/DO/MBBS, Figures 2b,c).

Figure 2c: Percent of respondents willing to recommend COVID-19 vaccination to their eligible family members

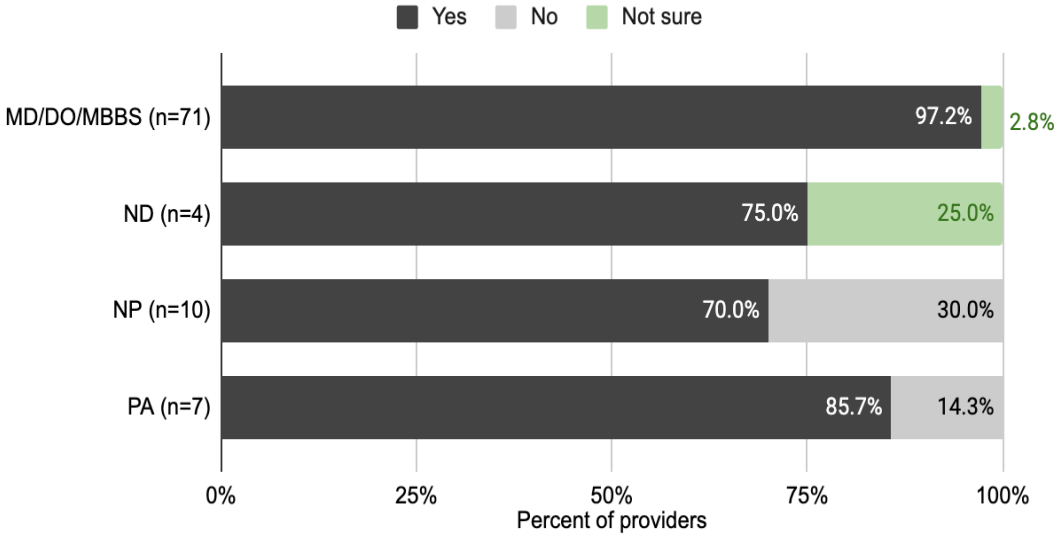
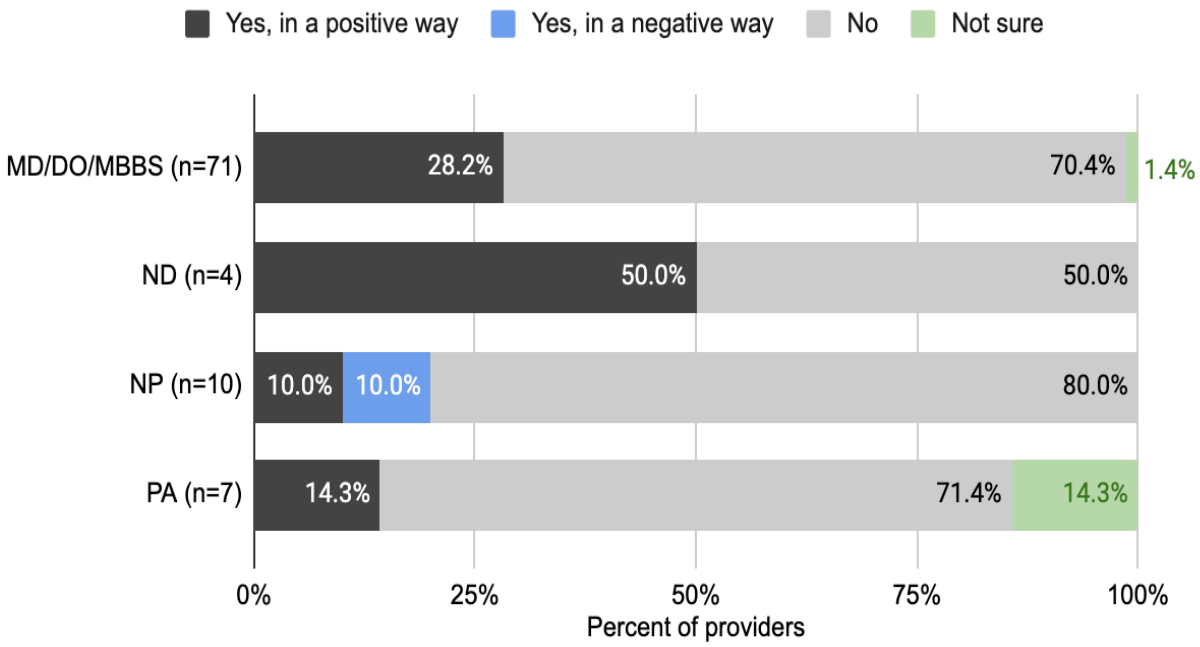
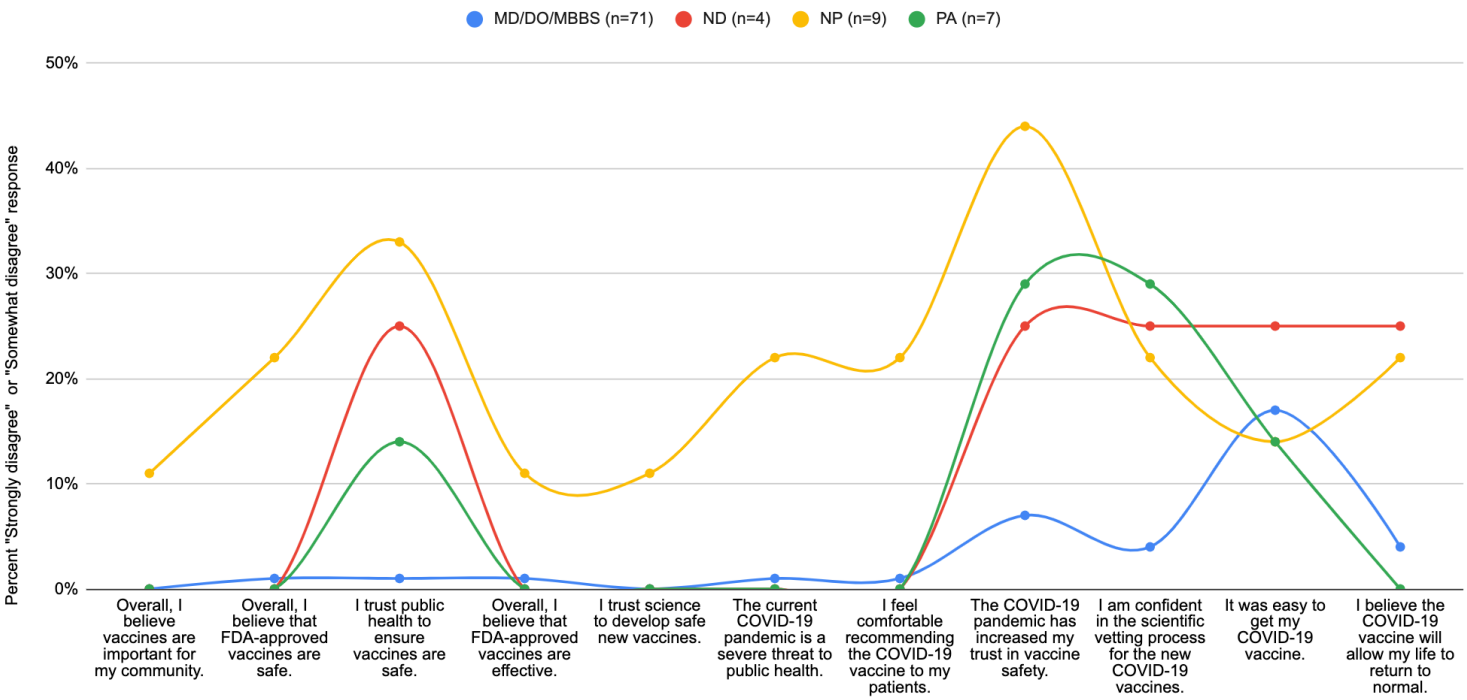


Figure 2d: Percent of respondents reporting a change in attitude toward vaccination during COVID-19 pandemic



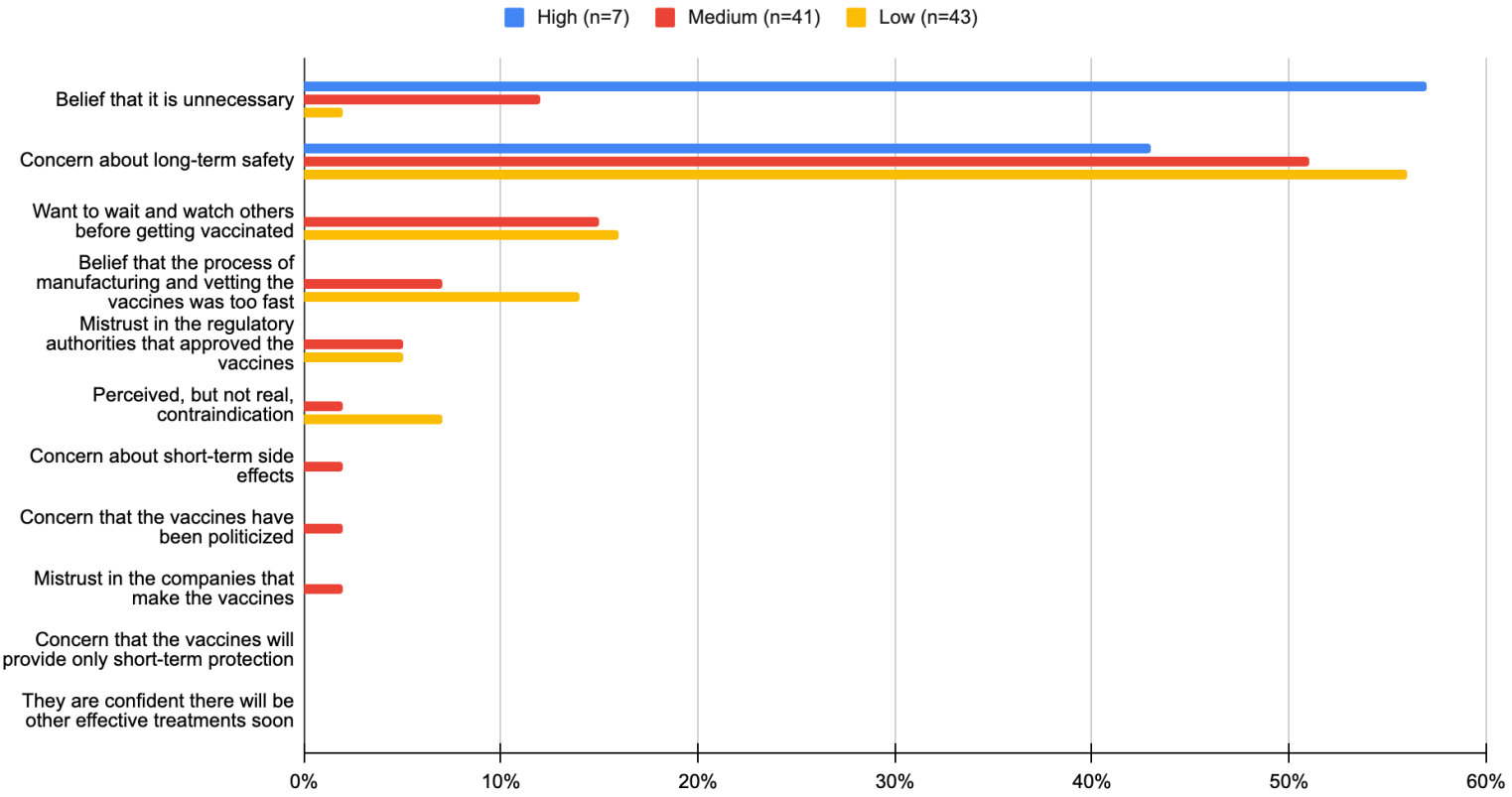
NDs (n=4) reported the highest percent positive change in attitude toward vaccination during the COVID-19 pandemic at 50%, followed by MD/DO/MBBS (n=71) at 28.2%, PAs (n=7) at 14.3% and NPs (n=10) at 10%. NPs were the only group to report a negative change in attitude toward vaccination during the COVID-19 pandemic (10% of NPs, Figure 2d).

Figure 3: Percent "strongly disagree" or "somewhat disagree" response to below statements about



Twenty-two percent of NPs (n=11) did not feel comfortable recommending the COVID-19 vaccine to patients, compared to 1% MD/DO/MBBS, 0% ND, 0% PA (Figure 3). Of NPs who responded, 22% disagreed with the statement that the COVID-19 pandemic was a severe threat to public health, compared to 1% MD/DO/MBBS, and 0% ND and PA. Additionally, 22% of NPs disagreed with the following statements: I trust in public health to ensure vaccines are safe, I believe that FDA-approved vaccines are safe, and I am confident in the scientific vetting process for the new COVID-19 vaccine. All provider types had high rates of disagreement with the statement that the COVID-19 pandemic had increased their trust in vaccine safety (NPs at 44%, 29% of PAs, 25% of NDs and 7% of MD/DO/MBBS). Furthermore, all provider types reported some difficulty getting their COVID-19 vaccine (17% MD/DO/MBBS, 25% ND, 14% PA and NP).

Figure 4: Top concerns about COVID-19 vaccination among healthcare workers by perceived level of vaccine hesitancy



Belief that the COVID-19 vaccination is unnecessary was most prevalent in areas with high vaccine hesitancy in healthcare providers at 57%, compared to 12% in medium and 2% in low vaccine hesitancy areas (Figure 4). The top concern among areas of low and medium provider vaccine hesitancy was concern about long-term safety, 56% in low, 51% in medium (43% in high). Additionally, areas of low and medium vaccine hesitancy among healthcare providers reported wanting to wait and watch others get vaccinated first, at 16% and 15%, respectively. Belief the vetting process of vaccines was too fast was a top concern only in areas of low and medium vaccine hesitancy, 14% in low, 7% in medium, 0% in high.

Discussion *(≥500 words)*

This study aimed to examine the attitudes, safety concerns and knowledge of various types of primary healthcare providers (NP, PA, ND, MD/DO/MBBS) regarding the COVID-19 vaccine. The results of this study show that COVID-19 vaccine hesitancy is prevalent among healthcare providers and may be increased in NPs. Our data showed the NPs were most likely to indicate that they disagreed with statements indicating trust in vaccine safety, the vetting process for the COVID-19 vaccine and sentiments that overall vaccines have a positive effect on public health. Some of the highest levels of disagreement, 22% of NP respondents, were indicated toward the following statements: “I feel comfortable recommending the COVID-19 vaccine to patients,” “I trust in public health to ensure

vaccines are safe," "I believe that FDA-approved vaccines are safe," "I am confident in the scientific vetting process for the new COVID-19 vaccine," and "the COVID-19 pandemic was a severe threat to public health." In contrast, less than 5% of MD/DO/MBBS respondents disagreed with these same statements. As such, possible considerations for this difference could be difference in primary training regarding vaccine science and safety, access to CME relating to vaccine education and area of practice. Also of note, the 8 of 12 NPs that responded to this survey practiced in rural areas. Therefore, it is unclear if NP-specific vaccine education and/or training or the rural practice setting are primary driving forces of this healthcare provider vaccine hesitancy. Additionally, the response rate of NPs overall was low. These limited data indicate that surveying more NPs in urban, suburban and rural practice settings is needed to elucidate these possible trends in vaccine hesitancy. The response from PAs and NPs to these same questions more similar to MD/DO/MBBS providers, which could be indicative of more similar training processes of these provider types; however, this remains difficult to interpret due to low number of respondents in these categories.

The WHO listed vaccine hesitancy among the "Top 10 threats to Global Health in 2019"[9]. Vaccine hesitance is a significant potential barrier to eradicating COVID-19, especially amidst the distrust and misinformation circulating worldwide regarding rapid vaccine development. A study by Dror et al. showed vaccine hesitance even among medical professionals and that the number one concern regarding the development of a COVID-19 vaccine among physicians and the general population is quality control, specifically vaccine safety[12]. These concerns, may then be relayed to and adopted by patients seeing these providers as well. In this study, vaccine we saw that "concern about long-term safety" was indeed a top concern among patients in areas of high, medium and low healthcare provider vaccine hesitancy (Figure 5); however, the top concern among patients who were hesitant or unwilling to get the COVID-19 vaccine in areas of high healthcare provider vaccine hesitancy was "belief that [the COVID-19 vaccine] is unnecessary" (Figure 5). Since it is known that a significant percentage of patients defer to their primary care health provider for recommendations regarding vaccination[6,7,8], these data suggest that provider vaccine hesitancy may indeed be influencing patient education about the utility of vaccination. However, it is also possible that number of COVID cases in the area of practice may influence both provider and patient disinterest in vaccination and belief that there is no need for it due to lack of exposure. The addition of data regarding number of COVID cases and COVID-related deaths by county of practice could inform this postulation to explain the degree of COVID-19 vaccine hesitancy in different regions.

Future research should focus on NP, PA and ND providers to better understand their knowledge, beliefs, and attitudes about COVID-19 vaccines due to our limited number of respondents in these provider categories. Investigation into the extent and depth of vaccine education in PA, NP, ND and MD/DO/MBBS training may inform further understanding of vaccine hesitancy differences between provider types. Overall, these results can inform future targeted vaccine education to healthcare providers during public health crises.

Conclusions *(2-3 summary sentences)*

The results of this study show that COVID-19 vaccine hesitancy is prevalent among healthcare providers and may be increased in NPs and those practicing rurally. Unfortunately, the response rate of NPs was low. Future research should focus on these providers to better understand their knowledge, beliefs, and

attitudes about COVID-19 vaccines. These results can also inform future targeted vaccine education to healthcare providers during public health crises.

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