



# Vaccine hesitancy and hesitant adoption among nursing students in Texas

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## ABSTRACT

**Background:** As the state facing the second-largest nursing workforce shortage in the U.S. and low vaccination rates among residents early in the pandemic, Texas provided a unique opportunity to examine vaccine hesitancy and hesitant adoption among nursing students in an environment where state-level executive orders prohibited mandatory vaccinations.

**Methods:** The purpose of this study was to describe the level of vaccine hesitancy and hesitant adoption among nursing students in the state of Texas. We used a convenient, opt-in, online survey of nursing students conducted between mid-April and mid-June 2022. The survey was distributed to all pre-licensure nursing programs in Texas.

**Results:** The majority of survey respondents ( $n = 599$ ) were between the ages of 18–28 (68 %), female (88 %) and white (57 %). Most received at least one dose of the COVID-19 vaccination (84 %). Of those receiving the vaccine, a high proportion (82 %) were identified as hesitant adopters. Respondents cited concerns about side effects (57 %) most frequently as the reason for vaccine hesitancy.

**Conclusion:** Given the worldwide nursing shortage, factors potentially impacting the future workforce, such as vaccine hesitancy and hesitant adoption, must be closely monitored. More research is needed to understand the concerns of nursing students and the motivations of hesitant and non-hesitant adopters.

## 1. Introduction

The COVID-19 pandemic brought into sharp focus the disparity of individual views on vaccinations in the U.S. Simultaneously, it placed unprecedented strains on the healthcare workforce. These new realities intersected to create potential threats to the stability of the healthcare workforce pipeline. Vaccine development offered a potential means for return to normalcy within both global society and the healthcare workforce (Gogoi, 2022; Powell, 2020), yet many expressed hesitancy and vaccine uptake did not reach anticipated levels (Galiant et al., 2023; Gogoi, 2022). Because nursing makes up the largest group of professionals in healthcare, it is important to understand vaccine hesitancy in this segment and the pipeline of nursing students who ensure its future.

The complex nature and context of the COVID-19 vaccination combined with clinical placement requirements for nursing students pose a challenge for nursing educators. While some studies have examined vaccine hesitancy among healthcare professionals, including nurses (ANF, 2020; Biswas et al., 2021; Gogoi et al., 2022; Kuter et al., 2021),

few have specifically addressed the views of nursing students after vaccines became readily available (Morris, 2022). Most studies including nursing students focused on intent to be vaccinated rather than actual behavior (Belingheri et al., 2021; Bonnema et al., 2021; Fontenot et al., 2021; Manning et al., 2021; Patelarou et al., 2021; Zhou et al., 2021). In addition, the definition and measurement of vaccine hesitancy are not consistent, producing considerable variation in results. Finally, an emerging concept, hesitant adoption, has received limited attention in the literature (Moore et al., 2022) Vaccine hesitancy among nursing students needs to be better understood to address the challenges facing the nursing workforce pipeline.

The purpose of this study was to describe the level of vaccine hesitancy among nursing students in Texas. As the state facing the second-largest pre-pandemic nursing workforce shortage in the U.S. (U.S. Department of Health and Human Services, 2017) and low vaccination rates among residents (Centers for Disease Control and Prevention, 2022), Texas provided a unique opportunity to examine vaccine hesitancy in an environment where mandatory vaccinations were prohibited by state-level executive orders (Texas Workforce Commission, 2021).

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## 2. Literature review

### 2.1. Nursing workforce shortage

Multiple recent reports describe a critical shortfall in the U.S. nursing workforce (Martin et al., 2023; Zhavoronkova et al., 2022; Berlin et al., 2022; U.S. DHHS, 2022; U.S. DHHS, 2017). Even before the pandemic, demand for registered nurses (RNs) in Texas was projected to outpace the supply every year for the next decade (Texas Health and Human Services, 2020). The pandemic placed tremendous strain on the workforce and exacerbated the shortage; many nurses fled the profession due to pandemic-induced workplace conditions that produced trauma, exhaustion, moral distress, and diminishing morale (Martin et al., 2023; Smiley et al., 2023; Zhavoronkova et al., 2022). Nurses with 10 or fewer years of experience are of particular concern since they have reported higher levels of fatigue and burnout than more experienced nurses, as well as intent to leave the profession within the next five years (Martin et al., 2023).

Researchers of employment patterns of nurses during the pandemic point to baccalaureate nursing program applications as a trend that bears watching. At the time of this study, Buerhaus et al. (2022) noted that applications to nursing programs grew at only 1.5 % in 2020 as compared with increases of 4.5 % and 8.5 % in the previous two years. Understanding vaccine hesitancy in nursing students may play a role in successfully managing the workforce pipeline (Peterson, Lee, & Nugent, 2022).

### 2.2. Mandates

When clinical agencies began to reopen to students, schools of nursing (SONs) in Texas were confronted by conflicting vaccine mandates. Federal entities required vaccination for health care organizations whilst state government prohibited any public institution from compelling COVID-19 vaccination (Texas Workforce Commission, 2021). With 93 % of programs reporting students with some level of vaccine hesitancy (Texas Board of Nursing, 2021), SONs faced multiple dilemmas for clinical placement, ranging from the ability to query students about vaccine status to planning accommodation for large numbers of students declining the vaccine since some clinical sites mandated vaccination while others did not. State schools and community colleges were particularly challenged since they were constrained by Texas mandates for public institutions (Texas Board of Nursing, 2020).

### 2.3. Vaccine hesitancy

Vaccine hesitancy, described broadly as a “delay in acceptance or refusal of vaccination despite availability of vaccination services” that is “complex and context specific, varying across time, place and vaccines ... and influenced by factors such as complacency, convenience and confidence” (MacDonald, 2015, p. 4163) is not limited to the COVID-19 era. Even before the COVID-19 pandemic, WHO identified vaccine hesitancy as one of the top 10 concerns in its 5-year strategic plan (WHO, 2019). Vaccines are a crucial element of countermeasures against epidemics, and hesitancy can potentially limit public health response against pathogens. Complicating efforts to address hesitancy is the complexity of the concept itself. In current literature, it encompasses varying conceptualizations of cognitions, affects, behavior, decision-making, and associations with concepts such as confidence, trust, complacency, and convenience (Bussink-Voorend et al., 2022). Some researchers now recommend that the focus of vaccine hesitancy be redirected toward a state of indecision or uncertainty (Bussink-Voorend et al., 2022; Larson, 2022; Larson, Gakidou, & Murray, 2022). Other researchers, however, note the existence of a “middle ground” in which individuals display hesitancy toward a vaccine and yet proceed with vaccination. This latter conceptualization has led to an emerging

concept in recent literature known as “hesitant adoption” (Eichelberger et al., 2022; Moore et al., 2022; Willis et al., 2021).

### 2.4. Hesitant adoption

Recent studies suggest that individuals move along a spectrum of vaccine adoption and refusal, making decisions based on contexts including lived experiences and personal motivating factors (Eichelberger et al., 2023). Hesitant adopters are described as “individuals who express some level of hesitancy about the vaccine but have also received at least one dose of the vaccine” (Moore et al., 2022, p.1 abstract). Researchers seeking to shed light on the concept of hesitant adoption recently explored factors that aided in overcoming barriers to vaccination, motivating factors, and trusted sources for vaccine information (Moore et al., 2022; Willis et al., 2021). They emphasized that “hesitancy toward vaccination should not be conflated with vaccine refusal, just as vaccine compliance should not be conflated with a lack of hesitancy” (Willis et al p.8). Those who hesitantly adopt now may progress to refusal in the future. To prepare for future epidemics, especially those caused by emerging or novel viruses including what the WHO refers to as “Disease X” (WHO, 2022), it is crucial to examine hesitant adoption.

### 2.5. Vaccine hesitancy in healthcare professionals

Several studies have examined COVID-19 vaccine hesitancy among healthcare professionals, including nurses (Rich-Edwards, 2022; American Nurses Foundation, 2020; Biswas et al., 2021; Gogoi et al., 2022; Kuter et al., 2021; McCready et al., 2023). Levels of hesitancy vary widely, with one scoping review reporting a range of 4.3 % to 72 % (Biswas et al., 2021). Vaccine hesitancy varied across roles and was associated inconsistently with multiple variables (McCready et al., 2023). In a survey of 12,939 nurses in the United States, the American Nurses Foundation (October 2020) found that only 34 % of respondents would voluntarily be vaccinated if their employer did not require it and only 14 % were very confident in the vaccine development process. In contrast, Rich-Edwards et al. (2022) found hesitancy to be rare (6.7 %) in their survey of 32,426 current and former nurses. This survey was conducted prior to issuance of COVID-19 vaccination mandates for healthcare professionals, yet 93 % had been, or planned to be, vaccinated. Despite these variations, common themes cited by respondents for not receiving the vaccine included concerns related to its safety, efficacy, and potential side effects (McCready et al., 2023; Rich-Edwards et al., 2022; Biswas et al., 2021; American Nurses Foundation, 2020).

### 2.6. Vaccine hesitancy in nursing students

Studies including nursing students have been conducted in China, (Zhou et al., 2021), Europe (Belingheri et al., 2021; Petalarou et al., 2021), and the United States (Bonnema et al., 2021; Fontenot et al., 2021; Manning et al., 2021; Morris, et al., 2022). Two studies focused on single schools in the Eastern and Northeastern U.S. regions and included faculty and students (Manning et al., 2021; Morris, et al., 2022). One U. S. study (Bonnema et al., 2021) included ten schools of medicine, nursing, and pharmacy randomly selected from the U.S. News & World Report 2021 Best School Rankings. Another U.S. study (Fontenot et al., 2021) included a convenience sample of five schools in five U.S. regions.

Most studies including nursing students were conducted between August 2020 and January 2021 (Belingheri et al., 2021; Bonnema et al., 2021; Fontenot et al., 2021; Manning et al., 2021; Petalarou et al., 2021; Zhou et al., 2021). This time frame began before the COVID-19 vaccine became available and ended when the vaccine was in its earliest stages of availability, thus these studies focused on students’ intent to be vaccinated against COVID-19 and/or attitudes and beliefs influencing this intent. The percentage of participants who expressed willingness to accept a COVID-19 vaccine ranged from 43.8 % to 83.6 % in sample sizes

ranging from 170 to 2249. Frequently cited reasons for vaccination included protecting others or oneself. Predominant concerns expressed included safety, side or adverse effects, and rapidity of the development process.

One study of nursing students and faculty was conducted later in the pandemic. Morris et al. (2022) collected data at a university in the Eastern region of the U.S. between February and March of 2021. Seventy percent (n = 170) of the participants had received at least one dose of the COVID-19 vaccine. Morris et al. found that 89.4 % (n = 235) were either fairly or completely confident that the vaccine was safe, and that only 22 % (n = 58) of those willing to receive the vaccine reported moderate to high concern regarding side effects or long-term efficacy.

Several challenges to interpreting findings of these studies exist. Most utilized survey methodology and convenience samples with investigator-designed instruments based on literature related to attitudes, beliefs, and behaviors surrounding vaccinations. No studies utilized the Vaccine Hesitancy Scale-Adult (aVHS) or other established scale to measure vaccine hesitancy, instead basing it on responses indicating uncertainty about, or refusal of vaccination when it became available. The lack of consistent definition or measurement is a barrier to understanding hesitancy. Geographic and cultural context of the various studies limit generalizability to other countries or regions.

### 3. Methods

#### 3.1. Design

To better understand the level of vaccine hesitancy in Texas nursing students, a descriptive study using a convenience sample was conducted. Through an opt-in online survey approach, data were collected between mid-April and mid-June 2022.

#### 3.2. Sample and data collection procedures

The survey was distributed by email to faculty and/or administrators in every pre-licensure program in the state (N = 110). Any student age 18 or older enrolled in a pre-licensure nursing program based in Texas was eligible to participate.

#### 3.3. Instruments

The survey was comprised of a total of 22 items covering demographic (4 items) and nursing program variables (e.g. public or private academic setting, 5 items), vaccine status (e.g. received at least one dose of COVID vaccine, 3 items), and the Vaccine Hesitancy Scale - Adult (aVHS) (10 items) (Akel et al., 2021). To develop the survey questions not included in the aVHS, we reviewed previous studies of vaccination attitudes, beliefs, and behavior (Arce et al., 2021; Burke et al., 2021; Salmon et al., 2021).

The aVHS was not modified for use in this study. Across multiple U.S. and international samples, the aVHS has performed as valid and reliable measure of vaccine hesitancy (Akel et al., 2021). The instrument's 10 items are scored according to a 5-point Likert scale ranging from "strongly disagree" to "strongly agree". The scale score can range from 10 to 50. Across several samples, internal reliability is strong ( $\alpha > 0.8$ ). When the aVHS score is used dichotomously (cut point at 25), it demonstrates strong discriminating properties across multiple populations (Akel et al., 2021). That is, vaccine acceptance is much more likely in individuals with low vaccine hesitancy scores and less likely for those with high vaccine hesitancy scores.

#### 3.4. Institutional review board

This study was approved by the Sam Houston State University Institutional Review Board on March 21, 2022 (#IRB-2021-355).

### 3.5. Data analysis

Descriptive statistics were used to describe the distribution of demographic, nursing program, and vaccine status variables, and the aVHS score. Nonparametric procedures were used to determine if significant differences existed between categories of vaccine status and vaccine hesitancy (aVHS) in key study variables. Due to low counts in multiple cells or lack of statistical significance, no statistically significant differences are reported in this analysis (McHugh, 2013).

## 4. Results

### 4.1. Sample characteristics

A total of 640 individuals began the survey, with 599 completing it. The 41 respondents who did not complete the survey were removed from the analysis. Table 1 describes the characteristics of the respondents. The majority of the sample was female (525, 88 %), between

**Table 1**  
Characteristics of Prelicensure Nursing Students in Texas, Spring 2022.

|   |                            | (n, %)      |
|---|----------------------------|-------------|
| Gender                                    | Female                     | (525, 87.7) |
|   | Male                       | (69, 11.5)  |
|   | Non-binary                 | (3, 0.5)    |
|   | Prefer to self-describe    | (2, 0.3)    |
| Age                                       | 18–28                      | (410, 68.5) |
|   | 29–38                      | (134, 22.4) |
|   | 39–48                      | (42, 7.0)   |
|   | 49–58                      | (11, 1.8)   |
|   | 59–68                      | (2, 0.3)    |
| Academic Setting                          | Public                     | (485, 81.0) |
|   | Private                    | (108, 19.0) |
| Ethnicity                                 | Not listed                 | (3, 0.5)    |
|   | Hispanic or Latino         | (136, 22.7) |
|   | White or Caucasian         | (339, 56.6) |
|   | Black or African American  | (63, 10.5)  |
|   | Multiracial or Biracial    | (28, 4.7)   |
|   | Asian or Pacific Islander  | (27, 4.5)   |
| Nursing Degree                            | Native American or Alaskan | (3, 0.5)    |
|   | Associate Degree           | (149, 24.9) |
|   | Bachelor's Degree          | (444, 74.1) |
|   | Other                      | (6, 1.0)    |
| Military Service                          | Yes                        | (24, 4.0)   |
|   | No                         | (575, 96.0) |
| Terms from Graduation                     | 1                          | (180, 30.1) |
|   | 2                          | (144, 24.3) |
|   | 3                          | (123, 20.6) |
|   | 4                          | (91, 15.2)  |
|   | 5                          | (25, 4.2)   |
|   | 6                          | (27, 4.5)   |
|   | 7                          | (4, 0.7)    |
|   | 8                          | (3, 0.5)    |
| Employed in Healthcare                    | Yes                        | (234, 39.1) |
|   | No                         | (365, 60.9) |
| At least one dose of COVID-19 Vaccination | Yes                        | (507, 84.8) |
|   | No                         | (92, 15.2)  |

the ages of 18–28 (410, 68 %), and White or Caucasian (339, 57 %). Most respondents were enrolled in a public academic setting (485, 81 %), pursuing a bachelor’s degree (444, 74 %), and were two terms or less from graduation (324, 54 %).

#### 4.2. COVID-19 vaccine

As expected, a majority of the responding nursing students had received at least one dose of the COVID-19 vaccine (507, 85 %). Due to the low number of unvaccinated respondents, significant differences in vaccination rates by demographic characteristics, such as ethnicity, could not be determined. However, it is noted that a higher proportion of White or Caucasian respondents were unvaccinated (23.5 %) than the total sample (15.4 %) (see Table 2). Of those respondents employed in healthcare (234, 39 %), less than half reported their employer required the COVID-19 vaccination (69, 29 %).

Respondents who reported receiving the COVID-19 vaccination (84.6 %) were asked, “Why did you receive the vaccination?” The most frequent response was, “I want to protect others in the community” (138, 27.3 %), followed by “I want to protect myself” (135, 26.7 %) and “It was required for clinical placement” (134, 26.6 %). Table 3 lists the frequency of all reasons given.

#### 4.3. Vaccine hesitancy

Consisting of 10 items, the internal consistency of the Adult Vaccine Hesitancy Scale (aVHS) was strong ( $\alpha = 0.89$ ). The majority of respondents scored greater than 25 on the aVHS, classifying them as vaccine hesitant (565, 94 %). Scores for the aVHS were skewed toward the upper end of the range. As seen in Fig. 1, more than 50 % of respondents scored higher than 41 (M = 38.17, range 10–50, SD = 8.61). When asked about factors that caused COVID-19 vaccine hesitancy, the most frequent response was, “I am concerned about side effects” (341, 57 %). Additional responses are reported in Table 4. Respondents could select multiple reasons for their hesitancy. Due to the low number of low-hesitancy respondents, significant differences in hesitation levels by demographic characteristics, such as ethnicity, could not be determined.

Respondents were able to “write in” other reasons for hesitancy. Approximately 10 % (60) shared comments. Comments generally fell into several major groupings, including side effects, vaccine ineffectiveness, COVID-19 is not a threat to my health, and ulterior motives for vaccinations. Responses ranged from, “Serious side effects like death” to “...fertility because I am young and would like to have kids...” to “The COVID vaccine is evidently a political issue with monetary gain for some. The American people have been lied to by government health organizations...” An apparent theme across the reasons for hesitancy most commonly selected and the write-in comments is the lack of trust in public health messaging and/or its sources.

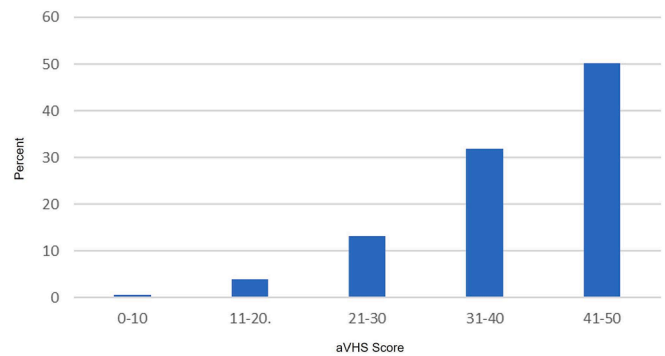
Hesitant adopters were identified as respondents who were vaccinated *and* reported a high level of vaccine hesitancy (see Table 5). Of the vaccinated respondents (508), 97 % (493) were classified as highly hesitant, indicating an unexpectedly high proportion of “hesitant

**Table 2**  
Vaccination Rates by Race/Ethnicity of Prelicensure Nursing Students in Texas, Spring 2022.

|                                   | Vaccinated (n, %) | Unvaccinated (n, %) |
|-----------------------------------|-------------------|---------------------|
| Race/ethnicity not listed here    | (3, 100)          | (0, 0.0)            |
| Asian or Pacific Islander         | (27, 96.4)        | (1, 3.6)            |
| Black or African American         | (57, 91.9)        | (5, 8.1)            |
| Hispanic or Latino                | (131, 97)         | (4, 3.0)            |
| Multiracial or Biracial           | (26, 92.9)        | (2, 7.1)            |
| Native American or Alaskan Native | (3, 100)          | (0, 0.0)            |
| White or Caucasian                | (260, 76.5)       | (80, 23.5)          |
| Total                             | (507, 84.6)       | (92, 15.4)          |

**Table 3**  
Reasons for Receiving the Vaccination Given by Prelicensure Nursing Students in Texas, Spring 2022.

|   | (n, %)      |
|---|-------------|
| I live with a person who is susceptible or vulnerable | (34, 6.7)   |
| I want to protect myself                              | (135, 26.7) |
| I want to protect others in the community             | (138, 27.3) |
| It was required for clinical placement                | (134, 26.6) |
| My employer required it                               | (21, 4.2)   |
| Other   | (45, 8.6)   |



**Fig. 1.** Histogram of aVHS Scores for Prelicensure Nursing Students in Texas, Spring 2022.

**Table 4**  
Reasons for Hesitancy Given by Prelicensure Nursing Students in Texas, Spring 2022.

|   | (n, %)      |
|---|-------------|
| I am concerned about side effects                                   | (341, 56.9) |
| There are medications that can help if I get COVID-19               | (54, 9.0)   |
| I am not concerned about getting seriously ill                      | (109, 18.2) |
| I don't like needles  | (27, 4.5)   |
| I think the vaccine development process was too quick               | (253, 42.0) |
| I don't think the government should tell me what to do with my body | (249, 41.6) |
| I don't trust public health officials                               | (83, 13.9)  |
| I don't think the COVID outbreak is as serious as people say        | (1, 0.2)    |
| My own immune system is strong enough to protect me                 | (141, 23.5) |
| I think the vaccine approval process was too quick                  | (270, 45.1) |
| I don't think my employer should tell me what to do with my body    | (229, 38.2) |
| I have several allergies  | (28, 4.7)   |
| My religious or spiritual beliefs                                   | (90, 15.0)  |
| My political beliefs  | (38, 6.3)   |

**Table 5**  
Levels of Vaccine Hesitancy by Vaccination Status in Prelicensure Nursing Students in Texas, Spring 2022.

|              | High Hesitancy (n, %)* | Low Hesitancy (n, %) | Total (n, %) |
|--------------|------------------------|----------------------|--------------|
| Vaccinated   | (493, 82.3)            | (15, 2.5)            | (508, 84.8)  |
| Unvaccinated | (72, 12.0)             | (19, 3.2)            | (91, 15.2)   |
| Total        | (565, 94.3)            | (34, 5.7)            | (599, 100)   |

\*All percentages are of the total number of respondents (599).

adopters” in this sample.

## 5. Discussion

Fewer than half of the respondents were employed in health care (39.1 %), and of these, only 29 % reported that their employer required vaccination. Thus, for the majority of nursing students, their only mandate to receive a COVID-19 vaccination was related to their enrollment in a prelicensure program and/or clinical placement for



required nursing courses. It is not surprising, then, that one of the most frequently cited reasons for receiving the vaccine was “It was required for clinical placement” (26.6 %). Other researchers have identified school as a structural motivator among hesitant adopters (Moore et al., 2021). With multiple clinical facilities requiring the vaccine for placement even if SONs did not or could not, inability to participate fully in clinicals could be a potent motivator.

The most frequently cited reasons for receiving the vaccine were related to the protection of others and self, which is consistent with key motivators for vaccine uptake identified by other studies (Belingheri et al., 2021; Kuter et al., 2021; Manning et al., 2021; Moore et al., 2021). Concern for side effects was cited by the highest percentage of respondents as a reason for hesitancy, which is consistent with multiple studies (Gogoi et al., 2022; Belingheri et al., 2021; Graupensperger et al., 2021; Kuter et al., 2021; Petalarou et al., 2021; Zhou et al., 2021). Our study did not attempt to delineate concern over long versus short-term side effects, so we cannot ascertain which type of side effect was of greatest concern to our participants, although consistent with Gogoi et al. (2022) and Morris et al. (2022), several write-in responses to our study specifically addressed “fertility.” As in other studies, this issue of trust seemed to underlie many of the reasons identified for hesitancy in our sample (Manning et al., 2021). Concerted efforts to understand and remedy the distrust between future and current healthcare providers, authorities in public health, and members of the research community, represent a critical challenge to address before the emergence of the next global health threat.

Our finding that more than 80 % of vaccinated participants in our study were categorized as having “high hesitancy” according to the aVHS was surprising. It contrasts sharply with other research that found a high degree of confidence in the vaccine and its safety (Morris et al., 2022) or described hesitancy as “rare” (Rich-Edwards, 2022). On the surface, this finding seems counterintuitive because a common assumption is that vaccinated individuals are not hesitant. Indeed, if, as some researchers suggest, vaccine hesitancy is “an attitude or sentiment” that “precedes a decision to become (or not become) vaccinated” (Larson et al., 2022), once the decision has been made, the moment of hesitancy has passed. Other researchers point out, however, that vaccine hesitancy is “complex and context specific,” changeable, and affected by multiple factors (MacDonald, 2015, p.4163); decision-making about vaccination exists across a spectrum (Eichelberger, 2022); and that conflating hesitancy with refusal is misguided (Willis et al., 2021). The complex nature and context of the COVID-19 vaccination combined with clinical placement requirements for nursing students pose a distinct challenge for nursing educators.

A strength of our study was that our survey queried all participants, regardless of vaccination status, about potential reasons for, or barriers to, vaccination. Although several studies could only explore intent due to the timing of vaccine release, limiting questions about hesitancy to those deemed “hesitant” will likely miss valuable information from those who could become “hesitant adopters.” Use of the aVHS allowed us to identify hesitant adopters, and the unexpectedly high levels of hesitant adoption in our sample prompted concerns regarding the potential for moral injury. Moral injury is “acting [in a way] that go[es] against an individual’s value and moral beliefs” (Norman & Manguen, 2020). Little is known about moral injury in this context. Comparing hesitant adopters with non-hesitant adopters across time may provide valuable insights into mitigating the effects of moral injury related to vaccination.

Although disentangling attitude from behavior will likely be valuable in providing greater clarity between hesitancy and vaccination, it does not capture the dilemma faced by those who are compelled to take an action (vaccination) while simultaneously experiencing hesitancy. It is essential to acknowledge this “middle ground”. Nursing students who hesitantly adopt because they perceive they have no choice may be at increased risk for moral distress/injury. This is concerning because moral distress/injury has been associated with “intent to leave” the

nursing profession (Sheppard et al., 2022; Ulrich et al., 2022). Given the potential moral distress or injury to student nurses related to hesitant adoption of the COVID-19 vaccination, and the certainty of additive effects experienced throughout a career in nursing, nurse educators may wish to consider curriculum content designed to teach future nurses skills related to moral resilience and moral repair (Rosen, Cahill, & Dugdale, 2022).

## 6. Limitations

This study’s generalizability is constrained by several limitations common to online surveys using convenience samples. First, it is not known how well the sample reflects the population of nursing students in Texas. Second, respondents self-selected into the study introducing the possibility of bias. To partially address these limitations, we compared the demographic characteristics of our sample with data from reputable sources describing similar characteristics at state levels. In most demographic and other characteristics, our sample generally reflects 2022 graduates from nursing programs in Texas, differing most notably in race and type of program. Somewhat more than half of our sample was white (56.6 %) while somewhat less than half of 2022 graduates were white (41.3 %). In the study sample, 74.1 % of participants were enrolled in BSN programs compared to 44.5 % of Texas 2022 graduates (Texas Center for Nursing Workforce Studies, 2023). Differences in all other demographic characteristics were minimal. Nevertheless, generalizations to other populations of nursing students should be made with caution.

## 7. Ideas for future research

Although it is too soon to determine the impact of the COVID-19 pandemic on career decisions of current and future nurses, a complex array of challenges including vaccine mandates and extreme staff shortages may affect nursing workforce capacity in ways not previously seen. A 2022 survey reports that entry-level baccalaureate applications decreased by 2.42 % resulting in the first enrollment decline since 2000 (AACN, 2023). Future studies considering steady-state demand or surge capacity of the workforce should take into account the potential impact of vaccine hesitancy. Future research should further explore reasons for students’ acceptance or refusal of vaccines; use an established scale to measure vaccine hesitancy; and be structured to capture the nuance of hesitant adoption (i.e. measuring hesitancy regardless of vaccine status) with consideration given to the possible implications (e.g. moral injury) of “de facto” vaccine mandates upon students who are hesitant.

## 8. Conclusion

COVID-19 is not the first highly transmissible novel virus, nor will it be the last. It posed unique challenges to the nursing workforce pipeline at the educational level and is a potential harbinger of future public health emergencies. Vaccine hesitancy is a potential risk to the nursing workforce, especially when vaccination for novel viruses is an expectation for clinical placement. If students change majors rather than accept a vaccine, this will affect the size of the future nursing workforce. Our current study revealed that more than 80 % of those vaccinated against COVID-19 were classified as “hesitant” according to the aVHS. It is vital for nursing educators to avoid conflating vaccine hesitancy with refusal, or vaccine acceptance with a lack of hesitancy. Healthcare professional educators must become alert to “hesitant adopters” and pursue methods to understand facilitators of, and barriers to, vaccine uptake to minimize the risk of workforce disruption.

## 9. Disclosures

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

### CRedit authorship contribution statement

**Devon M. Berry:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Data curation, Conceptualization. **Lavonne M. Adams:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Data curation, Conceptualization. **Sai Prathyusha Vytla:** Validation, Formal analysis, Data curation.

### Declaration of competing interest

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

### Data availability

The authors do not have permission to share data.

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