

ALETHEIA

Alpha Chi's Journal of Undergraduate Scholarship

Volume 8 | 2023

Vaccine Hesitancy Among Rural College Students

Hannah Hudson and Dr. Amy Madewell

Southeastern Oklahoma State University
Oklahoma Theta Chapter

Aletheia Vol. 8, 2023

Title: Vaccine Hesitancy Among Rural College Students

DOI: 10.21081/ax0370

ISSN: 2381-800X

Keywords: COVID-19, vaccine hesitancy, stress, college students

This work is licensed under a Creative Commons Attribution 4.0 International License. Author contact information is available upon request from aletheia@alphachihonor.org.

Aletheia—The Alpha Chi Journal of Undergraduate Scholarship

- This publication is an online, peer-reviewed, interdisciplinary undergraduate journal, whose mission is to promote high quality research and scholarship among undergraduates by showcasing exemplary work.
- Submissions can be in any basic or applied field of study, including the physical and life sciences, the social sciences, the humanities, education, engineering, and the arts.
- Publication in *Aletheia* will recognize students who excel academically and foster mentor/mentee relationships between faculty and students.
- In keeping with the strong tradition of student involvement in all levels of Alpha Chi, the journal will also provide a forum for students to become actively involved in the writing, peer review, and publication process.
- More information can be found at www.alphachihonor.org/aletheia. Questions to the editors may be directed to aletheia@alphachihonor.org.

Alpha Chi National College Honor Society invites to membership juniors, seniors, and graduate students from all disciplines in the top ten percent of their classes. Active on nearly 300 campuses nationwide, chapters induct approximately 10,000 students annually. Since the Society's founding in 1922, Alpha Chi members have dedicated themselves to "making scholarship effective for good." Alpha Chi is a member in good standing of the Association of College Honor Societies, the only national accrediting body for collegiate honor societies. A college seeking a chapter must grant baccalaureate degrees, be regionally accredited, and be a not-for-profit institution.



Title: Vaccine Hesitancy Among Rural College Students

DOI: 10.21081/ax0370

ISSN: 2381-800X

This work is licensed under a Creative Commons Attribution 4.0 International License.

Vaccine Hesitancy Among Rural College Students

Hannah Hudson and Dr. Amy Madewell

Southeastern Oklahoma State University
Oklahoma Theta Chapter

Abstract

This study aims to evaluate vaccine hesitancy among college students regarding the COVID-19 vaccine and uncover common reasons for hesitancy. Past research has suggested young adults may be more vulnerable to contract and spread COVID-19, as well as be more hesitant to receive vaccinations compared to other age groups (Sharma et al., 2021). Stressors brought on by the pandemic can lead to increased stress, anxiety, depression, and other behavioral changes. However, individuals who use preventative behaviors are less likely to experience increased stress than individuals who do not. Understanding vaccine hesitancy and the reasoning behind it can aid universities and employers in developing policies involving vaccination. We obtained a sample of 137 students from a rural university in the southwestern United States. Students were asked to complete an online survey that consisted of demographic questions, a COVID-19 questionnaire, a Vaccine Hesitancy questionnaire, the Perceived Stress Scale-10, and demographics. Our findings revealed the presence of hesitancy to receive COVID-19 vaccination in unvaccinated (46.7%) and vaccinated (48.2%) students, and overall mixed feelings about COVID-19 vaccination. More participants reported feeling very hesitant ($n = 53$) than not at all hesitant ($n = 37$) to receive a COVID-19 vaccine. Common reasons for vaccine hesitancy include side effects, controversy, ineffectiveness, and rushed research. Many participants (72.3%) reported experiencing moderate stress in the past month.

Keywords: *COVID-19, vaccine hesitancy, stress, college students*

The COVID-19 pandemic has affected society since the beginning of 2020. Millions have experienced the loss of loved ones, strained relationships, and stress regarding finances and health. People of all ages have also had to adjust to new learning and work environments due to the pandemic. These new challenges could lead to psychological consequences ranging from stress, anxiety, depression, substance abuse, and other behavioral changes (Zhai & Du, 2020). The prevalence of epidemics can create new stressors that could include fear and worry for oneself or loved ones, constraints on social activities due to quarantine, sudden life changes, boredom, frustration, misinformation, and financial loss (Son et al., 2020). As a result, many researchers believe college students' psychological health may be compromised by the COVID-19 pandemic (Haliwa et al., 2020).

Research has found that college students who use positive prevention behaviors (e.g., wearing a mask, social distancing, and hand washing) show less anxiety than those who used negative preventative behaviors (e.g., refusing to wear a mask, neglecting hand hygiene practices, and noncompliance with social distancing and quarantine guidelines; Guan et al., 2021). The prevention and control measures being taken can affect students' stress levels to different degrees and may cause negative effects on college students' health and perceived stress (Yang et al., 2021). Despite the known positive effects of preventative behaviors and the efforts made by health professionals to encourage COVID-19 vaccination, much of the public remains unvaccinated. According to the Centers for Disease Control and Prevention (CDC), 81.0% of the American population has received at least one dose of the COVID-19 vaccine as of February 2023 since the beginning of the pandemic in 2020 (CDC, 2023). According to USAFacts (2023), Americans 65 years old $\geq$ have the highest rate of COVID-19 vaccination with more than 95% having received at least one dose and 93% fully vaccinated. In the state of Oklahoma, 74.7% of residents have received one dose, 60.5% completed primary series, and 11.6% updated (Bivalent) booster dose (CDC, 2023).

Sharma and colleagues (2021) have suggested that college students may be more vulnerable to contracting and spreading COVID-19 due to multiple factors such as communal living, frequent travel between home and campus, and activities on campus. Researchers believe college students may also be less likely to receive vac-

cination for COVID-19 based on low flu vaccination trends among young adults compared to other age groups (Sharma et al., 2021). Wotring and colleagues (2021) found that common reasons for vaccine hesitancy include distrusting the vaccine, fear of side effects, untrustworthiness of the government, and having read negative reports from the media.

Many companies required COVID-19 vaccinations which resulted in employee severance and hostility in the workplace. This hostility could be due to vaccination hesitancy among other reasons, such as uncertainty and fear surrounding the virus leading to increased stress levels among employees, tension and disagreements between employees who have differing opinions regarding COVID-19 guidelines, and miscommunication due to remote work. Hsu (2021) states that hostile workers "represent only a tiny fraction of overall employees, not even 1% in some workplaces." However, such workers can "add up to thousands of people in many states" (Hsu, 2021). Accordingly, employers may benefit from research examining vaccine hesitancy. Understanding vaccine hesitancy in college students may also help universities develop and improve policies regarding vaccinations.

Method

Participants

The participants for this study consisted of students attending a rural university in the southwestern United States who were 18 years old and above. We obtained a sample size of 137 participants ($n = 137$) containing 29 Men (21.1%), 104 Women (75.9%), three Other (2.1%), and one preferred not to answer (0.7%). The diversity of this sample includes six Hispanic/Latino (4.3%), five Asian (3.6%), seven African American (5.1%), 72 Caucasian (52.5%), 19 Native American/American Indian or Alaska Native (13.8%), 26 Two or More Races (18.9%), and two preferred not to answer (1.5%). Participants ($n = 137$) were on average 25.3 years old ($SD = 8.8$, $Mode = 21$, $range = 18-66$), excluding the four participants that did not report their age. Of the participants, 115 students (83.9%) were full-time, 20 students (14.5%) were part-time, and two students (1.5%) preferred not to answer. Among the participants, 33 were Freshman (24.0%), 19 Sophomore (13.8%), 44 Junior (32.1%), 34 Senior (24.8%), four Graduate (2.9%) and three preferred not to answer (2.1%). Refer to Table 1 –

Table 1*Vaccination Statistics (N = 137)*

	<i>n</i>	%
Vaccination		
Vaccinated	66	48.2
Unvaccinated	64	46.7
Prefer not to answer	7	5.1
Vaccines Received		
1 st Dose	45	32.8
2 nd Dose	55	40.1
1 st Booster	25	18.2
2 nd Booster	9	6.6
Contraction of COVID-19		
Yes	64	46.7
No	66	48.2
Prefer not to answer	2	5.1

Materials

The Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983) was developed to assess stress in the past month. We included the PSS-10 to obtain an assessment of stress in college students within the past month of taking the survey. The PSS includes 10 items that follow a 5-pt Likert scale, with 0 (Never) to 4 (Very Often), with higher scores indicating higher levels of stress and lower scores indicating lower levels of stress. Cohen and colleagues (1983) found the PSS-10 to be a reliable predictor of stress, with Cronbach's alpha at 0.84. Of the 137 participants, 17 (12.4%) reported low stress, 99 (72.3%) reported moderate stress, and 21 (15.3%) reported high stress.

The COVID-19 questionnaire was assembled by the researchers of the study, inspired by Son et al (2020). The COVID-19-related questions assess the severity of how COVID-19 has impacted the participants' everyday lives. There are seven questions assessing a change in sleeping patterns, eating habits, stress, difficulty concentrating, financial difficulties, academic workload, and fear of contagion. These questions follow a 4-pt Likert scale ranging from 1 (None) to 4 (Severe), with higher levels indicating a higher level of impact and lower levels indicating a lower level of impact. Cronbach's alpha for these seven items is 0.87. Refer to Appendix A to view the COVID-19 questionnaire.

The Vaccine Hesitancy questionnaire was also assembled by the researchers. The hesitancy-related questions include six questions designed to assess vaccine statistics, hesitancy to receive the COVID-19 vaccine, and opinions regarding the vaccine to better understand

hesitancy. We asked participants if they had contracted COVID-19, if they had received the vaccine, and, if so, if they had received any boosters. Refer to the data in Table 1 for these statistics. Then, we asked participants if they were offered the COVID-19 vaccine today, how hesitant would they be to take it. Refer to Appendix B to view the Vaccine Hesitancy Item. For qualitative analyses, we asked participants to report positive and negative outcomes of the COVID-19 vaccine.

Procedure

This study was approved by the Institutional Review Board at the university, and the data for this study were collected during the spring and fall semesters in 2022. Data for the study were obtained anonymously through an online self-survey format on Sona-Systems, a research management system exclusively available to students across campus who were enrolled in Introductory Psychology courses or other behavioral science courses. Participants in this study were awarded five Sona points for their participation, which counted as bonus points for a behavioral science course of their choosing. Students' participation in this study was voluntary, and they were informed of their right to stop without receiving a penalty. After consenting to participate in this study, the participants were asked to complete the Perceived Stress Scale-10 (PSS; Cohen et al., 1983) to measure stress levels, a COVID-19 questionnaire to assess the severity of impact on everyday life, a Vaccine Hesitancy questionnaire to assess hesitancy and opinions towards the vaccine, and demographic questions. All participants were allowed 30 minutes to complete the survey and all participants were presented with the same measures in the same order. The participants in this study did not experience more stress than they would during a normal day.

Results and Discussion

One hundred and thirty-seven students aged 18 and older participated in this study. We ran an independent samples t-test comparing vaccinated students ($n = 66$, $SD = 6.59$; $PSS = 20.61$) and unvaccinated students ($n = 64$, $SD = 6.13$; $PSS = 21.12$) with perceived stress scores as the dependent variable. The result was not statistically significant, but the vaccinated students reported a lower stress scale when compared to the unvaccinated students, $p > .05$.

For further analysis, we wanted to know if students were still hesitant about receiving the COVID-19 vaccination despite the availability of the vaccine and the encouragement from medical professionals. By this time, the COVID-19 vaccine had been approved by the FDA for the second time (U.S. Food and Drug Administration, 2021). Of the sample, ($n = 137$), 62 students (45.3%) reported being moderately to very hesitant to receive a COVID-19 vaccination, similar to the findings reported by Wotring and colleagues (2021). Of the 37 participants (27%) that reported being not hesitant at all to receive the COVID-19 vaccine, two of these participants were not vaccinated. We wanted to analyze these participants further to gain a better understanding of why they remain unvaccinated despite not being hesitant at all. One of the participants was a 22-year-old Caucasian female working in the service industry. When asked, “What are some positive outcomes from the COVID-19 vaccine?”, this participant replied, “Ability to decrease the spread of the disease.” When asked, “What are some negative outcomes from the COVID-19 vaccine?”, the participant replied, “Not entirely sure what is in the vaccine, some refuse to get it.” The other unvaccinated participant was an 18-year-old African American who identified as a gender non-conforming person who worked in an educational setting. This participant replied, “Low risk of contracting the virus” as a positive outcome and they replied with, “N/A” when asked to detail negative outcomes. Both participants were full-time students who worked in high-interaction environments and provided more positive than negative based responses regarding the vaccine. While the reason these participants chose to remain unvaccinated is unclear, they reported that their employers did not require the vaccine. This information could be beneficial to consider when employers develop policies regarding vaccinations among workers in high-interaction environments.

Table 2

Vaccine Hesitancy for A Little to Somewhat and Moderately to Very hesitant groups (N = 102)

	<i>n</i>	%
<i>A little to Somewhat Hesitant Individuals (N = 38)</i>		
Vaccinated	22	57.8
Unvaccinated	10	26.3
Prefer not to answer	6	15.7
<i>Moderately to Very Hesitant Individuals (N = 64)</i>		
Vaccinated	9	14.2
Unvaccinated	52	83.5
Prefer not to answer	2	3.1

Qualitative analysis for “a little” to “somewhat” hesitant students

For the next qualitative analysis, the following open-ended questions resulted in diverse responses from the groups of “a little” to somewhat hesitant students. We analyzed responses for, “What are some positive outcomes of the COVID-19 vaccine?” and, “What are some negative outcomes of the COVID-19 vaccine?”, as well as hesitancy levels among participants. The following table includes the most common categories reported and example quotes from participants who are a little to somewhat hesitant to receive COVID-19 vaccination.

Table 3

Positive and Negative Outcomes of COVID-19 Vaccine in Participants who were A Little to Somewhat Hesitant (N = 38)

Positive Outcome of Vaccine	Example Quote	Frequency, <i>n</i> (%)
Health/Safety	“Higher immunity to contracting the Covid-19 virus and then lesser symptoms if you do receive it.”	29 (76.3)
Not Sure	“I don’t know any positive outcomes because, those I know who have received the vaccine are still getting COVID-19.”	4 (10.5)
Negative Outcome of Vaccine	Example Quote	Frequency, <i>n</i> (%)
Side Effects	“It made my arm really hurt for a day, and with 2nd dose I was badly sick feeling for 2-3 days.”	19 (50.0)
Ineffective	“I still got Covid before and after my vaccine, I got sick from the vaccine, I got post Covid syndrome. So, I’m just over all of it.”	6 (15.7)
Rushed Research	“I feel it was done quickly and I have an auto immune [disorder] so new vaccines make me nervous for how I will react to them.”	6 (15.7)
Societal Controversy	“People are politically separated. Lies and theories are being spread. Public on edge.”	3 (7.8)

Of the 29 participants who reported Health/Safety as a positive outcome, 17 participants (58.6%) were vaccinated, and seven participants (24.1%) were unvaccinated. Five participants (17.2%) chose not to answer. An example of a positive outcome of the COVID-19 vaccine quoted by a *vaccinated* participant who chose Health/Safety as a positive outcome: “It reduces how covid will affect you if you get it. Less severe.” An example of a positive outcome of the COVID-19 vaccine quoted by an *unvaccinated* participant who chose Health/Safety as a positive outcome: “While it doesn’t prevent it, it does give a bit of resistance to covid.” The positive reasons for getting vaccinated are similar for these participants even though one is vaccinated and the other is not. Common responses for positive outcomes of COVID-19 vaccination among these participants, unvaccinated and vaccinated, include reduced risk of contracting COVID-19 and lessening of symptoms.

However, similar to findings by Wotring and colleagues (2021), students are somewhat contradicting themselves in that they realize the benefits of the vaccine, but they are somewhat to very hesitant to get vaccinated, and this hesitancy is not related to one overarching rationale.

Interestingly, among the participants who reported being a little to somewhat hesitant to receive the COVID-19 vaccine, one participant reported, “More Online Options” as both a positive and negative outcome of the COVID-19 vaccine. This participant is an unvaccinated 23-year-old Native American female working in an educational setting and a full-time student. This participant reported, “More online options and different strategies” as a positive outcome and, “More things generated online and taking away from being face-to-face” as a negative outcome. Only one other participant reported more online options as a negative outcome of the COVID-19 vaccine by simply stating, “Education.” This participant is a 20-year-old Caucasian and Native American female working in the service industry and a full-time student who chose not to provide vaccination status.

Both participants reported their rationale for not getting vaccinated was justified because their employers did not require the COVID-19 vaccine. Bennel and colleagues (2021) conducted a study examining physiotherapists’ and patients’ experiences with telehealth during COVID-19 pandemic and found 47% of patients were moderately or extremely likely to choose videoconferencing for consultations in the future with technology acting as both a facilitator and a barrier. Together, these findings detail that students are choosing online options as a preventive behavior but are not completely satisfied with all outcomes and miss face-to-face interactions.

Another factor to consider is the digital divide commonly seen in southern Oklahoma. The digital divide is the gap between those who have access to the internet and those who do not. Many individuals living in rural areas do not have access to the internet, and those who do have a poor internet connection. As a result, the goal of Oklahoma politicians in 2022 is for 95% of residents to have access to secure and affordable broadband internet by 2028 (Oklahoma Broadband Office, 2022). Individuals of all ages who did not develop technological skills due to inaccessibility to internet struggle to adapt to the ever-changing world of technology as everyday activities continue to move online (e.g., socializing, healthcare, education, commerce, banking). Lai & Wid-

mar (2021) suggest students without access to reliable internet may fall behind academically during a time like the COVID-19 pandemic when access to internet is vital.

Qualitative analysis for moderately to very hesitant students

The qualitative data from participants who reported being moderately to very hesitant about receiving a COVID-19 vaccine has shown an interesting contrast in positive outcomes. Many participants reported multiple reasons for both positive and negative outcomes in their responses, while some participants simply reported one reasoning for both. Twenty-three participants (37.0%) reported feeling safer and less symptoms as positive outcomes of the vaccine. One participant reported, “Many have seen positive results in their symptoms being less extreme and some have not had COVID-19 again from then-on-out.” This participant is a 19-year-old Caucasian female employed part-time in food delivery and a full-time student. She is unvaccinated and mentioned her employer does not require the vaccine. Twenty-three other participants (37.0%) reported no positive outcomes: “I don’t think there is any positive [because] you can still get it; I just think it helps elderly people more than younger people.” This quote is from a 22-year-old Two or More Races female who is an unemployed full-time student. Only two participants from each of these subcategories were vaccinated. Li and colleagues (2020) found patients with underlying diseases to be more vulnerable to COVID-19 and the mortality rates among the elderly population (≥ 60 years old) to be higher than the average population. Similar to findings from Li et al (2020), the students in our sample included young adults, with very few reporting a chronic health condition as a concern. This sample of young, healthy students chose to remain unvaccinated and did not report a high rate of concern or mortality salience.

The third most common positive outcome of the COVID-19 vaccine was the benefits the vaccine offers the elderly population and other individuals at high risk, such as those with medical complications. One participant, a 22-year-old unvaccinated Caucasian female working in the service industry, reported, “It is helpful for those who are more feeble and highly susceptible for severe cases.” Tsai and colleagues (2021) found significant vaccine hesitancy in individuals with serious comorbid conditions as a result of lack of data examining how the vaccine could affect this population. All the par-

ticipants ($n = 7$) who reported this common theme were unvaccinated as well. Refer to Table 5 for further details.

Table 4

Positive and Negative Outcomes of COVID-19 Vaccine in Participants who were Moderately to Very Hesitant ($N = 62$)

Positive outcome of vaccine	Example quote	Frequency, n (%)
Feel Safer/Less Symptoms	"Positive outcomes may be potential protection from virus or less serious symptoms."	23 (37.0)
None	"I do not believe in getting the vaccine simply because there is a 99% survival rate for COVID."	22 (35.4)
Helps Elderly & Other	"For older aged and unhealthy people, it has helped them from getting the worst of it."	7 (11.2)
High-Risk Individuals	"I get to keep my career as a federal employee."	5 (8)
Ability to Travel	"Once getting the vaccine you are able to travel freely again."	3 (4.8)
Negative outcome of vaccine	Example Quote	Frequency, n (%)
Side Effects	"The side effects from the vaccine, strokes, infertility, and other potential outcomes. Not enough research has been done to convince me to take the vaccine."	28 (45.1)
Societal Controversy	"Disagreements among family members."	8 (12.9)
Multiple Negative Outcomes	"All the deaths, severe health issues people have developed, manipulation, poor economy, and more mental illness."	7 (11.2)
Rushed Research	"Vaccine is too new to know the long-term effects."	6 (9.6)
None	"None."	6 (9.6)
Ineffective	"Can still contract COVID-19."	6 (9.6)

One participant from this hesitancy group reported more online options as a positive outcome, but also mentioned how older individuals are negatively affected by virtual options becoming increasingly more common. They stated, "We've learned as a society that we can do many things virtually or online. This is a plus for young people, but at my work, I've seen this affect older people negatively." This participant is a 24-year-old female Caucasian working in the banking industry. She is unvaccinated and reported her employer does not require the vaccine but incentivizes it. This comment supports the discussion of more online options being perceived as both a positive and a negative outcome of the COVID-19 vaccine and pandemic, affecting different age populations differently. As previously mentioned, one participant, a 23-year-old Native American female working in an educational setting, listed more online options as both a positive and a negative.

The participants who reported being moderately to very hesitant to receive the COVID-19 vaccine commonly reported side effects from the vaccine as a negative outcome. Controversy, rushed research, and ineffectiveness were also listed as negative outcomes, with a few participants reporting not having noticed any negative outcomes. Many participants from this hesitancy group

listed multiple negative outcomes per response, including a 19-year-old Hispanic/Latino female who reported, "There are also multiple people claiming that after they got the vaccine they were hospitalized. With my family, 2 of my mother's cousins died about 2 weeks afterwards (in Mexico). Many claimed that many died a few days afterwards and were perfectly healthy before w/ no prior symptoms, no medications, and a healthy lifestyle. Over 150 workers were fired over refusing to get the vaccine. Doctors and nurses who studied for years over health [and] everything to know about viruses quit. Why? The worst of it is peer pressure. But it should be a personal choice? Each person should choose what to do with their bodies."

This participant reported not being required to take the COVID-19 vaccine as she is unemployed, so she remains unvaccinated. Another participant, an 18-year-old Caucasian female working in the technology support industry, listed both side effects and loss of jobs as a negative outcome: "The vaccine has shown to have many negative side effects, especially in pregnant women, affecting the future generations. It puts a lot of people out of a job because a lot of places are trying to require it." Like many other participants, this participant reported being unvaccinated and not required to take the COVID-19 vaccine. Another participant from this hesitancy group simply responded, "Literally everything" as a negative outcome of the COVID-19 vaccine.

Conclusion

Despite encouragement from medical professionals and financial incentives offered to students and employees to receive the COVID-19 vaccination, vaccine hesitancy is present among college students in this study. More participants reported feeling very hesitant ($n = 53$) than not at all hesitant ($n = 37$) to receive COVID-19 vaccination. Common reasons for vaccine hesitancy include side effects, controversy, ineffectiveness, and rushed research. However, 66 participants (48.2%) were vaccinated and 64 were unvaccinated (46.7%). Many participants reported remaining unvaccinated because they are not required to be vaccinated, whether by their employer or university. Only eight participants (5.8%) stated their place of employment required COVID-19 vaccination. One of these participants, a 22-year-old Native American female stated, "I am a preschool teacher, I was required to get the covid vaccine. Had I not been

required for my job, I would not have received the covid vaccine. I don't think anyone should have to be forced to take a vaccine if they don't want to." Several participants reported feeling hesitant to receive a COVID-19 vaccine while already being vaccinated. Our study revealed that many individuals still have mixed feelings about the COVID-19 vaccine.

Limitations and Future Directions

Participants for this study were limited to students enrolled at a small university located in rural Oklahoma, which resulted in a relatively small sample size. While a sample size of 137 can still yield valuable insights, it is important to consider these limitations when attempting to make broader conclusions or apply the results to a larger population.

Examining how different personalities cope with the pandemic and experience vaccine hesitancy could be beneficial for future research. Introverted individuals are less likely to be negatively affected by social distancing while extroverted individuals may struggle with isolation. Another future direction could be to examine the correlation between vaccine hesitancy and medical history. Research suggests individuals with autoimmune disorders and other diseases may be more hesitant to receive the COVID-19 vaccine (Tsai et al., 2021).

References

- Bennell, K. L., Lawford, B. J., Metcalf, B., Mackenzie, D., Russell, T., van den Berg, M., Finnin, K., Crowther, S., Aiken, J., Fleming, J., & Hinman, R. S. (2021). Physiotherapists and patients report positive experiences overall with telehealth during the COVID-19 pandemic: a mixed-methods study. *Journal of Physiotherapy*, 67(3), 201–209. <https://doi.org/10.1016/j.jphys.2021.06.009>
- Centers for Disease Control and Prevention. (2023, February). *CDC Covid Data tracker*. Retrieved March 9, 2023, from <https://covid.cdc.gov/covid-data-tracker/#vaccination-trends>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396. <https://doi.org/10.2307/2136404>
- Guan, J., Wu, C., Wei, D., Xu, Q., Wang, J., Lin, H., Wang, C., & Mao, Z. (2021). Prevalence and factors for anxiety during the COVID-19 pandemic among college students in China. *International Journal of Environmental Research and Public Health*, 18(9), Article e4974. <https://doi.org/10.3390/ijerph18094974>
- Haliwa, I., Spalding, R., Smith, K., Chappell, A., & Strough, J. (2020). Risk and protective factors for college students' psychological health during the COVID-19 pandemic. *Journal of American College Health*, 70(8), 2257–2261. <https://doi.org/10.1080/07448481.2020.1863413>
- Hsu, A. (2021, October 24). *Thousands of workers are opting to get fired, rather than take the vaccine*. NPR. <https://www.npr.org/2021/10/24/1047947268/covid-vaccine-workers-quitting-getting-fired-mandates>
- Lai, J. & Widmar, N.O. (2021), Revisiting the digital divide in the COVID-19 era. *Applied Economic Perspectives and Policy*, 43(1), 458–464. <https://doi.org/10.1002/aepp.13104>
- Li, P., Chen, L., Liu, Z., Pan, J., Zhou, D., Wang, H., Gong, H., Fu, Z., Song, Q., Min, Q., Ruan, S., Xu, T., Cheng, F., & Li, X. (2020). Clinical features and short-term outcomes of elderly patients with COVID-19. *International Journal of Infectious Diseases*, 97(August), 245–250. <https://doi.org/10.1016/j.ijid.2020.05.107>
- Oklahoma Broadband Office. (2022). *2022 Annual Report* <https://oklahoma.gov/content/dam/ok/en/broadband/documents/archives/OBO-2022-Annual-Report.pdf>
- Quintiliani, L., Sisto, A., Vicinanza, F., Curcio, G., & Tambone, V. (2021). Resilience and psychological impact on Italian university students during COVID-19 pandemic. Distance learning and health. *Psychology, Health & Medicine*, 27(1), 69–80. <https://doi.org/10.1080/13548506.2021.1891266>
- Sharma, M., Davis, R.E., & Wilkerson, A.H. (2021). COVID-19 vaccine acceptance among college students: A theory-based analysis. *International Journal of Environmental Research and Public Health*, 18(9), Article e4617. <https://doi.org/10.3390/ijerph18094617>
- Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research*, 22(9), Article e21279. <https://doi.org/10.2196/21279>
- Tsai, R., Hervey, J., Hoffman, K., Wood, J., Johnson, J., Deighton, D., Clermont, D., Loew, B., & Goldberg, S. (2021). COVID-19 vaccine hesitancy and acceptance among individuals with cancer, autoimmune diseases, or other serious comorbid conditions: Cross-sectional, internet-based survey. *JMIR Public Health Surveillance*, 8(1), Article e29872. <https://doi.org/10.2196/29872>

USAFacts. (2023, March 8). *US coronavirus vaccine tracker*. Retrieved March 10, 2023 from, <https://usa-facts.org/visualizations/covid-vaccine-tracker-states>

U.S. Food and Drug Administration. (2021, August 23). FDA approves first COVID-19 vaccine [Press release]. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-covid-19-vaccine>

Wotring, A. J., Hutchins, M., Johnson, M. K., Ferng, S.-F., Strawser, C., Pfrank, H., Warner, M., & Behrendt, L. (2021). COVID-19 vaccine uptake among college students at a Midwest university. *Journal of Community Health: The Publication for Health Promotion and Disease Prevention*, 47(2), 292–297. <https://doi.org/10.1007/s10900-021-01051-7>

Yang, C., Chen, A., & Chen, Y. (2021). College students' stress and health in the COVID-19 pandemic: the role of academic workload, separation from school, and fears of contagion. *PLOS ONE*, 16(2), Article e0246676. <https://doi.org/10.1371/journal.pone.0246676>

Zhai, Y., & Du, X. (2020). Addressing collegiate mental health amid COVID-19 pandemic. *Psychiatry Research*, 288(June), Article e113003. <https://doi.org/10.1016/j.psychres.2020.113003>

Appendix A – COVID-19 Questionnaire

COVID-19 Questionnaire (N = 137)				
Statement	Not true at all	Rarely true	Often true	True nearly all
	n (%)	n (%)	n (%)	n (%)
Since the COVID-19 pandemic, have you experienced an increase in stress?	24 (17.5)	46 (33.6)	44 (32.1)	23 (16.8)
Since the COVID-19 pandemic, have your sleeping patterns changed?	52 (38.0)	29 (21.2)	36 (26.3)	15 (10.9)
Since the COVID-19 pandemic, have your eating habits changed?	44 (32.1)	40 (29.2)	38 (27.7)	15 (10.9)
Since the COVID-19 pandemic, have you experienced difficulties with concentrating?	44 (32.1)	39 (28.5)	29 (21.2)	25 (18.2)
Since the COVID-19 pandemic, have you experienced financial difficulties?	47 (34.3)	34 (24.8)	35 (25.5)	21 (15.3)
Since the COVID-19 pandemic, have you experienced a difference in academic workload?	27 (19.7)	50 (36.5)	38 (27.7)	22 (16.1)
Since the COVID-19 pandemic, how much do you worry about contracting COVID-19?	61 (44.5)	44 (32.1)	23 (16.8)	9 (6.6)

Appendix B – Vaccine Hesitancy Item

Vaccine Hesitancy Item (N = 137)		
If you were offered the COVID-19 to-day, would you be hesitant to take it?	n	%
Not hesitant at all	37	27.0
A little hesitant	21	15.3
Somewhat hesitant	17	12.4
Moderately hesitant	9	6.6
Very hesitant	53	38.7