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Assessment of College Students in Understanding Beliefs, Behaviors, and Key Levels of Influence regarding COVID-19 Vaccine Uptake

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Introduction

The outbreak of SARS- CoV-2 (COVID-19 or Coronavirus) was first identified as a cluster of pneumonia cases in Wuhan, China (Centers for Disease Control and Prevention (Wu, Chen, & Chan, 2020). In the months that followed, the virus spread worldwide, becoming a pandemic, which put the public at high risk for health complications (Wu, Chen, & Chan, 2020). The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) worked to implement strategies to prevent further outbreaks of COVID-19. Strategies involved vital actions such as mask-wearing, hand washing, social distancing, reducing large social gatherings, and developing a vaccine. These efforts also included additional measures such as sanitization and self-monitoring for COVID-19 symptoms (CDC, 2021c). Realistically, even the best efforts to screen for COVID-19 symptoms did not adequately mitigate the spread of COVID-19 (Gostic et al., 2020). Therefore, a primary public health strategy against COVID-19 was to develop a vaccine as quickly as possible, which included emergency orders for widespread dissemination as soon as available (Khubchandani et al., 2021).

The operation to create and test the vaccine in the US was coined “Operation Warp Speed.” Unfortunately, the perception of a speedily developed vaccine may have contributed to the mistrust of the COVID-19 vaccine (Kim et al., 2021). On Monday, December 14, 2020, the first vaccine was administered to the US public (Loftus & West, 2020). This vaccine was a collaboration between two major pharmaceutical companies, Pfizer Inc. and BioNTech SE (Hopkins & Burton, 2020). While the vaccine rollout was set in stages, the US Food and Drug Administration (FDA) authorized the emergency vaccine for those aged 16 years and older (Hopkins & Burton, 2020). More vaccines were made available in the days and months following this authorization, including the Moderna COVID-19 vaccine and the Johnson & Johnson Janssen COVID-19 vaccine (CDC, 2021a). On December 18, 2020, the FDA conferred Moderna with emergency use authorization, while the single dose Johnson & Johnson Janssen would not be available until February 27, 2021 (CDC, 2021a). As these vaccines were made more widely available, there was also increased communication about the safety, effectiveness, and trust that the public had in the COVID-19 vaccines (Khubchandani et al., 2021). For the purposes of this study, each of the three vaccines (Pfizer, Moderna, and Johnson & Johnson) will be referred to as the COVID-19 vaccine.

The nature of the virus caused a greater severity of symptoms in the elderly and those with immunocompromised systems (Fung & Babik 2021). COVID-19 also rapidly spread in the healthcare system, which led to an increased demand to protect healthcare personnel (Fung & Babik 2021). The rollout of the vaccine occurred in different phases to protect those most vulnerable to the virus, beginning with healthcare personnel and those at the highest risk for complications associated with medical conditions (Dooling et al., 2020). The Advisory Committee on Immunization Practices (ACIP) and the CDC made vaccine recommendations to guide the vaccination rollout. Ultimately, the states were left to administer the vaccine to their priority populations. On May 10, 2021, the vaccine became available to everyone 12 years or older in the US (FDA, 2021).

As additional COVID-19 cases increase morbidity and mortality, vaccination status is at the forefront of preventive action. However, approximately 52% of people still need to be vaccinated

in Mississippi. These rates are even higher among 18-24 year-olds in Mississippi, where only 38% have reported full vaccination (Mississippi State Department of Health [MSDH], 2022).

COVID-19 Vaccine Hesitancy

In the past, vaccines have contributed to a steady reduction in the mortality and morbidity of several infectious diseases. Yet, there remain unvaccinated individuals (Dubé et al., 2013). Vaccine hesitancy is described as a “delay in acceptance or refusal of vaccination despite availability of vaccination services” (MacDonald, 2015, p.4161). The reasons a person may not be vaccinated vary and include, but are not limited to, sociodemographic factors, cultural factors, cognitive factors, psychological factors, and other specific reasons such as convenience to access a vaccine, complacency, or one’s confidence in a vaccine (Sallam, 2021). Understanding the reasons behind the lack of vaccine acceptance may be important to reduce the spread of COVID-19 and increase COVID-19 vaccine uptake among university students.

COVID-19 in College Students

Many have been affected by the pandemic in university communities (including students, faculty, staff, and others) and there is a desire to return to normalcy in the classroom and college environment (Graupensperger et al., 2021). Therefore, it is necessary to utilize the university community as a channel to supply additional communication regarding COVID-19 prevention behaviors. There are many reasons to focus on college student health, especially as this group has low adherence to physical distancing prevention measures (Graupensperger et al., 2021). According to the National Center for Education Statistics (2021), approximately 41% of people ages 18-24 are enrolled in two or four-year institutions, and college-aged students have one of the highest incidence rates of COVID-19 among all ages (Graupensperger et al., 2021). As a result, it is necessary to assess and provide health education and behavior change opportunities to this target population.

A foundational premise of useful research in health education and health promotion is the use of a theoretical base. This allows for the systematic assessment of cogent influences on health knowledge, attitudes, and behaviors while simultaneously providing data in a manner conducive to appropriate data analysis. By assessing constructs within an established theoretical framework, researchers can also facilitate critical analysis and identification of feasible and modifiable targets for change.

Purpose

The purpose of this study is to assess the core beliefs, behaviors, and critical levels of influence regarding COVID-19 vaccine uptake in college students. Past research in vaccine hesitancy highlights three pillars in understanding community perceptions: confidence, complacency, and convenience (SAGE Working Group on Vaccine Hesitancy [SAGE], 2014). Confidence highlights the safety and effectiveness of the vaccine. Complacency analyzes the perceived need of the vaccine. Convenience measures the physical accessibility or quality of service (SAGE Working Group on Vaccine Hesitancy, 2014).

Theoretical Framework

This study uses those perceptions outlined by the SAGE Working Group (2014) as well as The Theory of Planned Behavior (TPB) to analyze the perceptions of college students at a large southeastern university. TPB explores behaviors through beliefs and attitudes, intentions, perceived behavioral control, and social norms (U.S. Department of Health and Human Services [HHS], 2005). Beliefs and attitudes evaluate personal ideals. Intentions highlight the likelihood of performing an action. Perceived behavioral control overlaps with ideas of self-confidence to perform an action. Social norms analyze the groups that influence health behavior (HHS, 2005). This theory was used due to the encompassing viewpoint for vaccine hesitancy in college-aged students. Many factors influence health actions through interaction, not singularly. Furthermore, this research study assessed and analyzed college students' beliefs, intentions, confidence, and social influences that affected behavioral intention to receive the COVID-19 vaccine.

Methods

Participants

The participants in this study were 133 undergraduate students enrolled in upper-level sections of one exercise physiology, two chemistry, two biology, and one human development and family studies course. Participants were not compensated for their time. This study was designated as exempt by the institution's Institutional Review Board, IORG0000467.

Research Questions

The research questions for this study were mapped to the TPB.

Beliefs and Attitudes: What is the occurrence of vaccine hesitancy among college students attending a large southeastern university? Is there a difference in the predominance of vaccine hesitancy between classifications among college students attending a large southeastern university?

Intentions: What is the number of college students attending a large southeastern university who have received the COVID-19 vaccine? What number of college students attending a large southeastern university plan to receive the COVID-19 vaccine?

Perceived Behavioral Control: What is the number of college students attending a large southeastern university who believe they have the ability to receive the COVID-19 vaccine?

Norms: Who influences COVID-19 vaccine uptake decisions among college students attending a large southeastern university?

Instrument

The data collection instrument was a twenty-one-item questionnaire (Appendix A). The questionnaire had five sections: 1) beliefs and attitudes, 2) intentions, 3) perceived behavioral control, 4) norms, and 5) demographics. Sections 1-4 were informed by the TPB (beliefs and attitudes, intentions, perceived behavioral control, and norms). This section contained twelve questions, which were a combination of Likert-type and true/false responses. The final section

included nine demographic information questions: gender, race, ethnicity, sexual orientation, age, university information, and location of residency. The research questions were adapted from a research study from the Mississippi State Department of Health and The Mississippi Community Engagement Alliance Against COVID-19 Disparities (CEAL) Team (2021). The instrument was utilized by the Mississippi State Department of Health, and the author of the current study obtained permission for use in the COVID-19 vaccine hesitancy project in the university setting for college students.

Procedures

Students enrolled at a large, southeastern university were invited to complete a questionnaire administered through Qualtrics software. Various recruitment strategies were utilized to garner a pool of participants representative of the university's student body. The students were reached via a link or QR code. Information regarding the link was dispersed through summer classes, departmental representatives, and using the GroupMe application. The link was sent to upper-level classes in exercise physiology, chemistry, biology, and human development and family studies. The questionnaire link was also sent to summer enrollments in English courses through a departmental email. The messages sent via the GroupMe application were targeted to student organizations such as sorority and fraternity life and university recreation. Finally, the QR code and study information were dispersed via printed flyers on bulletin boards in high traffic areas on campus, such as the student recreation facilities, the student union, and cafeterias. The link to the survey was open for two weeks, providing the students with ample time to participate in the study.

Once the students scanned the QR code, participants were provided with information about the study and informed consent information. If a student did not consent to participate, the survey would automatically end. Students had the option to skip questions they felt uncomfortable answering. Completion and submission of the survey confirmed consent to participate.

Statistical Analysis

A statistical analysis of the data was performed using IBM SPSS Statistics. Several different statistical tests were run to compare demographics and the likelihood of vaccination. Demographics such as gender and classification were compared to vaccination status using a bivariate correlation. Comparisons made between those who had received the COVID-19 vaccine and those who had *not* received the COVID-19 vaccine were analyzed using independent sample t tests. The results were analyzed at a 95% confidence interval, and therefore significance was determined at an alpha-level of $p < 0.05$.

Results

At the end of the two weeks, there were 133 responses, with 116 complete responses. Of those complete responses, 107 undergraduate students completed the survey. Of the 107 responses 76 (71.03%) were female and 30 (28.04%) were male. A total of 68 (63.6%) identified as White, 29 (27.1%) as Black or African American, 3 (2.8%) as Asian, and 1 (.93%) as American Indian or Alaska Native. Of the students participating, 59 (55.6%) were seniors, 31 (29.2%) were juniors, 13 (12.26%) were sophomores, and 3 (2.83%) were freshmen. COVID-19 Vaccine Hesitancy Questionnaire results for part 2) beliefs and attitudes (questions 1-6), part 3) intentions (questions

7-10), part 4) perceived behavioral control (question 11), and part 5) norms (question 12) can be viewed in Table 1.

Table 1

COVID-19 Vaccine Hesitancy Questionnaire results for parts 2, 3, 4, and 5

Question	Mo	M	SD
1. I believe that the COVID-19 vaccine is safe.	2	2.29	1.17
2. I do not trust the intentions of the COVID-19 vaccine.	5	3.81	1.25
3. I'm not convinced that the COVID-19 vaccine is a real threat.	5	3.79	1.35
4. COVID-19 will not be severe for me so I will not get vaccinated.	5	3.79	1.35
5. I have access to get the COVID-19 vaccine in my community.	1	1.34	0.46
6. I cannot afford to get the COVID-19 vaccine.	5	4.83	0.48
7. I have received the COVID-19 vaccine.	1	1.4	0.49
8. I have not received the COVID-19 vaccine but plan to receive it in the next year.	2	1.9	0.3
9. I have not received the COVID-19 vaccine but plan to receive it in the long term.	2	1.84	0.37
10. I do not plan to receive the COVID-19 vaccine.	2	1.74	0.44
11. I could get the COVID-19 vaccine if I wanted to.	1	1.04	0.19
12. How likely are you to get the COVID-19 vaccine if the following urge you to get it?			
Channel of influence			
a. Regular primary care provider	1	2.15	1.35
b. The state health officer/MSDH	1	2.5	1.42
c. University or school	1	2.43	1.47

d. Health organizations (WHO, CDC)	1	2.49	1.45
e. Father/mother or close relative	1	2.23	1.32
f. Community leader	3	2.92	1.39
g. Pastor or minister	3	3.02	1.31
h. Local newspaper	3	3.28	1.3
i. National news	2/5 tied	3.14	1.44
j. Social networks	5	3.37	1.33
k. Celebrity	5	3.82	1.25
l. Political leader or party	5	3.65	1.33
m. Tribal leader	5	3.6	1.31
n. Indian health service	5	3.65	1.24
o. I will not receive the vaccine	5	3.7	1.59

Note: For the different sections, the numbers correlate to the following answers:

Part 2 Beliefs and attitudes (questions 1-6): 1=Strongly agree, 2= Somewhat agree, 3=Neither agree nor disagree, 4=Somewhat disagree, 5=Strongly disagree

Part 3 Intentions (questions 7-10) and Part 4 (questions 11) Perceived behavioral control: 1=True, 2=False.

Part 5 Norms (questions 12): 1=Extremely Likely, 2= Somewhat likely, 3=Neither likely nor unlikely, 4=Somewhat unlikely, 5=Strongly unlikely

Part 2 Beliefs and Attitudes Results

Of those who completed the survey, there were 29 (27.1%) participants that strongly agree, 42 (45%) that somewhat agree, and 42 (45%) that neither agree nor disagree that the COVID-19 vaccine is safe. This leaves 21 (20.63%) participants that somewhat disagree and strongly disagree with the safety of the COVID-19 vaccine. Based on the second question, “I do not trust the intentions for the COVID-19 vaccine,” responses show that 8 (7.48%) strongly agree 8 (7.48%) and 9 (8.41%) somewhat agree with that statement. Furthermore, 6 (5.61%) strongly agree and 22 (20.56%) somewhat agree with the statement, “I’m not convinced COVID-19 is a real threat.” The next question shows a similar range with a total of 20 (18.69%) students that strongly agree and somewhat agree that “COVID-19 will not be severe for me so I will not get vaccinated.” When asked about access to the vaccine, 96 (89.72%) strongly agreed with the statement, “I have access to get the COVID-19 vaccine in my community” and 94 (87.85%) strongly disagreed with the statement, “I cannot afford to get the COVID-19 vaccine.”

Part 3 and 4 Intentions and Perceived Behavioral Control Results

The next section of the questionnaire highlighted a series of true and false questions. The first question highlighted the proportion of undergraduate students that have received the COVID-19 vaccine with 64 (59.81%) selecting true. This left a total of 43 (40.19%) of undergraduate students that have not received the vaccine. Of those that have not received the COVID-19 vaccine, there were 10 (23.26%) that agreed they intended to receive the COVID-19 vaccine in the next year and 16 (37.21%) that agreed they intended to get it in the long term. Of those who had not received the COVID-19 vaccine, a total of 28 (65.12%) did not plan to be vaccinated. Furthermore, the final true and false question showed that of all the participants 102 (96.23%) believed that they could access the COVID-19 vaccine if they desired to do so.

Part 5 Norms Results

The last part of the questionnaire asked, “How likely are you to get the COVID-19 vaccine if the following received or urged you to get it?” There were several different channels of influence highlighted with the answer choices ranging from (1) Extremely likely, (2) Somewhat likely, (3) Neither likely nor unlikely, (4) Somewhat unlikely, and (5) Extremely unlikely. For the following influences: a) Regular Primary medical care provider, b) The State Health Officer/Mississippi Department of Health, c) School, d) Health Organizations such as the Centers for Disease Control, World Health Organization, or National Institutes of Health (Dr. Fauci), and e) Father/Mother or close relative, the most picked answer was (1) extremely likely. For the following influences f) Community leader, g) Pastor/minister at church, and h) Local news/newspaper, the most selected answer was (3) neither likely nor unlikely. For the national news, there was a tie for the most selected answer with (2) somewhat likely and (5) extremely unlikely. The remainder of the channels, including j) Social networks, k) Celebrity, l) Political leader or party, m) Tribal leader, n) Indian health service, and o) I will not receive the vaccine had the most selected answer as (5) extremely unlikely. For a summary of parts 2, 3, 4, and 5, see Table 2.

Table 2

COVID-19 Vaccine Hesitancy Questionnaire results for parts 2, 3, 4, and 5

Part 2: Beliefs and attitudes					
Question	Selected Answer Choice				
1. I believe that the COVID vaccine is safe.	27.10%	42.10%	11.20%	14.03%	5.61%
2. I do not trust the intentions of the COVID-19 vaccine.	7.48%	8.41%	18.69%	26.17%	39.25%
3. I'm not convinced that the COVID-19 vaccine is a real threat.	5.61%	20.56%	9.35%	18.69%	45.79%
4. COVID-19 will not be severe for me so I will not get vaccinated.	10.28%	8.41%	17.76%	19.63%	43.93%

5. I have access to get the COVID-19 vaccine in my community	89.72%	7.48%	1.87%	0.93%	0%
6. I cannot afford to get the COVID-19 vaccine.	0%	0%	4.67%	7.48%	87.85%

Part 3: Intentions

Question	Selected Answer Choice	
	True	False
7. I have received the COVID-19 vaccine.	59.81%	40.19%
8. I have not received the COVID-19 vaccine but plan to receive it in the next year.	10.28%	89.72%
9. I have not received the COVID-19 vaccine but plan to receive it in the long term.	15.89%	84.11%
10. I do not plan to receive the COVID-19 vaccine.	26.17%	73.83%

Part 4: Perceived Behavioral Control

Question	Selected Answer Choice	
	True	False
11. I could get the COVID-19 vaccine if I wanted to.	59.81%	40.19%

Part 5: Norms

12. How likely are you to get the COVID-19 vaccine if the following urge you to get it?

Channel of influence	Selected Answer Choice				
	a. Regular primary care provider	44.86%	24.30%	13.08%	6.54%
b. The state health officer/MSDH	33.02%	23.58%	18.87%	9.43%	15.09%
c. University or school	37.74%	23.58%	11.32%	12.26%	15.09%

d. Health organizations (WHO, CDC)	33.64%	27.10%	12.15%	11.21%	15.89%
e. Father/mother or close relative	38.32%	28.97%	14.02%	8.41%	10.28%
f. Community leader	19.63%	22.43%	24.30%	14.02%	19.63%
g. Pastor or minister	14.95%	20.56%	31.78%	13.08%	19.63%
h. Local newspaper	10.28%	19.63%	26.17%	19.63%	24.30%
i. National news	13.08%	28.97%	17.76%	11.21%	28.97%
j. Social networks	8.41%	22.43%	21.50%	18.69%	28.97%
k. Celebrity	5.61%	11.21%	21.50%	18.69%	42.99%
l. Political leader or party	7.48%	14.02%	24.30%	14.02%	40.19%
m. Tribal leader	9.43%	8.49%	31.13%	14.15%	36.79%
n. Indian health service	5.61%	11.21%	32.71%	13.08%	37.38%
o. I will not receive the vaccine	16.98%	8.49%	12.26%	4.72%	57.55%

Comparisons

Several comparisons were made to determine a statistical significance between groups. Using SPSS, a statistical analysis software, a bivariate correlation was used to determine if a relationship existed between those who are or are not vaccinated and gender. In the current sample, it was determined that there was not a statistical significance between groups ($p=.378$). Further descriptive statistics were used to analyze the relationship between those who are or are not vaccinated and classifications (lower classmen and upperclassmen). This bivariate correlation also showed no statistical significance ($p=.956$). A final test was run to compare the beliefs and attitudes between the vaccinated and those who were not. This analysis showed statistical significance pertaining to the different attitudes and beliefs. There was a statistical significance with the following questions:

1. I believe that the COVID-19 vaccine is safe. $p < .001$
2. I do not trust the intentions of the COVID-19 vaccine. $p < .001$
3. I'm not convinced that the COVID-19 vaccine is a real threat. $p < .001$
4. COVID-19 will not be severe for me so I will not get vaccinated. $p < .001$

Therefore, there is a significant difference in beliefs and attitudes between those who have received the vaccine and those who have not, pertaining to those questions.

Discussion

There are many widespread beliefs and attitudes regarding the COVID-19 vaccine. Understanding the perceptions that influence societal choices and behaviors is the next step in helping administer the vaccine. Today, administration of the vaccine is important. As new variants of the virus spread, resulting in a potential increase for hospitalizations, administering the vaccine is increasingly important (Breuniger, 2021; Putterman, 2021; Sun & Walker, 2021). Therefore, understanding what hinders college students from getting vaccinated must be at the forefront of the conversation. This analysis of college students showed that approximately 15-25% of participants do not believe that the COVID-19 vaccine is safe, do not trust the intentions of the COVID-19 vaccine, are not convinced that COVID-19 is a threat, and believe that the vaccine will not be severe for their age demographic. These findings highlight some of the reasons why college students may not be vaccinated.

Past studies have explored the thought process behind this reluctance, noting perceptions pertaining to safety, lack of trust, and lack of perceived severity. Concerns about safety and lack of trust can be addressed in the perceptions related to the vaccine rollout as some college students have a fear of the unknown or collateral side effects and lack of trust in testing efficiency (Graupensperger et al., 2021; Soares et al., 2021). As for the lack of perceived severity among this group, some believe that they do not need the vaccine because they perceive that they are at low risk, thinking they will not get coronavirus or only get a mild case (Fisher et al., 2020). These attitudes and beliefs are further understood because the nature of the virus was initially believed to only be severe for the elderly and immunocompromised (CDC, 2021a). However, as the virus changes so does the representative population of those that are being hospitalized. As of December 2-29, 2021, 87% of hospitalizations in Mississippi were unvaccinated or partially vaccinated individuals (Mississippi State Department of Health, 2021). Therefore, the need to increase the vaccination rate is vital to prevent further strain on the healthcare system.

Understanding the beliefs and attitudes of what hinders vaccine uptake can help predict the group's intentions. Based on this survey, 59.81% of survey participants received the vaccine, leaving 40.19% of the students unvaccinated. When the study was conducted in the summer of 2021, the results were similar to the national average for those vaccinated, 18 years and older (59.7%; CDC, 2021b). Furthermore, understanding the intentions of the unvaccinated group can reveal the percent of hesitancy in the population more clearly.

Reasons for delayed response in vaccine uptake can be attributed to those ideas mentioned previously, such as vaccine side effects, doubts about effectiveness, attitudes, and beliefs. Of study participants, 26% do not intend to get the COVID-19 vaccine. Further analysis of perceived behavioral control showed that of the 26% of students that did not plan to receive the vaccine, 100% thought they "could get the vaccine if they wanted to." This finding may be a unique finding for college students as there are often many barriers to receiving health care, such as lack of health insurance or financial support (Graupensperger et al., 2021).

In the past, studies have found a positive correlation between vaccine attitudes and perceived norms, meaning that if one person is hesitant, this attitude might contribute to someone else's hesitancy (Sinclair & Agerström, 2021). For this study, norms were measured in the light of

influential channels that might affect a student to act on a health behavior. For example, how might a doctor's recommendation compare to that of a student's parent's recommendation when it comes to influencing the student norms related to vaccination? In other words, from whom would the undergraduate college student take health advice most efficiently? Reviews of this data highlight that the most effective channels to use are: 1) Primary medical provider, 2) Mother/father or close relative, and 3) School or university. Although these channels were selected the most frequently, their answers can also be utilized in prevention programming and communication for health-related behaviors, specifically to increase vaccination among college students. When reviewing how these channels can influence norms, it is also important to consider the actual amount that students might engage in those norms, as often they have the incorrect perception of overall engagement in a healthy activity, which influences norms (Cox et al., 2019).

Strengths

The study had several strengths. First, this study further supported the literature in accordance with COVID-19 vaccine status supporting other previously completed studies. Second, the timing of this study was important as students were eligible to receive the vaccine and making determinations of whether to receive the vaccine or not. Third, the study sample was representative of the national average for those who had received the vaccine and those who had not yet received the vaccine for ages 18 and older.

Limitations

There were limitations to this study including a lack of randomization of the student body in the study population due to a reliance on convenience sampling and possible bias associated with all self-report-based instruments. The cross-sectional design, while useful in addressing the basic assessment goals of the project, also represents only a "snapshot" in what is an ever-evolving set of medical, social, and other considerations surrounding the ongoing pandemic. The quantitative nature of the survey, while offering efficacy in the collection of pertinent information couched in the TPB framework, did not address deeper insights that may have been acquired through related qualitative techniques such as elicitation interviews and other open-ended techniques. It is recommended that further research efforts utilize these qualitative techniques as a way to better measure underlying influences on behavioral, normative, and control beliefs. Additionally, the survey was implemented during the summer term and may not be representative of students who attend higher education during the fall and spring semesters. Lastly, a final limitation includes the lack of reliability and validity information for the survey instrument.

Conclusion

Today, the COVID-19 vaccine is widely available. Yet, there are varying reasons why people may not choose to vaccinate including barriers related to sociodemographic factors. For college students, understanding their health behaviors is essential to protect themselves and those around them to reduce the spread of COVID-19. By understanding the beliefs and attitudes of college students, organizations such as universities and federal health groups can address any misconceptions and attempt to alleviate barriers. This contribution can further help change

intentions to get vaccinated and influence the norms that are preventing COVID-19 vaccination. This study further highlights the importance of understanding the contributions to vaccine hesitancy to improve rates of COVID-19 vaccination participation among undergraduate students.

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Appendix A: COVID-19 Vaccine Hesitancy Questionnaire

Part 1: Consent agreement

IRB approval number: IRB 21-175

Understanding vaccine hesitancy by reviewing beliefs, behaviors, and key levels of influence regarding COVID-19 vaccine uptake in college students

Authors of study, institution

We would like to ask you to participate in this research study. If you participate in this study, you will be asked to complete a survey that will take 10-20 minutes to complete.

If you have any questions about this research project, please feel free to contact the MSU representative. Please understand that your participation in this research is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue your participation at any time without penalty or loss of benefits.

Please take all the time that you need to read through this document and decide whether you would like to participate in this research study.

If you decide to participate, your completion of the research procedures indicates your consent.

Part 2: Beliefs and attitudes

1. I believe that the COVID-19 vaccine is safe.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree
2. I do not trust the intentions of the COVID-19 vaccine.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree
3. I'm not convinced COVID-19 is a real threat.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree
4. COVID-19 will not be severe for me so I will not get vaccinated.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree
5. I have access to get the COVID-19 vaccine in my community.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree
6. I cannot afford to get the COVID-19 vaccine.
(1) Strongly agree; (2) Somewhat agree; (3) Neither agree nor disagree; (4) Somewhat disagree; (5) Strongly disagree

Part 3: Intentions

7. I have received the COVID-19 vaccine. True/False

8. I have not received the COVID-19 vaccine but plan to receive it in the next year.
True/False
9. I have not received the COVID-19 vaccine but plan to receive it in the long term.
True/False
10. I do not plan to receive the COVID-19 vaccine.
True/False

Part 4: Perceived Behavioral Control

11. I could get the COVID-19 vaccine if I wanted to.
True/False

Part 5: Norms

12. How likely are you to get the COVID-19 vaccine if the following receive or urge you to get it?
 - a. Regular Primary medical care provider
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - b. The State Health Officer/Mississippi Department of Health
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - c. School
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - d. Health Organizations such as the Centers for Disease Control, World Health Organization, or National Institutes of Health (Dr. Fauci)
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - e. Father/Mother or close relative
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - f. Community leader
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - g. Pastor/minister at church
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - h. Local news/newspaper
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - i. National news
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - j. Social networks
(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely
 - k. Celebrity

(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely

l. Political leader or party

(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely

m. Tribal leader

(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely

n. Indian health service

(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely

o. I will not receive the vaccine

(1) Extremely unlikely; (2) Somewhat unlikely; (3) Neither likely nor unlikely; (4) Somewhat Likely; (5) Extremely likely

Part 6: Demographics

13. Gender

- Male
- Female
- Non-binary/third gender
- Prefer not to say

14. Ethnicity

- Hispanic
- Non-Hispanic
- Prefer not to say

15. Race

- White
- Black
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other
- Prefer not to say

16. Sexual orientation

- Heterosexual
- Homosexual
- Bisexual
- Other
- Prefer not to say

17. Age

- 18
- 19
- 20
- 21
- 22
- 23 or older

18. Academic Standing

- Freshmen
- Sophomore
- Junior
- Senior

19. I am a student at institution.

- Yes
- No

20. I am a first-generation college student.

- Yes
- No

21. Are you a Mississippi native?

- Yes
- No