

# Ethical and Practical Implications of COVID-19 Vaccine Hesitancy among College Students: A Pilot Study

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**Abstract:** According to WHO, one of the most effective ways to protect people against COVID-19 is with the use of vaccines. As academic institutions prepare to fully re-open in the fall of 2021 and COVID-19 vaccines being readily accessible to all ages twelve and older in the U.S., college students are also getting ready to go back to normal campus operations for traditional in-person education. This raises the need to assess students' attitudes toward the COVID-19 vaccines by identifying and addressing reasons for their hesitancy. One major threat to the impact of vaccination in preventing disease and deaths from COVID-19 is low utilization of vaccines by some groups. We conducted a pilot study and interviewed 55 undergraduate science students enrolled in summer school in 2021. The majority of the students were female, younger, Hispanic, or Latino, and at the junior or senior level. More than half of them have been vaccinated (62%) and indicated that it is important to attend classes while vaccinated (75%). While there were a variety of reasons for hesitancy ranging from lack of concern to lack of initiative, 17% of participants stated that religion played a role in their decision. Evidence-based recommendations strategies based on religion, ethical, and social implications are provided.

**Keywords:** Vaccine Hesitancy, Ethical Implications, Social Implication, COVID-19, College Student

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## I. INTRODUCTION

The significant threat to human life and health, and the rapid progression of COVID-19 globally, led governments to temporarily close educational institutions in 150 countries and resort to online delivery of education to protect students, staff, and faculty (Mshigeni et al., 2021). Although, educational institutions were successful in providing online education to students for almost a year, most colleges and students are ready to return to a sense of normalcy starting Fall of 2021. With the availability of three Food and Drug Administration (FDA) approved COVID-19 Vaccines in the U.S. (CDC, 2021) - Pfizer-BioNTech, Moderna, and Johnson & Johnson's Janssen - President Biden announced his goal for vaccinating 70% of the U.S. population by the 4<sup>th</sup> of July 2021 (The White House, 2021). His rescue plan calls for relying on science and a national vaccination program that will reduce health disparities and safe openings of schools, colleges, and universities (Tanne [1], 2021). With the increased accessibility of effective COVID-19 vaccines now readily available for 12-year-olds and older in the U.S., more than 400 colleges are either requiring or recommending COVID-19 vaccines for college students before fall of 2021 (Dennan, 2021). According to U.S. News (2021), this means that students will be required to receive COVID-19 vaccinations in order to register for in-person classes or move into campus housing. This requirement is not only limited to private colleges, but large university systems such as the 23-campus California State University system also plan to adopt such mandates pending full approval by the FDA of at least one coronavirus vaccine (Moody, 2021; Redden, 2021).

Despite the increased availability of the COVID-19 vaccines, some hesitancy in vaccine acceptability remains among adults ages 18 to 39 based on a recent Centers for Disease Control and Prevention (CDC) report (Gessler, 2021). According to Sharma et al. (2021), while research is limited on vaccine acceptability, their preliminary results suggest high hesitancy in COVID-19 vaccine acceptability among college students. Although there are standard vaccinations that are required as part of immunization by U.S. colleges and universities that permit religious and medical exemptions, there are scarce data about the level of COVID-19 vaccine acceptance rates in college students. The severity and pervasiveness of COVID-19 pandemic has necessitated the emergency use of COVID-19 vaccines. While it is exciting for students to be transitioning from virtual education back to traditional in-person college experience on campus, more research is needed to assess the vaccine acceptance and readiness to adopt vaccines by college and university students for a smooth transition back to normalcy. This study focuses on student perspectives and attitudes toward the COVID-19 vaccines by identifying and addressing reasons for their hesitancy - such as fear, circulating myths, and misinformation - while taking into consideration the ethical implications of such immunization requirements given the past U.S. history of exploitation of minorities in medical studies (Baker, 2021). However, it must be noted that this study will only focus on the students' perspectives on the COVID-19 vaccines. The study will also make evidence-based recommendations about how to address vaccine hesitancy in this targeted population (18-39 old's), present study limitations, and the need for future studies to address other shortcomings.

## II. LITERATURE REVIEW

The U.S. has documented over 600,000+ deaths and has a higher mortality and morbidity rate compared to most other developed countries worldwide (Worldometer, 2021). The severity and pervasiveness of COVID-19 pandemic in the U.S. has necessitated the Emergency Use Authorization (EUA) of three COVID-19 vaccines. Rollout of the national COVID-19 vaccination program is well underway, with more than 300 million doses given in the U.S. as of July 2021 (CDC, 2021). Vaccination is highly effective at reducing severe illness and death from COVID-19. A major threat to the impact of vaccination in preventing disease and death from COVID-19 is low utilization rates of vaccines (Troiano & Nardi, 2021). Vaccine hesitancy is caused by a variety of context specific factors that vary across time, place, and different vaccines, and is influenced by issues such as complacency, convenience, confidence, and sociodemographic contexts (Mills et. al., 2020; Duffy et al., 2020; Razai, 2021; Sharma, Davis & Wilkerson, 2021). Vaccine hesitancy may also be related to misinformation and conspiracy theories which are often spread online, including through social media. In addition, structural factors such as health inequalities, socioeconomic disadvantages, systemic racism, and barriers to access are key drivers of low confidence in vaccines and poor utilization rates. There is still significant hesitancy in COVID-19 vaccine acceptance among some subgroups, including surprisingly, college students (Sharma, et al., 2021; Troiano & Nardi, 2021).

College students are vulnerable to SARS-Cov-2 infection due to a multitude of factors including communal residency in on-campus and off-campus housing, the reopening of college campuses and activities, and the necessity to travel between their home and campus (Lu, et al., 2020). Furthermore, college campuses have been identified as at risk to become “superspreaders” with likely impacts on neighboring communities (Lu, et al., 2020). The majority of U.S. universities will be requiring students to get the COVID-19 vaccine in order to return to campus for the fall 2021 semester. However, little research has assessed vaccine intentions among U.S. college students, nor considered the ethics of requiring college students to receive COVID-19 vaccines prior to returning to campus. To create effective strategies that will increase COVID-19 vaccination rates, it is important to understand the factors that contribute to COVID-19 vaccine intentions, hesitancy, and actual behavior, especially in demographic subgroups with potential hesitancy or low uptake of COVID-19 vaccines, such as some groups of college students.

The present study was based on a theoretical frame of the multi-theory model (MTM) for health behavior change to explore COVID-19 vaccination intentions among college students in the U.S. The MTM is particularly suitable for our purposes in the theory’s scope in trying to explain not only the intention but also the sustenance (i.e., maintenance) of behavior change (Sharma, 2015; Sharma, 2021; Hayes, et. al., 2019; Sharma, et. al., 2020; Sharma, et. al., 2021). The theory distinguishes between initiation (that is, one-time engagement in a health behavior) and sustenance outcomes (that is, long-term engagement in a health behavior) (Hayes, et. al., 2019; Sharma, et. al., 2015, 2020, 2021). The theory uses three constructs to explain initiation and three additional constructs to explain sustenance of a health behavior. For this study, only the initiation model and associated constructs were assessed as vaccine uptake is a one-time behavior (that is, administered in one or two doses) and not a long-term behavior change. For initiation, the MTM suggests that three constructs lead to initiation in a behavior change: a). participatory dialogue (whereby the advantages of a behavior change are seen as being more important than disadvantages), b). behavioral confidence (whereby the person becomes more certain in performing any given behavior), and c). changes in the physical environment (whereby the person has necessary resources for performing a given behavior).

### III. METODOLOGY

**Design:** We conducted a pilot study and interviewed 55 undergraduate students enrolled in summer school in 2021. We used a quantitative research method approach and gathered descriptive data. This methodology was the best choice among study participants due to time constraints and the nature of the present delivery of virtual education as a result of COVID-19 pandemic. The study received an Institutional Review Board (IRB) approval in the Spring of 2021 from the designated institution prior to data collection in the Summer of 2021.

**Sampling:** The survey data was collected from two required courses offered in the Summer of 2021. Both courses must be taken by students in different academic standing levels (freshman, sophomores, juniors, and seniors) prior to the completion of their undergraduate degree. A total sample of 55 undergraduate students were surveyed, male and female, ages 18 and older. No identifying information such as students’ names was inquired. Further, the survey was administered to all participants in the same environment (using Google forms) in a virtual setting following instructions that were approved by the university IRB board. There were no incomplete surveys and participants had an option to completely discontinue with the study if they felt uncomfortable for any reason.

**Survey Instrument:** The survey was constructed after a thorough literature review and input gathered from the research team. The demographic questions asked participants to share their academic standing level, age range, race/ethnicity, and sex. The second set of 10 questions were constructed using a Likert-scale comprised of COVID-19 vaccine readiness, information, beliefs, and past history assessment. We grouped the scores as follows: (4) *Strongly Agree*, (3) *Agree*, (2) *Strongly Disagree*, and (1) *Disagree*. The simplicity of our survey design allowed for an easy comparison of the data, and ultimately descriptive analysis. Since this is an exploratory study, the reliability of the survey instrument was not established; however, the instrument did undergo review from the IRB board and a group of colleagues whose feedback enabled improvements.

**Informed Consent:** A well-structured informed consent was administered following IRB review and approval. Participants were informed that their contribution to this study was completely voluntary and that it will not affect their current grade in the course. No student was coerced to participate in the study, and they were informed that their

participation was completely voluntary. Further, students were informed that there was no right or wrong answers, and they were free to discontinue with their participation at any time if they felt uncomfortable.

**Statistical Analysis:** We conducted descriptive statistical analysis to examine the frequency distribution of our sample in order to present demographics characteristics of the study participants. We summarized this data using N and percentages to provide the readers with an easy understanding of the findings.

#### IV. RESULTS

Below is a summary table presenting demographics characteristics of the respondents.

**Table 1: Demographic Characteristics**

Variable	Overall (N= 55)	
	N	%
<b>Sex</b>		
Female	49	89
Male	6	11
<b>Age</b>		
18-21	23	42
22-29	26	47
30-39	5	9
40+	1	2
<b>Race</b>		
Whites/European American	7	13
Black or African American	9	14
Hispanic or Latino	33	60
Asian or Pacific Islander	7	13
<b>Academic standing</b>		
First Year	0	0
Second Year	6	11
Third Year	19	35
Fourth Year	17	31
Fifth Year or more	13	24

*Table 1. Demographic Characteristics*

For this pilot study, a total of 55 undergraduate students were sampled in the summer of 2021 to assess any hesitancy about receiving the COVID-19 vaccine prior to the full reopening of campus operations in the Fall of 2021. Students responded to the survey electronically using Google Forms. The demographic characteristics of the sample are summarized in *Table 1* above. The distribution of the demographic characteristics is consistent with the overall student population at the selected institution whereby the majority of students are female, younger, and Hispanic or Latino. Almost 90% of the participants were junior or seniors.

**Table 2: College Students COVID-19 Vaccine Acceptance (Readiness)**

Below is a summary table presenting students readiness of the COVID-19 vaccine, their perception of information, beliefs, and past history relating to vaccine practices in the U.S.

<i>Please choose 1 of the following responses: (4) = Strongly Agree; (3) = Agree; (2) = Strongly Disagree; (1) = Disagree</i>	4	3	2	1
I have already received my COVID-19 vaccine this year (2021)	53%	9%	7%	31%
I am ready to receive my COVID-19 vaccine this year (2021)	44%	25%	9%	22%
I am open to receive the COVID-19 vaccine on annual basis, if recommended by the CDC and my University (2022 and beyond)	40%	29%	11%	20%
I will recommend the COVID-19 vaccine to other students at my University	45%	25%	5%	25%
It is important for me to attend classes in person while vaccinated with the COVID-19 vaccine	40%	35%	9%	16%
There is a lot of misinformation that prevents people from getting the COVID-19 vaccine by creating mistrust	45%	43%	4%	8%
Information shared regarding COVID-19 vaccines side effects by multiple media channels and/or social media platforms impacts my decision to get vaccinated	20%	40%	18%	22%
I have had COVID-19 and believe I am immune to the virus and do not need to get the vaccine"	5%	15%	47%	33%
My religion does not have any effect on my decision whether or not to get the COVID-19	58%	25%	2%	15%
I am not comfortable to receive the COVID-19 vaccine because of unethical Tuskegee experimentation on African American Males from 1932 - 1972	5%	18%	35%	42%

*Table 2: College Students COVID-19 Vaccine Acceptance (Readiness)*

Table 2 presents students’ responses to the COVID-19 vaccine; whereby more than half of them have been vaccinated (62%) while the remaining (38%) have not. For those who are not vaccinated, many of them are willing to receive the COVID-19 vaccine this year (69%). To further assess student’s readiness for returning to normal campus operations, we asked participants if they were open to receiving the COVID-19 vaccine on a regular basis just like any other seasonal flu preventive measure and surprisingly many of them are open to that idea (69%) but some of them are still hesitant (31%). We also asked participants if it is important for them to attend classes in person while vaccinated and many of them strongly agreed or agreed to the idea (75%). Further, the majority of the students (70%) are open to recommending this vaccine to other students on campus while some of them will not recommend it (30%).

The second phase of the Likert scale questions assessed students’ perceptions about the information that they received pertaining to the COVID-19 vaccine. When asked if the students felt there was a lot of misinformation that prevents people from getting the COVID-19 vaccine, the majority of them strongly agreed or agreed (88%) and only a small portion did

not (12%). We found that social media platforms play a role in students’ decision to receive the COVID-19 vaccine and that more than half of them (60%) are concerned about the side effects. Among those who have already been ill from the virus, only a small fraction of the sample (20%) strongly agreed/agreed to believing that they are immune from COVID-19 and hence believe that they do not need to get the vaccine again. More than half of the participants (83%) stated that their religion does not have any effect on their decision whether or not to get the COVID-19 while others disagreed (7%). Finally, when asked if participants were not comfortable in receiving the COVID-19 vaccine because of unethical Tuskegee experimentation on African American Males from 1932 – 1972, only a small minority of the sample agreed (15%) while the rest disagreed (85%).

**Table 3: Race/Ethnicity and I am open to receive the COVID-19 Vaccine Annually**

Below is a summary table presenting students readiness to receive the COVID-19 vaccine on an annual basis if recommended by the CDC and the University (2022 and beyond).

<i>Race/Ethnicity and One’s willingness to receive the vaccine annually</i>	<i>Strongly Agree/Agree</i>	<i>Strongly Disagree/Disagree</i>
Whites/European American	9%	3%
Black/African American	9%	7%
Hispanic/Latino	44%	15%
Asian/Pacific Islander	5%	5%

*Table 3: Race/Ethnicity and I am open to receive the COVID-19 Vaccine Annually*

Table 3 presents an analysis on the relationship between race/ethnicity and students’ willingness to receiving the vaccine on an annual basis. Despite the small sample size, majority of the Hispanic/Latino participants strongly agree/agree (44%) to receiving it annually compared to those who are hesitant about the idea (15%). Findings for Whites/European American and Black/African American participants were almost similar whereby 9% strongly agree/agree compared to those who are hesitant (3%; 7%) respectively. The results for Asian/Pacific Islander participants were split into half whereby 5% strongly agree/agree while the other half strongly disagree/disagree to receiving the vaccine on an annual basis.

**V. DISCUSSION**

From fall 2021, colleges will likely require or highly recommend COVID-19 vaccinations after weighing how best to encourage students and how to make it easily accessible, and after weighing whether to make it necessary for all or certain groups of students such as athletes and those living in residence halls or study abroad according to Morning Call (Snyder, 2021). For example, the California State University (CSU) and University of California (UC) systems both have said they plan to require students to take the Vaccine contingent recommended by the FDA of at least one vaccine (Redden, 2021). Colleges are looking for guidance from health authorities such as local, state or federal health departments (Snyder, 2021). According to the American College Health Association (ACHA): Vaccination is the most effective way for of institutions of higher education (IHEs) to return to safe, on-campus experiences this fall semester. The ACHA recommends COVID19 vaccination wherever allowed by state law and other sources, in accordance with the IHE's normal exemption practices (Redden, 2021). We were

not able to examine all the issues that may have relevance to Vaccine Hesitancy or Vaccine Readiness in college students' vaccine acceptance. However, we assessed the following themes: Vaccine hesitancy due to mistrust and misinformation, religious beliefs, ethical, and social implications such as fear of side effects, access to vaccines, and exploitation of black men in the name of medical experimentation such as the Tuskegee Affair while looking at demographic characteristics.

***(i) Vaccine Hesitancy due to Mistrust and Misinformation***

From studies it has been noted that “nearly one fourth of adults aged 18–39 years were unsure about whether to receive a COVID-19 vaccine or were probably going to get vaccinated, and nearly one fourth reported that they would probably not or definitely not get vaccinated,” per CDC (Gessler, 2021). According to this report, young adults, non-Hispanic Black, with lower income and educational attainment, living outside metropolitan areas with no health insurance coverage had the lowest reported vaccination rates and intent to get vaccinated even in the near future (Gessler, 2021, Baack et al., 2021). Sixty two percent of our participants reported to be vaccinated. Currently in the U.S., 62% of adults have been vaccinated (CDC, 2021). Eighty-eight percent of our participants agree there's a lot of misinformation that prevents people from getting the COVID-19 vaccine because of mistrust. Debunked myths also remain that influence acceptance such as: vaccines will change people's DNA; people will be given microchip barcodes in their arms with the vaccines for tracking; vaccine will not be effective because the virus will mutate; and people will have fertility issues after receiving a vaccine (Gessler 2021, Usman 2021).

This finding is in alignment with other studies. According to Mills et al. (2020), Duffy et al. (2020), Razai (2021), and Sharma et al. (2021) vaccine hesitancy is related to misinformation spread mostly on social media and other virtual platforms. The most common reasons to refuse vaccination include being against vaccines in general, concerns about safety and thinking that a vaccine was produced in a rush and is too dangerous, considering the vaccine useless because of the harmless nature of COVID-19, general lack of trust, doubts about the efficiency of the vaccine, belief about being already immune due to having had the virus, and doubts about the provenance of vaccine (Troiano & Nardi, 2021). According to Baack et al. (2021), vaccination intent and acceptance can be increased among this age group by creating awareness of the importance of vaccines to prevent the spread of the virus to friends and family, debunking myths with truthful information and by improving confidence in the vaccine safety and effectiveness.

***(ii) Religion***

Religion has been found to be an influencer in vaccine acceptance, such as religious teachings that emphasize the importance of prayers over medicine in Islam, Christianity, Judaism, etc., resulting in vaccine hesitancy among people who practice their religious faiths when coupled with the lack of knowledge about the importance of vaccines. Some religions have various prohibitions that deter some from taking the vaccine. For example, hesitancy occurs because of pork derivatives in vaccines for Muslims who practice Islam, and the Vatican's stance toward vaccination because vaccines use cell lines from aborted fetuses in Catholics (Garcia and Yap, 2021). However, having a religious leader explain the grounds that allow them to receive vaccines can be beneficial in changing their perceptions and in increasing vaccine uptake. For our study, a high percentage of students reported that religion (83%) did not affect their decision to get the vaccine; however, 17% did agree that religion played a role in their decision whether to get the vaccine or not.

***(iii) Ethical and Social Implications such as Fear of Side Effects, Access, and Tuskegee Affair***

The study found that 77 % of the sample did not feel that their decision to get the vaccine was influenced by previous unethical practices, such as the Tuskegee experimentation on African American males, versus 22% who agreed that their decision was influenced by these unethical experimentation in minorities in the past. This is a significant percentage because the study only had 14% of input from Black students versus 60% from Latino/Hispanic students. The sample population for the study included students from Public Health majors who may be more aware of the benefits of the vaccines.

Studies have indicated that trust in the vaccines pertaining to side effects and adverse reaction were important factors for adults aged 18–39 years who were unsure or hesitant. Information from trusted sources such as faith leaders, family, friends, and physicians versus employers might be a motivating factor. Messaging focused on the vaccines' ability to allow people to resume social activities, and thus encouraging the greater good of communities and friends and families, might be effective. Moreover, ensuring that vaccines are easily accessible, convenient, and available in places where young adults live and work could also improve vaccine coverage. It has been repeatedly stressed by nationally-recognized health



experts that high vaccination coverage among adults aged 18–39 years needs to be attained. They point out that this will be effective in protecting the population from COVID-19 and reduce community incidences of this virus. Increasing confidence in vaccine safety and effectiveness and emphasizing that vaccines are important for preventing the spread of COVID-19 to family and friends and resuming social activities might help increase coverage in this younger adult population, particularly among those who are unsure about whether to get vaccinated or not (Baack et al., 2021). According to Mills et al. (2020), Duffy et al. (2020), Razai (2021), and Sharma et al. (2021), low confidence in vaccines and poor uptake is driven by structural factors such as health inequalities, socioeconomic disadvantages, systemic racism, and barriers to access.

Vaccine hesitancy still persists despite the morbidity and mortality experienced by the U.S. population and worldwide. Fewer people in the U.S. are receiving vaccines every day as of April 1, 2021 (Tanne [2] 2021). Ethnic minorities, particularly African Americans, and people who are conservative politically remain unvaccinated at higher rates due to concerns around the vaccine itself or safety and inequitable distribution. Until recently, distribution was a major concern, people had difficulty making appointments utilizing the computer systems, and accessing vaccines because of transportation (Tanne [2] 2021). This issue of hesitancy can be addressed by empowering trusted community leaders, faith leaders, community social influencers, and family doctors to provide correct vaccine information, and collaborate with local health agencies to boost the vaccination rate in hesitant communities (Tanne [2] 2021).

#### ***(iv) Theory***

The multi-theory model (MTM) for health behavior change was useful to explain the findings for this study. *The first factor proposed*, which is participatory dialogue (whereby the advantages of a behavior change are seen as being more than disadvantages), was supported by 62% of the students saying that they have been vaccinated and 69% saying they are willing to get vaccinated on a regular basis. *The second factor proposed*, which is behavioral confidence (whereby the person becomes sure in performing any given behavior), was supported by 70% of the students saying that they were open to recommending the vaccine to others. *The third factor proposed*, which is changes in the physical environment (whereby the person has necessary resources for performing a given behavior), was supported by 75% of students saying that it was important to attend classes in person while vaccinated with the COVID-19 vaccine.

## **VI. RECOMMENDATIONS**

According to the WHO (2021), one of the most effective ways to protect people against COVID-19 is with the use of vaccines. With life resuming normalcy for people and COVID-19 vaccines being readily accessible to all ages 12 and older in the U.S., college students are also getting ready to go back to campus for traditional in-person education in the fall of 2021. As such, it is not uncommon for colleges and universities to make COVID-19 vaccination mandatory in order to increase vaccination rates and achieve public health goals. Although such policies may be perceived to impose on individual liberty and autonomy by some, given the severity of the pandemic communal well-being may need to be balanced with individual liberties to protect the health and wellbeing of the students, staff, and faculty population. As such we look at anticipated ethical and social implications of such a mandate and make recommendations to address the challenges identified in the study.

**(1) Ethical Considerations:** A number of ethical considerations such as necessity and proportionality, sufficient vaccine safety and efficacy, access, and equitable distribution, and ensuring public trust need to be taken into consideration to justify such mandates (WHO, 2021).

***(i) Necessity and proportionality:*** Mandatory vaccination is necessary and proportionate only when achieving a public health goal such as herd immunity, in this case protecting vulnerable student population and where the risks outweigh the benefits (vaccines would increase the prevention of significant risks of morbidity and mortality and/or promote significant and unequivocal public health benefits) per WHO (2021). Colleges and universities face significant challenges in opening up safely in the face of the pandemic. Findings from Lu et al. (2020) suggest that many institutions that had cautiously reopened in the fall of 2020 had experienced massive incidences of COVID-19 infections and were declared as hotspots for the pandemic. As such, college campuses pose risk to develop extreme cases of COVID-19 and are feared to become super spreaders for their neighboring communities. However, more research is needed to determine the precise effect of college outbreaks.



**(ii) Sufficient vaccine safety and efficacy:** Substantial evidence must be available that supports the safety and efficacy of the vaccine in the population for whom the vaccine is being made mandatory, and that there is evidence that the vaccine is an effective means in preventing serious infection and/or transmission and preventing or reducing hospitalization and protecting the capacity of the acute health care system. The risks associated with vaccination must also outweigh the risk of harm without the vaccine (WHO, 2021).

**(iii) Access and equitable distribution:** There should be sufficient and reliable supply of the authorized vaccine with reasonable and free access for all who are being made to receive the vaccine. Steps must be taken to ensure that vaccine uptake is not an additional burden or unfair demand on those required to be vaccinated (WHO, 2021).

**(iv) Ensuring public trust:** Given past history of exploitation on vulnerable and marginalized populations there exist issues in trust, such as the Tuskegee experiment of Alabama from 1932-1972 - a study on African American men who were deceived into participating in a study of untreated syphilis thinking they were being treated for “bad blood,” that resulted in the Belmont Report in 1979 (Baker, 2021). As such, there may be a lack of public confidence and trust on mandates, and specifically on the scientific community by populations who are African American. There is a need to ensure that the populations who are required to get the vaccines are provided with ample information to make informed decisions and to ensure that cultural and religious issues are considered to demonstrate respect for the participants. This will reduce mistrust in authorities with histories of unethical medical and public health policies (WHO, 2021).

**(2) Social implications:** Fear, trust, and barriers such as access to vaccines and transportation need to be addressed. Religious beliefs also play a role in the vaccine hesitancy. According to Latkin et al. (2021), lack of trust in vaccines can be due to fear of side effects. There are groups of people who have anti-vaccine attitudes which are negative about any vaccine, and they spread fear and misinformation about vaccine safety and potential adverse side effects. Historical and current systemic racism in the U.S. has also resulted in lower trust levels among African Americans. Studies have found that vaccine acceptability differs significantly by sociodemographic characteristics such as race, due to distrust in government. Social acceptance also plays a role in the trust dimension, since people’s attitudes and behaviors are influenced by their peers and social network, and based on the approval and disapproval of this network (Latkin et al., 2021). Scholars also highlight how a vaccine maker is perceived also plays an important role in the level of acceptance of that vaccine. An example is the ongoing opioid epidemic, which has resulted in people viewing pharmaceutical companies as exaggerating benefits, downplaying risks, aggressive marketing, and failure to warn the public of the addictive nature of the medicines (Latkin et al., 2021). There is a need for more research on trusted sources of COVID-19 information, specifically on perceptions of the trustworthiness of COVID-19 information from federal government agencies. In the end, the authors suggested that more studies to get a better understanding about the attributes that influence vaccine trust and vaccine uptake among the various population is needed (Latkin et al., 2021).

## VII. RECOMMENDATION FOR COLLABORATION AND OTHER STRATEGIES

It is important to work with all like-minded entities in this cause, such as religious and community leaders, healthcare professionals, academia, celebrities who support immunization – since they add positive voices to the public conversation, and moreover, their voices are trusted and heard. Healthcare professionals need to know that they are as trusted as other sources of information such as families and friends (MacDonald, 2018).

**(i) Effective communication and strategic campaigns necessary:** There are several evidence-based strategies known to increase vaccine acceptance such as engaging community. Many anti-vaccine sentiments can be due to lack of awareness and based on religious and social beliefs. Thus, promoting vaccination in communities through community and religious leaders can be more acceptable to people, as it leads to greater trust. Creating better access to immunization can also lead to increased uptake. While mandatory requirements may be necessary and initiated with good intentions, sometimes may result in increased anti-vaccine sentiments. Nudge strategies as highlighted by MacDonald (2018) may be a more effective strategy. Also, having effective communications strategies that are proactive and not reactive such as listening to people, tailoring messages that are appropriate for communities, cultures and religions, and sharing evocative stories can help people relate to their own experiences (MacDonald, 2018).

**(ii) Use of simple language and appropriate platforms:** Vaccine messages should be in a language that is understandable by the targeted groups. Technical language and jargon should be avoided. Pictorial examples such as info graphics can be easier

to understand, visually appealing and well-accepted. Being truthful in the messaging can also be beneficial, especially if they are about vaccine benefits, risks, and side effects. Framing the message appropriately matters (MacDonald, 2018). Using platforms that has a wider outreach can be helpful, such as Facebook, Twitter, Instagram, TikTok. Young adults in Generation Z use TikTok on a daily basis, and not enough vaccine messaging is disseminating using platforms used most by 18–24-year-olds (Cohen, 2021).

**(iii) Avoid using Herd Immunity:** Herd protection is a technical term (Jargon) and may sound less personal. It is better to use community protection or community immunity, as it creates a sense of belonging to the audience (MacDonald, 2018).

**(iv) Target vaccine hesitancy using the 5 Cs:**

According to WebMD, targeting the 5 C's can help address vaccine hesitancy:

**Confidence** – get people to understand the effects of vaccines, that they are safe, efficacious, and very much needed (McNamara, 2021).

**Complacency** – now that the vaccines are readily accessible, it is best to have conversations with people who are delaying getting the vaccine about the risks associated with not having the vaccine, this is important in the informed decision-making as well (McNamara, 2021).

**Convenience** – making the vaccines easily accessible and convenient for all by providing the vaccines in easy-to-reach areas such as at schools, colleges, pharmacies, grocery stores and so on, with no financial barriers will allow for increased uptake of the vaccine (McNamara, 2021).

**Communication** – effective communication and dispelling myths is very important. People need more facts and evidence. However, one-way communication without engaging in dialogue will not build trust or confidence in the vaccines. There has to be a genuine, transparent dialogue between vaccine subject matter experts and the public that allows for questions and answers (McNamara, 2021).

**Context** – putting everything in context related to people's ethnicity, culture, socioeconomic status can identify and address barriers. The messages should also be delivered through various platforms that are appropriate for different age groups and in languages that can be understood by different populations (McNamara, 2021).

## VIII. LIMITATIONS

Although the study is very timely and highlights students' perspectives and attitudes toward the COVID-19 vaccines, we acknowledge gaps and limitations that require additional research. The challenges discussed in the study are limited only to students' perspectives, and only from a small sample of 55 students from a single university. Our small sample size limits the generalizability of the findings to a larger population of students, affirming a need to use a larger sample size in the future to ensure study generalizability of research findings. We were also limited to disseminating our survey amongst public health students during the summer semester; this limited our data collection, given the short time frame we had before the start of fall semester. Additional research on students, staff, and faculty from a variety of institutions (private or state funded) with recruitment for survey respondents from all majors will provide more precise views on the hesitancy and acceptance of the COVID-19 vaccines for standardizing these vaccines as part of university immunization requirement purposes. As MacDonald (2018) emphasizes, there is no simple strategy to address all the barriers to vaccine acceptance so this requires different forms of detection and tailoring interventions to build and support vaccine acceptance. Another limitation identified is the lack of student collaboration/involvement to strengthen the research. Including students as collaborators in identifying questions and solutions to students' perceptions to barriers to vaccine acceptance might have enhanced the insights in this study (Mshigeni et al., 2021). Moreover, the study is limited in that we did not gather responses about the university faculty and staff perceptions of the COVID-19 vaccine. Future studies that reflect these perceptions can better relay the overall level of vaccine readiness on university campuses. Finally the sample size selected was highly skewed with regards to sex (89% female; 11% male). The students in our sample size are healthcare science students. Our finding is supported by previous studies that show that over 60% of employees entering the healthcare industry are women (Berlin, et al., 2019). Furthermore, nurses are more than 80% women, and they comprise a large part of the healthcare workforce (Berlin, et al., 2019). Our sample size was also highly skewed with regards to race (60% Hispanics). Although the finding mirrors the community where the university is located and the student population catered by the university, we recommend future studies that will gather data from a diverse group of students that will draw a deeper understanding of vaccine hesitancy among them.

## IX. CONCLUSIONS

The findings from this study yield important information to inform the development of health promotion programming, messaging, and interventions to increase COVID-19 vaccine uptake among college students. The exploration of COVID-19 vaccine acceptance among college students and its ethical implications may assist health promotion researchers and practitioners to create targeted and tailored messaging, especially for students reporting hesitancy towards the COVID-19 vaccine.

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