

# COVID-19 hesitancy and vaccine attitudes among African American and Nigerian college students

## Abstract

This cross-sectional study examined COVID-19 attitudes and vaccine hesitancy among African American and Nigerian college students ( $N=189$ ). African American and Nigerian college students were sampled from regional universities within the United States and Nigeria. Participants completed the World Health Organization (WHO) Vaccine Hesitancy Scale (VHS; 2014) and sociodemographic questions to assess attitudes, primarily vaccination hesitancy, toward COVID-19 vaccination. Independent  $t$  tests revealed no significant differences between the nationalities and any hesitancy in taking the COVID-19 vaccine ( $t(167)=.334, p=.739$ ). However, there was a significant effect for trust in the COVID-19 vaccine ( $t(174)=-3.42, p<.001$ ), with American students ( $M=0.59; SD=0.50$ ) showing more trust than Nigerian students ( $M=0.34; SD=0.48$ ). In addition, there was a significant effect for the overall general support of vaccines,  $t(176)=2.43, p=.016$ , with Nigerian students ( $M=0.86; SD=0.35$ ) showing more favor than American students ( $M=0.71; SD=0.46$ ). Additional analyses associated with the cross-cultural comparisons were conducted and discussed.

**Keywords:** vaccine attitudes, vaccine hesitancy, covid-19, Nigerian college students, African American college students

Volume 7 Issue 1 - 2022

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**Received:** December 15, 2022 | **Published:** December 30, 2022

## Introduction

An outbreak of a novel coronavirus (SARS-CoV-2) infection, COVID-19, emerged in December 2019 and rapidly spread in humans causing a significant threat to international health.<sup>1</sup> There was no populated region on the globe that was untouched by the virus. In the initial stages of the pandemic, the international community, guided in some areas by the World Health Organization, raced to find a cure, vaccine, or pharmaceutical therapeutic to mitigate the effect of COVID-19. "By December 11, 2020, the Pfizer vaccine became the first to receive emergency use authorization from the [United States] Food and Drug Administration (FDA)."<sup>2</sup> With the rapid development of the vaccine using new mRNA technology, misinformation, mistrust, and concerns associated with vaccine safety fueled vaccine hesitancy. COVID-19 vaccine hesitancy is a complex variable which can be influenced by culture. It is a vital determinant in curbing the rate of viral spread. MacDonald of the Strategic Advisory Group of Experts on Immunization (SAGE), explains the definition of the term vaccine hesitancy:

Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence.<sup>3,4</sup>

Earlier research has revealed that reluctance in vaccine acceptance is a worldwide problem, with a wide range of reasons given for the vaccine hesitancy. Lane et al.<sup>5</sup> explored 1110 reasons that were given in their three-year analysis paper and noted risk-benefit concerns, awareness and remote knowledge and sociocultural beliefs as the most cited reasons for why people were hesitant of vaccination, globally. Across many other research studies, the risk perception which bothers on safety concerns and cultural disbelief have been reported as dominant factors for hesitancy. These preceding factors bear a proportional correlation to the hesitancy towards COVID-19 vaccine from a negative attitude in refusal to obtain the immunizations based on culture or religious identity.<sup>6</sup> The cultural implications of COVID-19 vaccine hesitancy can stem hurdles that impede minority

groups from attaining quality equitable health access, notably vaccination accessibility. The prehistoric agenda of health inequity for ethnic minorities and racial injustice inside the medical system could be influential in cultural perception of vaccination services.<sup>7</sup>

## COVID-19 vaccine hesitancy among African Americans

COVID-19 vaccine hesitancy among African Americans can be the resultant feedback of mistrust and fear from cultural influence and societal constructs. The impact of COVID-19 among African Americans is reasonably the highest with the largest proportion of the viral occurrence, severe clinical appearance, high rate of hospitalization and mortality.<sup>8</sup> The consequential hesitancy and reluctance for COVID-19 vaccination services among African Americans exposes disparity based on sociocultural nuances as African American communities did not have apt access to COVID-19 testing kits, management facilities, and vaccine shots despite the severity of the outcomes of COVID-19 in the communities.<sup>9</sup> A large population of African Americans are skeptical of the COVID-19 vaccinations created in the heat of the pandemic, believing that compromises were utilized during vaccine research and production. The aforementioned situation is a reason for distrust and reluctance, which is heightened by the sociocultural injustice many have relatively endured.

## COVID-19 vaccine hesitancy among Nigerians

COVID-19 vaccine hesitancy among Nigerians represents diverse factors that contribute to the rate of reluctance demonstrated by citizens towards available vaccination services. There have been approximately 250,000 confirmed COVID-19 cases and a recorded high percentage of the cases are in the states of Lagos, Rivers and Federal Capital Territory, Abuja.<sup>10</sup> Even with the significant number of cases in the country, studies have shown a trend of hesitance and strategies taken to curb the apathy towards taking the vaccine.<sup>11</sup> The socioeconomic and cultural angle of the COVID-19 vaccine reluctance outlook borders on information dissemination in the country. Adigwe<sup>12</sup> reported in his study the number of reasons why Nigerians would not take the vaccine, and noted vaccine safety or risk

concerns, and the cost of purchasing the vaccine as a reasonable factor in the hesitance of Nigerians for the vaccine.

### Cross-cultural comparisons between African Americans and Nigerian samples

A cross-cultural comparison between African American and Nigerian samples will show some sociocultural factors that may predispose their perceptions of vaccination. The COVID-19 pandemic, especially, has exposed all to different levels of emotional discomforts and trauma, both directly and indirectly, and these are expected to have some levels of influences in the samples' perceptions of covid-19 vaccine.

The religious beliefs and practices of both populations have a huge influence in their worldviews and can influence their perceptions of vaccinations. Generally, Africans are known to be a very religious race. This African religiosity is even taken to another level in the words of Mbiti,<sup>13,14</sup> that Africans are reputed to be "notoriously religious." This African reputation for religiosity is a characteristic shared by both African American and Nigerian populations. Nigerians are known to be deeply religious, and religious beliefs and religious leaders are key factors that shape the people's worldviews.<sup>15</sup> The Christian religion and Islamic religion are the dominant religious groups in Nigeria, and with a sizable population of traditional religion. African religiosity can be deduced from the fact that African traditional religious beliefs and practices have in some ways permeated the practices of the adherents of the two major religions in Nigeria. The Nigerian sampled population of university students who were drawn from the South-East, South-West, South-South, North-Central, and North-West states are predominantly Christians. Their religious beliefs and religious leaders are more likely to promote medical-prevention measures and medical treatments like vaccinations for their members, while the other population from the North-West have a large Muslim population. Although, in the North-West, it is possible that there could be influence from the Islamic fanatical groups who are more suspicious of westernization and western education. The northern part of Nigeria has had a history of vaccine hesitancy.<sup>16,17</sup> In the northern part of Nigeria, there is a growing apathy among these fanatical groups on western education, westernization, and in many instances, they have used violence to achieve their goals.<sup>16</sup> The prevalence of vaccine hesitancy here is more likely higher. Therefore, in the South-East, South-West, South-South, and North-Central that were sampled, religious beliefs and religious leaders may not constitute a negative influence on the participants' perception of COVID-19 vaccination; however, the availability of the vaccine and the accessibility of the centers for vaccination constitute serious problems. The U.S. is known to be a country that has strong Christian religious groups and strong followership in comparison to what is the case in Europe. It was established that religious beliefs may have a direct impact in vaccine hesitancy in the U.S., and that 1 in 10 Americans indicated that the COVID-19 vaccine conflicted with their religious beliefs.<sup>18</sup> African Americans, like Nigerians, are also known to be deeply religious and religious beliefs and practices were the backbone of their resilience through the dark ages of American history and all the injustices they suffered in the U.S..<sup>19</sup> Some religious leaders in the African American communities have played more positive roles towards the perception of the of COVID-19 vaccines as beneficial to their people, and in countering the mistrust and conspiracy theories on the virus.<sup>20</sup> In, as much as, there may be no obvious religious influences in vaccine hesitancy among some of the sampled populations, the issues of the availability of the vaccine and the accessibility of vaccine centers separate the African American population and the Nigerian population.

While the university students in the U.S. are more likely to enjoy the vaccines availability in the hospitals, medical centers, and clinics within their universities and which are easily accessible to them, the experience of the university students in Nigeria is different. The vaccines were hardly available in Nigeria to the university students, and the clinics in the universities may not be well equipped to administer the delicate vaccines. In addition, the decision of the U.S. government to make COVID-19 tests readily available and accessible to all people in the U.S., markedly differentiates the African American students from the Nigerian university students who did not enjoy the same provisions by the Nigerian government.

It is natural that these populations are aware of their painful history of colonialism and slavery, which have very significantly impacted on their worldviews. While the Nigerian university students are knowledgeable of the history of colonialism, the colonial mentality, and its unfriendly policies, their African American counterparts are conscious of enslavement in the U.S., the systemic racism, discrimination, and social injustices that remain part of their struggles in the U.S.. These experiences breed mistrust and suspicion on certain public programs of their government, especially, such programs that require them to trust the government with their life during public medical emergencies.<sup>21</sup> And especially when such programs are marred with so many controversies and conspiracy theories. These may increase high levels of anxiety and mistrust. The trust issues can manifest in various ways to influence vaccine hesitancy among the sampled populations. The Nigerian populace do not trust whatever the government may tell them because of many years of corrupt practices by their leaders and the political class. There are many unfulfilled promises by Nigerian political class, and at times, with blatant lies and deceptions. The near revolution experience in Nigeria, tagged "End SARS", that is, End Special Anti-Robbery Squad<sup>22</sup> could be described as the climax of the rejection of the political leaders in Nigeria and especially the Buhari regime as corrupt and untrustworthy. The pluralistic nature of the Nigerian population, with many ethnicities that are politicized and sensitized into ethnic-political rivalry compounds the already unhealthy situation. Therefore, the Nigerian sampled population may have two major issues that confront them here: on one hand, they have difficulty trusting their political leaders and, on the other hand, there are controversies and conspiracy theories about the COVID-19 that resonate with trust issues. Thus, making the already bad situation even worse. The US sampled population share in the trust issue, but this may be alleviated with a better accountability, due process, and scrutiny that their political leaders are often subjected to. Even at that, their difficult experiences of the past, where some African Americans were used to study syphilis in the Tuskegee experiment, to observe the effect of this disease when untreated in the African American males, still resonates with trust issues. In the Tuskegee experiment, the participants' informed consent was not collected, the researchers lied to participants who were used as "test animals", and unfortunately, many participants died.<sup>23,24</sup> Although, a class action suit led to an out of court settlement in favor of the participants and their families, and an apology was tended by President Bill Clinton, the fact remains that unethical experiment was carried out using African American males and not White males, in a country dominated by White population. This case of the Tuskegee experiment can be a strong factor in vaccine hesitancy among African Americans. The Nigerian sampled population may equally be anxious about the possibility of foreign powers or colonial masters using Africans as test animals. This fear is not unrelated to certain experiences in Africa where foreign powers administered vaccines to African children without implementing the standard precautions or ethical guidelines. There is a case that implicated

Pfizer.<sup>25</sup> It was accused of carrying out a drug test on children in Nigeria without the usual ethical standards and the experiment was shrouded in secrecy. This left some children dead, and many were disabled.<sup>25</sup> Although Pfizer settled out of court after a lengthy and expensive litigation process, it still left behind a negative impression, fear, and suspicion that probably fueled vaccine hesitancy in northern Nigeria, and probably, Nigeria at large. Here, one can ponder on the question, how can the university students who may be aware of these regrettable acts, not be dissuaded from accepting vaccination during public medical emergencies like COVID-19 pandemic, especially when it has not been tested for a few years and proven to be safe? The Nigerian university students may likely have the option and attraction of using African traditional medication or alternative medicine to treat the symptoms of COVID-19 virus than their American university counterparts. The belief in the efficacy of alternative medicine in Nigeria is very strong and, at times, some may find it more potent in the treatment of certain diseases. This belief may not be limited to Africans within the continent but also among Africans across the globe. At the peak of the pandemic, some Africans in diaspora relied on the use of traditional medications to treat the symptoms of COVID-19. The American university students who are more exposed to better medical care and facilities may not find the alternative medication as a very attractive option, and their belief in African traditional medicine may not be that strong. What stands out here is the fact that African traditional medicine upholds medical hygiene and vaccination, thereby, offering African students a good background to accept vaccination.

The controversy surrounding the AstraZeneca vaccine which was sent to Africa was a troubling situation. The media<sup>26</sup> clearly stated that many COVID-19 vaccines that were sent to African countries are not recognized by the European Union, especially when presented for travel certificates. This may increase the tendency to hesitate in receiving the COVID-19 vaccine among the sampled Nigerian population more than the American sampled population who were not exposed to the same situation.<sup>18</sup>

It is worth noting that in the US, commendable efforts were made to properly inform and update the American public on COVID-19 virus and to counteract fake news and misinformation.<sup>27,28</sup> On the contrary, the Nigerian population did not enjoy such preparedness from the government. The U.S. has better equipped hospitals and medical facilities, and better approach to medical prevention measures, and these are likely to facilitate a background reinforcement to the sampled American university students to accept vaccination during public health emergencies. In addition, the doctor-patient ratio in the U.S. is about 1 doctor to 386 patients, while in Nigeria it is about 2500 patients to 1 doctor,<sup>29</sup> other reports put the ratio in Nigeria to 1 doctor to 5000 patients.<sup>30,31</sup> Prior to the COVID-19 pandemic, the medical sector suffered many challenges and the Buhari's regime made things even worse as more medical doctors left the country for other countries in search of greener pastures. The medical sector is in a crisis mode because as many doctors leave the country, medical tourism has escalated with a huge impact on the economy. Nigeria loses over 660 billion naira to medical tourism annually.<sup>32,33</sup> This background is hardly the kind that will sensitize the populace in times of public health emergencies and may likely not sensitize the populace in medical preventive measures like COVID-19 vaccinations. It is true that health disparities in the U.S. between African Americans and White Americans run deep, and the gap has continued to widen.<sup>34</sup> The consequences of these are obvious as more African Americans' life expectancy is four times lower than the White American and the COVID-19 data show that they are experiencing higher rates

of hospitalization and death compared to the White American population.<sup>23</sup> These are equally challenging but are minor challenges in comparison to the challenges the Nigeria population face in the health sector.

Social media was a tool that did not help either of the sampled populations against vaccine hesitancy in some respects. Social media helped to link the minority groups in ways never known in history, especially, the Africans in the continent and those in diaspora. Social media provided a better forum for the African race to be tutored or reminded about the injustices the African race has suffered and the many atrocities committed against them. It may mean different things to different people but to the Africans they ushered in a new era, which could be deciphered from the End SARS movement in Nigeria, and the "Black Lives Matter" movement in the U.S.<sup>22,35,25,36</sup> These sampled populations seem to be more active users of social media. The social media statistics show that Nigerians spend most time on social media in Africa, ranks number one in the African continent and then takes the ninth position, globally.<sup>37</sup> It is estimated that about 63 to 97 million Nigerians are unique users. The U.S. ranks second after China, with about 269 million unique users.<sup>37</sup> A more recent report ranks Nigeria second among countries where people spend the most time on social media.<sup>38</sup> The significance of these reports is that both sampled populations are more likely to receive more of their news from the social media and not from the mainstream media. This may predispose them to fake news and conspiracy theories that flooded the social media during the peak of the covid-19 pandemic.<sup>39</sup> These fake news and controversies affected the containment strategies in certain measures and were responsible for the loss of many lives, especially as they reinforced vaccine hesitancy. The death tolls and the exposure to the horrors of the catastrophic devastations of the COVID-19 pandemic can be a factor in a psychological predisposition of the populations to taking the vaccine. In this case, the African Americans were more exposed to the horrors of the virus, and this should have more direct impact on them than the Nigerian population. As of September 7, 2022, COVID-19 has claimed about 1,043,921 lives in the US, while in Nigeria, as of September 14, about 3,155 deaths have been reported.<sup>23,40,41</sup> Reports show that minority groups in the U.S., African Americans inclusive were experiencing higher rates of hospitalization and death compared to White American populations who constitute the largest population in the U.S.. This experience may be a factor in motivating the African American sampled population to accept medical containment strategies, more than their Nigerian sampled population counterparts who did not have similar experience. The data collected from a recent survey<sup>27</sup> give credence to this position.

The political climate in the U.S. at the peak of the COVID-19 pandemic was a regrettable one and was not helpful in the containment strategies. The political climate was one of overstretched partisan politicization of the medical preventive measures which engendered the lack of a collective political and economic will to fight the pandemic with a more united front. It made it easier for both fake news and controversies to thrive. If it had an impact on the American sampled population, it is about skepticism on the stories of the pandemic, and the impact could have extended to the Nigerian sampled population who were also at another receiving end through the social media. While toxic political climate in America did much, initially, to deny Americans a united force in fighting the pandemic, the divisiveness and bigotry engendered by the politicization and militarization of some ethnic groups in Nigeria could have raised another level of mistrust and suspicion among these ethnic groups and may have affected the vaccination exercise. The different ethnic groups in Nigeria have not less than 371 tribes;<sup>42</sup> demographically,

the American sampled population is more homogenous while the Nigerian sampled population is more heterogeneous.

In summary, there is no doubt that these various perspectives have given some insights on how the two sampled populations may have been psychologically predisposed to hesitate in receiving COVID-19 vaccination. However, these experiences simply make them vulnerable and do not directly translate to vaccine hesitancy, because if knowledge and wisdom should lead the way, at best, these experiences become a call to caution, diligence, conscientious decision, and responsible action. And in this latter case, the decision to receive COVID-19 vaccine will prevail over vaccine hesitancy.

This study will explore and examine cross-cultural analyses of vaccine hesitancy between African American and Nigerian students in tertiary institutions. We attempt to understand the vaccination attitudes, beliefs and ideas which are essential in strategic programming to enhance vaccination efforts among these groups. The research questions that undergird this study are:

- a) What is the relationship between nationality and COVID-19 vaccine hesitancy among African American and Nigerian college students?
- b) What are the determinants of vaccine hesitancy among African American and Nigerian students?
- c) What are the attitudinal characteristics of African American and Nigerian college students toward vaccines, particularly the COVID-19 vaccine?

We therefore hypothesize that:

H1. The nationalities (African American and Nigerian) will have similar attitudes toward vaccination, especially COVID-19 vaccination.

H2. Negative information, medical and governmental mistrust, and vaccine availability will be influential determinants of vaccine hesitancy among both groups.

## Methods

### Participants and study design

A cross-sectional design was used to collect self-reported data through an online survey deployed through Qualtrics. The 188 participants in this study were sampled from a Historically Black College/University in the southern United States ( $N=76$ ; 40.2%) and seven universities in the South-West and North-Central regions of Nigeria ( $N=107$ ; 56.6%). The participants self-identified as either Black/African American or “native” Nigerians (including diverse ethnicities such as Ebira (2.1%), Edo (.5%), Idoma (.5%), Igbo (22.8%), Igala (13.8%), Kakanda (.5%) and Yoruba (6.9%)). There was a total of 188 participants in the study with 56 males (29.8%), 120 females (65.6%), 5 missing gender data (2.7%) and six preferring not to say (3.2%). The participants were required to be at least 18 years of age ( $M=22.61$ ;  $SD=4.28$ ). The survey questionnaire consisted of: (1) World Health Organization (WHO) Strategic Advisory Group of Experts on Immunization (SAGE) Vaccine Hesitancy Scale (VHS) Version 1.0 (2014) using Tables 2 and 3<sup>4</sup>; (2) socio-demographic questions; and (3) questions to assess dimensions of vaccine attitudes.

**Vaccine Hesitancy Scale Version 1.0 (VHS; 2014):** “The WHO SAGE Working Group on Vaccine Hesitancy developed a common diagnostic tool, the Vaccine Hesitancy Scale (VHS), to identify

and compare hesitancy in different global settings”<sup>43</sup> Participants completed Table 2 and 3 of Vaccine Hesitancy Scales. Table 1, referred to as the Core Vaccine Hesitancy Survey, is used to assess vaccine hesitancy at the community level. It consisted of 12 yes/no questions with one item to indicate hesitated/refused for various vaccines. Table 3 is a 10-item 5-point Likert scale. Responses range from 1 (strongly disagree) to 5 (strongly agree). Three items (5, 9, 10) were reverse coded so that overall lower scores indicated more hesitancy and higher scores indicated less hesitancy.

### Socio-demographic and attitudinal assessment questions:

Participants were asked with open-ended questions their age, nationality, ethnicity, location, school attending, religious affiliation, and political affiliation. Questions with yes/no responses were asked regarding had the COVID-19 vaccine been taken, whether the participant intended to take the COVID-19 vaccine, whether the vaccine was trusted, and if there was any hesitancy toward the COVID-19 vaccine.

Approval from the Institutional Review Board of the American university was obtained prior to conducting the research. Participants were recruited from universities in the South-West and North-Central regions of Nigeria. The survey was distributed online via Qualtrics. Data were analyzed using IBM SPSS 28.0. Students had the potential to earn extra credit at the discretion of their course instructors.

## Results

Independent  $t$  tests, Pearson product-moment correlation, and logistic regression analyses were conducted to compare the African American and Nigerian samples.

Independent  $t$  tests revealed no significant differences between the nationalities and any hesitancy taking the COVID-19 vaccine ( $t(167)=.334$ ,  $p=.739$ ). However, there was a significant effect for trust in the vaccine ( $t(174)=-3.42$ ,  $p<.001$ ), with American students ( $M=0.59$ ;  $SD=0.50$ ) showing more favor than Nigerian students ( $M=0.34$ ;  $SD=0.48$ ). In addition, there was a significant effect for the overall general support of vaccines,  $t(176)=2.43$   $p=.016$ , with Nigerian students ( $M=0.86$ ;  $SD=0.35$ ) showing more favor than American students ( $M=0.71$ ;  $SD=0.46$ ). Table 1 contains the significant question items associated with nationality. Nigerians were coded “0” and Americans were coded “1”. Yes was coded “1” and no was “0”.

Logistic regression model was performed to see whether nationality predicts the odds of an individual’s COVID-19 vaccine hesitancy. The overall model was found not to be statistically significant (Chi-squared value (1)=.11,  $p=.737$ ). Logistic regression model performed to see whether nationality predicts the odds of an individual’s trust in the COVID-19 vaccine was found to be overall statistically significant (Chi-squared value (1)=11.17,  $p<.001$ ), with Nagelkerke R-squared value of .08. The model correctly classified 63.1% of the cases. Nationality was found to be statistically significant in predicting one’s trust in the COVID-19 vaccine (Chi-squared value (1)=10.84,  $p<.001$ ). Americans were 2.81 times more likely to trust the COVID-19 vaccine than Nigerians. Factors such as political and religious affiliation, belief in prayer, age, and gender were considered in post hoc and moderation/mediation analyses. No variables were detected as moderators or mediators of the relationship between nationality and vaccine hesitancy.

## Discussion

As we interpret the results, we do so with an understanding that the African American sample may be more homogeneous than the more

heterogeneous Nigerian sample. Even though the African American sample may be more homogenous, we do not assert that the African American sample is monolithic or void of heterogeneity. There were many ethnic groups within the Nigerian sample. These ethnic groups have various cultural beliefs, religious beliefs and practices that may

inform their decisions. The COVID-19 vaccine hesitancy has some variables that must not be ignored such as how well informed are the participants about the virus, vaccine availability and safety issues, Trust issues and public sensitization, etc.

**Table 1** Significant Item Correlations with Nationality (Nigerian/American)

Item	r	p-value
Have you taken the COVID-19 vaccine? Y/N	.581**	<.001
Is the vaccine readily available where you are located? Y/N	.507**	<.001
Do you believe that vaccines can protect you from serious disease? Y/N	-.337**	<.001
Do you think that most parents should have their children vaccinated with all the recommended vaccines? Y/N	-.226*	.002
Please indicate which vaccines you have hesitated or refused to get in the past. – COVID-19 (SARS-CoV-2)	-.161*	.037
Please indicate which vaccines you have hesitated or refused to get in the past. – Human Papilloma virus (HPV) vaccine	-.222*	.030
Please indicate which vaccines you have hesitated or refused to get in the past. – Polio vaccine	.230*	.020
Please indicate which vaccines you have hesitated or refused to get in the past. – Mumps vaccine	-.281**	.008
Please indicate which vaccines you have hesitated or refused to get in the past. – Rubella vaccine	-.303**	.005
Please indicate which vaccines you have hesitated or refused to get in the past. – “Pentavalent” or other combination infant vaccine	-.218*	.049
Has distance, timing of clinic, time needed to get to clinic or wait at clinic and/or costs in getting to clinic prevented you from getting immunized? Y/N	-.323**	<.001
Do you think that it is difficult for some ethnic or religious groups in your community/region to get vaccination? Y/N	.249**	<.001
Have you ever received or heard negative information about vaccination? Y/N. If you chose “yes” to the previous question, did you still get vaccinated after you heard the negative information?	.498**	<.001
Do you support vaccines? Y/N	-.187*	.012
Do you consider yourself to be one who typically worries a lot? Y/N	.217**	.004
Vaccine Hesitancy 5-point Likert scale questions. Scale 1 = strongly disagree to scale 5 = strongly agree – I am concerned about serious adverse effects of vaccines	-.236*	.002
How old are you?	-.336**	<.001
Do you trust the COVID-19 vaccine? Y/N	.251**	<.001
Do you have hesitancy about taking the COVID-19 vaccine? Y/N	-.026	.739

Notes. Nationality coded: Nigerian = 0 and American = 1. Y/N response coded: Yes = 1 and No = 0.

\* p < .05., \*\*p<.01

This research hypothesis stated that, “The nationalities (African American and Nigerian) will have similar attitudes toward vaccination, especially COVID-19 vaccination’, and that ‘Negative information, medical and government mistrust, and vaccine availability will be influential determinants of vaccine hesitancy among both groups’”. The results of this research support these assumptions as correct, therefore, the hypotheses are accepted. Although, the sampled populations, the American and Nigerian samples, show a few discrepancies in the positive and negative correlations respectively, but for the most part, the samples have shown similar attitudinal characteristics to vaccine hesitancy. A few dissimilarities could be accounted for by the levels of preparedness of the governments of both samples in times of public health emergency. Here, the American government will score much higher than the Nigerian government, and this disparity generally paved the way for some differences between the samples’ results.

The results have shown that more African American participants had taken the vaccine than Nigerians, while there were more Nigerians in the study. This could be understood from the level of preparedness

of the Nigerian government to contain the disease, which was at a lower level. The issues of adequate information about the virus, the availability, and accessibility, favor the African Americans. Probably, this issue of availability partly contributed to the government not making COVID-19 vaccination mandatory in Nigeria like the U.S. government. It may be remarkable to state that just the same way the African Americans suffer health inequity or disparity in the U.S., Nigerians also experienced vaccine inequity.<sup>44</sup> Unlike the Nigerian government, the American government was able to mitigate the consequences of such health disparity against African American with a better campaign against COVID-19.<sup>27</sup> Therefore, in the U.S., where the vaccines were more readily available, the U.S. university students could easily get vaccinated. In addition, the U.S. government put in place medical preventive measures, and containment procedures, which required continuous testing and/or vaccination, and in some cases made it mandatory in public spaces and government institutions. These steps promoted the culture of medical hygiene that more likely motivated the American university students to go and be vaccinated more than their Nigerian counterparts.

The results show that Nigerians, more than Americans, believe that vaccines can protect someone from serious disease. Most cultures in Nigeria believe in preventive medicine and some have preventive practices that can be described as traditional vaccination. Since many Nigerian cultures support vaccination, Nigerians are likely to accept vaccination. However, there is a history of vaccine hesitancy and rejection in the northern part of Nigeria where there is a large population of Muslims.<sup>17,45,46</sup>

According to the results, Nigerians think, more than Americans that most parents should have their children vaccinated with all the recommended vaccines because most Nigerian cultures, as mentioned earlier, believe in preventive medicine. Therefore, proper sensitization, the availability, accessibility, and affordability of the vaccines will be the major issues and not vaccine hesitancy. The results stated that more Nigerians than Americans, have hesitated or refused to get the COVID-19, HPV, Rubella, Mumps, and “Pentavalent” vaccines in the past. This may likely be so without proper sensitization and public awareness. Most of the participants came from the southern part of Nigeria without any history of vaccine hesitancy or rejection. In cases where the government has done a good job in an awareness campaign and good sensitization, vaccination has been successful in Nigeria, especially, in the southern part. Although the northern part of Nigeria has had cases of vaccine hesitancy and rejection.<sup>47,45,46</sup>

The finding that more Nigerians report that “distance, timing of clinic, time needed to get to clinic or wait at clinic and/or costs in getting to clinic prevented one from getting immunized”, is generally true of the Nigerian medical sector. The healthcare systems have many challenges and are finding it difficult to meet up with basic health needs and will perform below expectations in times of public health emergencies. Therefore, distance, time, cost, and access are some of the usual challenges that will reduce access to vaccination and vaccination success rate. In a situation where the data on doctor-patient ratio is about 1 doctor to 5,000 patients, the results will not be an encouraging one.<sup>30,31</sup>

The result that more Americans think it is difficult for some ethnic or religious groups in their community/region to get vaccinated may be understood from various perspectives. Could it be because of suspicion, mistrust, or disparity of healthcare between African Americans and the White Americans? Could it be because of the injustices done to African Americans in the past, such as the Tuskegee experiment? Reports have shown that religious leaders have played active roles in having African American receive vaccinations, therefore, this may need more information to unravel other variables. Probably, the widespread fake news and conspiracy theories that may have nurtured this perspective. Although data showed that about 1 out of 10 Americans believed that vaccination conflicted with their religious beliefs, the African Americans more than the White Americans responded to the campaign on the benefit of COVID-19 vaccination and were vaccinated.<sup>27</sup>

The result that more Americans reported having received or heard negative information about vaccination and, in spite of such, will still get vaccinated seem to fall in line with the general expectation. This is insightful in resolving the issue raised by the finding that preceded it. This may have happened because of the effort of the government to counteract fake news and conspiracy theories and the efforts of religious leaders in the African American communities to support the vaccination exercise for their people. Although, the American and Nigerian samples are reported to be leading unique social media users in the world, and thereby, more exposed to fake news and conspiracy theories on coronavirus.<sup>48</sup> The American sample may be more

vulnerable because of the politicization of COVID-19, which has the tendency to increase misinformation or create the loophole for fake news. In addition, the easier accessibility of the social media platforms in the US may be another factor. Besides, that they still get vaccinated may be accounted for by various factors such as: the sustained effort of the government to counteract all fake news and conspiracy theories, the mainstream media was active in disseminating the correct information on COVID-19 and counteracting misinformation, and the effort of various community and religious leaders discussed previously. And more importantly because the African American population was severely hit by the pandemic and may have compelled them to take the vaccine amidst all negative information. Therefore, all these put the American university students in a better position than their Nigerian counterparts.

The results showed that, overall, Nigerians have more support for vaccines than Americans. Probably, due to cultural beliefs and practices. As stated earlier, African traditional medicine is supportive of preventive medicine and for the most part, the religious leaders are very helpful in bridging the gap, creating the needed awareness, and with a support network for better results.

The findings showed that more Americans consider themselves ones who typically worry a lot. This could be understood from the African American history of slavery, systemic racism, discrimination, and other related intolerance they have suffered in the hands of the White American population. The African way of life seems not to have exposed them to such levels of worries and anxieties.

That more Nigerians trust the information received from the vaccine program to be reliable and trustworthy can be understood as possible because of the efforts of religious leaders. Nigerians are more likely to trust their religious leaders more than the government or the political class. Since Covid-19 pandemic is a global issue and not specific to the African population, the information will be seen as more objective than when it has to do with Africans alone.

The results show that more Americans significantly trust the COVID-19 vaccine than Nigerians. It seems more likely that Americans would trust the COVID-19 vaccine more than Nigerians because they suffered the devastating impacts of the virus more than Nigerians, the incidence and prevalence rates were many times more than what were the case in Nigeria. The virus, unfortunately, claimed the lives of about 1,043,900 Americans, and in comparison, to about 3,150 Nigerians.<sup>23,40,41</sup> The U.S. government more than the Nigerian government did a better job to carry the American public along throughout the difficult stages of the pandemic and beyond. The African Americans suffered the devastating impact of virus more than their Nigerian counterparts. Many of the sampled Nigerians may have heard the stories of the pandemic as a foreign disease and not something Nigerians should worry about; therefore, not having a serious direct impact may elicit some levels of hesitancy and trust issues compared to the American sampled population. In Nigeria, and Africa at large, malaria has claimed more life than the coronavirus. Malaria is caused by mosquitoes. According to the World Health Organization, this disease claimed more than 602,000 lives in Africa in 2021. In Nigeria malaria was responsible for about 200,000 deaths.<sup>49</sup> Therefore, if more people die in Nigeria and in Africa because of malaria, coronavirus, which did not hit Nigeria as hard may not have galvanized the conscious attention of Nigerians more than the Americans.

In conclusion, the African American and Nigerian samples showed no significant differences in the hesitancy toward the COVID-19 vaccine. Although African American students had more favorable attitudes toward the COVID-19 vaccine than the Nigerian students,

Nigerian students had a more favorable attitude toward vaccines in general. Cultural factors should be further examined along with vaccine access, equity, and disparities between the two regions.

## Acknowledgments

The authors would like to thank all the participants and faculty colleagues who contributed to the completion of the research study.

## Conflict of Interest

The authors have no conflicts of interest to declare. Each author contributed to the writing of the original manuscript.

## Funding

None

## Ethics statement

Ethics approval for this study was received by the Alabama State University Institutional Review Board (Approval number: 2020165). In accordance with the U.S. Department of Human Services Code of Regulations, Title 45 Part 46 Protection of Human Subjects, approval was based upon 45 CFR 46.101(b) (5). The study conforms to the provisions of the Declaration of Helsinki and the Belmont Report. Participants provided informed consent.

## Data availability statement

The data that support the findings of this study are available from corresponding author upon reasonable requests related to research and educational purposes.

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