

# Regional Analysis of Acceptance of COVID-19 Vaccines in Nigeria

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data were statistically analysed and then mapped using the Geographic Information System.

**Results:** The findings showed a very low level of acceptance of the full doses of COVID-19 vaccines vis-a-vis the population of each of the thirty-six (36) Nigerian States.

**Conclusion:** We therefore conclude that the population responses to receiving COVID-19 vaccines is very low in Nigeria, which signals a high level of health risk and vulnerability to the virus.

## Abstract

**Background:** Attempts at curbing the spread of SARS-CoV-2 have resulted in formulation and adoption of COVID-19 protocols in different countries. To further prevent contracting the virus, many developed countries are administering COVID-19 vaccines to their citizens and residents while the developing countries are not left out. The Nigerian government began administering COVID-19 vaccines on March 9, 2021. This study therefore analysed the acceptance of COVID-19 vaccines across different states in Nigeria.

**Methods:** The study utilised secondary data of COVID-19 vaccination in Nigeria. The dataset was obtained from OpenAFRICA, which was first created on September 1, 2021 and last updated in September 29, 2021. The

**Keywords:** coronavirus, SARS-CoV-2, COVAX, vaccination, immunisation

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## Introduction

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Worldwide, the COVID-19 pandemic has negatively impacted the human population. The information available as of August 29, 2021, shows more than 216 million COVID-19 cases, of which there have been over four million deaths [1]. Responses to COVID-19 are of varying dimensions, as several governments and governing bodies have taken serious measures to control the spread of the virus to stem the rising number of cases. The responses range from restriction of movement with the declaration of partial and total lockdowns, having infected persons quarantined or isolated, to observing protocols such as the use of nose masks, washing and disinfecting hands, as well as social distancing by the population. Different levels of compliance with such COVID-19 measures, protocols or regulations have been identified in various countries and across continents [2-7]. While some success has been achieved, measures such as lockdown could not be kept in place forever because of the negative effects on the economy of nations and the general wellbeing of the people. There would always be movement and the need for people to interact and live normally.

The most sought after alternative is vaccination, considering the historical events of similar pandemics. As such, the World Health Organisation (WHO) and governments of many nations resorted to vaccination of the global population to immunise them against Covid-19. It was believed that this action would either curb the spread of coronavirus or totally eliminate it. Therefore, the WHO stated the following:

“Equitable access to safe and effective vaccines is critical to ending the COVID-19 pandemic, so it is hugely encouraging to see so many vaccines proving and going into development. WHO is working tirelessly with partners to develop, manufacture and deploy safe and effective vaccines. Safe and effective vaccines are a game-changing tool but for the foreseeable future we must continue wearing masks, cleaning our hands, ensuring good ventilation indoors, physically distancing and avoiding crowds” [8].

Due to the complexity of producing vaccines, a wide time frame is permitted for vaccine development while different types of vaccine are researched and produced by a number of scientists and pharmaceutical companies. A few vaccines including Moderna and Pfizer-

BioNTech have been certified by international health organisations and distributed across continents [9,10]. A report showed that as of February 19, 2021, COVID-19 vaccines could be accessed by a total of 92 developing countries (low- and middle-income) through the COVAX Facility Advance Market Commitment (AMC) [11]. For instance, at the time of writing, [12] documented that 78 vaccines were developed and that they went through 4,778 clinical trials, which led to the development of seven vaccines that were certified by the WHO and later distributed to different countries.

There have been several studies [13-19] on COVID-19 vaccine development, distribution, accessibility and impact. Studies [20-27] on public responses regarding acceptance of vaccines are likewise increasing in number, providing global, continental and national coverage. However, there is a lack of research on the acceptance of COVID-19 vaccines in Nigeria within its regional context. We have therefore relied on available data to provide information on variation in responses to accepting COVID-19 vaccines across the Nigerian regions in terms of political states. The findings are expected to inform policies and actions on the distribution and administration of COVID-19 vaccines in the country. In addition, the findings would help direct scientists to study states with low level of vaccine acceptance to further understand the reasons and challenges for such a response in different areas in the states.

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## Methodology

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The dataset for COVID-19 vaccination was obtained from the repository of OpenAFRICA, as it is freely available online (<https://africaopendata.org/dataset/covid-19-data>). According to the metadata, the data were sourced from the National Primary Health Care Development Agency (NPHCDA). This is the Nigerian governmental body responsible for equitable improvement of health and quality of life through the primary health care system. This agency is likewise responsible for administering COVID-19 vaccines in Nigeria. The COVID-19 vaccination dataset obtained from OpenAFRICA was first created on September 1, 2021 and last updated in September 29, 2021. The dataset was downloaded as a comma separated value file (.csv), which was imported

into Microsoft Excel, version 2016, for statistical analysis.

A geographic information system (GIS) approach was employed to put the data in a spatial context. This requires the use of spatial data for Nigeria and the Nigerian states. The geometric data in the form of shapefiles were downloaded from the DIVA-GIS portal, which is an open-source website (<https://www.diva-gis.org/gdata>). The shapefiles were imported into the ArcMap environment of the ArcGIS Desktop 10.3 software for mapping. The csv file containing the distribution of COVID-19 vaccines was later added as attribute data to the Nigerian states' shapefiles. Both the spatial and attribute data were used to produce thematic maps styled as proportional symbol and choropleth maps. A proportional symbol map uses series of graduated symbols to represent geographical areas or regions relative to their quantitative data values. The choropleth map, on the other hand, uses colour, shape or pattern to represent geographical areas or regions relative to their quantitative data values.

## Results

The results (Figures 1-7) of acceptance of Covid-19 vaccines in Nigeria are presented and discussed in this

section. The COVID-19 vaccinations are administered in two phases, “the first dose” and “the second dose”. In our results of the acceptance of the first dose (Figure 1), thousands of people were vaccinated in each state. The highest number was recorded in Lagos State, with a turnout of 404,414 persons, while the lowest was in Bayelsa State with 22,693 persons. Similar situations are observable regarding the second dose (Figure 2), as 243,374 and 8,081 people who received the full dose in Lagos and Bayelsa accounted for the highest and lowest turnouts among the States. The estimates for the number of people who received the first dose but not the second are highest in Lagos (161,040) and Ogun (68,963) but lowest in Sokoto (7,129) and Yobe (10,662) (Figure 3). The number of those who did not received any of the two doses are highest in Kano (14,895,747) and Lagos (11,352,810 persons) but lowest in Bayelsa (2,247,187) and Nassarawa (2,448,251) (Figure 4)

Figures 5a and 5b show the proportion of the population of Nigerian states that has received at least one dose of COVID-19 vaccines. The highest proportion of those that have received the first dose is found in the Federal Capital Territory (FCT), which accounted for 4.33%. Next in line is Lagos State, which accounted for 3.37% of its population. The shares of the populations of Ogun, Kwara and Ekiti that have received the first dose are 2.40%, 2.24% and 2.14% respectively. The shares of the population of other states are less than 2.0%. Furthermore, 2.66% of the population of the Federal Capital Territory (FCT) and 2.03% of the population of Lagos



Figure 1a. **Vaccinated population: The populations of the states of Nigeria that have received one dose of COVID-19 vaccines.**

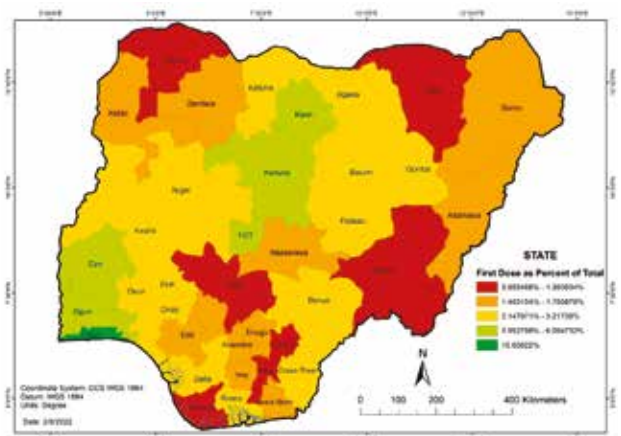


Figure 1b. **Total vaccinated population share: The proportion of population in each state in relation to all those who have received at least one dose of COVID-19 vaccines.**

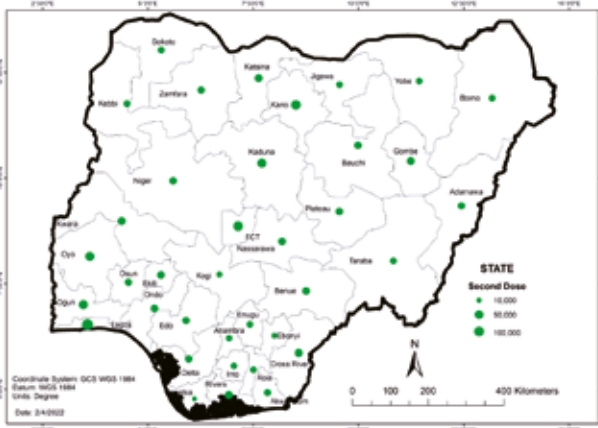


Figure 2a. Fully vaccinated population: The number of people in Nigerian states who have received two doses of COVID-19 vaccines.



Figure 2b. Total fully vaccinated population share: The proportion of population in each state in relation to the total number of those who have received two doses of COVID-19 vaccines in Nigeria.



Figure 3. Not fully vaccinated population: The population of states of Nigeria that that have received the first dose of COVID-19 vaccines but have not taken the second dose.

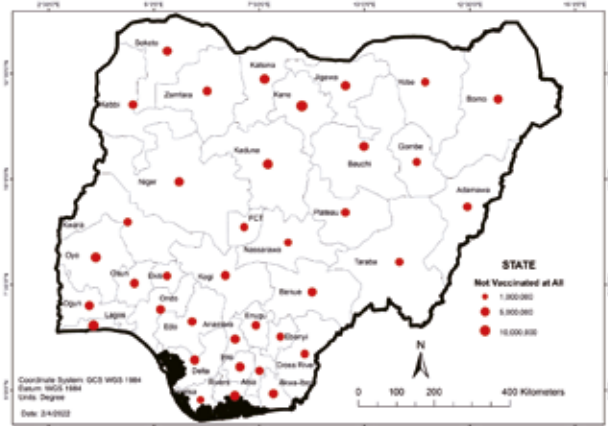


Figure 4. Non-vaccinated population: The population of states of Nigeria that have not received any doses of COVID-19 vaccines.

have received both doses. In Nassarawa, Kwara, Ogun and Gombe, both doses have been received by 1.26%, 1.09%, 1.08% and 1.04% of the population, respectively. In the remaining states, less than 1.0% of their population has received both doses of COVID-19 vaccines.

## Discussion

The Nigerian government commenced COVID-19 vaccination on the 5th of March 2021 after receiving almost four million doses of COVID-19 vaccines, specifically Oxford-AstraZeneca from COVAX [27]. The President received the first dose. A number of state governors

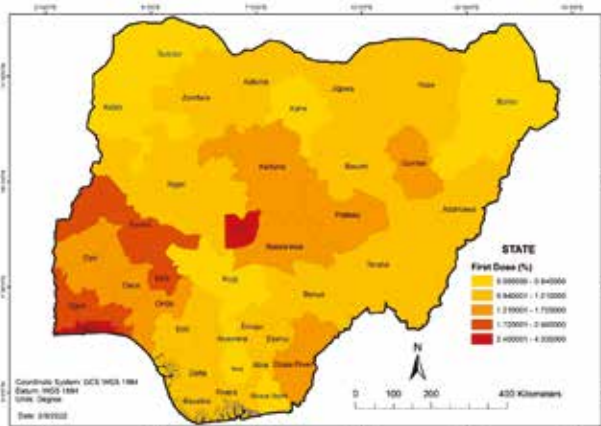


Figure 5a. Vaccinated population shares: The proportion of the population of Nigerian states that have received at least one dose of COVID-19 vaccines.

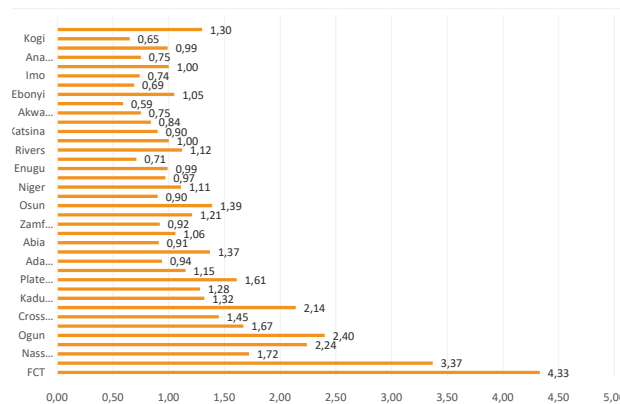


Figure 5b. Vaccinated population shares: The proportion of the population of Nigerian states that have received at least one dose of COVID-19 vaccines.

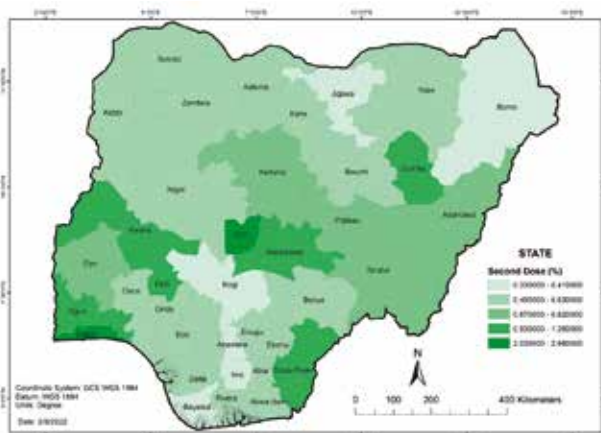


Figure 6a. Fully vaccinated population shares: The proportion of the population of Nigerian states that have received two doses of COVID-19 vaccines.

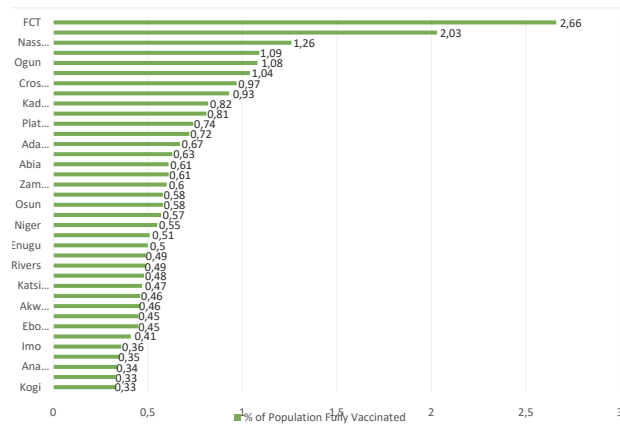


Figure 6b. Fully vaccinated population shares: The proportion of the population of Nigerian states that have received two doses of COVID-19 vaccines.

followed in the President’s footsteps and received COVID-19 vaccines in public in order to encourage vaccination in their states. These gestures were aimed to demonstrate the following to the public: (1) COVID-19 vaccines are not harmful to humans, as is claimed by some. If they were, the President and the governors of respective states would not be administered the vaccines considering that the constitution guarantees them a very high level of security and safety; (2) taking

the vaccine is important for each citizen and resident, regardless of their social and political status, if the nation is to combat the menace of the COVID-19 pandemic successfully; (3) if everyone received the vaccine while following COVID-19 protocols, the public would be encouraged to live normally without the fear of contracting the virus while embracing the new normal.

The population has subsequently received the vaccines, which were promoted in a series of advertisements and

awareness campaigns organised by health agencies in the media and in public places. There have been claims of low turnout by the people, but there is no empirical evidence to support such claims. While reading through the secondary data which we analysed regarding regional acceptance of COVID-19 vaccines in Nigeria, we obtained the actual estimates. We considered putting this in proportion of the population. Although the size of the population of Nigeria is estimated at 214,563,041 people (United Nations, 2019), the estimate from the data obtained through OpenAFRICA puts it at 195 million people. Of the Nigerian states, Kano and Lagos are among the states with populations of over ten million people, with 15,076,892 and 12,000,598 citizens respectively. The states with populations below three million are Ebonyi (2,880,383), Nassarawa (2,523,395) and Bayelsa (2,277,961).

The results on shares of total population are interpreted by a rating on a five-point performance scale (1 – Best, 2 – Good, 3 – Fair, 4 – Poor and 5 – Worst). The Federal Capital Territory (FCT), Lagos, Ogun, Kwara, Ekiti, Nassarawa and Gombe are states with the highest turnout for the first dose of COVID-19 vaccines, thereby constituting the best-performing states. Conversely, Sokoto, Kogi, Borno, Kano, Imo, Anambra, Akwa-Ibom and Kebbi have the lowest acceptance rates for the first dose of COVID-19 vaccines and therefore constitute the worst-performing states. Figures 6a and b show the proportion of the population of states in Nigeria that have received two doses of COVID-19 vaccines. The FCT, Lagos, Nassarawa, Kwara, Ogun, Gombe and Cross-River constitute the best-performing states, while Kogi, Jigawa, Anambra, Bayelsa, Imo, Borno and Ebonyi are the worst-performing states. Considering the shares of the population in general, the acceptance rate is very poor, as 191 million people in Nigeria (97.95%) have not taken the first dose of COVID-19 vaccines. While this low acceptance rate of the first dose persisted, not everyone who received the first dose also received the second dose. Less than 1.5 million people (0.27%) in Nigeria have therefore been fully vaccinated, which is alarming.

This study has some limitations. Our findings are limited to COVID-19 vaccinations before September 2021, as the data that were analysed were last updated on the 29th of September 2021. This implies we analysed past

data which nevertheless connote the recent available data, as most secondary data usually risk losing the virtue of being up-to-date even before being released [23]. Moreover, owing to the continuous nature of COVID-19 vaccination, new people have been accepting the vaccines beyond this date which were not represented in the data we analysed. Furthermore, we only focused on the population that have taken the first and second doses. However, the mutation by the COVID-19 virus has resulted in two new variants called the COVID Delta and Omicron. The cases of infections of these variants that were reported across countries warranted a booster vaccine being administered as the third dose. Data about this third dose are not available and so are not represented in our analysis.

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## Conclusion

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Nigeria continues to face the impact of the COVID-19 pandemic since new cases of the Delta and Omicron variants are still being reported. Despite that, we found a very low level of acceptance of the full doses of COVID-19 vaccines vis-a-vis the population of each of the 36 Nigerian states. We therefore conclude that the population's response rate to receiving COVID-19 vaccines is very low in Nigeria, which signals a high level of health risk and vulnerability to the virus. Such incidences have significantly negative social, economic, political and environmental impacts on nations. These findings should be used by policymakers in the country, who need to maintain the various COVID-19 vaccination awareness campaigns in the states. The public still need to be well-informed about the high risk involved in non-acceptance of these vaccines. Social scientists are needed to study the reasons for the low level of vaccine acceptance in each state to further understand the challenges for such responses by the public. Research grants and fellowships should be made available to these scientists by both the federal and state governments of Nigeria.

## References

1. WHO (2021). COVID-19 Weekly Epidemiological Update Edition 55, 31 August 2021. [https://www.google.com/url?sa=t&source=web&rct=j&url=https://reliefweb.int/sites/reliefweb.int/files/resources/20210831\\_Weekly\\_Epi\\_Update\\_55.pdf&ved=2ahUKewiK7rWR4-H1AhUOylUKHWtYCX8QFnoECCYQAQ&usg=AOvVaw0SIGJAISN37eyENQP8B8AW](https://www.google.com/url?sa=t&source=web&rct=j&url=https://reliefweb.int/sites/reliefweb.int/files/resources/20210831_Weekly_Epi_Update_55.pdf&ved=2ahUKewiK7rWR4-H1AhUOylUKHWtYCX8QFnoECCYQAQ&usg=AOvVaw0SIGJAISN37eyENQP8B8AW)
2. Kayrite, Q. Q., Hailu, A. A., Tola, T. N., Adula, T. D., & Lambyo, S. H. (2020). Compliance with COVID-19 preventive and control measures among food and drink establishments in Bench-Sheko and West-Omo Zones, Ethiopia, 2020. *International Journal of General Medicine*, 13, 1147–1155. <https://doi.org/10.2147/IJGM.S280532>
3. Benjamin van Rooij, B., de Bruijn, A. L., Folmer, C. R., Kooistra, E., Kuiper, M. E., Brownlee, M., et al. (2020). Compliance with COVID-19 Mitigation Measures in the United States. doi: 10.31234/osf.io/qymu3
4. Okafor B. N. (2020). Compliance to COVID-19 preventive measures towards the environmental health in Nigeria universities. *International Journal of Trend in Scientific Research and Development*, 4(6), 775- 782. [www.ijtsrd.com/papers/ijtsrd33353.pdf](http://www.ijtsrd.com/papers/ijtsrd33353.pdf)
5. Al-Shattarat, B, & Amuda, Y. J. (2021). Comparative report of compliance to precautionary measures against COVID-19 in Nigeria and Jordan. *Heliyon*. 7(8). doi: 10.1016/j.heliyon.2021.e07793
6. Padidar, S, Liao, S. M, Magagula, S., Mahlaba, T. A. M., Nhlabatsi, N. M., & Lukas, S. (2021) Assessment of early COVID-19 compliance to and challenges with public health and social prevention measures in the Kingdom of Eswatini, using an online survey. *PLoS ONE* 16(6): e0253954. doi:10.1371/journal.pone.0253954
7. Wright L, Steptoe A, & Fancourt D (2021). Patterns of compliance with COVID-19 preventive behaviours: a latent class analysis of 20 000 UK adults. *Journal of Epidemiology and Community Health*. doi: 10.1136/jech-2021-216876
8. WHO(2021a).COVID-19vaciness<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines>
9. WHO (2021b). Status of COVID-19Vaccines within WHO EUL/PQ evaluation process. <https://extranet.who.int/pqweb/key-resources/documents/status-covid-19-vaccines-within-who-eulpq-evaluation-processhere>
10. WHO (2021c). Country readiness for COVID-19vaccines. <https://www.who.int/news-room/feature-stories/detail/country-readiness-for-covid-19-vaccines>
11. Centers for Disease Control and Prevention. [CDC] (2022). Types of Vaccines Available. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines.html>
12. Yiaga Africa. (2021). Policy Brief on COVID-19Vaccine Management in Nigeria, pp. 1-11.
13. Aborode A. T., Olofinsao, O. A., Osmond, E., Batubo, A. P., Fayemiro, O., Sherifdeen, O., et al. (2021). Equal access of COVID-19 vaccine distribution in Africa: Challenges and way forward. *Journal of Medical Virology*, 93(9), 5212-5215. doi: 10.1002/jmv.27095
14. Adejumo, O. A., & Adejumo, O. A. (2021). Recalling the universal health coverage vision and equity in the COVID-19 vaccine distribution plan. *Pan African Medical Journal*, 13(39)197. doi: 10.11604/pamj.2021.39.197.29041
15. Amimo, F., Lambert, B., Magit, A., & Hashizume, M. A. (2021). Review of prospective pathways and impacts of COVID-19 on the accessibility, safety, quality, and affordability of essential medicines and vaccines for universal health coverage in Africa. *Global Health*, 17(1), 42. doi: 10.1186/s12992-021-00666-8
16. Bright, B., Babalola, C. P., Sam-Agudu, N. A., Onyeaghala, A. A., Olatunji, A., Aduh, U., et al. (2021). COVID-19 preparedness: capacity to manufacture vaccines, therapeutics and diagnostics in sub-Saharan Africa. *Global Health*, 17(1), 24. doi: 10.1186/s12992-021-00668-6
17. Eshun-Wilson, I., Mody, A., Tram, K. H., Bradley, C., Sheve, A., Fox, B., et al. (2021) Preferences for COVID-19 vaccine distribution strategies in the US: a discrete choice survey. *PLoS ONE*, 16(8). doi:10.1371/journal.pone.0256394
18. Massinga L. M., & Nkengasong, J. N. (2021). COVID-19 vaccine access in Africa: global distribution, vaccine platforms, and challenges ahead. *Immunity*, 54(7), 1353-1362. <https://doi.org/10.1016/j.immuni.2021.06.017>
19. Moodley, K., Blockman, M., Pienaar, D., Hawkrigde, A. J., Meintjes, J., Davies, M. A., & London, L. (2021). Hard choices: ethical challenges in phase 1 of COVID-19 vaccine roll-out in South Africa. *South Africa Medical Journal*, 111(6), 554-558.
20. Eze, U. A., Ndoh, K. I., Ibisola, B. A., Onwuliri, C. D., Osiyemi, A., Ude, A., et al. (2021). Determinants for acceptance of COVID-19 vaccine in Nigeria. *Cureus*, 13(11). doi:10.7759/cureus.19801
21. Kanyanda, S., Markhof, Y., Wollburg, P, & Zezza, A. (2021). Acceptance of COVID-19 vaccines in Sub-Saharan Africa: evidence from six national phone surveys. *BMJ Open*. doi:10.1136/bmjopen-2021-055159
22. Lindholt, M. F., Jorgensen, F., Bor, A, & Petersen, M. B. (2021). Public acceptance of COVID-19 vaccines: cross-national evidence on levels and individual-level predictors using observational data. *BMJ Open*. doi:10.1136/bmjopen-2020-048172
23. Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al. (2021). A global database of COVID-19 vaccinations. *Natural and Human Behaviour*, 5, 947–953. <https://doi.org/10.1038/s41562-021-01122-8>
24. Mohamed, N. A., Solehan, H. M., Mohd Rani, M. D., Ithnin, M., & Che Isahak, C. I. (2021). Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: a

- web-based survey. *PLoS ONE*, 16(8). doi:10.1371/journal.pone.0256110
25. Mustapha, M., Lawal, B. K., Sha'aban, A., Jatau, A. I., Wada, A. S., Bala, A. A, et al. (2021) Factors associated with acceptance of COVID-19 vaccine among university health sciences students in Northwest Nigeria. *PLoS ONE* 16(11). doi:10.1371/journal.pone.0260672
  26. Solís Arce, J. S., Warren, S. S., Meriggi, N. F., Scacco, A., McMurry, N., Voors, M. et al. (2021). COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med* 27, 1385–1394. <https://doi.org/10.1038/s41591-021-01454-y>
  27. Tobin, E. A., Okonofua, M., & Azeke, A. (2021). Acceptance of a COVID-19 vaccine in Nigeria: a population-based cross-sectional study. *Annals of Medical and Health Sciences Research*, 11(5), 1445-1452.
  28. Adebowale, N. (2021, August 9). COVID-19: Nigeria reschedules second batch vaccination to commence Monday. *Premium Times*. <https://www.premiumtimesng.com/news/top-news/478330-covid-19-nigeria-reschedules-second-batch-vaccination-to-commence-monday.html>



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## Sažetak

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Pozadina: Pokušaji suzbijanja širenja virusa SARS-CoV-2 rezultirali su oblikovanjem i usvajanjem protokola za COVID-19 u različitim zemljama. Kako bi dodatno spriječile zarazu virusom, mnoge razvijene zemlje svojim građanima i stanovnicima daju cjepiva protiv bolesti COVID-19, a zemlje u razvoju nisu izostavljene. Nigerijska vlada počela je primjenjivati cjepiva protiv bolesti COVID-19 9. ožujka 2021. Ova je studija stoga analizirala prihvaćanje cjepiva protiv bolesti COVID-19 u različitim državama u Nigeriji.

Metode: U studiji su upotrijebljeni sekundarni podaci o cijepljenju protiv bolesti COVID-19 u Nigeriji. Skup podataka dobiven je od platforme OpenAFRICA koja je nastala 1. rujna 2021. i zadnji je put ažurirana 29. rujna 2021. Podaci su statistički analizirani, a zatim mapirani s pomoću Geografskoga informacijskog sustava.

Rezultati: Nalazi su pokazali vrlo nisku razinu prihvaćanja punih doza cjepiva protiv bolesti COVID-19 u odnosu na populaciju svake od trideset šest (36) nigerijskih država.

Zaključak: Zaključujemo da je reakcija stanovništva na primanje cjepiva protiv bolesti COVID-19 u Nigeriji vrlo niska, što ukazuje na visoku razinu zdravstvenog rizika i ranjivosti na virus.

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Ključne riječi: plemeniti koronavirus, SARS-CoV-2, COVAX, cijepljenje, imunizacija

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