FRAMING THE COVID-19 VACCINE IN NIGERIA: AN ANALYSIS OF NIGERIAN MEDIA

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Abstract

Vaccine hesitancy is one stumbling block in managing the COVID-19 pandemic outbreak globally. Documented evidence shows vaccine hesitancy has existed for more than 100 years, with unnecessary mortality from vaccine-preventable diseases than otherwise might have happened. This is true in Nigeria; where the COVID-19 vaccination campaign suffered major setbacks, due to misinformation, fake news, and a lack of trust and suspicion of the vaccine's safety. Against this background, the influence of news framing came to the forefront as soon as the COVID-19 vaccination campaign was rolled out in Nigeria and the health authorities began urging citizens to get vaccinated. The media framing of the COVID-19 vaccine has arguably contributed to the rising COVID-19 vaccine hesitancy and the 39% vaccination rate (as of March 2024). Stiff-anti-vaccination sentiment, building on prior assumptions among the lay publics, coalesced into hesitancy against the COVID-19 vaccination among many Nigerians. Therefore, this study seeks to examine how Nigerian media framed the COVID-19 vaccination rollout. Identifying the factors that shape/influence the media's framing of the COVID-19 vaccination discussion in Nigeria. Examine the reported barriers to the COVID-19 vaccination adoption in Nigeria. The study adopts mixed methods, content analysis and natural language processing using sentiment analysis to explore data from YouTube videos and Nigerian online newspapers. The research applies the theory of planned behaviour and framing theory as the theoretical foundations to understand how the media (YouTube and Online Newspapers) frame the COVID-19 vaccination campaign in Nigeria.

Keywords: *COVID-19 Vaccination, Vaccine Hesitancy, Content Analysis, Framing Theory, Theory of Planned Behaviour.*

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"For indeed, with hardship, (will be) ease. Indeed, with hardship (will be) ease." Q94:5-6

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CHAPTER ONE

1.1 Introduction

COVID-19 is a deadly virus that has infected 775,431,269 million people and recorded 7,047,741 deaths as of May 22nd, 2024, according to the World Health Organization database (World Health Organization, 2023). Hence, the COVID-19 virus is tagged as a major public health challenge that requires a multifaceted emergency response to stem the infection and build herd immunity. Vaccination is the major step and key to achieving protection against the deadly infection of the COVID-19 virus (WHO, 2021). COVID-19 vaccines are the recognised therapeutic and pharmaceutical methods developed to curtail the COVID-19 infection (Izda et al., 2021; Liu et al., 2020; Sallam et al., 2021; Shih et al., 2020). However, vaccine hesitancy is one of the major barriers preventing people from getting vaccinated to achieve herd immunity against the COVID-19 virus (Cascini et al., 2021). Vaccine hesitancy refers to the behaviour of delaying or rejecting vaccinations despite vaccine availability (MacDonald et al., 2015). Vaccine hesitancy has a long-standing history among people who refuse vaccination for different reasons.

Previous studies have found a connection between vaccine hesitancy and lower vaccination rates (Lee et al., 2022; Pierri et al., 2023; Sallam et al., 2021). For instance, researchers discovered several factors that drive vaccine hesitancy. For example, the media, influential politicians, and religious beliefs are identified as strong drivers of vaccine hesitancy (Erchick et al., 2022; Purvis et al., 2021). Studies also recognised distrust for sources of information, i.e. mainstream media (e.g., newspapers, radio, & and TV etc), as well as fake news and misinformation on social media about vaccines facilitate vaccine hesitancy (Purvis et al., 2021; Truong et al., 2022). Media is an indispensable partner in health communication, particularly during the COVID-19 pandemic (Liu et al., 2020). However, studies show fake news and misinformation about COVID-19 vaccines are mostly

disseminated through online media platforms (Harper & Attwell, 2022). Therefore, how the COVID-19 vaccine is covered in Nigerian media, particularly, being aware of the widespread fake news and misinformation about the COVID-19 vaccine requires an investigation of Nigerian YouTube and online newspapers.

Previous studies have shown the rhetoric of political and religious opinion leaders has swayed trust and built negative messages around polio and meningitis vaccination campaigns in Nigeria (Obadare, 2005; Yahya, 2007). However, why these anti-vaccine messages gained Nigerian media's attention requires investigation for the sake of the population. Therefore, Nigeria is an ideal place to investigate the media's coverage of COVID-19 vaccine messages, specifically on YouTube and selected Nigerian online newspapers because of the backlash against meningitis and polio vaccines 20 years ago, and again against the COVID-19 vaccine. This research aims to investigate the role of media in the COVID-19 vaccination campaign rollout in Nigeria. To accomplish this, I analysed three independent articles examining the media sphere, focusing on social media (YouTube) and mainstream media (online newspapers).

1.2 A Contextual Background Assessment of Vaccine-Preventable Diseases and the COVID-19 Vaccination: highlighting the past and present barriers to effective vaccination in Nigeria.

Nigeria is home to over 400 different languages (Ikoro, 2019) and three major religious affiliations: Islam, Christianity, and traditional African religious beliefs (Afolabi, 2015). Nigeria has approximately 206,139,589 people, making it the most populous country in Africa (Nzediegwu & Chang, 2020; Pontianus & Oruonye, 2021). Nevertheless, the WHO confirms that Africa has witnessed an increase in outbreaks mostly from vaccine-preventable diseases over the past decades (WHO, 2023). However, as the giant of Africa, vaccination against vaccine-preventable diseases has been a controversial topic of discussion for decades in Nigeria (Jamo, 2020). Vaccine-preventable diseases are a family of diseases, such as

Chickenpox, Diphtheria, Flu, Hepatitis A, B, Hib, HPV, Measles, Meningococcal, Mumps, Polio, Pneumococcal, Rotavirus, RSV, Rubella, Tetanus, Whooping cough that vaccines can cure and eliminate or help stem these infections (Centers for Disease Control and Prevention, 2019).

Vaccination against vaccine-preventable diseases, particularly in densely populated northern Nigeria, is one of the lowest globally (Abdulkarim et al., 2011). Research shows the backlash of vaccine hesitancy in northern Nigeria has increased since the late 1990s when Pfizer's vaccine trial against meningitis and the vaccination campaign to eradicate polio in 2003 created overwhelming controversies (Jamo, 2020; Obadare, 2005). Therefore, understanding who is responsible for COVID-19 vaccine hesitancy in Nigeria is imperative for future vaccination programmes. For example, meningitis and poliomyelitis being the two most prominent and controversial vaccination programmes ended with lawsuits, boycotts, and the killing of vaccinators in northern Nigeria (Archibong & Annan, 2021; BBC, 2013). In the case of meningitis, the media reported the meningitis vaccine trials were carried out in a Muslim northern state as evidence to support the unsubstantiated claims that Pfizer and Western allies were conspiring and plotting to kill Muslims through vaccines (Archibong & Annan, 2021). Similarly, the polio vaccine was boycotted based on the assumption that it could cause infertility and sterility in women, in this regard, the media reported 12 vaccinators were killed in Kano's north-west Nigeria to disrupt the process in 2013 (BBC, 2013).

In Nigeria, empirical evidence has identified politics, religion, and cultural worldviews, as well as a lack of trust, as the major challenges and barriers that promote vaccine hesitancy (Anyene, 2014; Yahya, 2007). These ideological and cultural diversities are the core of decision-making and an integral part of the social and unique cultural fabric of Nigerian society (Adedini et al., 2018; Oyetunbi & Akinrinde, 2021). However, the superior

voices of political, cultural, and religious leaders have substantially shaped and influenced public resistance towards meningitis and poliomyelitis vaccination campaigns in Nigeria (Malakoff, 2001; Obadare, 2005; Yahya, 2006). At that time, traditional chiefs and religious clerics suggested the vaccines were part of the conspiracies of Western governments, particularly the United States, to reduce Nigeria's growing population, therefore, the oral polio vaccine was suspected of being loaded with carcinogenic, anti-fertility and HIV-virus (Obadare, 2005). Consequently, this lack of trust in Nigerian and Western governments and vaccines' safety and efficacy has encouraged behavioural resistance, mutual suspicion, and low demand for vaccines in multi-cultural Nigeria (Obi-Jeff et al., 2020; Yahya, 2007; Obadare, 2005).

The COVID-19 pandemic was first reported in Nigeria on the 27th of February 2020, (Apuke & Omar, 2021a). The WHO database currently shows Nigeria has 267, 188 confirmed cases and 3, 155 reported deaths from the COVID-19 virus as of May 22nd, 2024, (World Health Organization, 2024b). Efforts to curtail the COVID-19 pandemic in Nigeria have suffered major setbacks ranging from denialism and scepticism, especially, from prominent religious leaders like Pastor Chris Oyakhilome and Sheikh Sani Yahaya Jingir. For example, Jingir calls the virus a "Ghost of the West" scientifically created to stop Muslims from congressional Friday prayers and the pilgrimage to Mecca (Ibrahim, 2020). Nigeria launched the mass COVID-19 vaccination on 5th March 2021. Misinformation, fake news, politics, and religion play a significant role in disrupting and promoting COVID-19 vaccine hesitancy in Nigeria (Talabi et al., 2022; Wonodi et al., 2022). For example, statements of political leaders who hold key and influential positions like Governor Yahaya Bello have criticised and questioned the safety and efficacy of COVID-19 vaccines publicly in mainstream and social media, alleging the vaccines were meant to kill (Olatunji, 2021). Also, some highly visible religious leaders with significant followership viciously tagged the

COVID-19 pandemic in different ways, for instance, as an “act of God” or “wrath of God” instigating resistance against COVID-19 vaccines among their followers (Falade, 2022). Therefore, it is important to examine how the COVID-19 vaccine messages are framed to encourage vaccine uptake and reduce vaccine hesitancy (Wonodi, et al., 2022).

The media plays a crucial role in shaping public opinion and disseminating information. However, different social and behavioural forces use media to spread misinformation, fake news, and distrust. As a result, these factors influence the population's understanding of and response to the COVID-19 vaccination campaign. Against this background, this research aims to understand the role of media, particularly, YouTube and selected Nigerian online newspapers in shaping public opinions in the COVID-19 vaccination campaign. Also, using framing theory and natural language processing, the study uses sentiment analysis to explore the bias embedded in how the media frame COVID-19 vaccine messages in Nigeria.

1.2 Aims of the Study

1. To examine how Nigerian media frame the COVID-19 vaccination rollout
2. To identify the factors that shape/influence the media's framing of the COVID-19 vaccination discussion in Nigeria
3. To examine the reported barriers to COVID-19 vaccination adoption in Nigeria

1.3 Three Articles to Address the Thesis Questions

1. Sadiq, M., Croucher, S., & Dutta, D. (2023). COVID-19 vaccine hesitancy: A content analysis of Nigerian YouTube videos. *Vaccines*, *11*(6), 1057. https://doi.org/10.3390/vaccines11061057

2. Sadiq, M., Croucher, S., & Dutta, D. (under review). Framing the COVID-19 vaccine rollout in Nigeria: An analysis of online newspapers’ coverage of the COVID-19 vaccine. *African Journalism Studies*. Submitted in February 2024.

3. Sadiq, M., Croucher, S., Ma, L., & Kang, F. (under review). A sentiment analysis of the COVID-19 vaccine crisis in Nigerian online newspapers. *The International Journal of Crisis and Risk Communication*. Submitted in May 2024.

Article 1

Sadiq, M., Croucher, S., & Dutta, D. (2023). COVID-19 vaccine hesitancy: A content analysis of Nigerian YouTube videos. *Vaccines*, *11*(6), 1057. https://doi.org/10.3390/vaccines11061057

This paper adopts the theory of planned behaviour TPB to understand the reported barriers to the COVID-19 vaccine adoption from the Nigerian YouTube videos. Vaccine hesitancy has been extensively studied (Abdel-Raheem & Alkhammash, 2022; Betta et al., 2022) but little is known about the reported barriers to the COVID-19 vaccine adoption from the Nigerian media perspective. First, the paper aims to identify the tone of YouTube video headlines/titles associated with the COVID-19 vaccination campaign in Nigeria. The second aim of the paper was to describe the tone of Nigerian YouTube users' comments on Nigerian COVID-19 vaccine videos. Third, the paper also aims to explain the causes of COVID-19 vaccine hesitancy identified within Nigerian YouTube video user comments. This study has immensely contributed towards understanding the reported barriers to the COVID-19 vaccine adoption in Nigerian YouTube videos analysed. Even though, in the context of this paper, the theory of planned behaviour TPB could not sufficiently explain the fundamental beliefs that shape the attitudes of Nigerians toward COVID-19 vaccine hesitancy. However, misinformation and a lack of trust emerged as the key reported barriers to the COVID-19 vaccine adoption from the Nigerian YouTube videos analysed. Misinformation and a lack of trust are generally identified in numerous studies as the reported cognitive and behavioural barriers triggering vaccine hesitancy globally. By implication, this study demonstrates the robustness of the theory of planned behaviour as a guide for data analysis and suggests practical ways for the Nigerian government to develop appropriate vaccination communication strategies. This paper has been accepted and published in *Vaccines*, under *MDPI Scientific Journal Publisher. Vaccines* ranks among the top Q1 in the Immunology and

Medical categories, with a high-impact factor of 7.8, and has *h* index 85. This journal is specifically relevant for this paper given its focus on vaccine-related research and encouraging pragmatic ways to stem vaccine hesitancy.

Article 2

Sadiq, M., Croucher, S., & Dutta, D. (under review). Framing the COVID-19 vaccine rollout in Nigeria: An analysis of online newspapers' coverage of the COVID-19 vaccine. *African Journalism Studies*. Submitted in February 2024.

In health communication, scholars argue that the media is an important channel that helps in disseminating public health messages that inspire and assist people to embrace positive healthy behaviours (Black et al. 2021; Dai et al. 2022). However, the emergence of the COVID-19 vaccination campaign rollout attracted competing frames within the Nigerian media sphere. Therefore, three Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership*) were selected for analysis. Using framing theory, the paper aimed to investigate how frequently the COVID-19 vaccination was framed in headlines. Second, the paper examines the headline valence, and third, the paper explores the most frequently used frame in news articles before and after the COVID-19 vaccine rollout. Despite the existence of several studies on framing and vaccination campaigns (Altay & Mercier, 2020; Gesser-Edelsburg et al., 2022; Penţa & Băban, 2018), little research or no studies empirically examine how Nigerian online newspapers framed the COVID-19 vaccines between Dec 2020 – Dec 2022. This paper is strikingly relevant towards understanding the springboards of COVID-19 vaccine hesitancy given the prevailing problems and challenges associated with vaccine hesitancy in Africa, specifically, Nigeria, the most populous country in Africa. This article was submitted to the *African Journalism Studies*, it is under review. *African Journalism Studies* is published by Taylor and Francis, with a journal's impact factor IF of 2.19, *h* index 22. The Journal of *African Journalism Studies* ranked among the top Q2

journals specifically focusing on journalism studies in Africa, was appropriate and found suitable for this article based on its scope in promoting grounded and sound intellectual scholarship in the African continent. Similarly, the journal was specifically chosen to publish this paper considering the prevailing challenges vaccine hesitancy poses to vaccine-preventable diseases on the continent, the Journal, *African Journalism Studies,* published online will encourage, support, and serve as a guide to numerous researchers aiming to find empirical solutions to help make Africa a vaccine hesitancy free continent.

Article 3

Sadiq, M., Croucher, S., Ma, L., & Kang, F. (under review). A sentiment analysis of the COVID-19 vaccine crisis in Nigerian online newspapers. *The International Journal of Crisis and Risk Communication*. Submitted in May 2024.

In media practice, framing is a framework that describes how stories are constructed to prompt a desired interpretation or stimulate emotions or responses from the audience. Hence, sentiment analysis is a notable computer-based tool designed to explore how textual data can induce different emotions. According to (Kennedy, 2012), “sentiment analysis uses linguistic and textual assessment, such as Natural Language Processing, to analyse word use, word order, and word combinations and thus to classify sentiments, often into the categories of positive, negative, or neutral” (p. 435). This paper adopts the framing theory, using natural language processing and sentiment analysis to investigate and textually identify the bias and sentiments associated with how the Nigerian online newspapers framed the COVID-19 vaccine rollout. The article aims to analyse the frequency of the COVID-19 vaccine headlines in the three selected newspapers. Second, to explore the embedded sentiments and bias about the COVID-19 vaccines in the three selected newspapers. Third, identify the emergent frames, and fourth, predict future COVID-19 vaccine posts among the three newspapers selected. In line with previous studies, see (Nwaoboli, 2021; Olu-Abiodun et al., 2022;

Wonodi et al., 2022), people refused COVID-19 vaccines due to misinformation, fake news, and conspiracy beliefs circulating as the major barriers towards vaccine acceptance in Nigeria. Therefore, this article examines the sentiments associated with the COVID-19 vaccine crisis in Nigerian online newspapers. This paper was submitted to *The International Journal of Crisis and Risk Communication* and is currently under review. The *International Journal of Crisis and Risk Communication* ranked in the top Q2 journals with high impact factor, therefore, this journal is suitable to publish this article because of its track record and genuine intellectual rigour and reputation in Crisis and Risk communication research globally.

CHAPTER TWO

Literature Review

2.1 Introduction

This chapter establishes the study rationale and reviews relevant literature to underscore these key concepts: the COVID-19 vaccination campaign, the role of the media in pandemic health communication, an overview of YouTube and the COVID-19 pandemic communication campaign, online newspapers and the COVID-19 pandemic communication campaign, the role of politics, culture, religious beliefs, and vaccine hesitancy in Nigeria. The chapter further discusses the conceptual factors influencing COVID-19 vaccine hesitancy in Nigeria such as misinformation, fake news, and trust. The theory of planned behaviour (TBP) and framing theory are reviewed in this section as theoretical frameworks that guide understanding the barriers to COVID-19 vaccine adoption, and how three selected online Nigerian newspapers framed the COVID-19 vaccination campaign rollout in Nigeria. The theories also help answer the three research questions raised to examine the barriers to COVID-19 vaccine adoption in Nigerian YouTube videos and framing of the COVID-19 vaccination campaign rollout in three selected online Nigerian newspapers, which investigates the role of media and COVID-19 vaccine hesitancy in the Nigerian media context.

This study is designed around three articles that address the research questions and examine the role of YouTube and online newspapers in the COVID-19 vaccination campaign in Nigeria. Vaccination is critical to achieving herd immunity against COVID-19. However, this effectiveness depends on public willingness to vaccinate and fully inoculate a significant portion of the population (Ekwebelem et al., 2022). Therefore, mass vaccination is crucial to manage and control the COVID-19 pandemic. The next section is dedicated to reviewing key concepts in this study.

2.2 A Review of Key Concepts

This section focuses on reviews of the key concepts that shape the COVID-19 vaccination campaign, the role of the media, particularly, newspapers and YouTube as relevant channels and sources of information for health communication, and vaccine hesitancy in Nigeria.

2.2.1 COVID-19 Vaccination Campaign

On December 8th, 2020, Margaret Keenan was the first person to receive the Pfizer/BioNTech COVID-19 vaccine in the United Kingdom (UK) after it was officially approved (King, 2021). Keenan, a retired health worker, publicly promoted COVID-19 vaccination and was happy to motivate others to vaccinate (King, 2021). Consequently, the global vaccination campaign was kick-started to stem the infectiousness of the COVID-19 pandemic. Effective communication became crucial to educate people about the importance of vaccinating and ending the coronavirus pandemic (Khubchandani et al. 2021). Various campaign strategies have been implemented to achieve the inoculation target including training and capacity building, risk communication systems, internal and partner coordination, community engagement, public communication, tackling misperceptions, uncertainty, and misinformation management (Adebisi et al., 2021). Hence, the COVID-19 pandemic vaccination communication strategy is an approach that focuses on how the expansive media landscape promotes public involvement in vaccine acceptance (Pilch-Loeb, et al., 2021).

2.2.2 Crisis communication, COVID-19 pandemic, and the Media: An Overview of Global Media Framing of COVID-19 and Vaccines Crisis.

Over the years, academic writings in communication studies have shown that the field of crisis communication has largely evolved within public relations research (Avery et al., 2010; An & Cheng, 2010). Particularly, when scholars began analysing how organisations

respond to crises and their impacts on reputation management (Coombs, 2010). Therefore, public relations and crisis communication are two sides of the same coin that systematically apply similar communication components of comprehensive reputation management strategies. Hence, this research is grounded in the crisis communication approach and has developed its lens to study how Nigerian media frame the COVID-19 vaccination crisis. Grunig (2011) observed that public relations is systematically tied to the process of managing communication between an organisation and its audiences. On the other hand, in public health, crisis communication denotes how effective communication systems were adopted to increase awareness of a particular type of danger, its magnitude, consequences, and specific behaviours needed to mitigate such threat (Reynolds & Seeger, 2005). Therefore, the COVID-19 pandemic is a global health crisis that has caused unnecessary mortality and morbidity (Pollard et al., 2020). Drives socio-economic hardships and creates significant information disorder spreading like 'wildfire' across media platforms (Sellnow-Richmond et al., 2021). Researchers acknowledged the COVID-19 pandemic and vaccination campaign has been shrouded with speculations, misinformation and fake news (Havey, 2020; Marco-Franco et al., 2021; Raj & Goswami, 2020; Silva et al., 2023; Zimmerman et al., 2023). Therefore, a pragmatic approach to help us understand how the media frames COVID-19 and how the frames could potentially escalate or mitigate health crises is imperative. Scholars argue that the media connects people by covering the COVID-19 pandemic crisis story through different frames (Ogbodo et al., 2020). For instance, understanding how the media frame the prolonged COVID-19 pandemic crisis in three Western newspapers shows the German SüddeutscheZeitung, New York Times, and the British Guardian largely emphasise the economic consequences of the COVID-19 Crisis (Teschendorf, 2024). Similarly, (Ebrahim, 2022) shows that COVID-19 has been widely framed as a deadly pandemic that devastates and disrupts human life. Results indicated that the coverage predominantly

focused on severe consequences, while frames of reassurance were seldom addressed, despite the high survival rate. In line with previous research, therefore, this study intends to provide new insights into how the media frames the COVID-19 vaccine crisis from the Nigerian perspective.

2.2.3 Role of the Media (YouTube and Online newspapers) in Pandemic Health Communication

Pandemic communication is an important area that cannot be underestimated in public health as it is significantly influential in promoting critical health information (Croucher, 2024). Research shows media is one of the indispensable partners in health communication during the COVID-19 pandemic (Liu et al., 2020). Despite the existence of other sources of health information, media proved undeniably significant in disseminating important health messages (Konye, 2020). For instance, Nigerian newspapers have adopted different framing patterns in news, features, and editorials to communicate messages about the COVID-19 pandemic (Nwakpu et al., 2020). Considering the prevalence and reoccurrence of vaccine hesitancy in Nigeria, it is important to know and understand what is communicated about the COVID-19 vaccine in the media. Researchers discovered the Nigerian media were not able to adequately cover stories about the COVID-19 vaccine (Olijo, 2020). Akinwande et al. (2023), recognised that a media campaign-only strategy would have partly been more effective in driving the first-dose vaccination strategy in Nigeria to stem the COVID-19 pandemic. Therefore, the media's role, like YouTube and online newspapers, are recognised as an important source of information for sharing and receiving health communication during the COVID-19 pandemic vaccination campaign.

2.2.4 An Overview of YouTube and the COVID-19 Pandemic Vaccination Campaign

The development of the Internet and online media channels makes health information more accessible and greatly transformed health communication practices in Africa (Fayoyin,

2016). YouTube is an online platform that has more than 2.3 billion active users with more than 1 billion videos watched across 100 countries in 80 different languages, and 400 hours of videos uploaded daily (Mohsin, 2022). YouTube, therefore, is the second most visited website and a media channel that improves the domain of media convergence (Arthurs et al., 2018). Nigeria is a nation with considerable Internet penetration. The Internet penetration shows there are approximately 122.5 million Internet users in Nigeria (Adedeji, 2023).

However, due to the presence of significant Internet penetration, Nigeria is estimated to have over 33 million active social media users on different platforms including Facebook, Twitter, Instagram, WhatsApp, and YouTube (O'Peters, 2021). YouTube complements health information sharing and receiving, particularly, during the COVID-19 pandemic, rather than replacing traditional media in health communication (Ali & Yang, 2022; Moon & Lee, 2020; Sadiq et al., 2023). YouTube is one of the popular new media channels used to convey information about the COVID-19 pandemic in Nigeria (Dutta et al., 2020). With the development of COVID-19 vaccines, however, researchers observed YouTube serves as a platform that facilitates accessing and sharing health-related information that potentially influences people's decision-making process about the COVID-19 vaccination (Z. S. Ali & Yang, 2022; Basch et al., 2020).

Sharing and receiving news on social media platforms mostly helps spread information about the COVID-19 pandemic rapidly and quickly (Onwe et al., 2020). Research shows YouTube ads and videos were used to disseminate important public health information about COVID-19 (e.g., the role of microcelebrities during the COVID-19 pandemic), as well as news about COVID-19 vaccination campaigns (Agbese, 2022; Sadiq et al., 2023). Consequently, the impact of media convergence shows news articles are easily shared and accessed on social media platforms about the COVID-19 vaccination campaign in Nigeria (Nwaoboli & Asemah, 2021; Olu-Abiodun et al., 2022; Ugwuoke et al., 2021).

Nevertheless, empirical research indicates the quality and reliability of information regarding COVID-19 vaccines, especially on YouTube is mostly poor. For example, videos produced by medical professionals and educational channels, including health organizations, were more reliable than those from other sources (Chan et al., 2021). As a platform for sharing vital public health information, research suggests YouTube is influential in people's decision-making about pandemics, especially, considering how misinformation thrives about COVID-19 and vaccinations (Basch et al., 2021; Parabhoi et al., 2021). Therefore, Basch et al. (2020) suggested continuous tracking of YouTube is imperative to monitor what is communicated about the COVID-19 vaccine. Therefore**,** this study uses mixed methods content analysis to investigate the Nigerian YouTube platform and examine COVID-19 vaccine videos to understand the barriers to vaccine uptake from Nigerian YouTube user's comments. The next section reviews relevant literature and a brief history of newspapers and health communication in Nigeria, as well as the Nigerian online newspapers spheres and the COVID-19 pandemic vaccination campaign.

2.2.5 Health Communication, Online Newspapers, and the COVID-19 Pandemic Vaccination Campaign in Nigeria

According to (Lederman et al., 2008) “health communication is the study of the impact of communication on both health and healthcare delivery” (p. 4). Therefore, the role of newspapers in the coverage of health communication-related issues is well-documented in Nigeria (Torwel & Rodney, 2010). Online newspapers are part of the news media platforms that immensely support the COVID-19 vaccination awareness campaign (Shalini et al., 2022). Online newspapers are currently Nigeria's most viable and attractive means of news readership (Patrick, 2015). Studies show traditional print newspaper circulation is declining as online versions of newspapers are increasingly available and accessible for readers in different parts of Nigeria (Hassan & Azmi, 2018; Patrick, 2015). Readers' preference for

online newspapers is growing (Asemah & Gambo, 2016), access to the Internet and its interactive features, and the ability to provide timely information mostly motivate Nigerians to read online newspapers (Latiff, et al., 2015). Therefore, it is no surprise to see how most traditional newspaper publishers in Nigeria have transitioned to complement and provide online newspaper versions and frequently update their websites as well (Odeyemi, 2017).

Isaiah et al. (2019), discovered that online newspapers are functionally user-friendly and designed with significant interactive features for readers from the top 10 Nigerian online newspapers analysed. Therefore, online newspapers are crucial sources of reliable information for readers, especially during the COVID-19 pandemic, which has received significant attention in Nigeria's public health sphere (Hassan, Latiff, et al., 2015; Oguchi, 2022). Online newspapers are incredibly important to readers who consider them suitable and reliable for receiving information (Hassan, Nazri, et al., 2015). Particularly, when the COVID-19 pandemic became a critical area in public health that received heightened media coverage in Nigeria (Oguchi, 2022). This media attention confirms the significance of pandemic communication in conveying health-related information (Croucher, 2023). Hence, newspapers are recognised as conveyors of time-sensitive information to the people about COVID-19 across sub-Saharan African nations like Nigeria (Asubiaro et al., 2021). Specifically, in Nigeria, research shows newspapers covered more stories about COVID-19 than other media outlets like TV (Asogwa, 2021). However, factors such as ownership, editorial stance, political influence, and cultural/religious affiliations seem to affect news coverage and content, rather than just circulation and readership in Nigeria. Therefore, it is pertinent to note these factors (ownership, editorial stance, and geo-political influence, as well as culture /religion) as potential influencers of media coverage.

Media ownership refers to the control, financing, and ownership of major mass communication channels (e.g., radio, television, newspapers, magazines) by individuals or

powerful entities in a society. Media ownership research is crucial in journalism as it may impact or influence news content and practice (Sjøvaag & Ohlsson, 2019). Currently, there is little empirical evidence that shows how media ownership, politics, editorial stance, opinions, and features of online newspapers influence COVID-19 vaccine news coverage from the Nigerian perspective. Media ownership is an important factor recognised to play a significant role in influencing the messages intended to shape public opinion (Abubakre, 2017). In Nigeria, three broad types of media ownership were identified: government, private, and public service broadcasting (Targema & Ayih, 2017). Research shows media ownership and politics greatly influence TV news coverage of the COVID-19 pandemic in Nigeria, leading many to view the pandemic as a politically motivated virus highlighting the failings of the ruling party (Apuke & Omar, 2021b).

Similarly, editorials are a vital component of news media production and journalism practice. Editorials are the only section in a newspaper where the paper's opinions are expressly and carefully presented (Firmstone, 2019). However, with the emergence of Internet penetration and the transformed media landscape, online newspaper editors strive to balance democratic principles and economic benefits while maintaining editorial responsibility and control to promote an ideal editorial practice through participatory online media services (Ihlebk & Krumsvik, 2015). An editorial section offers an opportunity for the newspaper's editorial board to express its stance on matters deemed significant, and to provide insightful opinions to articulate their views on prominent issues (Golan & Lukito, 2015).

Newspaper editorials serve as a powerful platform where public opinions are shaped and health communication about the COVID-19 pandemic are discussed. For instance, Aziz et al. (2022) found COVID-19 editorials in Pakistani newspapers, especially in the *Dawn* newspaper identified problems, made moral judgments, diagnosed causes, and suggested

remedies, hence, the editorials provided valuable insights for policy decisions and guidance to the public and government. Also, with the emergence of the COVID-19 vaccination, Viswanath et al. (2021), discovered people who depended on mainstream newspapers, like the "*New York Times*, the *Washington Post*, or the *Wall Street Journal*" based on their exposure to news or the editorial slants about the COVID-19 news, were more likely to vaccinate themselves and their children.

Equally important to this research is the relevance of features in constructing COVID-19 pandemic vaccination stories. Features are usually longer stories, written about people or events. Features are part of the news production process that require significant resources, especially for features on politics, social issues, economy, and culture (Sjøvaag, 2016). Features mainly focus on and include soft news stories written, for example, in newspapers by journalists to entertain or to educate people about vital issues. Newspapers are considered vital sources of information that provide different updates, especially, when COVID-19 vaccines are developed and ready for trial (Zafri et al., 2021). Malik et al. (2023), suggested feature stories and opinion articles are valuable to understand how different newspapers framed COVID-19 vaccines. Consequently, the current research focuses on and includes editorials, opinion articles and feature stories to analyse the framing of the COVID-19 vaccination campaign rollout in Nigeria.

This study also considers examining all published COVID-19 vaccination stories from Nigerian online newspapers that emerged from political, cultural, and religious worldviews. Cultural and religious beliefs are the unique expressions of social values that form the basis of ideological principles in many societies, including Nigeria (Arowolo, 2022). In Nigeria, studies show cultural and religious leaders interpret spiritual values and set moral standards for their followers based on their general knowledge of social and moral values (Rahman et al., 2016). Therefore, Nigeria is a country where the influences of cultural, religious, trust,

and political polarisation are flaunted and reflected in news media coverage of national issues including vaccination campaigns (Ishaku, 2022; Musa & Ferguson, 2013; Obadare, 2005). As a result of the influences of cultural, religious, and political ideologies, for instance, interfaith cooperation emerged in Nigeria's public health as a concept that uses prominent influencers, such as political, and traditional leaders, religious leaders, imams, pastors, and political leaders to advocate for behavioural change and call for action to build trust and overcome suspicion in public health campaigns (Winiger & Peng-Keller, 2021).

2.2.6 Politics, Culture, Religious beliefs, and Vaccine hesitancy in Nigeria

Empirical evidence suggests Nigeria has a long history of vaccine hesitancy due to the backlash from polio and meningitis vaccines (Cooper et al., 2018; Omoleke et al., 2018; Taylor et al., 2017). The superior voices of cultural, religious, and political leaders are influential in shaping public resistance towards meningitis and poliomyelitis eradication vaccination campaigns in Nigeria (Malakoff, 2001; Obadare, 2005; Yahya, 2006). Research shows political and social leaders (i.e., where traditional chiefs and religious clerics in Nigeria) accused Western countries of using the oral polio vaccine to control population growth by adding anti-fertility, carcinogenic, and HIV-contaminated substances (Kopp et al., 2022; Obadare, 2005; Yahya, 2007). Therefore, distrust in the government, word-of-mouth misinformation, and propaganda disseminated through mass media channels, contributed to polio vaccine hesitancy in many parts of Nigeria (Kopp et al., 2022). As such, mistrust towards COVID-19 vaccine safety and efficacy in multicultural Nigeria has led to lower vaccination rates, creating mutual suspicion, and consequential behavioural resistance to COVID vaccination (Amuzie et al., 2021; Babatope et al., 2023; Sadiq et al., 2023; Sato, 2022).

Studies show lack of trust, especially in the Nigerian government, misinformation, and fake news, (cultural and religious conspiracies) on traditional and new media platforms

were the major factors and key drivers of vaccine hesitancy (Ekwebelem et, al., 2022; Sato, 2022; Talabi et al., 2022; Wonodi et al., 2022). For instance, the Nigerian media's vaccine stories were mostly focused on researchers from developed countries like the U.S., China, and the UK due to a lack of trust and undervaluing of African scientists in vaccine development (Olijo, 2020). On the other hand, challenges signifying the vaccines have side effects, are a mark of the beast, fear of safety, and other religious beliefs and conspiracy related-issues have fostered vaccine hesitancy, largely due to general misconceptions and misinformation in Nigeria (Olu-Abiodun et al., 2022; Wonodi et al., 2022).

2.3 Misinformation, Fake News, and Trust-related Factors Influencing COVID-19 Vaccine Hesitancy in Nigeria

2.3.1 Misinformation

In this study, misinformation, fake news, and trust are carefully conceptualised based on intellectual empiricism across boundaries and context-specific COVID-19 vaccine issues from the perspective of Nigeria's socio-political ambience. First, misinformation is a complex term and a concept that broadly defies universal definition. Although, the terms disinformation and mal – information are similar concepts but with noticeable different meaning and therefore not applicable to the context of this study. For instance, disinformation means intentionally spreading false information to mislead others, aiming to confuse and mix up fact with fiction. While mal information on the other hand means sharing information maliciously to cause chaos or reputational harm. In the context of this study, however, Jerit and Zhao (2020), see misinformation as a condition in which people hold incorrect factual beliefs with a high level of confidence. Misinformation also refers to any kind of false or inaccurate information that is either deliberately created or unintentionally spread (Southwell et al., 2019).

Consequently, based on the existing intellectual nuances and the nature of the concept, Vraga and Bode (2020), state misinformation is often influenced by factors specific to the lack of available evidence, expert opinions, and the general effect caused by the information ecosystem. Therefore, considering the existing divergence of conceptual definition for the term “misinformation”. Consequently, this study consciously adopted Southwell et al. (2019) conception which observed that misinformation could be “deliberate or unintentional “which thus aligns with this study's objectives. Therefore, misinformation is seen as any false or misleading information shared unintentionally, often due to misunderstandings or gaps in knowledge. Thus, misinformation about COVID-19 vaccines occurs when false information is deliberately or unintentionally spread, without any intent to cause harm.

The media landscape is a key information ecosystem that has witnessed a vast stream of misinformation since the start of COVID-19 vaccination campaigns (Kemei, et al., 2022). Research reveals misinformation is significantly associated with the decline in people's willingness to vaccinate, as seen in surveys from the UK and the U.S. (Loomba et al., 2021). For example, misinformation suggesting the COVID-19 vaccine is not safe or has side effects, and other cultural and religious conspiracies signifying the vaccines are the mark of the beast were famous across media platforms in Nigeria (Olu-Abiodun et al., 2022; Wonodi et al., 2022). Enitan et al. (2020) observed misinformation has fuelled vaccine hesitancy in Nigeria and suggested credible information is key to building trust in vaccination programs and countering fake news.

2.3.2 Fake news

The term “fake news is defined as the deliberate presentation of (typically) false or misleading claims as news, where the claims are misleading by design” (Gelfert 2018, p. 108). Consequently, this study adopted Gelfert’s (2018, p. 108) assumption of fake news as

the preferred definition to conceptually understand how the term fake news, the “deliberate presentation of (typically) false or misleading claims as news, where the claims are misleading by design”, could potentially be linked to how Nigerian media frame the COVID-19 vaccination campaign. Fake news can have serious consequences on people's intentions and behaviours (Farte & Obada, 2021). The persistent spreading of fake news is one of the primary reasons behind vaccine hesitancy (Carrieri et al., 2019; Kanozia & Arya, 2021; Krishna & Thompson, 2021). However, the WHO (2019) suggested it is vital to address vaccine hesitancy as it poses a significant threat to global public health. For example, since the start of the COVID-19 pandemic, Marco-Franco et al. (2021), observed the spread of COVID denialism, conspiracies, and fake news exacerbates the generation, circulation, and consumption of all types of news.

In Nigeria, social media platforms are often criticized for spreading fake news, while mainstream media is accused of disseminating ideologically biased misinformation to deceive unsuspecting members of the public (Okoro & Emmanuel, 2018). Since the official launch of the COVID-19 vaccination campaign in Nigeria on 5th March 2021, headlines and news stories in conventional media have been saturated with different news and information about the vaccines. Tsfati et al. (2020) found many people come across fake news stories not only on fake news websites but also through mainstream news outlets. Consequently, Talabi et al. (2022) discovered people who are predisposed to the vaccines' misinformation and fake news showed no significant change in their willingness to take the COVID-19 vaccination even when exposed to factual news. However, there is little empirical evidence that suggests how much of an impact social and conventional media had on Nigeria's COVID-19 vaccination campaign. Therefore, it is crucial to examine the accuracy of information and explore the rooted sentiments in what is communicated about COVID-19 vaccines across different

conventional media landscapes in Nigeria to help people make informed decisions regarding their health and encourage public trust.

2.3.3 Trust

Trust refers to the quality of integrity, tenacity, or positive character possessed by an individual or an entity (Mir et al., 2021). Trust is a crucial element in the development of the healthcare system as a social institution (Gilson, 2003). Establishing public trust in vaccines and the healthcare system is crucial for effective public health programs that provide lifesaving vaccinations (Ozawa & Stack, 2013). Trust is a behavioural tendency that influences and justifies how people view and react to public healthcare services. The perception of government institutions, communicating clear messages and knowledge on COVID-19 increases public trust and preventive health behaviours in pandemic control (Han et al., 2023). Similarly, with the start of COVID-19 vaccination campaigns, researchers have found people in most Asian countries who trust their leaders are more likely to accept COVID-19 vaccinations (Lazarus et al., 2021). Researchers also discovered people who have a lack of trust in the Nigerian government are not willing to accept and not likely to take COVID-19 vaccines (Ekwebelem et al., 2022).

Therefore, institutional trust in the context of this study refers to the level of confidence people have in government and public health institutions. Institutional trust plays a significant role in people's decision to get vaccinated and can also contribute to dispelling conspiracy theories that promote a general distrust of government institutions (Mir et al., 2021). Institutional trust is influential, as the solid link to social trust where people base their prior knowledge and experience on the ethical conduct and behaviours of the institutions (Sønderskov & Dinesen, 2016). Hence, the ability of institutions to consistently uphold their ethical standards and demonstrate integrity plays a crucial role in fostering trust (Downe et al., 2016). Consequently, trust is a fundamental component of developing successful and

cordial relationships as it encourages parties involved to engage in mutually beneficial interactions (Bachmann et al., 2015; Downe et al., 2016; Sønderskov & Dinesen, 2016). Therefore, in public health, a lack of trust in government and public health institutions, as well as misinformation about vaccines is a major threat to vaccination campaigns, especially during the COVID-19 pandemic (Bardosh et al., 2022; Dhama et al., 2021). With this in mind, this study examines Nigerian YouTube COVID-19 vaccine videos and analyses YouTube users' comments as the first step towards understanding the barriers of COVID-19 pandemic vaccine hesitancy using the theory of planned behaviour (TPB).

2.4 Theory of Planned Behaviour

The theory of planned behaviour (TPB) (Ajzen, 1985, 1991) combines intentions and perceived behavioural control to study and predict human behaviour. Ajzen's (1985, 1991) TPB identifies three factors that influence human behaviour: attitude, subjective norm, and perceived behavioural control. Attitude refers to how an individual views behaviour to be favourable or unfavourable; subjective norm entails the belief that individuals should or should not engage in behaviours based on the influence of those who matter to them; and perceived behavioural control is an individual's perception of how easy or difficult it is to carry out a behaviour. Hence, people's attitudes towards a behaviour are shaped and positively or negatively influenced by their beliefs about that behaviour (Ajzen, 2002). Research in health communication, particularly in vaccination campaigns, has shown people's beliefs play a role in their willingness or intention to get vaccinated (Biswas et al., 2021; Enea et al., 2023; Mattia et al., 2021). Given normative beliefs are related to social pressure or subjective norms, while behavioural beliefs present positive or negative attitudes towards the behaviour the control beliefs produce perceived behavioural control, which necessitates the willingness or difficulty to execute the behaviour (Ajzen, 1985).

Nuances of research exist about cognitive factors: trust, attitudes, knowledge, awareness, and perceived side effects of the COVID-19 vaccine, as well as the influence of social institutions, i.e. socio-political and cultural/religious opinion leadership have been studied as important factors that shape people's decision-making to vaccinate against the COVID-19 pandemic (Adekunle & Mohammed, 2022; Jennings et al., 2021; Zimmermann et al., 2023). In this study, the researcher argues these factors (trust, attitudes, perceived side effects, and the influence of cultural/religious opinion leadership) predict how cognitive and socio-behavioural factors shape YouTube users' comments about COVID-19 vaccine hesitancy in Nigeria. The current research further maintains cognitive and behavioural factors are powerful normative behavioural conditions that play a crucial role and are key in predicting why YouTube users' comments regarding the COVID-19 vaccine could potentially trigger vaccine hesitancy in the Nigerian YouTube platform. In addition, the study posits understanding these factors is critical in modelling the practical and empirical evidence to understand why and how cognitive and behavioural factors might influence the COVID-19 vaccination campaign in Nigeria. Therefore, examining the cognitive and socio-behavioural factors sheds more light on the complexities of the phenomenon and provides a sound empirical basis for developing effective future COVID-19 vaccine-related communication strategies to mitigate the influence of cognitive and behavioural barriers in vaccination and pandemic communication research.

Previous research shows anxiety, disbelief, mistrust, and fear of safety are critical considerations that shape people's intention to receive or not take the COVID-19 vaccine (Paul et al., 2022). As such, identifying the basics of communication and the imperatives of understanding how different people, specifically those whose opinions are influenced by social-behavioural factors, are needed for the COVID-19 vaccination process (Leach et al., 2022). Therefore, overcoming vaccine hesitancy requires increasing public trust and

willingness to receive COVID-19 vaccines (Thaker, 2021). Given that existing studies show most people denied the existence of the COVID-19 pandemic, it has made them more sceptical towards vaccines (Lindholt et al., 2021; Seddig et al., 2022). Consequently, communicating about the COVID-19 vaccine to people effectively suggests involving empathy, honesty, and truthfulness to build public trust (Broniatowski et al., 2021; Finset et al., 2020).

The potential risks of not getting vaccinated against the COVID-19 virus and the consequences of refusing to participate in the collective effort to achieve herd immunity through vaccination are enormous. This is particularly important to note, especially, for those who are sceptical, dismissive, or denying the existence of the COVID-19 pandemic (Breslin et al., 2021; WHO, 2022). Hence, understanding vaccine hesitancy and identifying contextual, cognitive, and socio-behavioural barriers is critical to successful vaccination outcomes, given that outcome is determined based on local contextual factors, vaccinations, as well as the people involved (French et al., 2020; Limbu et al., 2022). Therefore, identifying the determinants of vaccine hesitancy and then tailoring the vaccination campaign to fit this group is essential for behavioural change communication (Danabal et al., 2021).

This study is conceptually grounded and situated to use TPB to gain insights by examining the overarching behaviours of Nigerian YouTube users' comments on the COVID-19 vaccine issues. While YouTube has played a significant role in receiving and sharing public health information, there is limited literature that focuses on understanding the factors that influence vaccine hesitancy among YouTube users, and how this behaviour affects social and behavioural factors in the Nigerian YouTube media landscape.

Second, this study also uses content analysis and sentiment analysis to examine how three selected Nigerian online newspapers *(Vanguard, Daily Trust, and Leadership)* framed

the COVID-19 pandemic vaccination campaign as discussed in the next section, using framing theory.

2.5 Framing theory

In communication and media studies, framing is one of the most studied areas of research (Chong & Druckman, 2007; Matthes, 2009; Scheufele, 1999). By way of framing stories, issues and events, the media, is a powerful tool that shape and influence public opinion (de Vreese, 2005; Matthes, 2009; McCombs & Reynolds, 2002; Scheufele, 1999). As a concept, framing traditionally originated and is rooted in sociology and psychology, hence, conceptually connected to communication studies (Cacciatore et al., 2016). The conceptual foundation of framing in communication is set by Goffman (1974),who sees framing as the process where people consciously attempt to categorise, label, and interpret their experiences to make sense of them. Media “frames help people organise what they see in everyday life” (Borah, 2011, p. 248). Framing also means the process by which people develop a particular conceptualisation of an issue or reorient their thinking about an issue (Chong & Druckman, 2007, p. 104). Framing is, therefore, associated with how media communicate sources and present and define issues, events, or problems in a particular manner (de Vreese, 2005). As such, how the media present news or frame stories is influential in shaping public opinion and the way people think about a particular topic, event, or problem (McCombs & Reynolds, 2002).

Researchers argue understanding the concept of media framing effects is premised and germane to understanding the conceptual interaction between media and the audience (Scheufele, 1999; Sotirovic, 2000). Given that frames are essentially the mental structures or schemas that assist people in processing information (Wang et al., 2021). Hence, frames are considered schemes for presenting and understanding news items, however, framing is broadly and conceptually modelled from the perspective of media frames and audience

frames (Scheufele, 1999). The media frame is a combination of texts that reveals the existence or absence of selected “keywords, stock phrases, stereotyped images, sources of information, and sentences that provide thematically reinforcing clusters of facts or judgments” (Entman, 1993, p. 52). Similarly, media frames are the central media discourse for an event or issue conveying systematically organised ideas and language packages where Journalists “invent their own clever catchphrases, drawing on a popular culture that they share with their audience, and conceived of as a set of interpretive packages that give meaning to an issue” (Gamson & Modigliani, 1989, p. 3). Media frames serve as the vital conduit that any “written, spoken, graphical, or visual communication model communicators” use to construe or depict, for instance, “a person, event, episode, or issue, within a text” that is conveyed through an identified medium or channel to the targeted audience (D’Angelo, 2017, p. 1). The media frame, therefore, is conceptually labelled as an independent variable that predicts how information conveyed to the audience, as a dependent variable, reacts to mass-mediated messages (Scheufele, 1999).

Research on audience framing largely investigates “whether, how, under what conditions, and among whom frames in communication influence people’s perceptions of certain issues” (Aarøe, 2017). Three key psychological conditions underlining how issue framing effects shape the audience opinion were identified: the accessibility-applicability model, change in the importance of considerations and the content of considerations (Cacciatore et al., 2016; Slothuus, 2008). The accessibility model suggests exposure to a ‘set of considerations’ triggers their salience for all parties regardless of prior experience, whereas applicability effects state how prior knowledge structures of an audience member determine the resonance of a frame (Cacciatore et al., 2016). On the other hand, according to Slothuus (2008), an issue frame can influence people's opinions by changing the importance of existing considerations or introducing new perspectives or information previously considered

by the people. As such, an issue frame can “provide a new set of reason(s) for the people to support or oppose the issue. Therefore, the issue frame can shape people’s opinions by changing the content of the underlying considerations that make up their opinions” (p. 5).

Although the conceptualisation of media framing effects on the audience has been debated (Shulman & Sweitzer, 2018), the popular pragmatic social constructivism understanding argues the media's portrayal of social reality is shaped mostly by how the media define and interpret issues and events (Scheufele, 1999). At the same time, giving salience to certain aspects of the issues or events implies the media shape how individual cognitive processes influence how the audiences perceive and understand them (McLeod & Detenber, 1999; Scheufele, 2000; Yan, 2020). Communication scholars, particularly in political communication, discovered that framing effects persist longer among moderately knowledgeable individuals and dissipate quickly among both low and high-political knowledge groups (Lecheler & De Vreese, 2011). On the other hand, valence framing is another explanation for how framing effects can influence and trigger cognitive bias among the audience towards information judgment and decision-making process (Iotzov et al., 2023; McDonald et al., 2021).

In health communication research, particularly in vaccination campaigns, studies show that positively framed statements reporting more positive attitudes toward vaccination can influence vaccination attitudes (Altay & Mercier, 2020). For example, (Leader et al., 2009) found women who read that the HPV vaccine protects against cervical cancer were more likely to vaccinate themselves when the vaccine was available at a low or no cost. Similarly, recent studies show people who develop positive attitudes and less exposure to conservative media are more likely to get vaccinated against COVID-19 (Borah, 2023). Also, Abdel-Raheem and Alkhammash (2022) conducted a study where two groups of participants were exposed to pro and anti-vaccination messages in ‘semi-artificial news stories’ and

‘political cartoons.’ The study found readers of the news articles, and not the cartoons, were influenced by framing effects. This supports the notion that people actively try to organize, label, and interpret their experiences to make sense of them (Goffman, 1974). Therefore, implying people can use frames, as the "schemata of interpretation" to perceive, locate, identify, and label information (Goffman, 1974). Consequently, framing analysis demonstrates how communication and information genres such as speech, novels, and news reports can shape human consciousness (Entman, 1993).

Summary and research questions

Currently, Nigeria has only achieved vaccinating 39% of the general population against COVID-19 as of March 2024, which falls below the 70% vaccination target threshold set for 2022. At the same time, the number of COVID-19 cases keeps rising. Therefore, there is a need to reexamine the media's role and how mass-mediated messages circulate misinformation, fake news, and a lack of trust that potentially builds vaccine hesitancy against the COVID virus in Nigeria. Research shows in this digital age, media have the potential and serve as the conduit where public health messages reach diverse audiences through various new media outlets (Korda & Itani, 2013; Thorson & Wells, 2016; Wallington et al., 2010). However, mass-mediated messages hypothetically shape our perception of reality by drawing the reader's attention and emphasising certain aspects of news stories (Carragee, & Roefs, 2004). Therefore, framing is a process that shows how media present public health messages to shape audience understanding and influence public opinions on vital issues around public health (Wallington et al., 2010).

Thus, considering the context, framing theory is a suitable framework for understanding the role of online newspapers in the Nigerian COVID-19 vaccination campaign. The media have framed the COVID-19 vaccine differently. For example, researchers discovered news sourcing routines and news values has contributed to promoting

COVID-19 vaccine hesitancy in some sampled Pakistani newspapers (Kamboh et al., 2022). In addition, a content analysis of YouTube videos shows misinformation and a lack of trust about COVID-19 vaccine messages negatively influenced public perception and prompted vaccine hesitancy in different countries (Jin et al., 2021; Kessler & Humprecht, 2023; Sadiq et al., 2023). Therefore, how the media frames the COVID-19 vaccine debates around safety, and effectiveness, causing blood clots, and thrombosis is tantamount to promoting vaccine hesitancy (Ledford, 2021).

Despite existing research on framing effects (Aarøe, 2017; Druckman, 2001a, 2001b; Druckman et al., 2001; Entman et al., 2009; Lecheler & De Vreese, 2011; Scheufele, 1999), there is insufficient research examining news framing of COVID-19 and the COVID-19 vaccination rollout from a Nigerian perspective. Consequently, the fundamental challenges linking COVID-19 vaccine hesitancy, and these influential factors, misinformation, fake news, and trust are underexplored. Specifically, exploring the role of YouTube and online newspapers in the COVID-19 vaccination campaign has remained a cause for concern in Nigeria. Particularly, how these mediums give attention to the coverage of the COVID-19 vaccination campaign rollout, what is communicated about the vaccines, and the underlying sentiments around the COVID-19 vaccine media discussion are imperative. Therefore, this study is set to first, investigate the barriers to adopting the COVID-19 vaccine in Nigerian YouTube videos and user's comments. Second, the study examines news framing of the COVID-19 vaccination campaign rollout and conducts a sentiment analysis of three selected Nigerian online newspapers *(Vanguard, Daily Trust, and Leadership)*. Hence, the following key research questions were raised to guide the study:

2.6 Research Questions

1. How did Nigerian media frame the COVID-19 vaccination rollout?
2. What are the factors that shape/influence the media's framing of the COVID-19

vaccination discussion in Nigeria?

3. What are the reported barriers to COVID-19 vaccine adoption in Nigeria?

To answer these macro-level research questions, the researcher designed and has submitted three articles for publication. Table 1 presents the proposed publications to address research plans in line with the main objectives and research questions.

Table 1 Proposed Publications

Publications	Research Objectives	Research Questions	Medium
Article 1	To examine the reported barriers to the COVID-19 vaccination adoption in Nigeria	What are the barriers to the COVID-19 vaccine adoption in Nigeria?	YouTube
Article 2	To examine how Nigerian media frame the COVID-19 vaccination rollout	How did Nigerian media frame the COVID-19 vaccination rollout?	Three selected online Nigerian newspapers (*Vanguard, Daily Trust, Leadership*)
Article 3	To identify the factors that shape/influence the media's framing of the COVID-19 vaccination discussion in Nigeria	What are the factors that shape/influence the media's framing of the COVID-19 vaccination discussion in Nigeria?	Three selected online Nigerian newspapers (*Vanguard, Daily Trust, Leadership*)

Purposely designed for this research.

CHAPTER THREE

Research Methodologies

3.1 Introduction

This research adopts a quantitative content analysis method. Content analysis is a method for gathering and analysing the content of any form of "written, visual, or spoken" communication (Croucher, 2024, p.165). Hence, content analysis applies different techniques such as qualitative, quantitative, and mixed methods to collect data and contextualise findings (White & Marsh, 2006). In this case, the study adopts quantitative content analysis to examine the COVID-19 vaccination campaign in line with previous content analysis in vaccine-related research. Furthermore, the study also utilises natural language processing techniques as a computer-assisted tool to generate information from Nigerian online newspapers using sentiment analysis to analyse the COVID-19 vaccination campaign of Nigerian online newspapers.

This study uses a combination of descriptive statistics, thematic analysis, and sentiment analysis to analyse text and report findings. Given that the study is based on three articles, guided by research questions, a robust research method is required to investigate the complexities of the COVID-19 vaccination phenomenon in Nigeria. Table 2 presents the plans for the three articles with their respective titles, methods, formulated research questions, medium for data collection, and mode of data analysis guided by the positivist paradigm of social science research.

Table 2 An outline for the proposed three articles

Topic	Research Questions	Method	Medium	Mode of data analysis	Paradigm
Article 1 Vaccine Hesitancy: A Content Analysis of Nigerian YouTube Videos.	1. What is the tone of YouTube video headlines/titles related to the COVID-19 vaccination campaign in Nigeria? 2. What is the tone of Nigerian YouTube users' comments on Nigerian COVID-19 vaccine videos? 3. What causes of COVID-19 vaccine hesitancy are identified within Nigerian YouTube video user comments?	Content analysis	YouTube	1. Descriptive statistics. 2. Thematic analysis	Social science

Article 2 Framing the COVID-19 vaccine rollout in Nigeria: An analysis of online newspapers' coverage of the COVID-19 vaccines	1. How frequently did Nigerian newspapers' online editions frame COVID-19 in headlines before and after the vaccine rollout? 2. To what extent was the COVID-19 vaccine framed in terms of headline valence by Nigerian newspapers' online editions before and after the vaccine rollout? 3. What is the most frequently used frame in news articles about the COVID-19 vaccine in Nigerian newspapers before and after NAFDAC (National Agency for Food and Drugs Administration and Control) approval of the vaccine?	Content analysis	Online newspapers	1. Descriptive statistics. 2. Five generic frames by Semetko and Valkenburg (2000).	Social science

Article 3 Framing of the COVID-19 Vaccine Crisis: A sentiment analysis of selected online Nigerian Newspapers	1. What was the frequency of COVID-19- vaccine-related posts by each newspaper in 2022? 2. What frames emerged from the articles and headlines of each newspaper regarding COVID-19? 3. What was the overall sentiment conveyed by each newspaper regarding COVID-19? 4. To what extent can future newspaper publications be predicted based on the gathered data?	Content analysis	Online newspapers	Sentiment analysis	Social science

Research Paradigm

A research paradigm is key to exploring new perspectives to solve complex problems as well as propose novel solutions. It is a guide to unlocking conceptual ideas or theories, methodologies, and best research practices. A paradigm plays an essential role in our intellectual quest and shapes our scientific pursuits. A paradigm, therefore, is a fundamental belief system based on the conceptual assumptions and theoretical framework that shape our understanding of the world and how we study it (Abdul Rehman & Alharthi, 2016). At the same time, a paradigm is grounded on these sets of assumptions: epistemology (basic belief about knowledge), ontology (nature of reality), axiology (values), and the processes researchers follow towards uncovering what should be known, in other words, referring to the diverse methodological perspectives (Abdul Rehman & Alharthi, 2016; Aliyu & Adamu, 2015a; Hanson et al., 2005).

Drawing attention to the complexities of the existing beliefs such as positivism, interpretivism and critical theory in research, this study attempts to centre certain positions for envisioning different paradigms and conceptual alternatives that are foregrounded by underlying sets of values and linking these to the COVID-19 vaccination campaign, and vaccine hesitancy in media and communication research. Scholars argue a researcher's worldview is influenced by their identified paradigm and tradition, which forms a crucial part of the knowledge acquisition process (Kivunja & Kuyini, 2017). This study, therefore, is centred on positivism, a branch of social science otherwise known as naturalism, drawing upon Alharahsheh, and Pius's narration that positivism is a philosophical approach which emphasises or highlights scientific observation and generalisations to study society (Alharahsheh & Pius, 2020). The positivist paradigm believes "reality exists independently" and can be observed, identified, and clearly understood (Abdul Rehman & Alharthi, 2016, p. 53). The positivist view, therefore, emphasises the importance of empirical evidence and the

relevance of objective analysis in understanding the world around us (Alakwe, 2017; Berkovich, 2018; Park et al., 2020).

Previous studies show positivism accounts for 60% of the studies in mass communication research and is the leading philosophical paradigm in understanding the impacts of media and communication on society (Bryant & Miron, 2004; Potter et al., 1993; Rogers, 1981). Positivism is a natural or social science research where a logical scientific model is used to study social phenomena (Ali & Chowdhury, 2015). Potter maintains that in social science, researchers emulate this "logical framework of natural sciences". As such, social science researchers, "demonstrate that people are moved by causes of which they are unaware" (Potter et al., 1993, p. 320). Critics of the positivist paradigm argue pursuing research solely through a scientific model could cause dismissal and underestimation of research as a tool to understand the richness and complexity of our social world (H. Ali & Chowdhury, 2015). Similarly, this normative approach has also been criticised for being mainly Western-oriented due to the emergence of new media (Fourie, 2010). Nevertheless, scholars argue that "positivism could be regarded as a research strategy and approach that is rooted in the ontological principle and doctrine that truth and reality are free and independent of the viewer and observer" (Aliyu & Adamu, 2015 p. 81). However, this simple guiding ontological principle suggests that positivism remains crucial in natural and social sciences, particularly, for studies related to communication and mass media research (Alakwe, 2017).

There is a growing demand for methodological diversity as critics suggest paradigm compatibility as well as multidisciplinary research is necessary to include different approaches to improve research standards (Ghiara, 2020; Ryba et al., 2022; Venkatesh et al., 2013). As Park et al. (2020) have noted positivist research is not solely reliant on quantitative methods. Therefore, this study integrates sentiment analysis to further analyse the COVID-19 vaccine news stories generated from Nigerian online newspapers. Sentiment analysis is

especially relevant to understanding how sentiments can induce different emotions. According to Kennedy (2012), “sentiment analysis uses linguistic and textual assessment, such as Natural Language Processing, to analyse word use, word order, and word combinations and thus to classify sentiments, often into the categories of positive, negative, or neutral” (p. 435). This study uses quantitative content analysis, natural language processing and sentiment analysis to investigate YouTube and online newspapers as the crucial media platforms that reported the COVID-19 vaccination campaign rollout in Nigeria between Dec 2020 – Dec 2022.

3.3 Content Analysis

Historically, content analysis has been an integral part of communication research, offering valuable insights in the fields of mass communication and media studies (Croucher, 2024; Krippendorff, 2019; Macnamara, 2005; Stemler, 2015). Content analysis is a method for gathering and analysing the content of a text (Croucher, 2024). Therefore, according to (Carley, 1993) “content analysis focuses on the frequency with which words or concepts occur in texts or across texts” (p. 81). Content analysis is a research method that uses coding techniques and interpretation of latent meaning to analyse data in a structured and replicable way (Lock & Seele, 2015). However, this makes “content analysis a research technique for making replicable and valid inferences from text (or other meaningful matter) to the contexts of their use” (Krippendorff, 2019, p. 24). Consequently, in the domain of content analysis, Croucher (2024, p. 165) sees “text” as any form of “written, visual, or spoken” communication.

The advent of new media platforms has further revived and accorded prominence to content analysis, given that a wide range of data sources, including textual data, visual stimuli (e.g., photographs/videos), and audio data can be content analysed (Stemler, 2015). Hence, the domain of content analysis varies according to the goals set by the researcher(s), the

chosen approach or methods, the type of media and the contexts. The following methods: quantitative, qualitative, and mixed methods are the popular distinct approaches to content analysis. Given that "content analysis is a method that allows the researcher to analyse secondary communication material and draw (statistically tested) meaning from manifest as well as latent content" (Lock & Seele, 2015, p. S27). Quantitative content analysis, therefore, examines texts or transcripts, where researchers intend to draw statistical inferences (Franzosi, 2008).

3.3.1 Quantitative Content Analysis

Quantitative content analysis is an empirical method of scientific enquiry within the positivist research tradition that focuses on drawing statistical inferences largely from texts and transcripts (Franzosi, 2008; White & Marsh, 2006). This type of analysis also applies to text and audiovisual with the aim of quantifying trends in media (Champion et al., 2016). The content analyst "collects data about media content such as topics or issues, the volume of mentions, 'messages' determined by keywords in context (KWIC), circulation of the media (audience reach) and frequency" (Macnamara, 2005, p. 4). In quantitative content analysis, the researcher(s) not only present results, however, it must ensure that established procedures such as categories, coding, intercoder reliability, coding scheme etc can be replicated independently to ensure validity and reliability (Croucher, 2024; Krippendorff, 2019; Macnamara, 2005; White & Marsh, 2006). In this study, the researcher ensures the established procedures (i.e., content categories, coding, coding scheme, and intercoder reliability etc) for quantitative content analysis have been critically discussed, outlined, and applied in articles 1 and 2.

Quantitative content analysis has gained recognition and prominence in health communication research. For instance, Manganello and Blake (2010) conducted a quantitative content analysis to examine health communication messages in the U.S. media

and the findings show a remarkable increase in research on health-related messages from 1985-2005. Also, McCaw et al. (2014) investigated online health information to know what newspapers tell their readers, however, the findings discovered newspapers helped readers to source information online during pandemic outbreaks. Particularly many quantitative studies identified that newspapers play a significant role as conveyors of important health messages and shaping public response during the COVID-19 pandemic (Basch et al., 2020; Eric Msughter & Phillips, 2020; Xu et al., 2022). With the proliferation of social media platforms such as YouTube, researchers became interested in how YouTube users' behaviours changed toward public health messages (Sui et al., 2022). Also, researchers have begun to consider how misinformation through YouTube has immensely contributed to vaccine hesitancy (Donzelli et al., 2018). Therefore, this study adopts quantitative content analysis to examine how the COVID-19 vaccination campaign rollout in Nigeria was covered in three selected Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership),* and what is communicated about the COVID-19 vaccines in Nigerian YouTube. Articles 1 and 2 were conducted, and the findings addressed this research goal.

3.3.2 Natural Language Processing and Sentiment Analysis

Natural language processing is a computer-based tool that is becoming a popular method of data gathering gaining prominence in journalisms and mass media studies (Abdulmajeed & Fahmy, 2023). Natural language processing is an evolving grounded type of data gathering that helps researchers analyse big datasets and ensures a more rigorous sampling process is sustained (Shahin, 2016). In using a natural language processing interface, researchers explore how computer applications "can be used to understand and manipulate natural language text or speech to do useful things" (Chowdhury, 2003, p. 1). Therefore, natural language processing, also called opinion mining, is a powerful computer-assisted process used to extract meaningful information and generate insights from texts,

which involves techniques that can analyse text content for various purposes such as topic discovery, pattern identification, and trend analysis (Khan et al., 2016; Susnjak, 2024).

Natural language processing employs sentiment analysis as a computerised type of technique researchers use in identifying the existing polarization or bias in a dataset (Khan et al., 2016; Susnjak, 2024). As such, sentiment analysis is a critical process that analyses and classifies texts as positive, negative, or neutral (Liu, 2010; Mohammad, 2015; Nasukawa & Yi, 2003). However, the fundamental aim of sentiment analysis, is to extract meaningful insights from large volumes of unstructured data to gain a deeper understanding of the bias-embedded sentiment within the datasets (Birjali et al., 2021; Hajiali, 2020; Shayaa et al., 2018; Yadav & Vishwakarma, 2020). Research shows the COVID-19 vaccination campaign has emerged with intense debates and controversies regarding vaccine safety and efficacy (Gori et al., 2021). Hence, the media is the most prominent platform where the COVID-19 vaccination debates and controversial discourses occur (Massarani & Neves, 2021). For example, Zimmermann et al. (2023) compared the coverage of COVID-19 vaccine information campaigns and controversies in newspapers from Switzerland and Austria. The study found Swiss newspapers had more negative statements about the vaccine than those in Austria and scepticism about the vaccine and evaluative statements were only dominant in the Austrian newspapers. The negative stories about the COVID-19 vaccine are mostly framed as showing the vaccine has side effects, causing death, thrombosis, or blood clots (Amoretti & Lalumera, 2023).

In this research, article 3 (detailed process and methodology) is conducted through natural language processing combining a sentiment analysis approach to investigate the coverage of the COVID-19 vaccination campaign rollout in the selected online Nigerian newspapers (*Vanguard, Daily Trust, and Leadership newspapers)*. The aim is to explore how

news frames in the headlines and other stories related to COVID-19 vaccines might provoke bias that could potentially promote COVID-19 vaccine hesitancy.

3.4 Data Collection

Data collection is the process of generating information from relevant sources to solve given research problems. Data collection refers to the systematic process of gathering relevant information to gain insights about a particular research topic (Taherdoost, 2021). There are different types of data collection processes, however, in this research, data collection is conducted according to the three articles. Therefore, the researcher explains the three phases of data collection for each article as appropriately conducted and discussed in the following section.

3.4.1 Article 1. Methods of Data Collection

The paper adopts quantitative content analysis to extract relevant information for analysis from the Nigerian COVID-19 vaccine YouTube videos. Only the videos uploaded from March 2021 – December 2022 were considered for analysis. The chosen dates were justified given Nigeria launched the COVID-19 vaccination campaign in March 2021, to attain a 70% vaccination target by December 2022 to completely eradicate the COVID-19 pandemic in Nigeria. However, the search for relevant videos on www.YouTube.com (YouTube.com, 2022) accessed on 6 December 2022 was carried out using the following keywords “COVID-19 in Nigeria”, “COVID-19 vaccination in Nigeria”, and “COVID-19 vaccine hesitancy in Nigeria”. From the search, therefore, a total of 319 videos of the COVID-19 vaccine on Nigerian YouTube produced in English were generated. The generated YouTube videos were further sorted to confirm their relevance for inclusion, which is consistent with prior research (Briones et al., 2012; Nguyen et al., 2021). The researcher excluded 65 videos after careful sorting which were observed to be duplicated and those videos that were posted before March

2021, hence, leaving a total of 254 relevant COVID-19 vaccine YouTube videos for analysis in this study.

3.4.2 Coding Scheme

In content analysis, a coding scheme is a roadmap or a framework that systematically identifies areas of interest in the data for researchers. According to Treadwell and Andrea (2019), “a coding scheme means developing a classification system or categories into which each sampled unit can be placed”. Given that “content analysis requires all sampled units be placed in a category” (p. 219). In this study, each of the sampled COVID-19 vaccine YouTube videos was downloaded and saved together with the YouTube link. The YouTube videos were largely created by mainstream media channels, government sources, NGOs and international health organisations like W.H.O and UNICEF. However, to code and analyse the tone of the COVID-19 vaccine YouTube videos, the researcher coded only two features in the videos: the title/headline of the video and all user comments. The features were further categorised as positive, negative, and neutral. Researchers argue that it is a common practice to categorise the content and code messages as positive, negative, or neutral, specifically, in content analysis (Briones et al., 2012; Covolo et al., 2017; Nguyen et al., 2021).

Many previous studies using content analysis have used pre-existing coding schemes (White & Marsh, 2006). Therefore, this study followed previous research and adopted similar practices and categorised and coded messages under positive, negative, and neutral/not applicable. The categories in this study were defined as follows. First, messages that convey news about the existence of COVID-19 and support COVID-19 safety protocols and vaccination(s) are classified as having a positive tone in this study. Secondly, messages that contest the existence of COVID-19 and disapprove of vaccination are classified as having a negative tone. Third, messages that don't express any opinion on the existence of COVID-19

and instead focus on information that doesn't apply to the study context are classified as having a neutral or not applicable tone.

3.4.3 Coding

In content analysis, coding is a systematic process that involves assigning interpretive tags or text to relevant research categories or themes (Cope, 2010). In this study, the researcher developed a codebook to investigate and examine the reported barriers and causes of COVID-19 vaccine hesitancy from the generated samples of comments from Nigerian YouTube. However, thematic analysis was used adopting a modified list of themes for social media comments about vaccines, developed by Broniatowski et al. (2018) was utilised. Before coding, there was no specific pattern used except that only videos that had a comments section enabled are considered for analysis. The researcher observed most YouTube videos had disabled and turned off their comments sections, nevertheless, only 57 Nigerian mainstream media YouTube videos had comment sections enabled. Therefore, an online tool exportcomments.com accessed on 7 February (2023) (Export Comments, 2023) was used to generate the relevant comments from the 57 Nigerian COVID-19 vaccine videos with accessible comments. Finally, a total of 985 comments were retrieved, downloaded, and saved on Microsoft Excel for analysis.

The thematic analysis was conducted using a deductive approach. Deductive content analysis is employed when the analysis framework is based on existing knowledge. This approach is beneficial for testing an existing theory in a new context or for comparing categories across different periods (Elo & Kyngäs, 2008). Therefore, a set of predetermined categories in a list of themes for comments associated with vaccines on social media developed by Broniatowski et al. (2018) was adapted and modified. Analysis was made on Excel sheets with the main researcher and two coders who carefully read and linked the

aspects of chosen data from the YouTube user's comments that fit into the categorization frame.

3.4.4 Intercoder Agreement

Intercoder reliability is a generic term used in content analysis to describe how independent coders assess the characteristics of a message or object and draw similar conclusions (Lombard et al., 2010). Reliability in content analysis refers to the consistency of the coding process. It is the tendency for all assigned coders to code the same data in the same way over a period of time. For the content analyst, reproducibility simply means the ability of a group of coders to classify thematic categories in the same way (Busch et al., 2005). The primary aim of intercoder reliability in content analysis is to ensure the coding is accurate and reliable especially when human coders are involved (Croucher, 2024). There is no ‘standardised test’ of intercoder reliability, however, different techniques for measuring reliability are bound in content analysis, and each with its sound applicability and interpretation of data depending on the context (Lombard et al., 2010; Matthes & Kohring, 2008). However, according to Croucher (2024) in content analysis, “per cent agreement and Cohen’s kappa are the most common methods of evaluating intercoder reliability” (p. 170).

As part of the process of ensuring the accuracy of this study, two coders were assigned to code the data independently. According to Macnamara (2005), to achieve the highest degree of reliability in media content analysis, researchers are mandated or encouraged to use two or more coders, at least for a portion of the content (also known as the reliability subsample). Croucher (2024) argues higher reliability indicates greater consistency among coders in understanding content in the same way. Therefore, in this study, the intercoder reliability was measured using percentage agreement for sample size and final coding. The intercoder reliability for the final coding of the headlines/titles was 76.77%. The intercoder reliability for coding users’ comments was 79.03%.

3.4.5 Data Analysis

In this study, data was analysed using descriptive statistics, frequencies, and percentages in the quantitative content analysis section. However, thematic analysis was used to interpret the YouTube comments and generate meanings for the COVID-19 vaccine videos on YouTube. See (chapter 4) for the analysis of findings and interpretation of the results.

3.5 Article 2. Methods of data collection

This section collects data for article 2 of this study, a quantitative content analysis approach was used to collect data from three popular online Nigerian newspapers (*Vanguard*, *Daily Trust, and Leadership)* ranked among the top 10 newspapers in Nigeria (Newspaper Web Ranking, 2019). However, online editions of these (*Vanguard*, *Daily Trust, and Leadership)* newspapers were analysed for the periods chosen between December 2020 and December 2022.

3.5.1 Rationale for Selecting Newspapers

Nigeria has 43 daily newspapers in circulation (Fadairo et al., 2014). However, 26 of these newspapers have been listed in the 2019 top Nigerian newspaper rankings (Newspaper Web Ranking, 2019). Therefore, the national dailies *Vanguard, Daily Trust, and Leadership* were selected in this study. Researchers have acknowledged the role of some national daily Nigerian newspapers in reporting the side effects of COVID-19 vaccines (Soyemi et al., 2021). Therefore, these three national daily newspapers were chosen for four reasons. First, these newspapers were among Nigeria's top 10 most highly read and circulated newspapers: *Vanguard, Daily Trust, and Leadership* based on the 4th International Media and Newspapers (2019) ranking (accessed on May 10, 2023). Second, the newspapers were chosen based on regionality, with papers serving Nigeria's South and Central/Northern parts. Therefore, the selection of these newspapers was purposeful due to their unique geopolitical characteristics

and shared attributes. Third, the selected newspapers have a national reputation among those with in-depth and wider reportage of social, economic, political, and health-related coverage published in the English language. Even though other newspapers are published in different indigenous Nigerian languages, however, the English language is considered the official language of communication in Nigeria. Four, the newspapers were also chosen because Lagos, Kano, and Abuja were the epicentre of the COVID-19 pandemic, contributing 64.5% of the cumulative total of COVID cases in Nigeria (Dan-Nwafor et al., 2020; Lambu, 2022).

At the same time, the selected newspapers have unique geopolitical features, for example, the *Vanguard,* considered the leading newspaper in Nigeria, was established in 1984. *Vanguard* newspaper is domiciled in Lagos, South-West, a commercial city in Nigeria that has a wider circulation of 130, 000 hard copies on a daily average across the length and breadth of the country, and the paper is accessible online via this website: https://www.vanguardngr.com. *Daily Trust* started publishing as *"Weekly Trust"* in Kaduna North-West, the core city of northern states of Nigeria, and officially, the newspaper started publishing as *Daily Trust* in 2001 with offices in Kaduna and Abuja. *Daily Trust* has a special patronage across all the northern states, which considers it as the voice of northern Nigeria. Therefore, Daily Trust has enjoyed an online presence and at the same time, it is immensely enjoying wider circulation in northern Nigeria. This is the official webpage of Daily Trust: Daily Trust. The Leadership newspaper came into existence in 2004 and since then, the newspaper has continued to be recognised as one of the leading newspapers in Nigeria. The newspaper is headquartered in Abuja, the Federal Capital Territory, and has won several awards of excellence. Leadership is published in English, has a broader national coverage and online presence, as well as significant circulation in Abuja and other parts of Nigeria. This is the official website of the paper: https://www.leadership.ng.

3.5.2 Population and Sampling

The 26 listed newspapers on Web Ranking 2019 collectively formed the population of this study (Newspaper Web Ranking, 2019). However, given that there was a total lockdown and restrictions on socio-economic activities caused by the COVID-19 pandemic. Therefore, many newspapers were constrained to publish only the online versions. However, *Vanguard, Daily Trust, and Leadership* were among the major online newspapers in Nigeria (Nwabueze et al., 2019). As such, these three newspapers were chosen purposefully and sampled for analysis. Moreover, studying a manageable sample size is mostly encouraged in content analysis of newspapers (Luke et al., 2011). Given that researchers are recommended to avoid using random samples when selecting media content for analysis to minimize challenges (Rifle et al., 1993, 1996).

However, the sensitive nature of the study warrants that the researcher collects all the monthly and weekly editions per season of the years only for December 2020 – December 2022. This approach is adopted in line with previous research recommendations (Slater et al., 2008) of ensuring a balanced sample in terms of month and week of the year was important to represent news coverage during each year under study. Hence, the three newspapers were contacted for copies of all editions from December 2020 to December 2022. Each newspaper supplied pdf copies of each edition from the data collection period. A total of 2,277 soft copies (PDF) editions were supplied and collated for analysis.

After the collation was done and all pdfs saved, the researcher conducted data sorting of the relevant articles for analysis with the keyword search: COVID-19 vaccine, COVID-19 vaccination, COVID-19 Jab, however, 922 relevant articles were generated for analysis. Data cleaning was further conducted to ensure all relevant articles were included, hence, the researcher discovered seven articles were duplicated. Therefore, the seven articles were removed and excluded, leaving 915 articles for analysis. From the 915 articles, four articles

were discovered to report (Malaria, HPV, Lassa Fever, and Polio vaccines), thus excluded, and a total of 911 articles were retained for final analysis. The *Vanguard* had 307 news articles, the *Daily Trust* had 192 news articles, and the *Leadership* Newspaper had 412 news articles.

Table 3 Show the frequency and distribution of COVID-19 vaccine articles published in each sampled newspaper per month.

Months	**Vanguard**	**Daily Trust**	**Leadership**
December 2020	9	5	33
January 2021	36	16	65
February 2021	28	21	46
March 2021	71	27	57
April 2021	22	12	21
May 2021	14	5	15
June 2021	13	9	11
July 2021	14	3	13
August 2021	12	12	18
September 2021	22	12	21
October 2021	17	5	13
November 2021	9	10	16
December 2021	19	16	27
January 2022	9	3	14

February 2022	2	3	14
March 2022	3	8	1
April 2022	0	2	3
May 2022	2	3	3
June 2022	1	3	8
July 2022	1	3	4
August 2022	2	7	3
September 2022	0	3	4
October 2022	1	3	1
November 2022	0	0	1
December 2022	0	1	0
Overall total	307	192	412

3.5.3 Coding Scheme

All the 911 downloaded articles were saved in PDF. Two features were selected for coding to analyse how Nigerian newspapers present the COVID-19 vaccines before and after the rollout.: (a) headlines in the news articles and (b) the news articles. First, all headlines under each newspaper were grouped and calculated separately to examine the frequency. Second, all headlines were categorised as positive, negative, and neutral to examine headline valence. This idea of classifying media contents and coding messages as positive, negative, and neutral is a generally accepted universal research practice, especially in vaccine-related content analysis (Nguyen et al., 2021; Sadiq et al., 2023). Congruent with this practice, the researcher coded messages as positive when headlines conveyed information about herd immunity, vaccine efficacy, safety, availability, accessibility, etc., of COVID-19 vaccines. Messages were coded as negative when the headlines conveyed information suggesting vaccines cause death and side effects, COVID-19 vaccines are not safe or effective, etc. Last, messages were coded as neutral when the headlines did not mention vaccine efficacy or safety. Third, all the headlines and articles were coded to examine the most frequently used frames in the articles. The researcher developed a codebook, and the 911 articles were printed, and copies were provided to coders for analysis. The five generic frames developed by Semetko and Valkenburg (2000) were adapted and modified: the conflict frame, human interest frame, economic consequence frame, morality frame, and attribution of responsibility frame.

3.5.4 Intercoder Agreement/Reliability

Intercoder reliability is the major focal area of concern in most content studies where human coders are involved (Neuendorf, 2010). Reliability simply means the tendency in which consistency is achieved by coders in coding the same data over time. Therefore, intercoder

reliability refers to the level of agreement achieved and how independent coders harmoniously assess the characteristics of a message or artifact in the same way (Croucher, 2024; Lombard et al., 2010). Also, reliability relates to the tendency where coders can interpret and classify themes and categories in the same way (Busch et al., 2005). In this study, therefore, two coders, PhD students in communication, independently coded the data to ensure reliability. Macnamara (2005) proposed using two or more coders to increase the reliability of coded content samples, which is also known as a reliability subsample. The two coders use the percentage agreement for the reliability test. Croucher (2024) suggests using a high percentage of agreement to measure the average agreement among coders recommended. Therefore, in this study, the intercoder agreement for coding the headlines was 85.4%, while the intercoder agreement for coding the articles presented 72% agreement.

3.5.5 Data Analysis

Data was analysed using descriptive statistics, frequencies, and percentages for the headlines and generic frames adapted to analyse the COVID-19 vaccine stories in this study. See chapter 4 for the analysis of findings and interpretation of the results for the article 2.

3.6 Article 3. Methods

Article 3 utilises natural language processing (NLP) techniques, and sentiment analysis was conducted to examine how three selected Nigerian online newspapers *Vanguard, Leadership and Daily Trust* report the COVID-19 vaccine roll-out. Python was used to process data, and visualisation was done using Excel. Sentiment analysis was performed on headlines and news articles to gauge the newspapers' overall stance towards the COVID-19 vaccine roll-out. The

dataset was divided into training and testing sets. The model was then used to predict future sentiments expressed in the three sampled newspapers.

3.6.1 Data Collection

Octopus Collector for web content retrieval was used to scrape and collect data for analysis. Using four varying sets of keywords "COVID-19", "vaccine", "COVID-19 jab", or "vaccination", searches were conducted on the official websites of the three selected newspapers *Vanguard, Daily Trust and Leadership*, between December 1, 2020, to December 1, 2022. The software was also used to crawl information such as news headlines, publication dates, brief content descriptions, and links. Both headlines and news contents were collected and analysed separately. Moreover, only news articles posted in English were included in the study, while those in other languages were excluded. After collection, the data were processed and cleaned using Python and Excel. Initially, the collected data were observed to standardise different content formats for various keywords and websites. The main modifications included organising the data into columns for titles, links, dates, and brief content descriptions.

A preliminary analysis was conducted to determine the total number of news articles and identify the website with the highest number of news articles. Subsequently, for further analysis, Python was used to remove news articles containing blank lines, resulting in a dataset with valid content. Libraries such as TextBlob and NLTK were utilized to eliminate punctuation, special characters, and non-English bytes from sentences. Since the collected data consisted of news reports, the language usage was already formal and no additional processing was performed on word usage. Initially, a total of 9761 news items were collected from the three newspaper websites. Figure 1: number of news containing key words (including headline and news articles).

Figure 1. Keywords Frequency

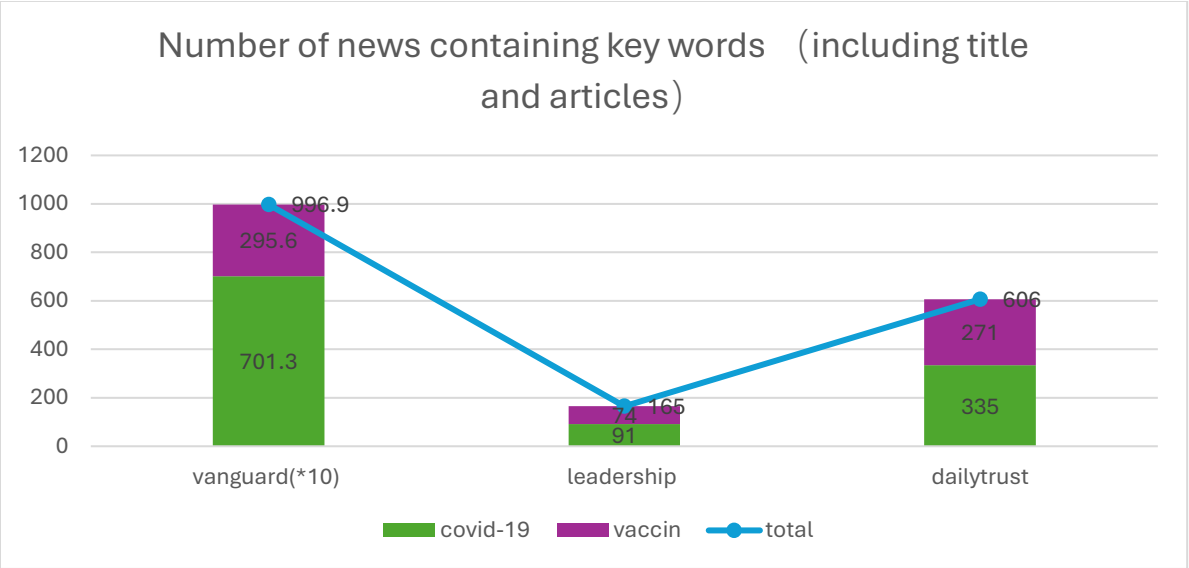

Figure 1. Keyword frequency shows the number of news containing keywords (including headlines and news articles).

During the review period, Vanguard emerged as the primary source of relevant news, contributing a total of 7982 related articles. In contrast, the other two newspapers posted significantly fewer articles, with Leadership publishing 1007 articles and Daily Trust posting 772 articles. After data screening and cleaning, 9412 news items remained for subsequent analysis. Irrelevant and unnecessary news articles were removed from the study. For instance, articles containing the keyword "COVID-19" but not mentioning vaccination-related topics were deemed irrelevant. Similarly, articles about vaccines unrelated to COVID-19 were excluded. Following data cleaning, nearly 50% of the news articles posted by *Daily Trust* were removed due to irrelevance, reducing the number from 772 to 442. Only 17 news articles were removed from *Vanguard*, and 2 pieces from *Leadership*, indicating the three selected newspapers publish news articles relevant to COVID-19 vaccines under the keywords search.

3.6.2 Sentiment Level Analysis

Sentiment analysis assists in analysing human emotions to determine its polarity (Hossain et al., 2021). It involves categorising textual information into objective and subjective texts based on the context of communication. Objective texts present information without expressing opinions or sentiments. Conversely, subjective texts convey opinions, emotions, or reactions. The objective of sentiment analysis is to comprehend individuals' states of mind conveyed through text, making it more applicable to subjective texts. Text sentiment can be determined at the phrase, sentence, or document level (Albrecht et al., 2020). In the study, the headline analysis is at the sentence level while the body paragraph analysis is at the document level. The process begins by importing the TextBlob class from the Textblob library. Subsequently, the text is defined, and a TextBlob object is created from the sentiment. The polarity method of the TextBlob object is then utilised to calculate the polarity score, which ranges from -1 to 1. Scores closer to 1 indicate positive sentiment, those closer to -1 denote negative sentiment, and values around 0 signify neutral sentiment. Following the polarity score calculation, sentiment is classified as positive, negative, or neutral based on the obtained score.

Finally, the original text, sentiment classification, and sentiment score are printed. In addition, we labelled and scored each news title and content summary, creating four new columns: title sentiment, title sentiment score, article sentiment, and article sentiment score. Simultaneously, we divided the dataset into training, testing, and prediction sets in a 9:1 ratio. Using the sentiment analysis model TextBlob, sentiment polarity was classified as positive, negative, or neutral. We assessed the model's performance by comparing the actual sentiment labels of the testing set with the predicted sentiment labels. We utilized a confusion matrix to evaluate the predictive performance of our models (Wang et al., 2021). Table 3 presents the

confusion matrix and model accuracy for each newspaper, derived from the linear SVC modelling process. For a detailed walkthrough of Support Vector Machine (SVM) and Natural Language Processing (NLP), readers can refer to the comprehensive guide provided by Rameshbhai and Paulose (2019) (Wang et al., 2021).

CHAPTER FOUR

Article 1.

COVID-19 Vaccine Hesitancy: A Content Analysis of Nigerian YouTube Videos

MASSEY UNIVERSITY
UNIVERSITY OF NEW ZEALAND
GRADUATE RESEARCH SCHOOL

STATEMENT OF CONTRIBUTION
DOCTORATE WITH PUBLICATIONS/MANUSCRIPTS

We, the student and the student's main supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the student's contribution as indicated below in the Statement of Originality.

Student name:	Mohammed Sadiq
Name and title of main supervisor:	Professor Stephen Croucher
In which chapter is the manuscript/published work?	Chapter Four

Describe the contribution that the student and members of the supervisory team have made to the manuscript/published work:[1]
The student collected and analysed data, in addition, the student wrote the review of literature, discussion and implications. The second, and third authors assisted with structure, analysis, theory development, and editing.

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  Sadiq, M., Croucher, S., & Dutta, D. (2023). COVID-19 vaccine hesitancy: A content analysis of Nigerian YouTube videos. Vaccines, 11(6), 1057. https://doi.org/10.3390/vaccines11061057
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Article

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Article

COVID-19 Vaccine Hesitancy: A Content Analysis of Nigerian YouTube Videos

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Abstract: Vaccination is key to developing herd immunity against COVID-19; however, the attitude of Nigerians towards being vaccinated stalled at the 70% vaccination target. This study engages Theory of Planned Behaviour to analyse the tone of Nigerian YouTube headlines/titles, and the tone of YouTube users' comments to examine the causes of COVID-19 vaccine hesitancy. YouTube videos uploaded between March 2021 and December 2022 were analysed using a content analytic approach. Results show 53.5% of the videos had a positive tone, while 40.5% were negative, and 6% neutral. Second, findings indicate most of the Nigerian YouTube users' comments were neutral (62.6%), while 32.4%, were negative, and 5% were positive. From the antivaccine themes, analysis shows the people's lack of trust in the government on vaccines (15.7%) and the presence of vaccine conspiracy theories mostly related to expressions of religion and biotechnology (46.08%) were the main causes of COVID-19 vaccine hesitancy in Nigeria. The study presents implications for theory and recommends ways for governments to develop better vaccination communication strategies.

Keywords: COVID-19 vaccine; theory of planned behaviour; health communication; content analysis

check for updates

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1. Introduction

Effective communication about behavioural change related to the COVID-19 vaccination entails the ability of people to comply with health communication messages designed to create awareness, reduce concerns, inform, and counter fears related to COVID-19 vaccines and build the required willingness to be vaccinated [1]. Social and behavioural barriers, nevertheless, are influential factors that can affect how effectively COVID-19-related behavioural change is communicated [2,3]. People's refusal to adhere to COVID-19 protocols has contributed to spikes in the number of COVID-19 infections and deaths [4]. Consequently, the World Health Organization (WHO) advised vaccination as key to developing herd immunity against COVID-19 [5]. Herd immunity occurs when a significant percentage of people (i.e., the population) develop immunity against infectious diseases through vaccination; as such, the chances of disease transmission from one person to another will considerably decrease. The potency of behavioural change communication has been challenged because of growing misinformation since the emergence of the COVID-19 vaccination rollout in 2020 globally [3,6–10]. Researchers discovered relevant types of information and sources related to people's beliefs assist in shaping behavioural responses and intentions and are critical to public health crisis management and preparedness [11].

Researchers have observed that the influence of misinformation emanating from new media channels has affected and contributed to the increased causes of hesitancy against COVID-19 vaccination efforts globally [12]. Similarly, in Nigeria, the influence of COVID-19 misinformation, particularly on new media platforms, has contributed to only 33.86% of the population being fully vaccinated, even though a 70% vaccination rate was projected by the end of 2022 [13–15]. It is pertinent, therefore, to examine the influence of social and

behavioural barriers against peoples' intentions and willingness to receive the COVID-19 vaccination in Nigeria. This study examines the link between COVID-19 vaccination in Nigeria and YouTube, a popular new media platform in the nation. Specifically, this study has three aims. First, this study identifies the tone of YouTube video headlines/titles related to the COVID-19 vaccination campaign in Nigeria. Second, this study describes the tone of Nigerian YouTube users' comments on Nigerian COVID-19 vaccine videos. Third, this study explains the causes of COVID-19 vaccine hesitancy identified within Nigerian YouTube video user comments.

1.1. Health Communication on YouTube

According to the World Health Organisation (WHO), there have been 266,463 confirmed cases of the COVID-19 pandemic in Nigeria and 3155 deaths, as of 15 February 2023. According to a recent study, several Nigerian states are vulnerable to the COVID-19 pandemic due to the high coronavirus (SARs CoV-2) seroprevalence of approximately 78.9% due to low vaccination rates [16]. Serology is the examination of blood samples tested for antibodies built against (SARS-CoV-2), the virus that causes COVID-19 [15]. YouTube accounts for 5.29 million user channels in Nigeria, a country with 33 million active new media users [17,18]. YouTube is one of the most popular new media platforms in Nigeria and is particularly relevant for sharing and receiving public health information on the COVID-19 pandemic [19,20].

Internet penetration has created the emergence of new media platforms (WhatsApp, Twitter, Facebook, TikTok, YouTube, etc.), that provide easy access to online health communication and public health information. Various social networks, like Facebook, WhatsApp, Instagram, and YouTube, are being leveraged to disseminate information about the COVID-19 pandemic [21]. Making health communication video ads has become a popular campaign communication channel (e.g., the role of microcelebrities during the COVID-19 pandemic) on YouTube [19]. A complex story can be simply understood in an eye-catching way with the help of a YouTube video campaign narrated and presented in an entertaining and informative manner [22,23]. This development explains why YouTube is influential in public service campaign advertising used to distribute promotional videos to educate people on the COVID-19 pandemic [24].

According to Mohsin [25], YouTube has a record 2.3 billion active users, over a billion hours of video watched in 100 countries, 80 languages, and 400 h of videos uploaded every day. This makes many of the health communication messages disseminated on YouTube highly recognised by users and acknowledged as the primary source of information, knowledge, and awareness creation on public health and individual well-being [26]. Nigeria has 33 million active users of new media channels like WhatsApp, Facebook, and YouTube [17]. YouTube became a major source of information in 2019 that predicted the health behaviours of social media users, on whom many people rely for information about the COVID-19 pandemic [27]. Despite its vital role in conveying important public health information, scholars have noticed that YouTube is also being used as a source of misinformation and disinformation in public health, particularly for promoting negative and false information about COVID-19 [19].

1.2. Misinformation on COVID-19 Vaccination Communication on YouTube

Vaccine hesitancy is not a recent occurrence in Nigeria. Research shows many people are opposed to vaccinations, especially with the backlash against polio vaccines 30 years ago [28–30]. However, with the COVID-19 pandemic, misinformation disseminated through social media, such as YouTube [19], has helped the spread of conspiracies that affected the COVID-19 vaccine uptake in Nigeria [31], exponentially escalating vaccine hesitancy [31,32].

The spread of misinformation during pandemics has been a documented practice since the Middle Ages [33]; however, the viral nature of misinformation on social media is a significant source of concern as well as a threat to public health [34]. Since the beginning

of the COVID-19 pandemic, fake news has been widely disseminated, making people distrust the integrity of information from healthcare services and political authorities [35]. Misinformation is derived from concepts mostly related to falsehoods and fake news on new media and other information ecologies, sometimes including social forces [36]. Misinformation has created serious public panic, which has led to support for harmful public health practices against the COVID-19 pandemic [37]. Misinformation on YouTube is a major source of concern in public health crises such as the COVID-19 vaccination campaign [19], especially as the channel is used in fostering rumours and exponentially spreading conspiracy theories on COVID-19 vaccines [9,38]. According to Krishna [39], the rate at which misinformation about vaccinations spreads, in general, is worrisome enough to be classified as an epidemic. Misinformation about major pandemic outbreaks is arguably one of the main reasons why they linger, as with HIV/AIDS, or more recently with the Ebola outbreak in West Africa [40]. Unverified sources posted on new media platforms play critical roles in reporting false numbers of COVID-19 cases, providing inaccurate guidelines, and promoting unapproved therapies and remedies as antiviral cures [35,41–43]. Misinformation promotes social anxiety about health, giving rise to chaos, dishonesty, financial exploitation, and fear [44]. Fear and misunderstanding created by misinformation largely affect people's willingness to report their well-being and seek treatment [45].

Krishnan and Thomson [40] concluded a major and controversial form of health misinformation is about COVID-19 vaccines. Several studies have closely examined this area of misinformation and concluded that the media influences public perceptions of vaccine disputes. Therefore, through numerous efforts to erase misconceptions about vaccines and reduce vaccine hesitancy, extant scholarship suggests a few strategies to address the issue [40,44,46]. To counter misinformation, the concept of health literacy is key to any discussion of health-related information. It refers to people's ability to obtain, process, and understand basic health information and services necessary for making informed health decisions [47]. However, according to Krishnan [39], misinformation has created a barrier to people's ability to attain health literacy, since those armed with incorrect knowledge would be ill-equipped to make proper health decisions. Misinformation about health issues has persisted, particularly on social media, increasing vaccine hesitancy [34,40,44] because misinformation is commonly used on the continuum to establish the scope of vaccine acceptance and vaccine rejection [33].

Misinformation has expanded because Internet penetration and networking sites like YouTube [48] have allowed users to discuss and share health-related misinformation and ideas with potentially large audiences [34,48]. Therefore, the problem for health communication research is how to evaluate the accuracy of such messages shared online and used in addressing future research directions [40]. Studies have shown sharing accurate information, particularly through YouTube, is an important component of health communication [44]. According to Mheidly and Fares [44], providing people with reliable scientific information can be useful during pandemics, especially when it is honest and accurate. In contrast, false information can exacerbate the pandemic by supporting inadequate or risky behaviours and promoting unsafe practices.

1.3. Social and Behavioural Barriers

The Theory of Planned Behaviour (TPB) [49,50] predicts that human behaviour is readily influenced by three concepts. First, attitude towards the behaviour indicates the degree to which a person(s) views an action as being favourable or unfavourable [51]. Second, subjective norm refers to the belief that most people who matter to an individual believe he or she should or should not engage in the behaviour in question [49,50]. Third, perceived behavioural control determins the perceived ease or difficulty of carrying out the behaviour [49,50]. In this regard, behavioural beliefs can influence how people exhibit a positive or negative attitude towards the behaviour [52] It has been established that peoples' beliefs related to social institutions (opinion leaders and sociopolitical institutions)

and behavioural-related factors characterised by trust, attitudes, knowledge, awareness, and perceived side effects of the COVID-19 vaccine are influential on the willingness or intention to be vaccinated [9,53,54].

This study argues that these dimensions serve as important guides that model the social and behavioural factors that shape YouTube users' comments on COVID-19 vaccination hesitancy in Nigeria. The constructs, however, demonstrate that normative beliefs are related to social pressure or subjective norms, while behavioural beliefs present positive or negative attitudes towards the behaviour, and control beliefs produce perceived behavioural control, which entails the willingness or difficulty to execute the behaviour [49].

People's personal experiences of fear, disbelief, mistrust, and anxiety are critical considerations for the intention to receive the COVID-19 vaccination. As such, understanding the fundamentals of interacting with different people, particularly those whose preconceived opinions are shaped by social-behavioural factors, is necessary for the COVID-19 vaccination process [55]. Therefore, overcoming vaccine hesitancy is related to increasing public trust and willingness to be vaccinated against the COVID-19 virus [56]. It is important to note that the COVID-19 pandemic has made many people sensitive and anxious; hence, understanding their views is critical, and communicating with them about the vaccine should take an encouraging tone that is honest, accurate, and truthful [57,58].

On the other hand, it is crucial to also discuss the risks involved in not being vaccinated and the repercussions should people refuse to do their part in achieving herd immunity through vaccination, particularly those who are dismissive or doubtful about the COVID-19 pandemic [5,59]. Therefore, understanding vaccine hesitancy locally and the influence of social and behavioural barriers are critical in this regard, given that outcomes can be influenced by local factors related to the given contexts, vaccinations, and the people involved [1,60]. Identifying the determinants of vaccine hesitancy among the hesitant group and then tailoring the vaccination campaign to fit this group is essential for behavioural change communication [2]. To address the problem, inclusive health communication centred on the empirical analysis of social and behavioural barriers is imperative to effective vaccination communication, which must be carefully planned and managed to encourage COVID-19 vaccine uptake [59]. Moreover, if poorly designed and executed, a COVID-19 vaccination campaign could undermine increasingly tenuous beliefs in vaccines and the public health authorities that recommend them [1,8].

This study employs TPB as a theoretical guide to develop an understanding of COVID-19 vaccine hesitancy behaviours from YouTube users' comments. Although YouTube has greatly contributed to information sharing and receiving in public health, little attention has been paid to the factors that influence the intention of YouTube users towards COVID-19 vaccine hesitancy and the consequences of such behaviour in relation to social and behavioural factors. Therefore, the basic tenets of TPB guide the data analysis to identify how YouTube users communicate about COVID-19, specifically vaccine-related issues. Therefore, the following research questions are put forth to better understand the links between the COVID-19 vaccination campaign in Nigeria and YouTube use:

RQ1: What is the tone of YouTube video headlines/titles related to the COVID-19 vaccination campaign in Nigeria?

RQ2: What is the tone of Nigerian YouTube users' comments on Nigerian COVID-19 vaccine videos?

RQ3: What causes of COVID-19 vaccine hesitancy are identified within Nigerian YouTube video user comments?

2. Methods

Videos uploaded between March 2021 and December 2022 were analysed. These dates were chosen because March 2021 was when the COVID-19 vaccination was launched in Nigeria, and the expected 70% threshold to fully vaccinate and eradicate the COVID-19 pandemic in Nigeria was expected to be reached by December 2022. A search for videos on www.YouTube.com (accessed on 6 December 2022) [61] with the keywords "COVID-19

in Nigeria", "COVID-19 vaccination in Nigeria", and "COVID-19 vaccine hesitancy in Nigeria" was conducted. The search produced 319 videos in English. The videos were further sorted by relevance, which is in line with previous studies [22,62]. The primary researcher observed that 65 videos did not meet the criteria for inclusion because the videos were duplicates or posted before March 2021. Thus, 65 videos were excluded from the analysis, leaving 254 videos.

2.1. Coding Scheme

Each video was downloaded, and the link was saved. The following two features were selected for coding to understand the tone of the videos: (1) the title/headline of the video and (2) all user comments. Titles/headlines and user comments were categorised as positive, negative, and/or neutral. Categorising media content and coding messages as positive, negative, or neutral/not applicable is a common practice in content analysis [22,62,63]. Following a similar practice, in this study, messages coded under a positive tone were classified as any information that conveys news about the existence of COVID-19 and supports COVID-19 safety protocols and vaccination(s). A negative tone was classified as any information that contests the existence of COVID-19 and disapproves of the vaccination. A neutral/not applicable tone was classified as any information that neither approves nor disapproves or is silent on the existence of COVID-19 and instead focused on information that is not applicable to the study context.

2.2. Coding

The primary researcher developed a codebook to explore the causes of COVID-19 vaccine hesitancy from the comments made by YouTube users. Most of the YouTube videos have turned off their comments section; nevertheless, 57 Nigerian mainstream media YouTube videos had their comments available; therefore, an online tool (exportcomments.com accessed 7 February 2023) [64] was used to generate comments from the 57 videos with accessible comments. A total of 985 comments were retrieved, downloaded and saved on Microsoft Excel for analysis. The list of themes for comments associated with vaccines on social media developed by Broniatowski et al. [65] was modified and utilised.

2.3. Intercoder Reliability/Agreement

Reliability within content analysis refers to its stability, which is the tendency for all assigned coders to consistently recode the same data in the same way over a period of time. Reproducibility is the tendency for a study group of coders to classify thematic categories in the same way [66]. To ensure the reliability of this study, two coders independently coded the data. According to Macnamara [67], for maximum reliability in media content analysis, it is required that two or more coders are used, at least for a sample of content (called the reliability subsample). The intercoder reliability for coding the headlines/titles was 76.77%. The intercoder reliability for coding users' comments was 79.03%.

3. Results

To explore RQ1 about the tone of YouTube videos related to the COVID-19 vaccination campaign in Nigeria, all videos' titles/headlines were coded. Of the 254 videos, the majority (53.5%) were positive in tone (n = 136), while 40.5% (n = 103) were negative, and the remaining 6% (n = 21) were neutral/not applicable.

To explore RQ2 about the tone of Nigerian YouTube users' comments on the Nigerian COVID-19 vaccine, 985 comments were generated from 57 videos with accessible comments. The comments were coded (CM1–CM 57). The analysis shows 32.4% of the comments were negative (n = 319) and 5.0% of the comments were positive in tone (n = 49). However, 62.6% of the comments were neutral/not applicable to the analysis (n = 617). This can be attributed to two reasons. First, many of the comments generated were discussing travel, politics, etc. and did not discuss vaccination(s). Second, many comments were "antivaccine" emojis and did not include textual content.

To explore RQ3 about the causes of COVID-19 vaccine hesitancy identified within Nigerian YouTube video user comments, a thematic analysis was conducted following Broniatowski et al.'s [65] thematic approach. This analysis identified 319 negative and 49 positive comments among a total of 368 YouTube users' comments. Table 1 presents antivaccine themes and provaccine themes, including the number of comments analysed under each category and exemplified comments.

Table 1. Examples of YouTube Users' Comments on the COVID-19 Vaccination and Corresponding Themes: March 2020–December 2022.

Theme (A)	Antivaccine Themes	Comments (*n*)	Example Comments
Theme 1	Freedom of choice/ antimandatory vaccines	12.22% (*n* = 39)	"Free and informed medical consent". "My body, my choice! not going to be bullied, coerced, or threatened into taking something the Nigerian government or scientists don't have a clue about its contents". "Not one Nigerian scientist can tell us what is contained in that vaccine it's telling people to inject into their veins". "People should be allowed to make decisions for their health. COVID-19 is a scam". "Making it compulsory will only increase the suspicion index of citizens concerning the vaccine … wrong advice for real". "Stand for FREE CHOICE".
Theme 2	Cannot trust government on vaccines	15.7% (*n* = 50)	"Sell-out leaders as always. Know shame. Be wise and don't even accept this from them". "Can the Nigerian Government be trusted? Those who received the stimulus money should be vaccinated". "The manufacturers don't trust their vaccine and you have to sign an indemnity". "And you administer this to humans". "If you said the vaccine is safe and that people with the vaccine are safe from contracting the virus or spreading the virus, why is the government so desperate of imposing the vaccine if they are not puppets to those, they've collected funds from". "Nigeria leaders ready to sacrifice Nigerians in order to please Bill Gates".
Theme 3	Pharmaceutical companies want vaccine profits	1.88% (*n* = 6)	"Viruses are a product of the Earth's ecological cycles. They regulate the planet's ecosystems and evolve life forms. The Earth also produces Humans, and our populations are also regulated by the planet in order to maintain our ecosystems". "Vaccines are not naturally occurring they don't adapt and change like our body's immune system and some people only care about getting rich". "COVID-19 is a business"
Theme 4	Vaccines cause bad side effects	12.53% (*n* = 40)	"Your odds of dying are greater getting the vaccine than getting COVID". "Are you guys, okay? the manufacturer says they are not liable if anything happens". "This is absolutely rubbish, common sense is not common at all". "Don't COMPLAIN if some of them DIE or their health is AFFECTED because of the VACCINES. Many symptoms occur after the vaccine is applied". "Similar side effects with elephantiasis vaccine"
Theme 5	General vaccine conspiracy theories	46.08% (*n* = 147)	"My people die because of the lack of knowledge. Lucifer and his messengers of the new world order are on rampage, making sure the entire world becomes his prey! As for me and my household, we will not bow to the gods of Babylon, which is what this mass vaccination campaign is all about! This is the most sophisticated crusade humanity has ever seen! It's so sad Christians can't see the hand of Satan in all this!" "Stop! They're taking pictures like it's a spectacle! Jesus is my vaccine. Please repent" "If you take the vàcx, forget it, you're going straight to hell, for you have taken the mark of the beast … you become a GMO". "Take the vaccine, you die or lose your fertility". "It's mRNAa TECHNOLOGY. their words". "It is not medicine. Elon musk: "mRNA technology is like a computer program in your body".
Theme 6	Vaccine ingredients are dangerous	9.71% (*n* = 31)	"This YouTuber is a fool for encouraging people to take the poisonous vaccines". "No, to COVID-19 poisonous vaccines". "Not realizing 💉 is just poison, folk in the US". "Nigerians should know better! #saynotothepoisonjab #thejabislethal"
Theme 7	Diseases are not so dangerous	1.88% (*n* = 6)	"Why take a shot when it goes away on its own wake-up". "Take off the masks Trust Me it's not needed. Peace". "Hard to listen or take serious people who wear mask". "Funny that my friend living in Bakomo Africa said nobody wears masks and nobody has it … ".
	Total	100%	

Table 1. *Cont.*

Theme (A)	Antivaccine Themes	Comments (*n*)	Example Comments
Theme (B)	Provaccine themes		
Theme 8	Vaccines work	61.2% (*n* = 30)	"Funky made it … thanks for sharing your experience. I have taken my first (Pfizer) vaccine dose here in the US (North Carolina). The only side effect I can think of was a pain in my arm where the injection took place, it only lasted overnight. The next day was fine". "Am fully vaccinated and boosted". "Thank God the vaccine is now in Nigeria … … can't just wait".
Theme 9	Vaccination protects herd immunity	12.2% (*n* = 6)	"This is great content so that people will be aware of the importance of vaccination". "Thank you for encouraging everyone to get vaccinated to protect themselves from COVID-19".
Theme 10	People who do not vaccinate put me/my kids at risk	2.0% (*n* = 1)	"Origbo, Haba can't we for once celebrate good news? Please can you share with us why unvaccinated people should be allowed into 9ja? I just returned to the United States from 9ja last week and did COVID-19 test a day before departure. It's a requirement by the American government. What's wrong with requiring unvaccinated to get it done? Thank you!"
Theme 11	Alternative medicine does not work	24.6% (*n* = 12)	"Actually, not advised to take ibuprofen due to the side effect of possible bleeding. Note!! I said possible not compulsory. Safest is paracetamol. One of the screening questions we ask here in the UK is "do you have a bleeding disorder and also do you take anticoagulants. therefore, ibuprofen is not advised".
	Total	100%	

4. Discussion

This paper examined the influence of social and behavioural barriers to the COVID-19 vaccination campaign in Nigeria. First, content analysis assessed the tone of YouTube video headlines/titles related to the COVID-19 vaccination campaign in Nigeria. Second, the study analysed Nigerian COVID-19 vaccine YouTube videos and described the tone of YouTube users' comments about COVID-19 vaccines. Third, a thematic content analysis explained the causes of COVID-19 vaccine hesitancy identified within Nigerian YouTube video user comments.

Results of the findings show Nigerian COVID-19 vaccination campaign headlines/titles on YouTube from the government were predominantly positive (53.5%). In contrast, findings of YouTube users' comments revealed that while 62.6% were neutral/not applicable in the analysis, the remaining 32.4% of comments were negative, while only 5.0% were positive in tone about the COVID-19 vaccination. These findings corroborate Briones et al. [22], who found public discussions on YouTube about the HPV vaccine were predominantly (51.7%) negative and suggested "future research could determine whether the source and tone of the video, as well as the specific content, are related to the negativity or positivity of the comments" (p. 485). The results of the current study confirm the tone of headlines/titles about COVID-19 vaccination messages from the government were positive; nevertheless, the tone of users' comments on COVID-19 vaccines was largely negative. The present study also used thematic content analysis to explore the causes of vaccine hesitancy according to YouTube users' comments. Most respondents who critiqued vaccines in their comments (*n* = 319) posted about how governments cannot be trusted on vaccines, as well as general vaccine conspiracy theories. Those who promoted vaccinations tended to comment on how vaccines work.

The results of this study provide some support for the explanatory nature of the Theory of Planned Behaviour. User comments about the government cannot be trusted on vaccines and freedom of choice/antimandatory vaccines often articulated that vaccines should not be required. These comments were prompted by social movements and human rights advocacy groups that challenged the government on mandatory vaccination. The theory of planned behaviour suggests people's behaviour is determined by their attitudes, subjective norms, and perceived behavioural control [49]. In this regard, subjective norms suggest individuals (e.g., opinion leaders, social institutions, or pressure groups) shape the beliefs of most people who matter to them and believe they should or should not engage in the

behaviour in question [49,50]. As such, their attitude towards the behaviour determines the degree to which a person(s) views an action as being favourable or unfavourable [51]. In this case, subjective norms shaped the user's behavioural intentions and stimulated negative behavioural control towards taking the jabs as unfavourable towards their "freedom of choice". On the other hand, the analysis also showed fear of vaccines due to safety-related concerns. People are hesitant of vaccines for fear of vaccine safety, mentioning the "odds of dying greater taking the vaccines" than being infecting with COVID. This clearly showed people are generally misinformed about COVID vaccinations. Krishna [39] confirms misinformation has created a barrier to people's ability to attain health literacy since those armed with incorrect knowledge would be ill-equipped to make proper health decisions. According to the theory of planned behaviour, Ajzen, [52] predicts that behavioural beliefs can influence how people exhibit a positive or negative attitude towards the behaviour. Therefore, Breslin et al. [59] confirm some people will only agree to take the COVID-19 vaccine if there are no reported side effects. In Africa in particular, Limbu et al. [60] discovered one of the main factors driving vaccination intentions was perceived behavioural control.

In addition, study found that users' comments on general conspiracy-related theories dominated discussions online. Our findings provided further support that misinformation on social media is a threat to vaccination campaigns, especially, in the COVID-19 vaccination campaign. Montagni et al. [35] observed that since the beginning of the COVID-19 pandemic, fake news has been widely disseminated, making people distrust the integrity of information from healthcare services and political authorities. In Nigeria, Abayomi [68] confirms the lack of openness and accountability in the COVID-19 pandemic's response has exacerbated the deteriorating public trust. The findings also revealed expressions of religious beliefs and biotechnology-related conspiracies dominated users' discussions about COVID-19 vaccines, for instance, some users believe, "Take the vaccine, you die or lose your fertility", while others suggest "It's mRNA Technology . . . ", and most shockingly, some said "Jesus is my vaccine" or the vaccine is a "Mark of the beast". This type of religious misinformation and conspiracy theory was mentioned, for example, in Makurdi, Nigeria, where vaccine hesitancy has persisted due to aphorisms about Jewish expectations of the anti-Christ, such as the mark of the beast, being chained to hell, acting immorally, and having animalistic inclinations, among others, according to research by Uroko and Okuosa [69].

5. Implications for Theory

5.1. Misinformation and Trust

Although TPB-guided data analysis in this study, it has not adequately addressed the underlying beliefs that shape the attitudes of Nigerians towards COVID-19 vaccine hesitancy. Generally, from this analysis, we fully understand that sharing misinformation unabated during a pandemic can have greater consequences that could possibly cause a lack of trust in messages emanating from public authorities. Lovari [70] observed that disseminating misinformation, especially during a pandemic like COVID-19, if not properly managed, can amplify risk behaviours that could potentially be harmful to the people. Consequently, vaccine hesitancy was likely due to misinformation and a lack of trust in the Nigerian government's messages. The unrelenting misinformation from sources other than government institutions led to a lack of trust; thus, the overriding concepts in public safety campaign messages have mostly been ignored by many Nigerians. In this case, TPB could not fully explain vaccine hesitancy among Nigerians in relation to what and how the sources of misinformation influence distrust of the government's messages to be negatively perceived.

5.2. Framing

The second implication of the study lies in the inherent framing of headlines/titles. Although mostly positive, the choice of words in framing the headlines/titles mostly contra-

dicts the intended meaning. For example, the headlines/titles "Did people's power really lead to COVID-19 vaccines being destroyed in Nigeria?", and "Around one million doses of COVID-19 vaccines wasted in Africa's Nigeria" were considered negative in this analysis. The unsuitable choice of words can lead to a lack of understanding about the importance of vaccinations; hence the desired meaning of the message was not effectively communicated. Philosophically, frames are meant to select given aspects of identified realities and make them salient to draw positive public attention and gain support. Therefore, YouTube users might be potentially misinformed about the importance of the government's COVID-19 vaccination messages due to the incorrect choice of frames in some of the headlines/titles analysed.

5.3. Practical Implications and Policy Contributions

Content creators were part of the provaccine themes that effectively influenced vaccine messages by educating people about vaccines protecting herd immunity as exemplified in this comment, "This is great content so that people will be aware of the importance of vaccination". This study, therefore, proposes that governments should adopt collaborative strategies with trained content creators to develop proactive risk communication, with a top-down and bottom-up communication approach, specifically, with local healthcare providers, mass media, community/traditional chiefs, religious leaders or organisations, and pressure groups to ensure people are well-informed and adequately enlightened about the benefits of vaccines. Most importantly, due to inadequate public amenities in many parts of Nigerian communities, a door-to-door COVID-19 vaccination awareness campaign should be implemented. In a recent study, Adebimpe and Adeoye [71] suggested one significant method being utilised to improve vaccination at the state level is door-to-door vaccination.

Furthermore, the findings of this study highlighted the paucity of public trust, ineffective public health policies, and lack of accountability in the government of Nigeria, which cause vaccine hesitancy. The findings of this study will help governments in designing communication strategies to promote public trust in vaccines and increase public access to verified information based on the safety and efficacy of vaccines. This can be achieved through messages logically designed to increase public trust on the basis of honesty and transparency, partly providing sufficient information on the vaccine production process, ingredients, effective administration, and how to combat counterfeit vaccines. Sato [72] suggests when people had more trust in the government, it is more likely for them to accept the COVID-19 vaccine, since vaccine hesitancy in Nigeria is partly related to people's distrust of the government. Second, the study can guide policymakers to provide evidence-based campaign strategies on the safety and effectiveness of vaccines; thus, practically outlining the benefits of vaccines and communicating effectively to reduce barriers of perceived risks, removing such risk perceptions, should be the core of the vaccination campaign in fostering public confidence [73]. Third, these findings can guide public policy directions on accountability. Policymakers will understand that being accountable to the people during pandemics through socioeconomic measures will ameliorate people's suffering and hardships and consequently help address the challenges of vaccine hesitancy and increase vaccine uptake in Nigeria.

In summary, social and behavioural barriers will continue to present obstacles to Nigeria's ambition to end the scourge of the COVID-19 pandemic due to the presence of vaccine hesitancy; hence, this will also affect Nigeria's national vaccination plans. Currently, the WHO database shows that only 33.86% of people are fully vaccinated against COVID-19 in Nigeria, as of 22 May 2023 [74]. The vaccine uptake is very low considering the massive population of Nigeria of approximately 216 million people. Therefore, to increase the ratio of vaccine uptake, as a suggestion for policy making, the government must develop the appropriate collaborative interventions, where all the critical stakeholders (i.e., opinion leaders, traditional/cultural and religious leaders) should be involved in the

vaccination education campaigns to bridge the lack of trust in the government and debunk misinformation and fears about the safety and efficacy of COVID-19 vaccines.

6. Limitations and Future Research

The study is limited to the analysis of YouTube videos; however, future research should investigate the impact of misinformation and trust in COVID-19 vaccination communication expanded from YouTube to Facebook and Twitter, as figures reveal that around 33 million Nigerians utilise these platforms. Additionally, the current political landscape was saturated with 2023 political and electioneering campaign activities; consequently, social distancing protocols were ignored. This may have increased the number of COVID-19 cases in Nigeria. Therefore, based on this observation, future research should examine the role of COVID-19 vaccination misinformation and trust in Nigeria's 2023 general election campaign.

7. Conclusions

From the findings of this study, three key conclusions were made. Based on the idea that misinformation has caused a lack of trust in the Nigerian government's COVID-19 vaccination messages, this research has proposed the following three key areas and solution strategies to address misinformation about vaccination campaigns in Nigeria.

7.1. Administrative and Policy Directions

Given the negative impact of misinformation in public health campaigns, this study suggests policymakers at all levels of governance in Nigeria should promote health literacy campaigns as one of several critical strategies for reducing misinformation in public health. Particularly, media literacy should be encouraged, and increased training of information officers is required to address mediocrity gaps as part of proactive pre- and postpandemic communication management. This means providing instructional materials to help people recognise and evaluate the accuracy of information as well as the credibility of various online information outlets is critical. The aim of media literacy is to shape people's ability to obtain, process, and understand basic health information and services necessary for making informed health decisions, as Sørensen et al. [47] found that negative media misconceptions of vaccines can decrease the demand for vaccinations and increase vaccine hesitancy [32].

7.2. Development of Healthcare Professionals

In Nigeria, healthcare professionals are lagging in terms of training. Frontline healthcare workers in particular should be trained and equipped with effective communication skills needed to effectively communicate safer paths during public health emergencies like the COVID-19 pandemic. Shaw [75] observed many patients have little knowledge of medical terminologies; consequently "layman's" language is paramount to ensure that messages are accurately conveyed while conversing with people.

7.3. Research Collaborations

To fully understand the root causes and consequences of public health misinformation, this study proposes that governments at all levels in Nigeria, including local and international healthcare organisations, should encourage research and development. Findings of research like the ongoing study will help determine the sources of misinformation and suggest effective measures to address such problems.

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CHAPTER FIVE

Article 2.

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In which chapter is the manuscript/published work?	Chapter Five

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The student collected and analysed data, in addition, the student wrote the review of literature, discussion and implications. The second, and third authors assisted with structure, analysis, theory development, and editing.

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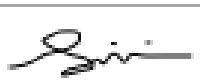
Student's signature:		Main supervisor's signature:	Croucher, Stephen Digitally signed by Croucher, Stephen Date: 2024.05.27 13:49:45 +12'00'

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Framing the COVID-19 vaccine rollout in Nigeria: An analysis of online newspapers' coverage of the COVID-19 vaccine

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Abstract

The COVID-19 vaccination campaign rollout attracted competing frames within the Nigerian media sphere. Three newspapers (*Vanguard, Daily Trust, and Leadership*) were selected for analysis. Framing theory was used to examine how frequently the COVID-19 vaccination was framed in headlines, the headline valence, and the most frequently used frame in news articles before and after the vaccine rollout. A total of 911 articles were analyzed. Content analysis revealed most of the headlines were positive. In addition, attribution of responsibility was the most frequently used frame, while the morality frame was the least frequently used frame. These findings suggest framing can have significant implications for understanding public health and reveal the impact of social and political influencers in pandemic information management.

Keywords: Framing, content analysis, attribution theory, Nigeria, COVID-19, pandemic communication

Nigeria reported the first case of COVID-19 on February 27, 2020, (Apuke and Omar 2021), and there have been 267, 188 confirmed cases and 3,155 recorded deaths (World Health Organization, 2024). The Nigerian government aimed to vaccinate 70% of the population by the end of 2022 (Olu-Abiodun, Abiodun, and Okafor 2022). However, as of Feb 2024, only 39% of the population was fully vaccinated (WHO, 2024). Vaccine hesitancy remains a barrier influencing people's willingness to vaccinate and achieve herd immunity against COVID-19 in Nigeria (Sadiq, Croucher, and Dutta 2023). Vaccine hesitancy is a behavioural condition in which people delay or refuse vaccination (MacDonald et al. 2015). Vaccine hesitancy is a global public health challenge affecting people's beliefs and behaviours towards adopting vaccines (WHO, 2019). Vaccine hesitancy is among 10 major global health threats (WHO, 2019). Researchers have studied various contributing factors to vaccine hesitancy, such as misinformation, distrust, health literacy, complacency, and limited vaccine access (Lee et al. 2022; Zhang et al. 2021).

Particularly, vaccine misinformation and fake news infiltrate social and traditional media, therefore, causing vaccine hesitancy (Silva et al. 2023). Specifically in Nigeria, vaccine hesitancy is partly caused by a lack of trust and access to vaccines and, a lack of credible information or news about the vaccine (Sadiq, Croucher, and Dutta 2023). Consequently, reducing vaccine hesitancy and promoting vaccine acceptance entails understanding the factors connected to these behaviours (Ogundele, Ogundele, and Beloved 2020). This study examines how Nigerian newspapers framed the COVID-19 vaccine and how these frames contribute to vaccine hesitancy. The press can encourage healthy behaviours that alleviate the spread of diseases (Ghassabi and Zare-Farashbandi 2023). How vaccine information is framed influences people's attitudes and perceptions about the COVID-19 vaccination (Cesareo et al. 2023). Using framing Entman (1993) as a theoretical

lens, this study explores such frames and proposes ways to manage and learn from such frames for future pandemics.

COVID-19 Vaccination Campaign in Nigeria

The mass vaccination campaign was implemented in March 2021 to achieve 70% inoculation goals (Olu-Abiodun, Abiodun, and Okafor 2022). Hence, tackling misperceptions, and misinformation management were among the top campaign strategies used to mobilise people to curb the virus (Adebisi, Rabe, and Lucero-Prisno 2021). Nevertheless, these challenges erupted COVID-19 vaccination campaign in sub-Saharan Africa— lack of funding, targeting vulnerable groups, safety concerns, poor vaccination rollout, lack of equitable distribution, delayed vaccine access, and vaccine hesitancy (Sato 2022; WHO 2021).

Before the COVID-19 vaccination campaign, Nigeria experienced vaccine hesitancy against the meningitis and polio vaccines (Taylor et al. 2017). People were hesitant and boycotted polio vaccines, due to misinformation about reported carcinogenic contaminants, HIV-laced ingredients, and anti-fertility substances (Obadare 2005). Similarly, research shows that misinformation about vaccine safety and efficacy also leads to scepticism about the COVID-19 vaccine in Nigeria (Sadiq, Croucher, and Dutta 2023). Therefore, an effective health communication campaign suggests vital information about COVID-19 vaccines should be tailored to educate people about the safety and efficacy of vaccines in preventing the spread of the COVID-19 virus (Finset et al. 2020).

Media and Perception of COVID-19 Vaccine

Although, the media is indispensable in health communication (Liu et al. 2020). However, during the COVID-19 pandemic, the media has widely spread misinformation, heightening vaccine hesitancy (Israel-Turim et al., 2023). For instance, social media channels has easily facilitated access to misinformation and fake news about the COVID-19 vaccines

(Zimmerman et al. 2023; Lee et al. 2022; Israel-Turim et al. 2023). Similarly, Silva et al. (2023) discovered the press (i.e., mainstream media) was partly acknowledged source of 'fake news' and misinformation associated with the COVID-19 vaccine hesitancy. However, the Nigerian YouTube users' comments also revealed that COVID-19 vaccine hesitancy is motivated by a lack of trust and misinformation in the online media sphere (Sadiq, Croucher, and Dutta 2023).

COVID-19 Vaccine and the Online Media Sphere

The media helps to publicise health messages to stimulate positive healthy behaviours among people (Black et al. 2021; Dai et al. 2022). In this regard, news media links the audience with health specialists as a vital source of health information to navigate health and safety information, especially during the COVID-19 pandemic (Solvoll and Høiby 2023). Therefore, the success of vaccine-related campaign messages depends on public buy-in and is primarily influenced by media coverage (Gadzekpo et al. 2023). For instance, researchers observed that traditional media like newspapers are essential to providing a swift response to counter rumours spreading rapidly on social media in the assessment of COVID-19 vaccine safety (Black et al. 2021).

Vaccine safety plays a crucial role in aiding public acceptance and adoption of vaccines (Victoria et al. 2010). Consequently, the ability of information to inspire a public response to accept vaccines depends on how the information is framed (Cesareo et al. 2023). For example, newspapers are regularly used in health campaigns to expose populations to awareness formation and behavioural change messages to address vaccine hesitancy (Gadzekpo et al. 2023). Although research shows that newspapers can shape public health behaviours, there needs to be more data on how newspapers frame and present health information online to their readers (McCaw, McGlade, and McElnay 2014).

Framing and the issues around COVID-19 Vaccine

Framing provides insights into how a particular message is presented in the media to shape the audience's understanding. According to Entman (2007), "framing is the process of culling a few elements of perceived reality and assembling a narrative that highlights connections among them to promote a particular interpretation" (p. 164). Framing makes selected aspects of a perceived reality more salient to encourage a specific problem definition, causal analysis, moral judgement, and remedy promotion (Entman, 1993). Communication researchers argue that the media is effective in framing stories, especially conveying reports on (influenza-related illnesses/deaths, avoiding infection from viruses, vaccine information, and public accountability) that predicted people's intention towards H1N1 and Flu vaccines (Xu, Ellis, and Laffidy 2022; Nan, Xie, and Madden 2012). However, the emergence of the COVID-19 pandemic has given rise to how misinformation continues to shape decision-making about vaccines in competing media reports (Semeraro et al. 2022; Cesareo et al. 2023; Israel-Turim et al. 2023; Pierri et al. 2022).

For instance, negative media frames attributed COVID-19 vaccines as causing death and thrombosis (Kaur-Gill, 2022; Semeraro et al., 2022). Similarly, information framing, vaccine attributes, and peer influence have significantly influenced and impacted parents' decision-making to vaccinate their children (Wang et al. 2022). However, as the COVID-19 vaccination campaign still unfolds globally, there is a dearth of studies and limited research on how Nigerian newspapers reported the COVID-19 vaccine rollout. Considering how vaccine hesitancy has continued influencing people's willingness to vaccinate, examining news framing is, therefore, pertinent to the COVID-19 vaccination campaign in the Nigerian context (Sadiq, Croucher, and Dutta 2023).

How information is framed may influence people's attitudes and perceptions about the COVID-19 vaccine (Cesareo et al. 2023). Thus, this study examines the frames used in headlines of Nigerian newspapers (online editions) related to the perception and adoption of

COVID-19 vaccines. We focus on frame setting to identify how 'headlines' were reported about COVID-19 vaccines. Newspapers frame COVID-19 vaccines differently (Ashwell & Murray, 2020; Barnes & Colagiuri, 2022). Thus, we propose the first research question:

RQ1: How frequently did Nigerian newspapers' online editions frame COVID-19 in headlines before and after the vaccine rollout?

Conceptual assessment of framing effects and the COVID-19 Vaccines

Framing effects are natural outcomes of logic that link survival to past experiences. People are shaped by their experiences to choose certain positive events and avoid situations with presumed negative consequences (Erdogdu 2019). Framing effects can be presented in positive and negative tones as this can fundamentally affect attitudes, behaviours, and opinion formation (Chong and Druckman 2007). One way to identify or understand the positive and negative framing effects is through valence framing. Valence framing suggests information presented with positive or negative narratives could form different opinions. The type of negative or positive valence influences the perception of what is said by altering how it is said (Erdogdu 2019). In valence framing, for example, attribute or goal frames show framing information negatively or positively could affect health decisions (Krishnamurthy, Carter, and Blair 2001). Valence framing, therefore, has received considerable empirical attention, in understanding health-related behaviours and especially, HPV and H1N1 vaccination research (Nan and Madden 2012; Nobel 2023).

However, social, and behavioural psychology scholars who understand the effects of valence frames on human behaviour suggest it is influential in behavioural change and people's decision-making processes (McDonald et al., 2021). According to McDonald et al. (2021), the effects of valence framing occur when people make different choices or assessments based on whether the diverse message options are presented in terms of their positive outcomes (e.g., vaccines protect herd immunity) or their negative consequences (e.g.,

vaccines cause side effects and death). Although research on the COVID-19 vaccine is still evolving, the effects of valence frames show that framing the safety of vaccines in a positive valence increases vaccine acceptance (Strickland et al. 2022). Therefore, valence frames are appropriate in this study as they help us clarify the nature of information in the headlines used by Nigerian newspapers to frame the COVID-19 vaccines. In their findings, Barnes and Colagiuri (2022) confirmed positive framing increased booster intention for the new vaccine (i.e., Moderna) but decreased intention among people who had previously received vaccinations and for a move to Pfizer among those previously receiving AstraZeneca. Therefore, Ashwell and Murray (2020) asserted that the media emphasis on positive vaccination reporting may be having the opposite effect of engendering resistance to vaccination among those who are hesitant toward vaccines. Thus, in the current study, we examine the manifestations of these framing patterns (Negative, Positive, and Neutral) and how these might provide more insights regarding the perception and adoption of the COVID-19 vaccine in Nigerian online newspapers before and after the vaccination campaign rollout. Specifically, we propose the second research question:

RQ2: To what extent was the COVID-19 vaccine framed in terms of headline valence by Nigerian newspapers' online editions before and after the vaccine rollout?

Media framing and social construction of issues around COVID-19 vaccines

Media frames shape our perception of reality by drawing reader's attention to certain aspects of news stories (Carragee and Roefs 2004). Journalists use frames to construct meanings and influence social issues (Carragee and Roefs 2004). Highlighting key aspects of stories is essential in providing the audience with the parameters to analyse information effectively (Carter 2013). For example, generic frames can produce conceptual effects on how the media frames are perceived (de Vreese, 2005). Generic frames can be identified across different topics and situations extending beyond thematic limits (Entman, Matthes, and

Pellicano 2009). However, Semetko and Valkenburg (2000) identified five generic frames: Conflict frame, Human Interest frame, Economic consequence frame, Morality frame, and attribution of responsibility frame. Generic frames are increasingly used in health communication research (de Vreese, 2005). Particularly, the generic frames were used to understand how the media framed the COVID-19 pandemic as a global health crisis (Ogbodo et al. 2020).

The conflict frame highlights differences and disagreements between individuals, groups, institutions, or countries (De Vreese, 2005). Human interest frames share personal experiences and emotions and can aid humanitarian efforts by emphasizing emotional angles in the stories (Cho and Gower 2006). The economic consequence frame presents the economic impact of an issue or event in the news (Semetko and Valkenburg 2000). The morality frame occurs in the context of religious tenets or moral prescriptions; thus, news often discusses the moral aspect of issues (Semetko and Valkenburg 2000). The attribution of responsibility frame assigns blame or solutions to specific entities or individuals. Semetko and Valkenburg (2000) analysed how the 1997 European Head of Government meeting was covered in television and newspapers across three countries, and the attribution of responsibility frame was the most prevalent. Human interest and poor related issues were dominant frames in the content analysis of global media during the COVID-19 pandemic (Radebe 2022; Ogbodo et al. 2020).

Our research follows previous studies and adapted the five categories from Semetko and Valkenburg (2000) to analyse how Nigerian online newspapers, *Vanguard, Daily Trust,* and *Leadership*, reported on the COVID-19 vaccination before and after the rollout. We propose the third research question:

RQ3: What is the most frequently used frame in news articles about the COVID-19 vaccine in Nigerian newspapers before and after NAFDAC (National Agency for Food and Drugs Administration and Control) approval of the vaccine?

Method

Online *Vanguard*, *Daily Trust, and Leadership* newspaper editions were analysed between December 2020 and December 2022. These dates were chosen because the first COVID-19 vaccine/jab was officially launched globally on December 8, 2020; after that, Nigeria rolled out the national vaccination plan on March 5, 2021. Newspapers were chosen for two reasons. First, three of Nigeria's ten most highly circulated newspapers were chosen: *Vanguard, Daily Trust, and Leadership* based on the 4th International Media and Newspapers (2019) ranking (accessed on May 10, 2023). Second, the newspapers were chosen based on regionality, with papers serving Nigeria's South and Central/Northern parts. Newspapers were contacted for copies of all editions from December 2020 – December 2022. Each newspaper supplied pdf copies of each edition from the data collection period. A total of 2,277 soft copies (PDF) editions were supplied and collated for analysis. One of the authors conducted data sorting of the article headlines with the keyword search: COVID-19 vaccine, COVID-19 vaccination, COVID-19 Jab, and generated 922 articles for analysis. Data cleaning was conducted to ensure all relevant articles were included, and we discovered seven articles were duplicated. Therefore, the seven articles were excluded, leaving 915 articles for analysis. From the 915 articles, four articles were discovered to report (Malaria, HPV, Lassa Fever, and Polio vaccines), thus excluded, and a total of 911 articles were retained for final analysis. The *Vanguard* had 307 news articles, the *Daily Trust* had 192 news articles, and the *Leadership* Newspaper had 412 news articles.

Coding scheme

We downloaded and saved the 911 articles in PDF. Two features were selected for coding to analyse how Nigerian newspapers present the COVID-19 vaccines before and after the rollout.: (a) headlines in the news articles and (b) the news articles. First, all headlines under each newspaper were grouped and calculated separately to examine the frequency. Second, all headlines were categorised as positive, negative, and neutral to examine headline valence. This idea of classifying media contents and coding messages as positive, negative, and neutral is a generally accepted universal research practice, especially in vaccine-related content analysis (Sadiq, Croucher, and Dutta 2023; Nguyen et al. 2021). Congruent with this practice, we coded messages as positive when headlines conveyed information about herd immunity, vaccine efficacy, safety, availability, accessibility, etc., of COVID-19 vaccines. Messages were coded as negative when the headlines conveyed information suggesting vaccines cause death and side effects, COVID-19 vaccines are not safe or effective, etc. Last, messages were coded as neutral when the headlines did not mention vaccine efficacy or safety. Third, all the headlines and articles were coded to examine the most frequently used frames in the articles. The primary researcher developed a codebook, and the 911 articles were printed, and copies were provided to coders for analysis. The five generic frames developed by Semetko and Valkenburg (2000) were adapted and modified: the conflict frame, human interest frame, economic consequence frame, morality frame, and attribution of responsibility frame.

Intercoder Agreement/Reliability

In content analysis, reliability relates to stability, the tendency for all coders to reliably code the same data reliably over time. However, the tendency for coders to classify themes and categories in the same way is known as reproducibility (Busch et al. 2005). Two coders independently coded the data to ensure reliability. Macnamara (2005) suggests using two or more coders to code content samples, also known as a reliability subsample. While the

percentage agreement was used to measure the average agreement among coders (Croucher 2024). The intercoder agreement for the headlines was 85.4%, while the agreement for coding articles was 72%.

Results

All selected article headlines were coded to answer RQ1, which examines the frequency to which Nigerian newspapers' online editions framed COVID-19 in headlines before and after the vaccine rollout. The *Vanguard* published 307 articles that discussed the COVID-19 vaccine rollout. Before the rollout, it published 120 (39%); after the rollout, it published 187 articles (61%). The *Daily Trust* published 192 articles that discussed the COVID-19 vaccine rollout. Before the rollout, it published 78 (41%), and 114 (59%) after the rollout. The *Leadership* published a total of 412 articles that discussed the COVID-19 vaccine rollout. Before the rollout, it published 280 (68%), and after the rollout, it published 132 (32%). Table 1 presents the frequency and distribution of COVID-19 vaccine articles published per month.

Table 1. Frequency and distribution of COVID-19 vaccine articles published per month

Months	**Vanguard**	**Daily Trust**	**Leadership**
December 2020	9	5	33
January 2021	36	16	65
February 2021	28	21	46
March 2021	71	27	57
April 2021	22	12	21
May 2021	14	5	15
June 2021	13	9	11
July 2021	14	3	13
August 2021	12	12	18

September 2021	22	12	21
October 2021	17	5	13
November 2021	9	10	16
December 2021	19	16	27
January 2022	9	3	14
February 2022	2	3	14
March 2022	3	8	1
April 2022	0	2	3
May 2022	2	3	3
June 2022	1	3	8
July 2022	1	3	4
August 2022	2	7	3
September 2022	0	3	4
October 2022	1	3	1
November 2022	0	0	1
December 2022	0	1	0
Overall total	307	192	412

RQ2 examined the extent to which the COVID-19 vaccine was framed regarding headline valence by Nigerian newspapers' online editions before and after the vaccine rollout. All 911 article headlines were examined and categorized as positive, negative, or neutral. Most of the headlines, 55% (n = 504), were positive, while 16% (n = 143) of the headlines were negative, and 29% (n = 264) of the headlines were neutral.

RQ3 explores the most frequently used frame in news articles about the COVID-19 vaccine in Nigerian newspaper coverage before and after NAFDAC approval. Table 2

presents the findings of the frames identified and the number of articles examined under each frame, including the exemplified articles. Following the work of Semetko and Valkenburg (2000), our analysis showed that attribution of responsibility was the most frequently used frame (40%, *n* = 365), while the morality frame was the least frequently used frame (5%, *n* = 46) in the Nigerian newspapers framing of COVID-19 vaccines before and after the rollout.

Table 2. Examples of generic frames on the COVID-19 vaccines and corresponding frames: December 2020-December 2022.

Generic frames	Number of articles	Exemplified frames
Conflict frame	9% (n = 84)	Governor Bello rejects COVID-19 vaccine, says it's meant to kill (***Vanguard*** January 20 2021). COVID-19: Osun gives civil servants 21 days ultimatum on vaccine (***Vanguard*** 20 Sep 2021). AstraZeneca's COVID vaccine not suitable for young people if…..—Britain's 'Professor lockdown' (***Daily Trust*** April 6 2021). Iran bans vaccines from U.K., U.S. (***Leadership*** December 9 2020). Moderna Sues Pfizer For Infringing Patents Over Vaccines (***Leadership*** August 28 2022).
Human interest	39% (n = 356)	No cases of adverse reactions after AstraZeneca vaccination, says NPHCDA (***Vanguard*** March 12 2021). Brazil halts vaccination of pregnant women after 1 dies (***Vanguard*** May 12 2021).

		COVID-19 vaccines don't create a magnetic effect (***Daily Trust*** July 7 2021). Pfizer, Moderna COVID-19 vaccines do NOT lower sperm count, study finds (***Daily Trust*** June 22 2021). Russia's Sputnik V Vaccine Has 92% Efficacy in Trial (***Leadership*** January 8 2021). Study Finds Pfizer Vaccine 85% Effective After First Shot (***Leadership*** February 20 2021). COVID-19 Vaccine is safe—Health Commissioner (***Leadership*** March 8 2021). Woman Vomits Blood After Receiving Vaccine in Kaduna (Leadership April 1 2021).
Economic consequence	7% (n = 60)	N150bn, not N400bn, needed for COVID-19 vaccines----Peter Obi ….offers to help negotiate supply (***Vanguard*** February 3 2021).

		African countries to pay $3-$10 per COVID-19 vaccine dose under A.U. plan. *Nigeria requires about $283m to obtain 42m doses* (***Vanguard*** January 21 2021). F.G. budgets N5.8bn for vaccine institutes (***Daily Trust*** January 13 2021). Coronavirus kills 77 Nigerians in 1 week. *As 1 in 5 persons tests positive.* *F.G. releases N10bn for domestic vaccine production* (***Daily Trust*** January 19 2021). We need N400bn for COVID-19 vaccines--- Minister (***Leadership*** 23 Dec 2020).
Morality frame	5% (n = 46)	COVID-19 Vaccines not mark of '666', Anglican Primate assures Nigerians (***Vanguard*** February 15 2021). COVID-19: Saints of God, have faith in God, not in vaccines (***Vanguard*** April 4 2021). Islamic council seeks halal ruling before COVID-19 vaccination (***Daily Trust*** January 8 2021).

		Imo monarch advises Nigerians to take COVID-19 vaccines (***Daily Trust*** March 19 2021). COVID-19: Nigeria must produce its own vaccines---Prophet Omale (***Leadership*** January 7 2021). COVID-19: Take Your Jabs in Public Sultan Urges Political Leaders (***Leadership*** March 20 2021). Sheikh Dahiru Bauch Urges Muslims to Take COVID-19 Vaccine (***Leadership*** March 4 2021).
Attribution of responsibility	40% (n = 365)	It's irresponsible to say COVID-19 vaccines are killers---- Clark (***Vanguard*** February 13 2021). F.G. hints at taking action against COVID-19 vaccine hesitancy (***Vanguard*** September 1 2021). Governors take COVID-19 jabs (***Daily Trust*** March 11 2021). Again, F.G. allays fears over COVID-19 vaccines (***Daily Trust*** January 20 2021).

		Kaduna Govt Partners With Zipline for Drone-delivered Vaccines (***Leadership*** February 4 2021). NSIA, NSSF, Artites Create Vaccination Awareness Through Lagos Event (***Leadership*** September 19 2021).
Total	**100%**	

Discussion

This study examined how three selected online editions of Nigerian newspapers (*Vanguard, Daily Trust, and Leadership*) framed the COVID-19 vaccination campaign before and after the rollout. First, we analysed all the headlines to explore the frequency with which Nigerian newspapers' online editions framed COVID-19 before and after the vaccine rollout. Our findings show that the *Vanguard* newspaper published 307 news articles on the COVID-19 vaccination campaign rollout. We discovered that 120 (39%) of the news articles were published before and 187 (61%) were published after the rollout. Similarly, from 192 generated articles, our findings revealed that the *Daily Trust* published 78 (41%) news articles before and 114 (59%) news articles after the rollout.

To validate our findings, previous research, Xiao, and Su (2020) discovered that after the approval of the HPV vaccine, the number of news stories conveying HPV vaccine effectiveness from the sampled newspapers significantly increased. By implication, increased media coverage and giving prominence to vaccine-related campaigns is a critical determinant of successful public buy-in about the campaign (Gesser-Edelsburg, Hijazi, and Cohen 2022; Okorie 2022). Our findings also supported the proposition that the media is an essential partner in health communication, especially during the COVID-19 pandemic (Liu et al. 2020). Therefore, our findings further reinforce that newspapers are regularly used in health campaigns to expose populations to awareness formation and behavioural change messages to address vaccine hesitancy (Gadzekpo et al. 2023).

Contrary to our findings in the *Vanguard* and *Daily Trust*, our study discovered that *Leadership* only accorded prominence to COVID-19 vaccination campaign coverage before the rollout. Consequently, the Leadership, which topped first with a total of 412 news stories, had the most news articles 68% (n = 280) published on COVID-19 vaccination before the rollout (i.e., between December 8, 2020, and March 4, 2021), and published only 132 (32%)

news articles after the rollout (i.e., between March 5, 2021 – December 31, 2022). Our research findings present no clear rationale to suggest why the frequency of the COVID-19 vaccination campaign news coverage drastically dropped in the *Leadership* after the rollout. Future studies can examine news coverage trends on future health-related issues to understand the reasons behind such outliers. Nevertheless, the findings of this research validate the significance of framing theory in understanding how newspapers frame health issues. At the same time, contributes to understanding how newspapers shape critical health communication campaigns, during the COVID-19 vaccination campaign rollout from the Nigerian media perspective.

Second, we examined the extent to which the COVID-19 vaccine was framed in terms of headline valence by Nigerian newspapers' online editions before and after the vaccine rollout. Most of the headlines, 55% (n = 504) were positive, while 16% (n = 143) of the headlines were negative, and 29% (n = 264) were neutral. In line with previous studies, Chong and Druckman (2007) conceptualise that framing effects can sway attitudes, behaviours, and opinions positively or negatively. Consequently, our findings corroborate with Chong and Druckman's (2007), suggestion that positive information mostly dominates the coverage of the COVID-19 vaccination campaign of the three selected Nigerian newspapers. These positive headlines contained vital information in the news articles suggesting COVID-19 vaccines are safe and effective for use which constituted the 39% (n = 356) human interest stories. Our findings further support Strickland et al.'s (2022) research, which suggests that framing vaccine safety positively can potentially boost acceptance. These results, like those of Cesareo et al. (2023), show that the way COVID-19 vaccine information is framed will influence people's attitudes and perceptions.

On the other hand, our findings also present how the three selected Nigerian newspaper headlines framed negative information about the COVID-19 vaccines. The

newspaper's choice of words in presenting some of the COVID-19 vaccine information could negatively influence and shape public perception to boycott or reject COVID-19 vaccines for safety-related concerns. Previous studies by Silva et al. (2023) identify that negative vaccine information and fake news sometimes find their way into social and traditional media. Similarly, our findings reveal some headlines create a negative perception of the COVID-19 vaccine as part of the 16% (n = 143) negative headlines. The headlines could potentially promote vaccine hesitancy as Nigeria rolled out the vaccination campaign with AstraZeneca as the only available brand of COVID-19 vaccine in the country. Hence, the stories could uphold widespread misinformation in other media outlets challenging the safety and efficacy of COVID-19 vaccines. More so, these newspaper editions were published online, so it is easier to share the contents online to other new media platforms, thus, increasing the potential dangers of misinformation and vaccine hesitancy.

From the beginning of the COVID-19 vaccination rollout, there was widespread misinformation that gained momentum among people suggesting COVID-19 vaccines “cause H.I.V.," or fake news about the vaccines having a "magnetic effect," and or misinformation about the vaccines "lower sperm count." The current study confirms previous research, showing that misinformation is a significant challenge driving vaccine hesitancy, particularly when the media exacerbates misinformation about COVID-19 vaccines (Israel-Turim et al. 2023). Previous works Obadare (2005) found similar results were obtained where people were hesitant and boycotted polio vaccines in the polio-endemic northern Nigeria, due to misinformation about reported carcinogenic contaminants, HIV-laced ingredients, and anti-fertility substances.

Third, we explored the most frequently used frame in news articles about the COVID-19 vaccine in Nigerian newspaper coverage before and after NAFDAC approval. Our findings reveal that attribution of responsibility featured as the most frequently used frame

(40%), and the morality frame was the least frequently used frame (5%) in Nigerian newspapers' framing of COVID-19 vaccines before and after the rollout. The findings are like Semetko and Valkenburg's (2000, 105) suggestions that “responsibility for causing or solving social problems could have been attributed to the individual or the government”. Interestingly, our findings show that the government at all levels in Nigeria and its vital functional institutions (i.e., NAFDAC, NCDC, NPHCDA, etc.) were responsible for encouraging people to get vaccinated and that the collective efforts of different individuals and groups of social influencers or opinion leaders (i.e. medical experts, political leaders, artists, corporate bodies etc) whose opinions matter in shaping the national vaccination campaign plans to end the scourge of COVID-19 pandemic in Nigeria were also critical. For instance, it is the responsibility of the NAFDAC to ensure the safety, regulate, and approve the use of any drugs in Nigeria. The headlines framed the NAFDAC discharging its responsibility before and after the rollout.

Interestingly, our findings established the significant roles of social influencers and opinion leadership in both frames (Attribution of Responsibility and Morality frames) in public health campaigns. However, the findings could not correlate with the outcome of this influence on the audience due to the absence of people's responses or feedback to justify opinion formation. Therefore, future research should examine other media platforms (e.g., X or Facebook) and investigate the underlying sentiments between social influencers, opinion leaders, and opinion seekers. Using this approach may resolve the question of who is responsible for COVID-19 vaccine hesitancy in Nigeria. These platforms (e.g., X or Facebook) have user response features (e.g., comments sections, tweets, retweeting, shares, likes, etc.) that enable researchers to analyse and explore people's responses or feedback to messages posted by social influencers and opinion leaders. It is, therefore, beneficial, and

crucial for designing public health messages during pandemics, such as the COVID-19 vaccination campaign.

Theoretical implications

Framing theory

Based on these findings, it is evident that the COVID-19 vaccination campaign received considerable coverage in Nigerian newspapers. The narrative used in framing the vaccines were mainly positive, with an emphasis on the safety and efficacy of the vaccine. This approach aims to motivate people to vaccinate and eliminate doubts about the vaccine's effectiveness. The study's results support the findings of Kilgo et al. (2019), who found that traditional media is crucial in managing information during pandemics. Specifically, newspaper articles were less likely to publish stories that instilled fear about the outbreak of the Ebola pandemic.

Similarly, during the COVID-19 vaccination campaigns, traditional news channels like radio, television, and newspapers played a vital role in sharing information that boosted vaccine acceptance (Piltch-Loeb, Merdjanoff, and Meltzer 2021). Providing positive coverage of COVID-19 vaccines is paramount for newspapers to shape public opinion and foster vaccine adoption. Hence, framing stories that emphasise the safety and effectiveness of vaccines has contributed to achieving this goal. Media play a crucial role in shaping people's opinions and willingness to get vaccinated. However, the media can sometimes cause scepticism towards vaccines (Okorie 2022). Therefore, framing theory explains the media's role as a partner in health communication, especially during the COVID-19 pandemic (Liu et al. 2020). However, the findings of this research also revealed how the COVID-19 vaccination campaign is partly connected to the impact of social influencers and opinion leadership, particularly with the importance of the attribution of responsibility and morality frames. Therefore, attribution theory could be valuable in guiding future research to predict

the catalyst of vaccine hesitancy in Nigeria between social influencers, opinion leaders, and opinion seekers on social media platforms (e.g., X or Facebook).

Attribution theory and the role of opinion leadership

An implication of this study lies within the inability of framing theory to connect stimuli and response frameworks conceptually. First, a disadvantage of mainstream media outlets, like newspapers, is the delay or, at some points, the absence of a feedback mechanism to justify the impact of health communication behaviours. Second, many challenges, including poor vaccine rollout, insufficient supply, safety concerns, and lack of trust, limited Nigeria's vaccination drive. However, we observed that news headlines employed strategic choices of frames to assign responsibility. For instance, public health institutions and the government maintained positive, subtle, and sometimes neutral tones in COVID-19 vaccine-related frames before and after the rollout. This strategic choice of frames was likely employed to avoid pointing fingers at the government for the problems. Our findings, therefore, support Semetko and Valkenburg's (2000, 106) argument that "the predominance of the responsibility frame in these national media outlets suggests the importance and potential influence of political culture and context on the framing of problems and topics in the news".

Rimer and Kreuter (2006) suggest it is essential to understand how people pay attention to communication, deem it relevant, and respond to it when analysing critical health behaviours. Therefore, further research using different approaches and integrative concepts, attribution theory, and opinion leadership will be valuable to examine and predict who is responsible for COVID-19 vaccine hesitancy in Nigeria. "Attribution theorists like (Weiner 1972, 203) argue that the core of attribution theory examines how the allocation of responsibility manifestly guides subsequent behaviour". Opinion leaders, on the one hand, are recognised and considered experts in a specific field and have gained the trust of their audience as dependable sources of information. On this note, the findings of this study have

identified the role of social influencers (i.e., artists, political leaders, and religious/traditional leaders) in shaping the news farming process on the COVID-19 vaccination campaign in Nigeria. More research is needed to determine if trust in opinion leadership can predict public response to COVID-19 vaccination, mainly through social media platforms such as X or Facebook.

Practical and policy contributions

This study identified social influencers and opinion leaders as major team players who shaped the news-framing process in the COVID-19 vaccination campaign before and after the rollout in Nigeria. Therefore, we proposed holistic collaboration between the media, social influencers, opinion leaders (medical experts, traditional/religious leaders), local and international public health institutions, and the government at all levels in Nigeria. This approach will create the required synergy and adopt credible and effective information management strategies for awareness creation to ensure people are informed and well-educated during public health emergencies like the COVID-19 pandemic. A credible source of information, particularly one that tailors messages to explain the importance of vaccines and the benefits of vaccines to people, including the safety and efficacy of vaccines, is a vital component of an effective vaccination campaign (Chevalier-Cottin et al. 2020; Dubé and MacDonald 2016).

Second, our study identified the Nigerian government's lack of proactive risk management plans, particularly the lack of adequate public health facility storage across major and densely populated cities in Nigeria like Kano and Lagos. As such, when the vaccines were made available, it was difficult for public health workers to store vaccines at the required temperature, given the short shelf life of the vaccines. Hence, people are hesitant to take vaccines because of safety concerns, especially in remote and rural areas with few or no standard public health facilities to store the vaccines. This study suggests that improved

risk management strategies should be critical to the emergence of successful public health campaigns in Nigeria. Third, the development of the Internet has changed how mass communication is shared and received online. The Internet has 'revolutionised' and become a key resource centre for information sharing during the COVID-19 pandemic, hence; digitised traditional channels of communication (i.e., newspapers, radio, and television) have been made available online to people (Gesser-Edelsburg, Hijazi, and Cohen 2022). Therefore, in collaboration with government and public health authorities, the media, journalists, and other stakeholders must ensure that only trusted channels in cyberspace convey public health messages with verified sources and put in place fact-checking mechanisms to ensure people are provided with genuine vaccine information. Fact-checking is a critical process that helps journalists to utilise verified information sources to checkmate viral misinformation, especially on social media platforms, due to direct refutations of false information and tactics provided for the audience to engage and critically evaluate news and information (Tully and Singer 2024).

Vaccine uptake is low compared to the population of Nigeria, which has 216 million inhabitants. Less than 40% of the population is fully vaccinated, according to the WHO dashboard (accessed December 1, 2023), versus the 70% target by the end of 2022. Thus, governments and policymakers must engage in effective crisis communication plans and develop national information management strategies as roadmaps to tackle future pandemic occurrences. Early in vaccination campaign strategies, involvement, and collaboration with major team players (i.e., media, medical experts, social influencers, traditional/religious leaders, etc.) are paramount to accomplishing vaccination objectives.

Limitations and Future Research Direction

This research is limited to the analysis of three national newspapers. These newspapers are among three of the top 10 newspapers in Nigeria, based on readership. Future

research could examine all the top 10 newspapers to fully understand newspaper coverage in future pandemics and have a more comprehensive understanding of this issue. Similarly, considering the dangers of misinformation and vaccine hesitancy, the advent of the Internet has changed how mass communication is received. Thus, future research could explore the role of social influencers and opinion leaders on new media platforms (e.g., X or Facebook) in shaping public health campaigns, given the interactive nature of these tools.

This study explored how vaccination campaigns are framed in the news. It showed how such framing can have significant implications for understanding public health-related issues and the emergence of social and political influencers in the pandemic information management and vaccination process from a Nigerian perspective.

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CHAPTER SIX

Article 3

MASSEY UNIVERSITY
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STATEMENT OF CONTRIBUTION
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We, the student and the student's main supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the student's contribution as indicated below in the Statement of Originality.	
Student name:	Mohammed Sadiq
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In which chapter is the manuscript/published work?	Chapter Six
Describe the contribution that the student and members of the supervisory team have made to the manuscript/published work:[1]	The student conceived the idea, wrote the review of literature, discussion and the implications. The second author assisted with structure, analysis, theory development, and editing. The third and fourth authors collected and analysed data.
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A Sentiment Analysis of the COVID-19 Vaccine Crisis in Nigerian Online Newspapers

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Abstract

This paper examines how Nigeria's *Vanguard, Daily Trust, and Leadership* newspapers framed the COVID-19 vaccination campaign roll-out. Using framing theory, we applied natural language processing and sentiment analysis to understand the tone of Nigerian newspapers on the COVID-19 vaccine between December 1, 2020, and December 1, 2022. Findings indicate *Vanguard* reported the most on the vaccine, while *Daily Trust* reported the least. Results of the sentiment analysis revealed headlines were predominantly neutral, whereas the content of the news articles were generally positive in tone. The emergent frames of the COVID-19 vaccine had positive, neutral and negative descriptors, and all prediction accuracies were above 94% in predicting future newspaper publications about the COVID-19 vaccine. By implication, the three major newspapers actively informed the public about the COVID-19 vaccine roll-out and highlighted political, and socio-economic impact.

Keywords: *Framing Theory, COVID-19 Vaccination, Content Analysis, Natural Language Processing, Sentiment analysis*

COVID-19 is one of the world's deadliest public health crises, infecting 774,075,242 people and killing 7,012,986 people globally (World Health Organization, 2024b). Health experts strongly recommend vaccination to protect people and prevent the spread of the virus (Gerotziafas et al., 2021; World Health Organization, 2022). COVID-19 vaccines were developed to prevent the spread of the virus, stimulate quick immunological response, and aid in herd immunity against infection (Stern, 2020). As such, developing vaccines has helped reduce the virus's transmissibility and severity in corona-endemic countries (Anwar et al., 2023). Generally, vaccines provide life-saving protection against illnesses and keep people safe from the harmful effects of infectious diseases (Anwar et al., 2023).

The global COVID-19 vaccination campaign started on December 8, 2020. In March 2021, Nigeria launched a mass COVID-19 vaccination campaign aimed at vaccinating 70% of Nigeria's population (Olu-Abiodun et al., 2022). Nevertheless, studies established that hesitancy to take the vaccine hindered the 70% vaccination target to stop the spread of the virus by the end of 2022 (Olu-Abiodun et al., 2022). Nigeria is the most populous country in Africa, with an estimated population growth of 239 million people by 2025 (Pontianus & Oruonye, 2021). As of November 2023, only 39% of the total population was fully vaccinated, while new cases continue to surface (World Health Organization, 2024a). However, little is known about the catalyst of COVID-19 vaccine hesitancy, especially, in relation to how Nigerian newspapers framed the COVID-19 vaccine rollout. Hence, knowing what is communicated about the COVID-19 vaccine in Nigerian newspapers is imperative. Previous studies on other vaccines, such as the polio vaccine, show newspapers have published mostly negative stories about immunisation campaign (Olufowote, 2011).

However, in a global public health crisis like the COVID-19 pandemic, the media’s role as an agent of social change cannot be underestimated (Anwar et al., 2020). Consequently, the media is an important campaign tool that shapes public opinion during

periods of instability, particularly during a pandemic (Shalini et al., 2022). Messages and information disseminated through media platforms are influential and key in shaping people's perception of vaccines (Zimmermann et al., 2023). The media has become a valuable source of information about the COVID-19 vaccination and is recognised as a prominent partner that creates awareness in the fight against COVID-19 (Anwar et al., 2020, 2023).

Therefore, this study examines how three leading Nigerian newspapers (*Vanguard, Daily Trust,* and *Leadership*) framed COVID-19 vaccines. Using Framing Theory (Entman, 1993; Goffman, 1974), as a theoretical lens, this study employs sentiment analysis as a natural language processing technique to investigate the types of sentiment used in framing the COVID-19 vaccine from the global rollout on December 8, 2020, and December 31, 2022, when Nigeria set to achieve a 70% vaccination target.

Framing Theory, Media Coverage, Vaccine Hesitancy, and the COVID-19 Vaccine Crisis

Framing is a critical concept in media practice that explains how stories are structured to prompt a particular interpretation or stimulate a response from the audience. In a larger context, framing research explicates how media messages affect the audience (Scheufele, 1999; Tewksbury & Scheufele, 2009). Goffman (1974), argues people consciously attempt to categorise, label, and interpret their experiences to make sense of them. Therefore, people use frames as “schemata of interpretation” to locate, perceive, identify, and label information (Goffman, 1974). Frames are the “mental schemas” that help people process information (Wang et al., 2021). Therefore, the framing process entails selecting any aspects of a perceived reality and making them more salient to encourage a specific problem definition, causal analysis, moral judgement, and remedy promotion (Entman, 1993; Entman & Rojecki, 1993). As such, “framing is the process of culling a few elements of perceived reality and

assembling a narrative that highlights connections among them to promote a particular interpretation" (Entman, 2007, p. 164).

Hence, framing is the mental construction of any key aspects of social reality in a story that provides the audience with the parameters to process and interpret information effectively (Carter, 2013). Frames guide the attention of the audience to the preferred aspects of issues in a story (Wang et al., 2021). Frames can broadly be categorised under generic or issue-specific frames (De Vreese & Lecheler, 2012). Generic frames can be identified across different topics and situations, thus, extending beyond thematic limits. Whereas issue-specific frames are relevant or specific to an issue or event, however, all issues have a unique set of issue-specific frames relevant to that context (Entman et al., 2009).

An issue-specific frame is how online news headlines report on the COVID-19 pandemic (Ebrahim, 2022). Specifically, how the media report on the COVID-19 pandemic (Apuke & Omar, 2021a, 2021b), is an issue that compares Nigerian media reports of the COVID-19 pandemic crisis across different media landscapes, particularly, television news coverage and newspapers that focus mainly on issues around the COVID-19 pandemic. However, in the context of the COVID-19 pandemic, the issue of the COVID-19 vaccination campaign emerged. Generally, COVID vaccines are meant to help build our immune system and create antibodies that provide a defence when we are exposed to SARS-CoV-2, the virus that causes COVID-19 (Florindo et al., 2020; World Health Organization, 2022).

Nevertheless, in many parts of the world, especially, in Africa, people are hesitant to get vaccinated against COVID-19, mostly because of misinformation and contradictory information that emanates from the media (Ackah et al., 2022). Vaccine hesitancy is a threat and a major challenge to the global advocacy campaign against vaccination programmes (World Health Organization, 2015, 2019). Vaccine hesitancy occurs when people refuse to take vaccines despite availability (MacDonald et al., 2015; Nuwarda et al., 2022; World

Health Organization, 2015). Particularly, in Nigeria, people refused COVID-19 vaccines due to misinformation, fake news, and conspiracy beliefs as the significant barriers to vaccine acceptance (Nwaoboli, 2021; Olu-Abiodun et al., 2022; Wonodi et al., 2022). Empirical evidence shows the media framed the COVID-19 vaccine differently. For instance, research shows vaccine hesitancy is triggered by many beliefs such as fear of vaccine safety and side effects, lack of trust in pharmaceutical industries, and contradictory messages from media sources (Ackah et al., 2022). Researchers discovered fake news and misinformation circulating in the media about COVID vaccines causing infertility, blood clots, death and thrombosis, and magnetic effects, etc (Anwar et al., 2023; Kanozia & Arya, 2021; Malik et al., 2023a; Silva et al., 2023; Zimmermann et al., 2023).

Trust, politics, culture, and religious beliefs are strong influencers of vaccine hesitancy (Nuwarda et al., 2022; Sadiq et al., 2023; Whitehead & Perry, 2020; Wong et al., 2020). A comparative analysis of United States and Chinese press suggests the COVID-19 vaccine has been politicised in the media, mostly portraying competing political and ideological interest groups (Abbas, 2022). Also, a lack of trust in the Nigerian government, and misinformation from cultural and religious conspiracies that run through conventional and new media platforms are major factors driving COVID-19 vaccine hesitancy in Nigeria (Ekwebelem et al., 2022; Sato, 2022; Talabi et al., 2022; Wonodi et al., 2022). Studies of vaccine hesitancy on Nigerian YouTube videos posted from March 2021 to December 2022 showed Nigerian mainstream news media headlines framed COVID-19 vaccines as mostly negative (Sadiq et al., 2023).

Framing news stories as negative or positive can be understood through valence framing. Valence news framing argues messages shape people's opinions, induce cognitive bias, and help dictate emotions, and other mental effects from a text when presented as positive or negative (Erdogdu, 2019; Iotzov et al., 2023; Lecheler et al., 2015; McDonald et

al., 2021; Mohammad, 2016). Research shows when what is said, is altered by how it is said, then the valence, positive or negative, affects how a message is perceived (Erdogdu, 2019). Valence framing research has received substantial empirical attention in health communication, particularly, in human papillomavirus, (HPV), H1NI, and COVID-19 vaccination research (Nan & Madden, 2012; Nobel, 2023; Sadiq et al., 2023a). The impact of valence frames on behaviour implies negative or positive valence is influential on people's decision-making process (McDonald et al., 2021). Therefore, according to McDonald et al. (2021)

> The effects of valence framing occur when people make different choices or assessments based on whether different message options are presented in terms of their positive outcomes (e.g., vaccines protect herd immunity) or their negative consequences (e.g., vaccines cause side effects and death). (p. 2)

Research shows framing the COVID-19 vaccine positively can significantly increase public acceptance of vaccination against the COVID-19 pandemic (Strickland et al., 2022). Previous studies have shown that while positive framing attributes increased booster intention for the new vaccine (Moderna), it decreased the intention among people who had previously received vaccinations and led to a shift to receive Pfizer among those who had previously received AstraZeneca (Barnes & Colagiuri, 2022). Therefore, valence frames, positive, negative and or neutral are suitable and applicable to this study to analyse the nature of the COVID-19 vaccine sentiments in the headlines of three selected Nigerian online newspapers (*Vanguard, Daily Trust,* and *Leadership*).

Study Rationale

Studies have shown the way media messages are framed can shape public opinion and guide attitude formation on different topics (Erdogdu, 2019; Lecheler et al., 2015), especially, how framing issues shape public perceptions around the COVID-19 vaccination (Cesareo et

al., 2023; Chen et al., 2022; Demuyakor et al., 2024). Framing research has mostly focused on using inferential statistics and frequencies to analyse the effects of media messages on issues; however, natural language processing using sentiment analysis to analyse media effects is an under-utilised approach in framing research. As the COVID-19 pandemic is a global public health crisis, newspapers serve as the channels where governments and public health authorities communicate important health messages about the COVID-19 vaccination campaign. The way messages are framed about the COVID-19 vaccination is vital in shaping public opinion on vaccination intentions (Betta et al., 2022; Chen et al., 2022). Moreover, research has shown newspapers mostly framed messages in a positive way, conveying the efficacy of the COVID-19 vaccine (Zeid & Tang, 2022), while some research has shown negative framing of the COVID-19 vaccine in newspaper reports (Semeraro et al., 2022). Whereas other studies show vaccine messages are mostly neutral in the case of human papillomavirus vaccination coverage in South Africa (Attipoe-Dorcoo et al., 2018). This study brings new insights into news framing and health communication research from the COVID-19 vaccination campaign rollout in Nigeria. Therefore, to further understand how the COVID-19 vaccine is portrayed, and leverage advancements in sentiment analysis and natural language processing, we propose the following research questions to examine COVID-19 vaccine news coverage in *Nigerian* newspapers:

RQ1: What was the frequency of COVID-19- vaccine-related posts by each newspaper from 2020 - 2022?

RQ2: What was the overall sentiment conveyed by each newspaper's headlines and articles regarding the COVID-19 vaccine?

RQ3: What frames emerged from the articles and headlines of each newspaper regarding COVID-19 vaccine?

RQ4: To what extent can future newspaper publications be predicted based on the

gathered data?

Method

Using natural language processing, a computer-based tool and sentiment analysis, a computerised technique that researchers employ to identify the existing polarisation or bias in a dataset (Khan et al., 2016; Susnjak, 2024), an analysis was conducted on the coverage of the Nigeria COVID-19 vaccine roll-out in *Vanguard*, *Leadership* and *Daily Trust* newspapers. The data underwent processing in Python and visualization was done in Excel. Sentiment analysis was performed on both articles and headlines to gauge the newspapers' overall stance towards the COVID-19 vaccine roll-out. The dataset was split into training and testing sets, and the model developed in the study was employed to predict future sentiment expressed in the newspapers.

Data Collection and Processing

The data used in this study were collected using the Octopus Collector for web content retrieval. Searches were conducted on the official websites of the three major newspapers using four keywords "COVID-19", "vaccine", "COVID-19 jab", or "vaccination", covering the period from December 1, 2020, to December 1, 2022. The software was also used to crawl information such as news headlines, publication dates, brief content descriptions, and links. Both headlines and body paragraphs were collected and analysed separately. Only news articles posted in English were included in the study. After collection, the data were processed and cleaned using Python and Excel. Initially, the collected data were observed to standardize different content formats for various keywords and websites. The main modifications included organizing the data into columns for headlines, links, dates, and brief content descriptions.

A preliminary analysis was conducted to determine the total number of news articles and identify the website with the highest number of news articles. Subsequently, for further analysis, Python was used to remove news articles containing blank lines, resulting in a dataset with valid content. Libraries such as TextBlob and NLTK were used to eliminate punctuation, special characters, and non-English bytes from sentences. Since the collected data consisted of news reports, the language usage was formal and no additional processing was performed on word usage. Initially, a total of 9761 news items were collected from the three newspaper websites. During the review period, *Vanguard* emerged as the primary source of relevant news, with a total of 7982 related articles. The other two newspapers posted fewer articles, with *Leadership* publishing 1007 articles and *Daily Trust* posting 772 articles. After data screening and cleaning, 9412 news items remained for analysis. Irrelevant and unnecessary news articles were removed from the study. For instance, headlines containing the keyword "COVID-19" but not mentioning vaccination-related topics were deemed irrelevant. Similarly, articles about vaccines unrelated to COVID-19 were excluded.

Sentiment Level Analysis

Sentiment analysis assists in analysing human emotion to determine polarity (Hossain et al., 2021). It involves categorizing textual information into objective and subjective texts based on the context of communication. Objective texts present information without expressing opinions or sentiments. Conversely, subjective texts convey opinions, emotions, or reactions. The objective of sentiment analysis is to comprehend individuals' states of mind conveyed through text, making it more applicable to subjective texts. Text sentiment can be determined at the phrase, sentence, or document level (Albrecht et al., 2020). In this study, the headlines analysis is at the sentence level while the body paragraph analysis is at the document level. The process begins by importing the TextBlob class from the Textblob library. Subsequently, the text is defined, and a TextBlob object is created from it, the

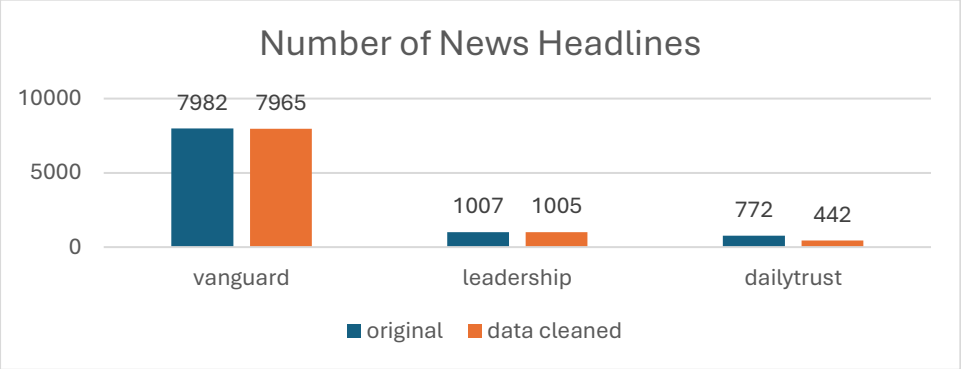
sentiment. Polarity method of the TextBlob object is then utilized to calculate the polarity score, which ranges from -1 to 1. Scores closer to 1 indicate positive sentiment, those closer to -1 denote negative sentiment and values near 0 signify neutral sentiment. Following the polarity score calculation, sentiment is classified as positive, negative, or neutral based on the obtained score. Finally, the original text, sentiment classification, and sentiment score are printed. In addition, we labelled and scored each news title and content summary, creating four new columns: title sentiment, title sentiment score, article sentiment, and article sentiment score. Simultaneously, we divided the dataset into training, testing, and prediction sets in a 9:1 ratio. Using the sentiment analysis model TextBlob, sentiment polarity was classified as positive, negative, or neutral. We assessed the model's performance by comparing the actual sentiment labels of the testing set with the predicted sentiment labels.

Results

Keywords Frequency

To answer *RQ1*, *Vanguard* published the most COVID-19 vaccine-related posts n = 7965, followed by *Leadership* n = 1005. *Daily Trust* published the least amount of COVID-19 vaccine-related posts, n = 442. Results are depicted in Figure 1.

Figure 1. Number of COVID-19 vaccine-related news headlines.



Overall Sentiments

The wordings analysed in the three news websites' headlines tended to be neutral, followed by positive (*RQ2*). This indicates each newspaper adheres to a generally neutral

stance about the COVID-19 vaccine in headlines. Whereas the content of stories presented in the articles analysed shows use of neutral language appears to decrease. However, the analysis reveals an increase in the use of positive sentiment to slightly outweigh negative sentiment. This implies the overall news coverage of the COVID-19 vaccine tends to lean towards the use of positive sentiment. These results are depicted in Table 1.

Table 1: Overall Sentiment Table

		Vanguard	%	Leadership	%	Daily Trust	%
Headlines	Positive	1692	21.23%	201	19.94%	70	15.73%
	Neutral	5618	70.51%	722	71.63%	332	74.61%
	Negative	658	8.26%	85	8.43%	43	9.66%
Articles	Positive	4130	51.83%	368	36.51%	161	36.18%
	Neutral	2339	29.36%	503	49.90%	233	52.36%
	Negative	1499	18.81%	137	13.59%	51	11.46%

Emergent Frames

Analysing the emergent frames in the three selected newspaper headlines and articles (*RQ3*) collectively revealed the overall common words in positive sentiment frames mostly include “new” and “first”, while the negative sentiment frames show words like “fake,” “poor,” and “killed” were frequently observed in the analysis as presented in Figure 2. Furthermore, the analysis also shows *Leadership* stands out as the newspaper that predominantly used economic-related frames like "funding," "stakeholders," and "bank," compared to *Vanguard* and *Daily Trust*, which tended to emphasise health-related frames. This suggests *Leadership* prioritizes frames that discuss global economic and political topics and places less emphasis on health-related issues. Common words are grouped by word connections and similarity in Figure 2.

Figure 2: Common Word Analysis Frames

Headlines

Positive

Negative

Neutral

Articles

Positive

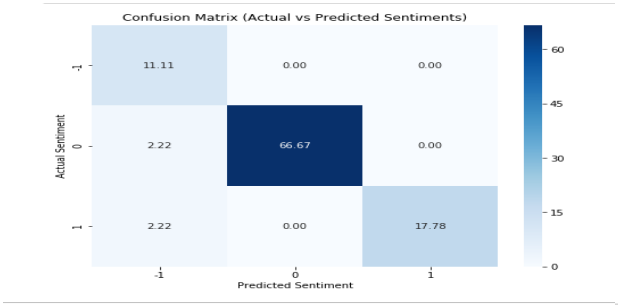
Negative

Neutral

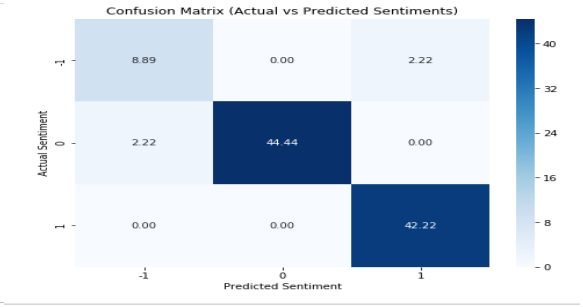
Prediction

As shown in Tables 2 and 3, all prediction accuracies are above 94%, indicating the effectiveness of our model (*RQ4*). The sentiment prediction accuracy of headlines is better than that of the content. Furthermore, the results allow for the prediction of future posts by each newspaper using the model. Concerning headlines, the majority of tone across all three newspapers is expected to be neutral. Among the remaining headlines, a positive tone will likely outnumber a negative tone. Regarding the articles, *Vanguard* is anticipated to have the highest volume of positive content, followed by neutral, and then negative. *Leadership* is expected to have a high volume of neutral content, followed by positive, and then negative content. *Daily Trust* follows a similar pattern to *Leadership* but with a smaller sample size.

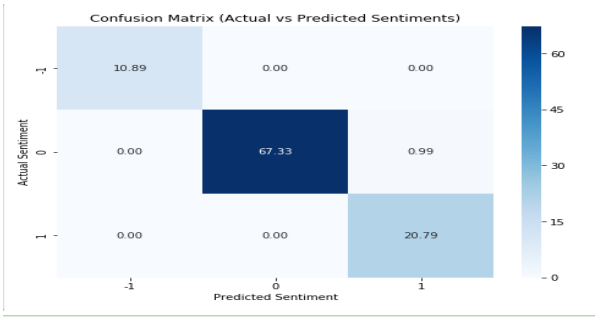
Table 2: prediction confusion matrix



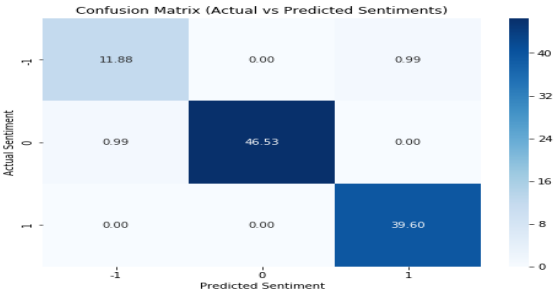
Daily Trust Headlines



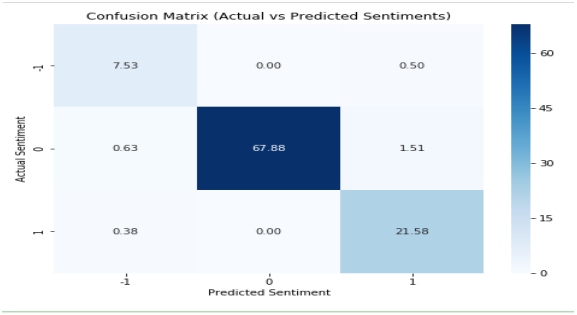
Daily Trust Articles



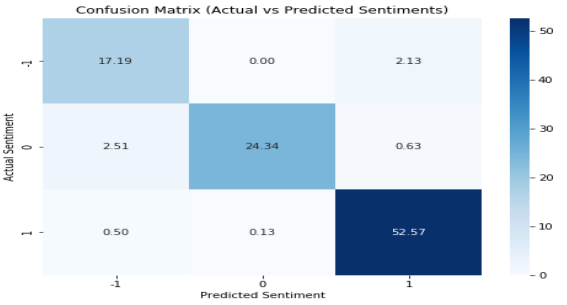
Leadership Headlines



Leadership Articles



Vanguard Headlines



Vanguard Articles

Table 3: prediction rate

	Vanguard	Leadership	Daily Trust
Headlines	96.99%	99.01%	95.56%
Articles	94.10%	98.02%	95.56%

Discussion

Research shows online news is a popular and important source of information that shapes public perceptions and sentiments on vaccines in the era of digitisation (Attipoe-Dorcoo et al., 2018). Therefore, our analysis of online headlines and news articles from December 2020 – December 2022 in *Vanguard, Daily Trust,* and *Leadership* newspapers provides valuable insights and implications of news framing on the COVID-19 vaccination rollout, shedding more light on the nuances in news articles, and the overall sentiment conveyed in framing the COVID-19 vaccination campaign rollout in Nigeria.

First, we examined the frequency of COVID-19 vaccine-related posts in the three selected online newspapers. The findings indicate *Vanguard* reports the highest (n = 7965) frequency of headlines, followed by *Leadership* (n = 1005), and then *Daily Trust* (n = 442) (*RQ1*). Second, we analysed the overall sentiment conveyed by each newspaper's headlines and news articles regarding. Results of the sentiment analysis revealed COVID-19 vaccine-related headlines were predominantly neutral, whereas the content of the COVID-19 vaccine news articles had a generally positive tone (*RQ2*). Third, we explored the emergent frames of the COVID-19 vaccine in the headlines and news articles of each newspaper. Results showed the emergent frames of the news articles and headlines had positive, neutral, and negative descriptors (*RQ3*). Finally, we examined the extent to which future newspaper publications could be predicted. Our findings suggest all prediction accuracies are above 94% in predicting future newspaper publications about the COVID-19 vaccine-related posts (*RQ4*).

In this study, our findings show there are notable differences in the frequency of COVID-19 vaccination-related posts in the headlines and news articles in the selected newspapers, as the results indicate *Vanguard* reports the highest, with *Leadership* and *Daily Trust* posting fewer headlines. Based on the results, *Vanguard* is more inclined towards covering pandemic-related topics, emphasizing public health issues pertinent to the Nigerian

population. In contrast, *Leadership* and *Daily Trust* allocate less space to health-related matters and focus more on economic and political topics. Although our findings could not specifically present a connection to newsroom best practices as a rationale to justify this inclination. However, one possible justification could be that *Vanguard,* based in Lagos, prioritised the COVID-19 vaccination campaign because Lagos is the epicentre of the COVID-19 pandemic and the economic gateway of Nigeria. As such, *Vanguard's* coverage encompasses a broad range of topics, including politics, economy, and current affairs, and has a focus on societal issues (Vanguard, n.d.). Given that *Vanguard's* history of independence from political control positions it as a publisher that values unbiased reporting.

The *Leadership* and *Daily Trust* newspapers are in the Federal Capital Territory, where compliance with public health measures is paramount due to the presence of top government officials. Therefore, given its stated values, *Leadership* may prioritise reporting political leaders as a means to fulfil its mission of advocating for good governance and holding leaders accountable on health-related issues and the COVID-19 pandemic. Political news is crucial for informing citizens about government actions, policies, and accountability measures. Our findings, therefore, corroborate Abbas (2022), who observed that the press politicised reports on the COVID-19 vaccine in the media to portray competing political and ideological interests. Similarly, *Daily Trust,* being the largest circulating newspaper, predominantly focused on reporting health issues related to Northern Nigeria, which indicates its impact within the region.

Therefore, the differences in news emphasis among these newspapers may stem from their unique editorial philosophies, audience preferences, and market dynamics. Conceptual evidence suggests editorial policy and ownership are key determinants of news value and influence news content. Thus, *Leadership* and *Daily Trust* newspapers publishing fewer reports on the COVID-19 vaccination campaign could be linked with editorial policy and

ownership. Editorial policy is an internal structural framework or an ideological mechanism that influences news values and professionally guides newsroom policies and practices (Barkho, 2021). Ownership defines how powerful individuals and entities control, finance, and own communication channels (e.g., radio, television, newspapers, and magazines) and determine message output (Abubakre, 2017). Editorial policy and ownership may have played a significant role in news coverage; thus, as communication is key to understanding the nature of pandemics (Croucher, & Diers-Lawson, 2023), we suggest future research investigate the role of editorial policy and ownership in public health crisis communication management.

Second, the sentiment analysis provides deeper insights into the overall tone of the coverage. The headlines generally maintained a neutral stance with a subtle bias towards positive sentiment, conveying terms like "dose," "targets," "health," "pandemic," "protocols," "stakeholders," "compulsory," "urges," and "second" as nouns frequently used in discussions about COVID-19 vaccines. We observed that format difference is one possible reason accounting for the neutrality of headlines. In principle, headlines are generally short and act as a quick summary or teaser for the main article. Therefore, headlines serve as the source material that captures the reader’s attention in search engines (Spcollege, n.d.). Therefore, a neutral tone in this context suggests using technical and procedural terms to describe aspects of vaccine administration, public health guidelines, and regulatory measures.

Our analysis also shows the three newspapers' news content is mostly inclined towards positive language in framing the regulatory approval of the AstraZeneca vaccine as safe and effective to enhance public confidence and encourage uptake, indicating an optimistic framing of the COVID-19 vaccination campaign, and pandemic-related developments. Our analysis also reveals the three selected newspapers’ articles generally mentioned the States (state governments), agencies, NCDC, Federal government, specialised

organisations and NGOs, and public health institutions responsible for coordinating, implementing, and regulating COVID-19 vaccine measures across the length and breadth of Nigeria. Conceptually, researchers argue media frames shape our perception of reality by highlighting certain aspects of news stories (Carragee & Roefs, 2004), because journalists use frames to create meanings and interpretations of events that shape public opinion on social issues (Carragee & Roefs, 2004). Our findings, conform to previous research that shows vaccine-related messages are mostly framed with a neutral tone in the case of online news coverage of human papillomavirus vaccination in South Africa (Attipoe-Dorcoo et al., 2018). Other studies, however, which corroborate these findings, show newspapers positively frame messages, conveying the efficacy of the COVID-19 vaccine (Zeid & Tang, 2022).

Studies have observed that people fear vaccines when the media sensationalise vaccine information in headlines (Parsons Leigh et al., 2022). News headlines should prioritise accuracy, presenting extraordinary and relevant stories (Molek-Kozakowska, 2013). News articles, on the other hand, can explore opinions and interpretations more freely and embed statements in a more complex discourse (Padmaja et al., 2014). Especially during times like the COVID-19 pandemic, journalists might use a positive tone in news articles to frame the COVID-19 vaccine and boost public intention to vaccinate (Barnes & Colagiuri, 2022). Additionally, analysing common words associated with positive and negative sentiment elucidates the prevailing narratives within news articles (Malik et al., 2023c). Consequently, in our analysis, the common words are grouped by similarity and marked as collocations, which sheds light on meaningful connections between words within a text (Williams, 2001). These collocations are words that consistently appear together in a text, forming connections that can be depicted as networks of nodes and collocates (Brezina, 2016; Brezina et al., 2015). Examining these connections helps us understand how the term “COVID-19 vaccine” was framed and portrayed in Nigerian newspapers (Malik et al., 2023).

Thus, our findings conceptually demonstrate the framing concept is a powerful process in media practice that influences how news media select aspects of a perceived reality and make them more salient to encourage a specific problem, causal analysis, moral judgement, and remedy (Entman, 1993; Entman & Rojecki, 1993).

Theoretical Implications

Our findings show that Nigerian online newspapers extensively covered the COVID-19 vaccine rollout. The sentiment analysis revealed COVID-19 vaccine headlines were predominantly neutral, and the news articles showed the COVID-19 vaccine messages were mostly positive in the emergent frames. The model also accurately predicted COVID-19 vaccine-related posts in the three selected online Nigerian newspapers. By implication, our research suggests the media has a powerful role in shaping public opinion by framing stories, issues, and events (de Vreese, 2005; Matthes, 2009; McCombs & Reynolds, 2002; Scheufele, 1999). Therefore, our analysis of the COVID-19 vaccination campaign rollout further provides new insights into framing research and demonstrates the strength of framing theory in shaping public health crises, such as the COVID-19 pandemic from a Nigerian context.

In an effort to understand the role of the media in the COVID-19 vaccination campaign, previous studies by Sadiq et al. (2023), employed the theory of planned behaviour (TPB) to examine vaccine hesitancy in Nigerian YouTube videos. The findings show a lack of trust, and how the media frames the headlines greatly influences YouTube users' discourse around the COVID-19 vaccine. Framing theory argues media channels report sources, present issues and define events, or problems in a specific manner (de Vreese, 2005). Therefore, how the news is presented or how stories are framed by the media has a significant impact on shaping public opinion and influencing how people perceive a particular topic, event, or problem (McCombs & Reynolds, 2002). Using framing theory, our findings discovered news frames motivate intrinsic vaccine behaviours with verbs like "get" and "receive," which

denote the actions involved in accessing and adopting the COVID-19 vaccine. Hence, communicating the COVID-19 vaccine with carefully crafted words suggests new methodological insights using natural language processing to glean dynamic linguistics properties in designing suitable vaccine messages (Demuyakor et al., 2024; Malik et al., 2023; Zeid & Tang, 2022).

Scholars argue framing is conceptually understood from the perspective of media and audience frames (Scheufele, 1999). In our findings, the common word analysis empirically connects media frames to negative vaccine attributes indicating a lack of proper management and negative effects related to vaccination. For example, the words “poor" vaccine distribution, "fake" vaccines, and instances where vaccines "killed" individuals underscore challenges not only in vaccine implementation and public health management but also indicate media portraying vaccines in a negative way that could potentially promote hesitancy. Vaccine hesitancy is globally recognised as a major behavioural challenge in vaccine administration (World Health Organization, 2015, 2019). However, fake news is one of the known catalysts of vaccine hesitancy where the media sometimes can vaccine messages negatively (Nwaoboli, 2021; Olu-Abiodun et al., 2022; Wonodi et al., 2022).

The results of our study demonstrate that media framing combines texts which reveal the existence or absence of selected “keywords, stock phrases, stereotyped images, sources of information, and sentences that provide thematically reinforcing clusters of facts or judgments” (Entman, 1993, p. 52). Media frames are organized ideas and language packages used by journalists to convey the central media discourse for an event or issue, where journalists “invent their own clever catchphrases, drawing on a popular culture that they share with their audience, and conceived of as a set of interpretive packages that give meaning to an issue” (Gamson & Modigliani, 1989, p. 3). Our study further confirms that media frames act as a crucial channel that communicators use to convey a person, event, episode, or issue

within a text through an identified medium or channel to the targeted audience. These frames can be written, spoken, graphical or visual communication models that communicators use to construe or depict the intended message (D'Angelo, 2017). A media frame reinforces how mass-mediated messages interact with the audience (Scheufele, 1999). In this regard, encouraging more research on framing theory and natural language processing is crucial, especially using sentiment profiling or opinion mining. This will not only help bridge existing methodological gaps but also aid in understanding how the media frame vaccine messages, such as the HPV vaccine, which was recently rolled out in Nigeria.

Practical Implications

In a crisis, like the COVID-19 pandemic, communicating accurate messages that provide vaccine efficacy and safety information is essential for effective public health crisis management. As Nigeria is the most populous country in Africa (Pontianus & Oruonye, 2021), when faced with a significant public health challenge like the COVID-19 pandemic, by implication, it requires a robust response from the government and media outlets to address public health concerns and disseminate accurate information about vaccination efforts. Therefore, our findings revealed that mentions of countries like India and Japan, as well as organizations like the Nigeria Centre for Disease Control (NCDC) and government public figures, Ministers and key political office holders like Vice President Prof Yemi Osinbajo, signify global cooperation and governmental support for vaccination efforts. Given that the COVID-19 vaccination defines the government's effort to defend people against the virus, there is generally a positive tone towards the main sources of the news (Adiprasetio & Larasati, 2020).

As a practical guide, the findings of our study demonstrate the vital role online newspapers play in framing and promoting a collaborative approach adopted by various stakeholders in the fight against the COVID-19 pandemic, instilling confidence in the public

regarding the safety and efficacy of COVID-19 vaccines. However, due to the uncertainty about negative frames that question the effectiveness of vaccines, the public might have reservations or even lack of trust in the government (Kumar et al., 2016). Therefore, the expression about the relationship between the vaccine roll-out and the political establishment is neutral in this case. Hence, the media need to be cautious when sharing information about COVID-19 vaccines and explore communication strategies that could prevent negative portrayals of vaccination efforts and encourage trust in the government (Deuze, 2020; Sadiq et al., 2023). Similarly, our findings reveal that in terms of demographic descriptors, words like "Residents," "Workers," "Dr.," and "People" are neutral terms used to denote individuals living in specific areas, employed in various occupations, or holding professional qualifications. However, these descriptors provide insight into the diverse groups involved in vaccination efforts without implying particular attitudes or sentiments toward vaccination. More so, making references to "Million" or "Billion" doses of vaccines may underscore challenges in vaccine distribution and administration. Despite global efforts to ramp up production and supply, disparities in access, logistical constraints, and supply chain disruptions have hindered equitable vaccine distribution in many parts of Nigeria. As such, large numbers of doses may highlight the magnitude of the vaccination task, but they also underscore the urgency of addressing supply constraints and ensuring equitable access to vaccines for all populations. Therefore, we recommend proactive pandemic crisis management plans, specifically, focusing on pre-crisis, reactive, and post-crisis communication strategies rooted in awareness creation and media literacy to address communication gaps against major agents of vaccine hesitancy such as misinformation, fake news, and conspiracy beliefs in vaccination campaigns in line with previous studies (Sadiq et al., 2023).

Future Research and Limitations

The project encountered potential limitations that warrant acknowledgement and consideration for future research. One notable limitation pertains to the automatic categorization of words by the Natural Language Processing (NLP) tool. While the NLP algorithm effectively categorized words into positive, neutral, and negative categories, certain terms like "Africa" and "cases" were erroneously coded due to their inherent complexities. Consequently, these terms were excluded from the analysis to ensure the accuracy of the results. To mitigate this limitation, future research could focus on retraining the sentiment analysis model based on the insights gleaned from this analysis.

By refining the Natural Language Processing algorithm and enhancing its ability to discern nuanced meanings, researchers can improve the accuracy and reliability of sentiment analysis in the context of COVID-19 vaccine discourse. Another limitation of the project is the sample size, which consisted of articles from three Nigerian newspapers: *Daily Trust, Vanguard,* and *Leadership*. While these newspapers offer valuable insights into COVID-19 vaccine discourse in Nigeria, the scope of the sample may not capture the full spectrum of opinions, perspectives, and trends within the Nigerian media landscape. Moreover, relying on three newspapers may introduce bias and inaccuracies in the analysis, potentially skewing the findings. To address this limitation, future research could expand the sample size to include a more diverse range of newspapers, online media sources, and social media platforms. By incorporating a broader array of sources, researchers can obtain a more comprehensive understanding of public discourse surrounding COVID-19 vaccines in Nigeria, thereby enhancing the robustness and generalizability of the findings.

These findings underscore the relevance of framing theory to understand news priorities and sentiment trends within newspaper coverage of the vaccination campaign rollout in Nigeria. The distinct approaches taken by *Vanguard, Daily Trust,* and *Leadership* reflect their unique editorial philosophies and audience preferences, which can inform future

research and communication strategies aimed at enhancing public discourse and facilitating informed decision-making during health crises in Nigeria and beyond.

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CHAPTER SEVEN

Discussion

6.1 Key Findings

This study aimed to investigate how the Nigerian media framed the COVID-19 vaccine. The first article examined the reported barriers to COVID-19 vaccine adoption through a content analysis of Nigerian COVID-19 vaccine YouTube videos. The second article examined how the Nigerian online newspapers framed the COVID-19 vaccination rollout between Dec 2020 – Dec 2022. The third article examined the factors that shape or influence the media's framing of the COVID-19 vaccination discussion in Nigeria. In this section, the implications, limitations, and recommended future research directions of the study are explained and highlighted. Overall, the findings attempt to elucidate the role of YouTube and Nigerian online newspapers in vaccination campaigns, specifically identifying the reasons for COVID-19 vaccine hesitancy from the Nigerian media perspective. The research findings contribute to the existing literature in framing research and apply the theory of planned behaviour and framing theory in the context of the COVID-19 vaccination campaign on Nigerian YouTube videos and Nigerian online newspapers. Next, I outline the articles/ findings in detail.

In **Article 1**, the theory of planned behaviour was first set to guide the investigation of the reported barriers to COVID-19 vaccine adoption. Misinformation and a lack of trust were identified as the reported barriers to COVID-19 vaccine adoption in Nigeria. Findings show the tone of YouTube headlines was mostly neutral 62.2%, with 32.4% negative, and only 5.0% positive. Therefore, analysis of the tone of YouTube headlines shows the importance of how media frames vaccine messages. The rationale for this study adopting the theory of planned behaviour is to explore how relevant social-behavioural factors could trigger vaccine

hesitancy in the Nigerian media context. The theory of planned behaviour provides logical explanatory support for understanding the reported barriers towards the COVID-19 vaccine adoption from Nigerian YouTube users' comments thematically analysed. Primarily, a lack of trust in the vaccines, the Nigerian government, misinformation, and conspiracy-related beliefs have significant implications that trigger vaccine hesitancy in Nigeria's COVID-19 vaccination campaigns. The thematic analysis revealed that people are hesitant to vaccinate against COVID-19 due to subjective norms. Subjective norms refer to how powerful individuals such as opinion leaders, social institutions, or pressure groups shape the beliefs of people who matter to them, influencing their decision to engage or not in certain behaviours (Scheufele & Krause, 2019; Tasnim et al., 2020). Therefore, people consider "no COVID jab" unfavourable largely due to misinformation. Vaccine misinformation mostly emerges from the subjective behaviours of the opinion influencers from YouTube users' comments who influence and shape their opinions. Misinformation creates a barrier to health literacy as incorrect knowledge impedes people from making informed health decisions (Okpara et al., 2021). Therefore, misinformation, a lack of trust and framing are key constructs identified and linked with COVID-19 vaccine hesitancy from the Nigerian YouTube videos analysed.

In Article 2 which manuscript was submitted for publication in the Journal of *African Journalism Studies,* in this study, data was collected from 912 relevant stories that mention the COVID-19 vaccine, in three leading selected Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership newspaper*) were analysed to examine the influence of framing in the COVID-19 vaccination campaign in terms of frequency, headline valence, and emergent frames. What frame/theory was used? Maybe a sentence here. Findings of frequency indicated *Leadership* has 412 published stories, *Vanguard* has 307 stories, and *Daily Trust* recorded the lowest with 192 reported stories on the COVID-19 vaccination rollout. The analysis revealed most of the headlines 55% (n = 504) were positive, while 16%

(n = 143) were negative, and 29% (n = 264) of the headlines were neutral. Based on the results, attribution of responsibility emerged (40%) as the most frequently used frame and the morality frame only (5%) as the least frequent frame that emerged. These findings demonstrate the relevance of framing theory. In this context, framing is a relevant framework that defines how the media structures news stories to evoke certain interpretations or stimulate the reactions of their audience. In this regard, the framing concept also establishes the important roles social influencers and opinion leaders play in Nigeria's COVID-19 vaccination campaign under the attribution of responsibility and morality frames). These results are in agreement with previous studies that reveal mainstream media channels such as Radio, Television, and newspapers played a significant role in sharing relevant awareness messages that boosted vaccine acceptance (Piltch-Loeb et al., 2021).

Article 3 manuscript was submitted for publication in the *International Journal of Crisis and Risk Communication Research*, the paper investigates how these three selected Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership newspaper*) reported the COVID-19 vaccine crisis, using natural language processing and sentiment analysis. Natural language processing is a computer-based data collection approach that is gaining prominence in journalism and communication studies. In this study, Natural language processing is relevant to explore sentiments and bias in how Nigerian online newspapers framed the COVID-19 vaccine in Nigeria. The approach uses opinion mining strategies, otherwise called sentiment analysis tools to identify embedded bias and sentiment in data sets. Leveraging this approach, this study analysed large datasets generated from three selected Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership newspaper*) to examine the frequency of posts, identify sentiments, explore emergent frames, and predict future posts in the Nigerian newspapers framing of the COVID-19 vaccine crisis. Findings indicate *Vanguard* posted the highest (n = 7965), and *Leadership* has (n = 1005), while, *Daily Trust* has only (n = 442)

recorded the lowest numbers of headlines posted on news framing of the COVID-19 vaccine crisis in Nigeria. Secondly, the results of sentiment analysis show headlines are generally neural, and the content of news articles were predominantly positive. The findings equally reveal that emergent frames were positive, neutral, and negative for the headlines and news articles analysed. Therefore, these results contributed to shaping our understanding of how news media frames stories in different ways creating potential tripartite cognitive consequences. Lastly, the analysis presented above 94% accuracy in predicting future posts for the COVID-19 vaccine news among the three selected Nigerian online newspapers. In this regard, the findings suggest journalists have used different tones, (positive, negative, and neutral) in reporting the COVID-19 vaccine crisis in Nigeria in line with previous studies (Malik et al., 2023; Sadiq et al., 2023; Zeid & Tang, 2022).

6.2 Theoretical Implications

This section explains the theoretical implications of the theory of planned behaviour and framing theory in this study. First, the theory of planned behaviour TPB is relevant to this research because of its ability to link intentions to certain beliefs that shape behaviour. Therefore, this study adopts TPB in Article 1 to understand how attitudes, subjective norms, and perceived behavioural control interact in shaping the reported barriers to COVID-19 vaccine adoption in Nigerian YouTube COVID-19 vaccine videos. Second, given the recognised role traditional media like newspapers can play in health communication, this study found the framing theory relevant to examine and understand how Nigerian online newspapers frame the COVID-19 vaccine rollout between Dec 2020 – Dec 2022. Framing theory is a normative research framework and approach to investigating media-audience relationships in the context of communication research, specifically, how the media builds frames in stories is relevant and recognised in influencing and shaping public opinions.

Therefore, this section begins by discussing and explaining the theoretical implications of the theory of planned behaviour for this research.

Theory of Planned Behaviour

Rooted in psychology, the theory of planned behaviour (TPB) simply argues that beliefs shape behaviour. According to TPB, attitude, subjective norms, and perceived behavioural control are the three core components that influence behavioural intentions (Ajzen, 1985, 1991). Therefore, the theory of planned behaviour (TPB) by Azjen (Ajzen, 1985, 1991), was used to guide data analysis and understand the reported barriers to the COVID-19 vaccine adoption in Article 1. The findings conceptually established a lack of trust and misinformation as the key reported barriers to COVID-19 vaccine adoption from YouTube users' comments and how vaccine messages were negatively framed in the headlines. However, the theory of Planned Behaviour (TPB) failed to fully explain the underlying beliefs and inherent behaviours that shape people's attitudes towards the COVID-19 vaccine. Nevertheless, the findings of this paper corroborated with previous studies that discovered misinformation and a lack of trust as the reported barriers to COVID-19 vaccine adoption. For instance, the results show COVID-19 vaccine misinformation was viral on YouTube videos in the users' comments with different responses and conspiracies suggesting the COVID-19 vaccine is a “mark of the beast”, the vaccines are not “safe and ineffective”, and the vaccine causes “blot clots, death, and thrombosis” demonstrate the overwhelming influence of misinformation in promoting misunderstanding of important public health messages.

Therefore, the media landscape is a central information ecology that has witnessed an enormous stream of misinformation during the COVID-19 immunisation campaigns (Kemei, et al., 2022). Research shows misinformation substantially contributed to the decrease in the

willingness people exhibit towards vaccination against the COVID-19 virus as studies reported in the UK and the U.S. (Loomba et al., 2021). In this regard, misinformation is a threat to trust, especially against public health messages during pandemics (Sadiq et al., 2023; Kemei, et al., 2021; Loomba et al., 2021). However, when not properly managed, misinformation can amplify risk perceptions and trigger unwarranted behaviours towards a pandemic such as COVID-19 (Lovari, 2020). Therefore, with misinformation circulating relentlessly, trust in public health measures to curb the pandemic is threatened, hence, vaccine hesitancy thrives. In the context of Nigerian YouTube videos analysed, Sadiq, et al. (2023) discovered that false COVID-19 vaccine information from unreliable sources has led to mistrust of public service messages, hence, causing the public to ignore important safety messages. Therefore, the barriers to COVID-19 vaccine adoption in relation to misinformation need further investigation. As such, the researcher systematically selected three Nigerian online newspapers and adopted the framing theory in Articles 2 & 3, to further understand how Nigerian media, specifically online newspapers reported the COVID-19 vaccination campaign. Next section discusses theoretical implications of framing theory in this study.

Framing theory

As a newsroom practice, framing is used as a framework to define issues in a story and, at the same time, to promote the desired outcome or gain audience response to certain issues. Therefore, based on the analysis of this study, it was discovered that the Nigerian newspapers selected (*Vanguard, Daily Trust, and Leadership*) considerably accorded prominence to the coverage of the COVID-19 vaccination campaign rollout. First, in Article 2, the results of content analysis show vaccine messages among the three selected newspapers (*Vanguard, Daily Trust, and Leadership*) were largely positively framed and designed to convey the safety and efficacy of the vaccines, even though there were few noticeable frames

analysed that conveyed negative messages about the COVID-19 vaccines. As such, according to researchers, presenting framing effects as conveying positive or negative tones can significantly influence attitudes, behaviours, and opinion formation (Chong & Druckman, 2007).

Studies have shown that media messaging about vaccines proves effective, particularly when stories framed, for example, transmit positive awareness reports that present influenza-related illnesses/deaths, measures for avoiding virus infection, vaccine information, and public accountability. This type of positive framing is believed to have influenced people's intentions towards H1N1 and flu vaccines (Nan et al., 2012; Xu et al., 2022). Piltch-Loeb et al. (2021), uncovered mainstream news channels (Radio, TV, & Newspapers) are crucial in sharing positive messages that boost COVID-19 vaccine acceptance. As such, framing vaccine messages as positive is an effective way to encourage people to accept vaccines, especially, when safety and efficacy are emphasised (Penţa & Băban, 2018).

In fact, this current research, framing the COVID-19 vaccine in Nigeria, an analysis of Nigerian media, empirically demonstrates that framing is a concept that conceptually links vaccine messages as an effective pandemic communication strategy to foster vaccine acceptance and adoption. As research shows, media frames simply refer to the organised ideas and language packages through which journalists systematically guide discourse about an event or issue in the public sphere and "invent their own clever catchphrases, drawing on a popular culture that they share with their audience, and conceived of as a set of interpretive packages that give meaning to an issue" (Gamson & Modigliani, 1989: p3).

This thesis extended the framing scholarship by providing new insights and empirical ties to further understand how cognitive and social barriers can be dissected and be

effectively addressed through media messaging of vaccines. Given that the sampled newspapers (*Vanguard, Daily Trust, and Leadership*) mostly focused on safety and efficacy issues related to the COVID-19 vaccine. Therefore, the media coverage that emphasises the safety and efficacy of vaccines is especially important in designing pandemic communication that aims to improve vaccination campaigns. As well as to support the global crusade against vaccine hesitancy, and possibly foster vaccine adoption among the vaccine-hesitant groups in Nigeria, the giant of Africa. In this study, therefore, the framing theory proved useful in explaining how media systematically acts as a partner in health communication during the COVID-19 pandemic (Liu et al., 2020).

Consistent with the thematic findings, also, the Attribution of Responsibility frame has also expounded on the role of social influencers in the COVID-19 vaccination campaign. The Attribution of Responsibility frame shows media coverage can foster collaborative efforts between public actors and social influencers such as non-governmental organisations, public philanthropies, and the private sector in supporting Nigerian government efforts to stem the COVID-19 pandemic in the country. Similarly, the Morality frame, on the other hand, suggests negative COVID-19 vaccine information can potentially influence people's opinions, especially, as these messages emanate from highly influential cultural and religious leaders. Studies confirmed that COVID-19 vaccine hesitancy in Nigeria is partly fuelled by misinformation from cultural and religious conspiracies that spread through both traditional and digital media platforms (Ekwebelem et al., 2022; Sato, 2022; Talabi et al., 2022; Wonodi et al., 2022). Based on the findings of this study, therefore, a triangulation of the framing theory and two-step-flow theory would be a potential research direction that could help examine the influence of vaccine messages from opinion leaders and how these messages could potentially shape vaccine acceptance and adoption.

Secondly, this research aimed to analyse how the media framed the COVID-19 vaccination campaign in Nigeria. Therefore, Article 3 integrates inferential statistics and qualitative data obtained through computer-based tools, Natural Language Processing, and sentiment analysis to examine polarity and embedded bias in COVID-19 vaccine news coverage in three Nigerian online newspapers (*Vanguard, Daily Trust, and Leadership*). Natural language processing utilises sentiment analysis tools to identify bias in data sets (Khan et al., 2016; Susnjak, 2024). Therefore, sentiment analysis can categorise texts as positive, negative, or neutral (Liu, 2010; Mohammad, 2015; Nasukawa & Yi, 2003). At the same time, sentiment analysis can also group common words based on similarity and mark them as collocations to reveal meaningful connections within a text (Williams, 2001).

In Article 3, the findings suggest the three selected Nigerian online newspapers gave prominence to the coverage of the COVID-19 vaccination campaign. Results of sentiment analysis discovered the COVID-19 vaccine headlines were mostly neutral, while the content of news articles generally maintained a positive tone about the COVID-19 vaccine in the emergent frames. The model accurately predicted vaccine-related posts in selected newspapers for future posts. this study supports previous research which acknowledged the media's influential role in shaping public opinion through framing stories, events, and issues (de Vreese, 2005; Matthes, 2009; McCombs & Reynolds, 2002; Scheufele, 1999). This analysis of the COVID-19 vaccination campaign rollout between 2020 – 2022 presents new insights into framing research and validates the strength of framing theory in shaping public health crises, especially, the COVID-19 pandemic, from a Nigerian media context. As a result, misinformation, conspiracy theories and a lack of trust about the COVID-19 vaccine campaign messages are some of the major reported barriers circulating in the Nigerian media sphere.

Furthermore, these findings, suggest that by using natural language processing and sentiment analysis, media channels present news and stories in a specific way based on their sources and interests (de Vreese, 2005). As such, how the media presents the news significantly shapes public opinions and influences perceptions of events, issues, and problems (McCombs & Reynolds, 2002). In these findings, the framing theory guides data analysis to discover news frames that stimulate genuine vaccine sentiments, such as using verbs like "get" and "receive," which connote the actions that translate into accessing and adopting the COVID-19 vaccine. Therefore, framing theory helps us to understand that carefully designing the wording of COVID-19 vaccine messages is significantly beneficial in enhancing effective vaccine communication (Demuyakor et al., 2024; Malik et al., 2023; Zeid & Tang, 2022).

Based on previous framing scholarship, how the media influences the audience can simply be understood theoretically from the way media frames such stories (Scheufele, 1999). Therefore, this study found that media frames linked the COVID-19 vaccine messages with adverse linguistic attributes such as portraying harmful vaccine effects and poor vaccine administrative management. For instance, media wordings like “poor vaccine distribution”, “fake vaccines”, and vaccine “killed people” are examples of news reports about the COVID-19 vaccines, and by implication, these types of frames could promote hesitancy, given that vaccine hesitancy is declared worldwide as a foremost behavioural challenge bedevilling and affecting vaccine administration (World Health Organization, 2015, 2019). In this context, fake news has also contributed as the known catalyst of vaccine hesitancy where the media frames vaccine messages from unreliable sources (Nwaoboli, 2021; Olu-Abiodun et al., 2022; Wonodi et al., 2022).

In summary, the results of this study simply demonstrate triangulation of media framing and sentiments analysis is useful in revealing the presence or absence of certain

“keywords, stock phrases, stereotyped images, sources of information, and sentences that provide thematically reinforcing clusters of facts or judgments” (Entman, 1993, p. 52). As the findings of this study discovered how the media uses certain keywords and catch-phrases like “received” and “get” to report the COVID-19 vaccine messages to the audience. Therefore, journalists use media frames as pre-established set ideals and language packages, to communicate and initiate discourse that is critical to an event or issue, and “invent their own clever catchphrases, drawing on a popular culture that they share with their audience, and conceived of as a set of interpretive packages that give meaning to an issue” (Gamson & Modigliani, 1989, p. 3). Therefore, the findings of this study confirm that framing vaccine messages as negative, positive, and neutral, or how the media specifically draws audiences' attention through the Attribution of responsibility and Morality frames, reflects the critical role media play in using different sets of interpretive mechanisms to discourse the COVID-19 vaccine in Nigeria. Hence, frames are the channels communicators use to convey information about an issue or event to their target audience (D’Angelo, 2017). The frames used in communicating may include written, spoken, graphical or visual models that enable communicators to convey their intended messages effectively (D’Angelo, 2017). Given that a media frame is a popular way in which mass-mediated messages interact with the audience (Scheufele, 1999). In this regard, it becomes imperative to encourage and expand research on framing theory and natural language processing is considered essential, particularly employing sentiment profiling or opinion mining. This approach will not only help close the existing methodological gaps but also assist in comprehending how the media frames vaccine messages such as the HPV and Malaria vaccines which the Nigerian government recently introduced (Ajayi, & Emeto, 2023: Makoni, 2023).

6.3 Implications for Methodology

The study demonstrates the quality and distinctiveness of the Internet and computer-based tools to recognise bias and identify sentiments in how Nigerian online newspapers framed the COVID-19 vaccines. Essentially, this study foregrounded that using Internet and online tools like www.exportcomments.com, and computer-based approaches such as natural language processing and sentiment analysis, and newspapers in PDF copies) for content analysis is gradually evolving as a great methodological contribution to explore diverse research intersections in journalism and media research. Scholars confirmed that 'Internet-based' data gathering tools are fast becoming a new practice that more researchers are recently craving to adopt for data collection (Benfield & Szlemko, 2006). Therefore, computerised tools mostly complement manual data extraction and help improve coder reliability in content analysis. However, the rise of the Internet and new media platforms, such as YouTube, Facebook, X, Instagram, and TikTok, has provided researchers with the opportunity to explore the vast amount of data available on these platforms (Nieborg et al., 2020). Despite the availability of large datasets on these platforms, and user response features, however, a systematic and reliable way to extract and scrape information has always been a challenge for researchers (Manovich, 2011). However, the emergence of online tools like Octopus Collector, and www.exportcomments.com as well as applications such as Python, TextBlob and NLTK has greatly eased such difficulties and yielded a more accurate and reliable process to extract data for analysis. In this study, the researcher subscribed and downloaded all relevant comments from Nigerian YouTube videos for analysis between Mar 2021 – Dec 2022, and results have produced positive outcomes in analysing and understanding key socio-behavioural and cognitive factors, where misinformation and a lack of trust emerged as the reported barriers to COVID-19 vaccine adoption from the Nigerian perspective.

Therefore, the research opted to apply computer-based tools to further investigate the COVID-19 vaccine rollout in the three selected Nigerian online newspapers. In this study, computer-based tools, natural language processing and sentiment analysis emerged to complement the statistical ingenuity and explore the linguistic attributes to recognise bias and identify sentiments in how the online newspapers reported the COVID-19 vaccines. Bias occurs when news stories focus on facts and make explanations correspond to and support their bias, this means reporting stories in a way that suits a predisposed narrative (Morstatter, et al., 2018). Therefore, this study scrapes large datasets to recognise bias and identify sentiments in how newspapers reported the COVID-19 vaccines. hence, the process demonstrates that scraping larger datasets is achievable and reliable using the framing theory to guide computer-based techniques natural language processing and sentiment analysis. However, the findings of this study in Article 2 show that Nigerian online newspapers largely adopted a positive tone to frame the safety and efficacy of the COVID-19 vaccines. Nevertheless, the results of Article 3 indicated that headlines were mostly neutral, while the content of the news articles conveyed positive sentiments about the COVID-19 vaccines. The findings revealed the overall common words in positive sentiment frames mostly include “new” and “first”, while the negative sentiment frames show words like “fake,” “poor,” and “killed” were used by the Nigerian online newspapers to report the COVID-19 vaccines.

By implication, integrating two different approaches, content analysis and natural language processing to study how Nigerian media frame the COVID-19 vaccine, demonstrates the urgency to design a context-specific pathway model, and vaccine message design logic to discretely address vaccine-hesitant groups. Particularly, in Nigeria, where politics, regionalism, religiosity, and multiculturalism are an integral part of the decision-making process, hence, vaccine messages should logically be designed to integrate both linguistic attributes and sociocultural dynamics. Currently, health communication research is

saturated and predominated by Western-based individualist ideologies. Therefore, a context-specific model and vaccine message design logic rooted in the context-specific ‘choice of words’, collectivism, and sociocultural dynamics of the Nigerian people is critically required. This approach is necessary and potentially effective for communicating vaccine messages considering the seeming ideologies of the people in Nigeria. In this regard, designing context-specific messages is not only helping to address vaccine-related misinformation and conspiracies, but it would also equally support advancing multi-dynamic health communication research geared towards promoting vaccine adoption and addressing vaccine hesitancy in Nigeria. This means a robust and holistic framework with context-specific messages to address sociocultural linkages, public trust and behavioural attributes is a significant roadmap towards achieving effective vaccination campaigns and a vaccine hesitancy free Nigeria.

6.3 Practical Implications and Contributions for Strategic National Vaccination Policymaking Plans

This research has significant practical implications for the governments at all levels (central, state, and local government areas), public health agencies, non-governmental organisations, pharmaceutical companies and key players and actors in the vaccination campaign administration in Nigeria and beyond. This contribution is key to recognising and considering the following strategic policy tools to stem vaccine hesitancy and improve vaccination campaigns. Based on the challenges established from the analysis of the COVID-19 vaccination campaign rollout, Nigeria is currently experiencing a lack of effective and workable solutions for policymaking on national immunisation plans. Therefore, the findings of this research highlighted the following key pragmatic strategies: collaborative interventions with relevant stakeholders, image restoration, health communication

competencies, and a centre with trained emergency health information personnel to address national immunisation campaign plans.

6.4 Collaborative Interventions Towards Enhancing Routine Vaccination Plans in Nigeria

6.4.1 Administrative and Policy Collaborations

Currently, the WHO database shows that only 39% of Nigerians are fully vaccinated against COVID-19 in Nigeria, as of 22 May 2024 (World Health Organisation, 2023). There is a low rate of COVID-19 vaccine uptake in Nigeria, hence, this is a cause for concern considering Nigeria's massive population of approximately 216 million people. Therefore, to address these issues related to low vaccination uptake, the government should develop collaborative interventions that involve all critical stakeholders, including content creators, opinion leaders, and traditional/cultural and religious leaders. Through vaccine awareness education campaigns, these key stakeholders can help bridge the existing lack of trust in the pharmaceutical companies and the Nigerian government and address misinformation and fears about the safety and efficacy of COVID-19 vaccines. For instance, in Article 1, content creators who supported vaccines effectively promote herd immunity, educate, and encourage people about vaccines in comments like this "This is great content so that people will be aware of the importance of vaccination". This study suggests governments at all levels collaborate with trained content creators to develop proactive risk communication messages stressing the importance of top-down and bottom-up communication approaches for vaccine administration in Nigeria.

Similarly, in Article 2, the study identified social influencers and opinion leaders as major team players who shaped the news-framing process in the COVID-19 vaccination campaign before and after the rollout in Nigeria. Therefore, a holistic collaboration between the media, social influencers, opinion leaders (medical experts, traditional/religious leaders),

local and international public health institutions, and the government at all levels is proposed to address vaccine hesitancy in Nigeria. For instance, Article 3 of this study's findings made references to media reports about countries such as India and Japan, including public agencies like the (Nigeria Centre for Disease Control (NCDC) and prominent public figures, Ministers, and important political leaders like Vice President Prof Yemi Osinbajo, indicate global collaboration and administrative support to promote vaccination campaigns. In this regard, the COVID-19 vaccination campaign shows the efforts of the government to defend Nigerians against the COVID-19 virus, based on the positive tone media used to address sources of news (Adiprasetio & Larasati, 2020). By implication, these findings contributed to highlighting the need to create the required synergy and adopt credible and effective information management strategies for awareness creation to ensure people are informed and well-educated during public health emergencies like the COVID-19 pandemic.

6.4.2 Capacity Building and Development of Healthcare Service Providers

In Nigeria, frontline healthcare workers need effective communication skills to guide public health efforts and vaccine interventions during emergencies like the COVID-19 pandemic. Shaw (Shaw, 2018) observed that patients often lack knowledge of medical terminologies, therefore, it is essential to communicate using simple terms to ensure accurate messaging to reduce uncertainty when communicating. Therefore, collaboration among local healthcare providers, mass media, community/traditional chiefs, religious leaders, NGOs, and pressure groups is crucial to ensure people are well-informed and enlightened about vaccine benefits. It is vital for the Nigerian government at all levels to implement a door-to-door COVID-19 vaccination awareness campaign, especially, in most of the remote Nigerian communities due to inadequate public amenities because researchers such as Adebimpe and Adeoye, (2021) found that a door-to-door vaccination is a significant method to improve and encourage people to vaccinate at the state level.

*6.4.*3 The Need for Improved Research for Health Communication Competencies

Research, like the ongoing study, is an excellent way to comprehend the underlying factors and effects of public health misinformation, therefore, this study suggests that governments at all levels in Nigeria, as well as local and international healthcare organizations, should encourage research and development. This means research will help develop the required communication competencies and help identify the sources of vaccine misinformation and suggest effective measures to address them. Collaborative research is also important in identifying, fostering, and helping the Nigerian government design proactive risk management plans to address existing shortages of public health facilities in many parts of Nigeria, particularly, the densely populated cities of Kano and Lagos. This will help provide the needed temperature to store vaccines ease the storage problems faced and regulate the short shelf life of the vaccines. Given that safety concerns are one of the major challenges identified as driving vaccine hesitancy, people don't want to vaccinate, specifically in rural communities having few or no basic health amenities to store the vaccines. Therefore, this study proposed improved risk management policies to consider adequately funding research aimed at improving health communication competencies in public health campaigns across Nigeria.

6.5 Image Restoration Strategy to Promote Trust in Public Health Interventions in Nigeria

The chain of trust in public health has noticeably been diminished due to the backlash of the Meningitis and Polio vaccines 20 years ago in Nigeria. Therefore, a lack of trust in public health messaging resurfacing in the 21st century with the COVID-19 vaccination campaign suggests the urgent need to restore public trust. Research shows Nigerians do not trust the government on vaccines (Yahya, 2006, 2007: Obadare, 2005). Therefore, trust is a cognitive process that links mental representations of oneself, others, the situation, and

emotions. However, as a social institution that provides essential services, trust is crucial to the development of the healthcare system (Gilson, 2003). Therefore, determining people's trust in vaccines and healthcare services delivery is crucial for effective public health programs that provide lifesaving vaccinations (Ozawa & Stack, 2013).

However, the findings of this study highlighted the paucity of public trust, misinformation, vaccine-related conspiracy theories, lack of effective health communication and lack of accountability in the government of Nigeria which causes vaccine hesitancy. Therefore, this study is imperative to help governments in planning communication strategies aimed at fostering public trust in vaccines and enhancing public access to design credible messages about the safety and efficacy of vaccines. This can be achieved by designing messages that increase public trust through honesty and transparency. These messages should provide sufficient information about the vaccine production process, ingredients, effective administration, and how to combat vaccine counterfeits. Sato (2022) observed that in Nigeria, vaccine hesitancy is largely due to people's distrust of the government. Thus, greater trust in the government could lead to higher acceptance of the COVID-19 vaccine.

This study can serve as a useful tool for policymakers to develop campaigns based on evidence and communicate the safety and effectiveness of vaccines. The aim is to effectively communicate the benefits of vaccines and address any perceived risks that may act as barriers to vaccination. Given that the principal aim of any vaccination campaign should be to remove these risk perceptions and foster public confidence (Ramot & Tal, 2023). Finally, these findings can provide guidance on how to promote accountability during pandemics. Policymakers should, therefore, prioritise being accountable to the people through improved access to equitable socio-economic measures, as this can address healthcare issues. Donation of health items, relief materials and free medical services would be a good palliative initiative

for the predominantly poor masses introduced during pandemic emergencies. As a result, this may help address vaccine hesitancy and increase vaccine uptake in Nigeria.

6.6 Emergency Public Health Information Management Centre

A successful vaccination campaign requires a reliable source of information that tailors its message to explain the significance of vaccines, their benefits, efficacy, and safety to people (Chevalier-Cottin et al., 2020; Dubé & MacDonald, 2016). Therefore, providing a centre responsible for emergency public health information will help healthcare agencies and policymakers in Nigeria to focus on promoting health literacy campaigns to reduce misinformation about public health issues. Given that promoting media literacy and providing adequate training to information officers to address gaps in communication is important in vaccine management. This includes a proactive communication approach that must be considered before, during and after the pandemic. It is also crucial to provide instructional materials that help people identify and evaluate the accuracy and credibility of online sources. This will enable people to make informed decisions based on reliable information. Media literacy teaches critical skills required to help people acquire, comprehend, and evaluate important health information. This includes the ability to make informed decisions about healthcare services. Given that negative media coverage of vaccines, for example, can lead to a decrease in demand for vaccinations and increase vaccine hesitancy (Nan & Madden, 2012). Therefore, Sørensen et al. (Sørensen et al., 2012) emphasised the importance of media literacy as critical in countering such misinformation.

The emergence of the Internet has transformed the process of sharing and receiving mass-mediated messages online. As such, it is important for trusted channels to convey public health messages with verified sources and to put in place fact-checking mechanisms to ensure people are provided with genuine vaccine information. Fact-checking is a crucial process for journalists to ensure that they use only verified sources of information. This process helps

them to combat the spread of false information, particularly on social media platforms. Fact-checking provides direct refutations of false information and also equips the audience with the necessary tools to engage and critically evaluate news and information (Tully & Singer, 2024).

The vaccination rate in Nigeria is lower than its population of 216 million. As the most populous country in Africa (Pontianus & Oruonye, 2021), when faced with a significant public health challenge like the COVID-19 pandemic, by implication, it requires a robust response from the government and media outlets to address public health concerns and disseminate accurate information about vaccination efforts. According to the WHO dashboard (accessed on May 29, 2024), only 39% of the population is fully vaccinated, which falls below the target of 70% set to be achieved by the end of 2022. Therefore, it is the obligation of government and policymakers to utilise 'effective crisis communication' strategies and advance national information management frameworks to tackle pandemic incidents in the future. This study is a practical guide that demonstrate online newspapers can play a significant role in framing and promoting positive messages to fight against the COVID-19 virus, imparting confidence and conveying relevant vaccine messages addressing the safety and efficacy of COVID-19 vaccines.

6.7 Limitations and Future Research Directions

This research investigated how the media framed the COVID-19 vaccination campaigns in the headlines and news articles. The findings reveal how such framing can have substantial consequences such as misinformation and lack of trust for understanding issues related to public health and the advent of social influencers in the COVID-19 pandemic communication management and immunization process in the Nigerian context. The research is not without its limitations for future research considerations. First, about the context this research was conducted in the Nigerian media sphere. Therefore, the research is limited to

analysing YouTube videos and three selected Nigerian online newspapers. Although the newspapers are ranked in the top 10 Nigerian newspapers based on readership, future research could focus on examining all top-ranking newspaper's readership. Secondly, considering the rapid spread of misinformation, a lack of trust and vaccine hesitancy is also relative to other new media platforms as well. Therefore, it is worthwhile to investigate platforms like X, Facebook, Instagram, and TikTok due to the presence of interactive features that could be useful for future researchers to understand how social influencers and opinion leaders shape public opinions on vaccination campaigns. Third, given the relevance and power of media sources in previous vaccine hesitancy in Nigeria. Therefore, interviewing journalist, key actors or content creators as media sources that shapes vaccination campaign news gathering and production process would be a great idea and suggestion for future research directions.

Another limitation relates to the automatic categorisation of words by the Natural Language Processing (NLP) tool in the third study. While the NLP algorithm effectively categorised words into positive, neutral, and negative categories, certain terms like "Africa" and "cases" were erroneously coded due to their inherent complexities. Consequently, these terms were excluded from the analysis to ensure the accuracy of the results. To mitigate this limitation, future research could focus on retraining the sentiment analysis model based on the insights gleaned from this analysis. By refining the Natural Language Processing algorithm and enhancing its ability to discern nuanced meanings, researchers can improve the accuracy and reliability of sentiment analysis in the context of COVID-19 vaccine discourse.

Another limitation of the project is the sample size, which consisted of articles from three Nigerian newspapers: *Daily Trust, Vanguard,* and *Leadership*. While these newspapers offer valuable insights into COVID-19 vaccine discourse in Nigeria, the scope of the sample may not capture the full spectrum of opinions, perspectives, and trends within the Nigerian

media landscape. Moreover, relying on three newspapers may introduce bias and inaccuracies in the analysis, potentially skewing the findings. To address this limitation, future research could expand the sample size to include a more diverse range of newspapers, online media sources, and social media platforms. By incorporating a broader array of sources, researchers can obtain a more comprehensive understanding of public discourse surrounding COVID-19 vaccines in Nigeria, thereby enhancing the robustness and generalizability of the findings. These findings underscore the relevance of framing theory to understand news priorities and sentiment trends within newspaper coverage of the vaccination campaign rollout in Nigeria. The distinct approaches taken by *Vanguard, Daily Trust,* and *Leadership* reflect their unique editorial philosophies and audience preferences, which can inform future research and communication strategies aimed at enhancing public discourse and facilitating informed decision-making during health crises in Nigeria and beyond

CHAPTER EIGHT

Summary

The importance of media coverage, specifically, news framing of vaccine-related communication has been investigated and critically explained in numerous studies (Ashwell & Murray, 2020; Demuyakor et al., 2024; Malik et al., 2023; Xiao & Su, 2020). However, further steps to complement the global health communication efforts towards improving vaccine uptake and adoption, as well as to stem vaccine hesitancy are necessary and significantly evolving from the perspective of vaccine-hesitant countries like Nigeria (Akinyemi et al., 2021; Ayenigbara et al., 2021; Enitan et al., 2020; Olu-Abiodun et al., 2022; Olufowote, 2011; Sadiq et al., 2023). Consequently, since the emergence of the COVID-19 pandemic, researchers in health communication have investigated the role of media in COVID-19 and vaccine-related communication in the African contexts, see (Asubiaro et al., 2021; Ayenigbara et al., 2021; Okorie, 2022).

Particularly, these studies are conducted as part of the academic Mega force that acknowledges existing research scholarships recognising the role of Nigerian media in vaccination campaigns (Akinwande et al., 2023; Nwaoboli & Asemah, 2021; Sadiq et al., 2023). Nevertheless, the current study is an empirical effort contributing towards improving health communication studies, specifically, vaccine-related communication research from the context of the Nigerian media sphere. Given that vaccine hesitancy is a major setback to Nigeria's national vaccination drive and plans to eradicate vaccine-preventable diseases which pose a serious challenge to the fragile public health sector. Therefore, the media is one of the relevant institutions and a critical partner in health communication campaigns in Nigeria, particularly, the media helps provide warning messages during the COVID-19

pandemic and vaccination campaign (Akinwande et al., 2023; Gever & Ezeah, 2020; Oyama & Okpara, 2017).

However, little is known about the role of YouTube, and how Nigerian online newspapers frame the COVID-19 vaccination rollout. Specifically, there is a dearth of research that investigates the reported barriers to COVID-19 vaccine adoption and factors that influence news framing of the COVID-19 vaccination rollout in the Nigerian media landscape. Given the rising COVID-19 cases and widespread vaccine hesitancy in the country, these gaps in knowledge persist despite identifying many research efforts on COVID-19 vaccine hesitancy. Given these problems, this study was envisioned and aims to: examine how Nigerian media frame the COVID-19 vaccination rollout, secondly, to identify the factors that shape/influence the media's framing of the COVID-19 vaccination discussion in Nigeria, and third, to examine the barriers to the COVID-19 vaccination adoption in Nigeria. To accomplish this task, a comprehensive literature review was conducted, and a review of key concepts was identified such as misinformation, fake news, trust, politics, culture, and religiosity as critical factors that influence media coverage of vaccination campaigns.

First, news framing is strongly associated with how vaccine messages are framed in the headlines. The findings of this study in general show vaccine headlines are predominantly neutral and positive, although, with notably fewer negative vaccine headlines. Second, linking vaccine hesitancy to how the media adopted and reported the COVID-19 vaccines on YouTube has been understudied. However, this study demonstrates based on how the vaccine headlines were framed, misinformation and conspiracy theories about vaccines and a lack of trust in the vaccines and the Nigerian government significantly contributed to vaccine hesitancy from the Nigerian YouTube videos and user comments analysed. Therefore, it is paramount to further explore, using different approaches such as interviews and focus group

discussions, how the reported barriers could potentially influence vaccine hesitancy in different contexts. Third, this study identified the Attribution of Responsibility frame as the most frequently used and the Morality frame as the least used frame in the COVID-19 vaccination campaign rollout in Nigeria. In this regard, attribution theory and two-step-flow theory can be applied to investigate further, who is responsible for vaccine hesitancy in Nigeria. Finally, the results of the sentiment analysis remarkably reveal that emergent frames suggest COVID-19 vaccine headlines are neutral and news articles had positive and negative descriptors. This study, therefore, proposed further research to be conducted to understand the implications of negative news framing of vaccine messages on people's willingness to adopt vaccines in different contexts.

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vaccination in Switzerland and Austria. *Scandinavian Journal of Public Health*. https://doi.org/10.1177/14034948231195388

Appendix 1. Manuscript Submitted to African Journalism Studies

Dear Stephen Croucher,

Thank you for your submission.

Submission ID	**248506498**
Manuscript Title	**Framing the COVID-19 vaccine rollout in Nigeria: An analysis of online newspapers' coverage of the COVID-19 vaccine**
Journal	**African Journalism Studies**

If you made the submission, you can check its progress and make any requested revisions on the Author Portal

Thank you for submitting your work to our journal.
If you have any queries, please get in touch with RECQ-peerreview@journals.tandf.co.uk.

Kind Regards,
African Journalism Studies
Editorial Office

Appendix 2. Manuscript Submitted to JICRCR

From: jicrcrdomain@gmail.com <jicrcrdomain@gmail.com>
Date: Monday, 13 May 2024 at 9:08 AM
To: Stephen Croucher <S.Croucher@massey.ac.nz>
Subject: [JICRCR] Submission Acknowledgement

> You don't often get email from jicrcrdomain@gmail.com. Learn why this is important

Stephen Croucher:

Thank you for submitting the manuscript, "A Sentiment Analysis of the COVID-19 Vaccine Crisis in Nigerian Online Newspapers" to Journal of International Crisis and Risk Communication Research . With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Submission URL: https://jicrcr.com/index.php/jicrcr/authorDashboard/submission/153
Username: scroucher

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Prof. Dr. Audra Diers-Lawson

Audra Diers-Lawson, Editor-in-Charge

JICRCR