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SYSTEMATIC REVIEW

Thematic Evaluation of Global Alliance for Vaccines and Immunization's (GAVI) Contribution to Nigeria

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Abstract

Background: Many developing countries rely on external support to enhance their healthcare systems.

Objectives: To thematically evaluate GAVI, the Vaccine Alliance's interventions on immunization in Nigeria by reviewing abstracts of research papers indexed in Scopus. Available literature includes published articles about GAVI, the Vaccine Alliance's intervention on immunization in Nigeria or reports of GAVI's success stories.

Methods: The study is a retrospective cross-sectional analysis of abstracts of previously published articles with a common scope. The abstracts of the papers are indexed in the Scopus database, and the data were extracted and analyzed to produce themes using thematic analysis.

Results: The thematic analysis yielded seven themes and 18 subthemes, which were used to produce a framework. The seven themes and their corresponding subthemes are: (i). Economic Evaluation and Financing of Vaccine Programs (cost-effectiveness, financial transition, investment in vaccine technology and infrastructure, and co-financing agreements). (ii). Effectiveness and Impact of Vaccination Programs (Public Health Outcomes and Community Health Impact) (iii). Global and local collaboration in health initiatives (international partnerships in vaccine delivery and local collaboration). (iv). Innovations in Vaccine Technologies and Systems Integration (technological advancements and system integration). (v). Policy Development and Institutional Support (policy formulations and institutional roles). (vi). Program Monitoring, Evaluation, and Learning (evaluation and adaptation, and monitoring mechanisms). (vii). Vaccine Accessibility and Equity Challenges (socioeconomic factors, geographic disparities, access barriers, and equity initiatives in vaccine distribution).

Conclusion: The themes represent the current state of GAVI, the Vaccine Alliance's intervention in Nigeria, and the framework derived from them could be helpful for decision-making.

Keywords: Equity, GAVI, Intervention, Nigeria, SDG vaccine, Themes, Word cloud

Introduction

Many developing countries, such as Nigeria, rely on external support to enhance their Healthcare systems. In Nigeria, domestic spending on the health sector has been declining while external donations support improving primary health care has been on the increase. ^[1] This support comes in various forms, including technical advice and technical and project management expertise, as well as funding for essential equipment, supplies, and initiatives to achieve equitable and sustainable healthcare. In the past few years, the Global Alliance for Vaccines and Immunization (GAVI) has had a big impact on public health in Nigeria and other developing countries. ^[2] It has done this by improving immunization and dealing with the complicated issues that arise from the interaction of economic, technological, and social issues. As a result of their support in immunization, this has led to routinization, ^[3] which is the introduction of new vaccines, and expansion of immunization to underserved populations. ^[4] The major success stories of the GAVI intervention are the drastic reduction of the incidence and mortality of poliomyelitis, measles, maternal and neonatal tetanus, influenza, pneumococcal, and herpes and their current efforts in supporting mass vaccination of young girls are expected to reduce the future incidence of cancers caused by human papillomavirus (HPV). Their roles in ensuring mass vaccination against COVID-19 remain among their greatest achievements in the last four years. GAVI's successes are due to a combination of

factors, including commitments by the Governments of developing countries, affordable pricing, sustained vaccine supply, and improvements in supply chains and logistics. ^[5]

GAVI, the Vaccine Alliance, has significantly supported Nigeria's immunization efforts since 2001. Their contributions have supported vaccine and cold chain procurement, technical assistance, immunization campaigns, and overall health system improvements. ^[6] However, with Nigeria's economic growth surpassing GAVI's eligibility threshold, the country entered a Gavi transition phase in 2018. This transition aims to achieve complete self-reliance in funding its immunization program by 2028. ^[7] To navigate this process successfully, Nigeria must address potential financial and programmatic challenges that could hinder the sustainability of its immunization program.

The aim of this paper is to thematically evaluate GAVI interventions on immunization in Nigeria by reviewing abstracts of research papers that contained the keyword "GAVI interventions in Nigeria". The papers are extracted from the Scopus, Elsevier database for articles published in 2023. Themes were obtained that could be beneficiary in strengthening. This paper builds revealed themes and subthemes of evidence of GAVI's intervention in Nigeria.

Available literature here are published articles of GAVI's intervention on immunization in Nigeria or reports by GAVI's success stories. However, this paper builds up evidence from already published peer-reviewed articles. Through this study,

the authors hope to distill the key elements that contribute to the success of GAVI's vaccine efforts in Nigeria, offering suggestions for future strategies and actions based on the thematic analysis. This method not only helps us understand how GAVI's programs affect many areas, but it also helps revealed how their interventions have affected different aspects of health systems in Nigeria. This pooled evidence could be areas of further interventions or a form of a summary that documented GAVI's interventions in Nigeria.

Method

Study Design

The study is a retrospective cross-sectional analysis of abstracts of previously published articles with a common scope. The abstracts of the papers are indexed in the Scopus database, and the data were extracted and analyzed to produce themes. The abstracts include references to primary research articles, reports from health organizations, and reviews that provide empirical data and theoretical discussions relevant to GAVI's operations.

Data Collection and Eligibility Criteria

The comprehensive step by step process will produce the same data. The data set consists of 43 abstracts from different research studies and papers that provide a view of GAVI's impact on immunization in Nigeria. The detailed of how the final sample size of 43 was obtained is as follows.

i). The Scopus database was queried with the search terms GAVI OR Global alliance for vaccines AND Nigeria. The search was done between January 3 and 5, 2024.

ii). The search yielded 730 documents.

iii). The search was restricted to articles published in 2023 because, the authors are interested in currency of research in that context which reduced the articles to 55 papers.

(iv). Papers without abstracts or written in any language apart from English, those that does not contained the search terms in the abstracts and those that does not have Nigeria as settings or themes were excluded. This reduced the articles to the final sample of 43.

(v). Multi-country articles are included. Hence, some of the quotes may include some countries other than Nigeria.

(vi). No articles from grey literature were added.

(vii). The abstracts were extracted, cleaned, prepared, and saved in Microsoft Word for thematic analysis.

Statistical Analysis and Quality Assurance

The paper employs a qualitative analysis using NVivo to systematically categorize and evaluate the content of the abstracts according to predefined themes and subthemes. This structured approach allows for an in-depth exploration of the complex dynamics involved in national immunization strategies and their broader implications. Word cloud was used to graphically showed the patterns of words contained in the abstracts of the 43 articles.

To ensure the validity and reliability of the findings, NVivo-12 was used to meticulously code, classify, and structure the abstracts. Also, stop words such as introduction, background, methods, results, conclusion, and discussion were excluded

from the abstracts. Triangulation and peer debriefing were employed to ensure the trustworthiness of the research. Finally, Scopus is chosen because it is a controlled database with peer-reviewed content, transparent indexing, and wide coverage.

Results

Word count analysis

The 43 articles can be assessed when you visit their respective journal websites. [8-50]

The word cloud depicting the frequency of words in the abstracts is shown in Figure 1. Larger words such as vaccine, support, countries, global, health, GAVI, cost and others represent frequently used terms which provides a starting point for understanding the core themes and ideas emerging from the data. Words that clustered could provide a hint on the expected themes.



Figure 1: Word cloud diagram of most used words

Thematic Analysis

This section of the paper presents the comprehensive findings derived from the thematic analysis of 43 abstracts detailing the impact of the GAVI on immunization programs in Nigeria. Through a meticulous examination of the abstracts, seven themes and 18 subthemes that provide critical insights into the financial strategies, health outcomes, policy impacts, and technological innovations associated with GAVI's

interventions, have been identified (Figure 2). The findings are categorized according to the established thematic framework, which aids in explaining aspects of GAVI's initiatives. Each theme provides a lens through which we can assess the effectiveness of vaccination programs, explore innovative approaches within the immunization landscape, and understand the economic and policy-driven underpinnings that support these public health efforts. This

section aims to synthesize these observations to furnish stakeholders with actionable insights and evidence-based

recommendations to enhance future vaccination strategies and health policies in Nigeria and similar contexts globally.

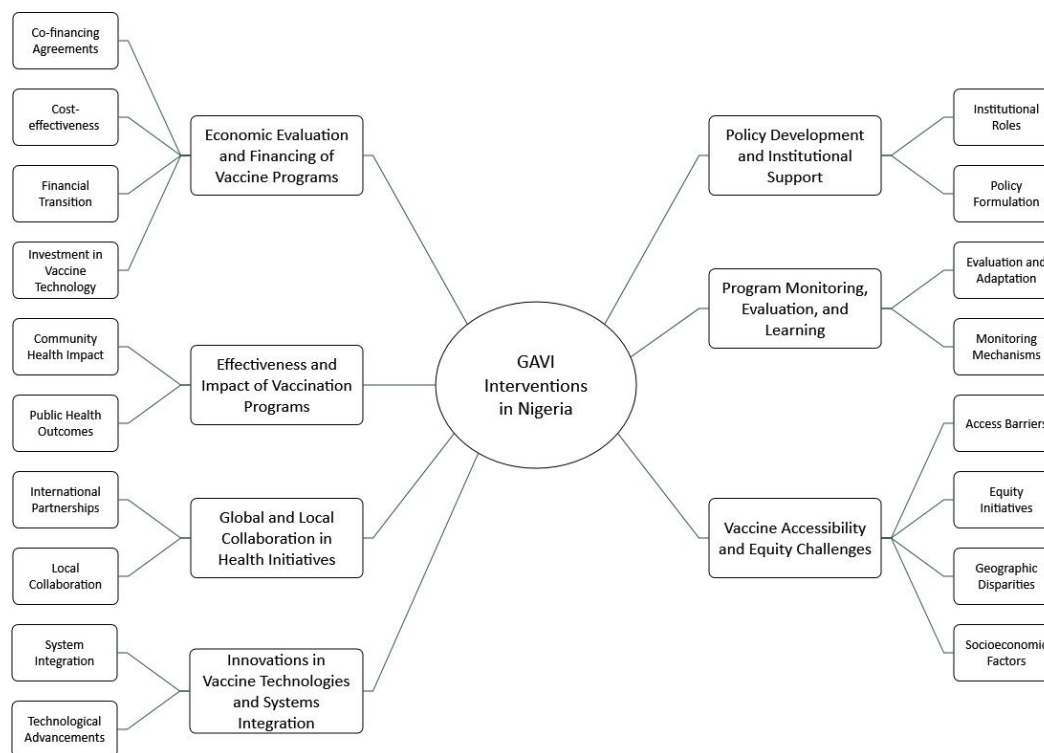


Figure 2: Mind map showing themes and subthemes

Theme I: Economic Evaluation and Financing of Vaccine Programs

This theme examines the financial aspects of vaccine initiatives, highlighting the cost-effectiveness of different vaccination strategies and the sustainability of GAVI funding of immunization in Nigeria. It encompasses discussions on budget impacts, investment requirements, and the balance between domestic and external funding sources. The analysis in this theme is crucial to understanding how financial strategies are developed and implemented to support the effectiveness and expansion of vaccine programs.

This theme is further divided into four subthemes: cost-effectiveness studies,

financial transition, investment in vaccine technology and infrastructure, and co-financing agreements.

Cost-effectiveness: This subtheme analyzes the financial efficiency of various vaccine interventions by comparing their costs to the health outcomes they achieve. It examines a range of vaccines, assessing their cost-effectiveness in terms of both budgetary impact and public health benefits. This analysis is crucial for policymakers and health organizations aiming to allocate limited resources effectively.

By assessing cost-effectiveness, these analyses help ensure that investments in vaccination yield maximum public health returns. [51]

Financial transition: This subtheme examines changes in vaccine funding that are leading to greater financial independence, emphasizing the shift from donor-driven assistance to long-term domestic funding. It highlights the challenges and logistical issues that nations must address as they transition to financial independence for their vaccination programs.

Investment in vaccine technology and infrastructure: This subtheme focuses on the strategic allocation of financial resources to the development and enhancement of vaccine technologies and the healthcare infrastructure in Nigeria. It emphasizes the financial commitments made by GAVI to bolster the technological and structural foundations of immunization programs, ensuring their effectiveness and adaptability to new challenges and opportunities.

This subtheme collectively conveys the dynamic nature of investments in vaccine technology and infrastructure which experts have discussed how GAVI's innovative financing mechanisms have facilitated the introduction of new vaccines in lower-income countries, significantly reducing disease prevalence and mortality rates. ^[52] Highlighting the critical role of financial strategies in advancing public health objectives through improved vaccine technologies and strengthened healthcare infrastructure.

Co-financing Agreements: This subtheme focuses on the collaborative funding efforts between Nigeria and GAVI to support immunization programs, analyzing how shared financial responsibilities between the duo and strategies are implemented to enhance vaccine accessibility and program

sustainability. Co-financing agreements are crucial for building national ownership and ensuring fiscal sustainability as countries transition from donor support to self-reliance.

Theme II: Effectiveness and Impact of Vaccination Programs

This theme focuses on the tangible health outcomes of vaccination programs facilitated by GAVI's interventions in Nigeria. It covers the direct public health impacts, such as reductions in disease prevalence and mortality rates, as well as the broader effects on community health resilience. The importance of immunization programs in raising public health standards and enhancing population well-being is highlighted by this theme area.

This theme is further divided into two subthemes: public health outcomes and community health impact.

Public health outcomes: This subtheme focuses on the direct public health effects of vaccination efforts, such as reductions in disease and mortality rates. The quotes from various abstracts underscore the significant positive impacts of vaccination programs on public health in developing countries.

Community health impact: This subtheme explores the broader impacts of vaccination on community health standards and resilience, highlighting how immunization programs contribute to overall public health improvements beyond direct disease prevention. The focus is on understanding the extended benefits of vaccination that strengthen community health, particularly in the primary healthcare centers (PHC), including preventing disease outbreaks and reducing healthcare costs.

Theme III: Global and Local Collaboration in Health Initiatives

Addressing the dynamics of partnership and cooperation, this theme explores the roles and interactions between international alliances like GAVI and Nigerian governance structures and agencies. It highlights how these collaborations shape and support vaccine initiatives, emphasizing the importance of coherent efforts between global and local entities to enhance the effectiveness of immunization programs.

This theme is further divided into two subthemes: international partnerships in vaccine delivery and local collaboration.

International partnerships in vaccine delivery: This subtheme explores the pivotal role of international alliances, such as the GAVI and other donor agencies, in supporting and enhancing local vaccine initiatives. It highlights the importance of global collaborations in addressing public health challenges through shared responsibilities and resources. These partnerships are instrumental in integrating diverse vaccine efforts across geopolitical landscapes to ensure equitable access to vaccines worldwide.

Local collaboration: This subtheme focuses on the cooperation between various local stakeholders, including government agencies, healthcare providers, influencers, religious and traditional leaders, community leaders, and non-governmental organizations, to enhance the effectiveness of vaccine programs. This collaborative approach is critical in directing immunization strategies to the unique cultural, socio-economic, and

logistical challenges present within different geopolitical regions of Nigeria.

Theme IV: Innovations in Vaccine Technologies and Systems Integration

Innovation is key to advancing public health initiatives, and this theme delves into the technological progress in vaccine development and delivery systems. It discusses how new technologies are integrated into existing health frameworks to enhance the reach and efficacy of vaccination efforts and adapt to evolving health challenges.

This theme is further divided into two subthemes which are technological advancements, and system integration.

Technological advancements: Advances in vaccine development and technology represent a crucial aspect of global health initiatives, bridging the gap between local needs and global scientific progress. This subtheme captures the evolving landscape of vaccine technology, including the integration of digital tools, which supports effective immunization strategies and surveillance systems in Nigeria. Such advancements not only improve the efficacy and delivery of vaccines but also ensure that public health responses are adaptable to emerging health crises.

Key aspects of this subtheme include the development of new vaccines that meet global health standards, the use of digital technologies to enhance immunization information systems, and the strategic introduction of these technologies in response to specific health challenges. These innovations play a pivotal role in shaping the effectiveness of vaccination programs

and in responding to global health emergencies such as the COVID-19 pandemic.

System integration: This subtheme focuses on the incorporation of new vaccines into existing healthcare systems, a critical aspect of enhancing immunization strategies globally. It involves both technological advancements and strategic collaborations between international and local entities to ensure effective integration into public health infrastructures.

These instances demonstrate the ongoing efforts to adapt health systems to new challenges and technologies, ensuring that vaccine integration not only responds to immediate health needs but also contributes to the long-term resilience and effectiveness of health care systems in Nigeria. Such integration is vital for maintaining continuous protection against evolving health threats and ensuring equitable access to healthcare innovations.^[53]

Theme V: Policy Development and Institutional Support

This theme examines how policies are developed and implemented to support effective vaccination campaigns. It looks at how immunization initiatives are supported by policy, the roles played by different international and governmental organizations in these processes, and how these policies are modified to meet local and global health requirements.

This theme is further divided into two subthemes: policy formulation and institutional roles.

Policy formulation: This subtheme focuses on the critical process of crafting effective

policies that support and enhance vaccination programs in Nigeria. Policy formulation in this context involves developing strategic frameworks that address financial, operational, and ethical barriers to effective immunization coverage. This subtheme examines how laws are crafted to ensure fair access to vaccines and meet the complex requirements of public health programs.

Institutional roles: This subtheme explores the vital roles that government bodies in Nigeria and international partners play in implementing vaccine-related policies. It emphasizes the collaborative efforts required to navigate the complexities of public health interventions, reflecting on how diverse stakeholders contribute to policy execution and compliance.

Theme VI: Program Monitoring, Evaluation, and Learning

Critical to the continual improvement of health initiatives, this theme covers the mechanisms for monitoring and evaluating vaccination programs. It includes discussions on how data from these immunization programs in Nigeria are used to gain insights, inform future strategies, and adjust ongoing initiatives to better meet the health needs of the population.

This theme is further divided into two subthemes. The subthemes are evaluation and adaptation, as well as monitoring mechanisms.

Evaluation and adaptation: This subtheme focuses on the methodologies used to assess the effectiveness of immunization programs and the subsequent adaptations based on feedback and outcomes. This process is

crucial for the continual improvement and fine-tuning of health initiatives, ensuring they are responsive to changing needs and circumstances.

Monitoring mechanisms: The subtheme focuses on the tools and methods utilized to track the progress and effectiveness of immunization programs in Nigeria and supported by GAVI. These mechanisms are critical for ensuring transparency, accountability, and data-driven decision-making in policymakers. Monitoring mechanisms in vaccine programs involve a variety of analytical tools and approaches that provide insights into the operational aspects of immunization efforts. One pivotal method is the synthetic control method, which assesses program effectiveness by constructing a counterfactual model based on pre-existing data trends.

Theme VII: Vaccine Accessibility and Equity Challenges

This theme addresses the challenges and strategies related to ensuring equitable access to vaccines, particularly for marginalized or hard-to-reach populations. It includes analysis of barriers to vaccine distribution and initiatives designed to improve fairness and effectiveness in vaccine delivery across different geopolitical regions and socioeconomic groups in Nigeria.

This theme is further divided into four subthemes. The subthemes are socioeconomic factors, geographic disparities, access barriers, and equity initiatives in vaccine distribution.

Socioeconomic factors: This subtheme examines how socioeconomic variables such

as income and social status influence vaccine accessibility and uptake, highlighting some disparities issues that affect immunization programs. This aspect is crucial for understanding how different subpopulations are either benefited or disadvantaged by public health strategies.

Such socioeconomic insights are supported by broader research in public health. For example, studies have consistently shown that lower socioeconomic status is associated with reduced access to healthcare services, including vaccinations. ^[54]

Geographic disparities: This subtheme delves into the variations in vaccine access and associated health outcomes across different geopolitical regions of Nigeria, highlighting the challenges and inequalities in immunization coverage. This subtheme is critical in understanding how different geographic areas, particularly within low- and middle-income countries, experience divergent health impacts due to varying levels of vaccine accessibility.

Access barriers: This subtheme focuses on recognizing and resolving the many barriers that prevent the efficient dissemination of vaccines. These obstacles include social, financial, and logistical issues that make it difficult to distribute vaccines fairly, particularly in underdeveloped or areas of difficult terrain such as nomadic or pastoral areas.

Equity initiatives in vaccine distribution: Ensuring equitable access to vaccines across all population segments is a cornerstone of successful public health strategies. This subtheme focuses on the strategies implemented to overcome barriers and facilitate fair vaccine distribution,

particularly to vulnerable or marginalized groups. These populations often face significant immense challenges in accessing healthcare services, a critical concern that necessitates targeted interventions.

Discussion

This paper has identified themes and subthemes that deepen our understanding of the dynamics of GAVI's intervention in Nigeria and, by extension, in developing countries. These represent the current state of knowledge, further broken down into themes that are important for understanding how GAVI's interventions have contributed to positive public health outcomes in Nigeria and other low-resource settings.

The first area that has featured prominently is cost-effectiveness, which focuses on comparing different vaccination strategies. The goal of cost-effectiveness in immunization is to find the most efficient approach that maximizes public health benefits while minimizing financial burdens. Some factors to consider include the cost per dose, the vaccine's effectiveness, the target population, and the number of doses required. One probable reason for the emergence of this subtheme is that GAVI often demands value for money for its investments.^[55] Secondly, cost-effectiveness is a key factor considered by policymakers in decision-making to ensure that limited funds for vaccinations are used most effectively to maximize public health outcomes.^[56]

Financial transition refers to the process by which countries shift from relying on external funding, such as support from

GAVI, to financing their immunization programs domestically. The likely reason this subtheme emerged is that Nigeria and other developing countries will transition away from development assistance for health (DAH) as their economies grow.^[6] Another reason is that researchers are concerned that the withdrawal of funding from international development partners could undermine universal health coverage (UHC) or lead to reversals in health gains.^[57] Also, an increasing number of studies have proposed solutions to ensure the sustainability of immunization in anticipation of funding shortfalls.^[58-60]

Investing in vaccine technology and infrastructure includes cold chain infrastructure, manufacturing capacity, and healthcare workforce training or strengthening immunization service delivery, which are essential for improving the effectiveness and efficiency of immunization programs.^[61] This subtheme emerged due to the introduction of HPV mass immunization in Nigeria in 2023 and the importance of infrastructure in the effective delivery of vaccines, as well as issues related to intellectual property, local vaccine production, and process development.^[62]

Co-financing agreements involve countries contributing a portion of the cost of vaccines procured through organizations like GAVI. These agreements, described as public-private partnerships, help countries take ownership of their immunization programs and build sustainable financing mechanisms.^[63] The emergence of this subtheme is due to its being a core function of GAVI. Their intervention to support low- and middle-

income countries (LMICs) in purchasing vaccines is based on co-financing agreements. GAVI often requires LMICs to include co-financing strategies that plan for transitioning out of support. ^[64]

Public health outcomes focus on the measurable benefits of vaccination programs. This subtheme emerged because public health outcomes are the product of vaccination. The two major outcomes are reductions in disease prevalence and mortality rates. Both outcomes lead to a better quality of life for those who have been vaccinated. This subtheme emerged because the outcomes are usually metrics used either to report the success of GAVI's interventions in LMICs or to evaluate their impact. ^[65]

The impact of vaccination programs extends beyond individual health outcomes to community health resilience. Immunization programs help build community immunity, also known as herd immunity, which protects individuals who are not vaccinated, such as infants, the elderly, or those with weakened immune systems. This subtheme probably emerged due to COVID-19 vaccination, in which the initial strategy is to build herd immunity. ^[66] Also, some researchers have reported the implications of mass vaccination-induced herd immunity.

This subtheme (international partnership on vaccine delivery) focuses on how GAVI and other international organizations have contributed to Nigeria's vaccination efforts. They have provided financial and technical support and helped with global advocacy for vaccines' role in achieving the Sustainable Development Goals (SDGs) and improving the quality of life for the populace. ^[67] The emergence of this subtheme could be due to

GAVI's role, collaboration between GAVI and other donor agencies, and international partnerships that increase vaccination rates, improve vaccine procurement and cold-chain management, and build local capacity and expertise in vaccine delivery, ensuring sustainability beyond international development partner support. ^[68]

This subtheme (local collaboration) focuses on the essential role of Nigerian government structures and agencies in a successful program. The emergence of this subtheme could be because of collaboration among different government agencies and local non-governmental organizations or development agencies, community involvement in vaccination, and the role of traditional and religious rulers or influencers in improving immunization coverage and campaigns.

The emergence of technological advancements as a subtheme could be due to two reasons. Firstly, technological advancements have revolutionized vaccine development, leading to the creation of new vaccines, and improving the efficacy of existing ones. Lastly, technology has also improved vaccine delivery systems, making immunization more accessible and efficient. ^[69] Innovations such as microneedle patches and thermostable vaccines, which deliver vaccines painlessly and without the need for refrigeration, have the potential to revolutionize vaccine administration, especially in resource-constrained settings. ^[70] Similarly, advancements in drone technology have enabled the delivery of vaccines to remote and hard-to-reach areas, improving vaccine coverage rates. ^[71]

The subtheme (system integration) explores how Nigeria can integrate these new technologies into its existing health frameworks. The emergence could be due to growing demand for research on the benefits of integrating new technologies into the country's health systems, which can improve data management and decision-making, optimize vaccine supply chain management, and utilize technology to build the capacity of healthcare workers involved in immunization. ^[72]

This subtheme (policy formulation) focuses on the creation and implementation of policies that support vaccination programs in Nigeria. This theme emerged because GAVI intervention is a policy-level agreement between the government (in this case, Nigeria) and GAVI. Additionally, GAVI support is based on existing national laws, legislation, and policy frameworks in low- and middle-income countries (LMICs). ^[73] Similarly, institutional roles, as a subtheme, explore how various institutions shape and implement vaccination policies, including partnerships and collaborations among national governments, international donors, and NGOs. These partnerships are crucial in evaluating and assessing disease threats, shifting public attitudes towards immunization, and adopting technological advancements. ^[74]

Evaluation and adaptation, and monitoring mechanisms are two interrelated subthemes used in tracking and evaluating the impact of immunization programs, ensuring continuous improvement of the program. Evaluation involves how data from monitoring and evaluation (M&E) are used to improve immunization programs. The

process could involve identifying gaps in immunization coverage, assessing the effectiveness of the process, and adapting strategies to tackle identified challenges. ^[75]

The emergence of these subthemes may reflect GAVI's need to track progress made by implementing partners and evaluate their support interventions against set goals and targets, thereby ensuring accountability, transparency, improved efficiency, and evidence-based decision-making. ^[76]

The last theme is about vaccine accessibility and equity challenges. Here, the theme emerged from the urgent need to explore barriers and facilitators to equitable vaccine distribution and strategies to bridge these gaps. Socioeconomic factors such as poverty, illiteracy, and limited access to healthcare could create barriers to vaccination. These factors often combine with other geographical factors to create disparities. ^[77]

The emergence of geographical disparities as a subtheme could be that most strategies in immunization often target vaccinating those who are underserved or living in hard-to-reach areas. Socioeconomic and geographical factors are often exacerbated by limited infrastructure to support vaccinations, security concerns, and cultural beliefs or practices that may discourage or distort vaccination in some communities. All these factors, combined with the cost of vaccination, shortage of healthcare workers, and discrimination, help create barriers to access leading to inequities. ^[78] Lastly, the emergence of inequity as a subtheme highlights the importance of addressing it through various measures such as targeted vaccinations to reach marginalized populations, free or subsidized vaccinations,

incentivization, routinization, and evidence-based campaigns to tackle vaccine hesitancy. [79]

The limitations of this research are as follows. The abstract could contain limited information, which could limit the comprehensiveness of the research. Additionally, the focus of papers published in 2023 comes with the benefit of currency, but historical changes could have been neglected. The choice of prioritizing currency over history is because the authors are interested in the current situation to properly guide policymakers, especially as Nigeria and other LMICs prepare to transition out of GAVI support in the next few years. Moreover, the abstracts extracted contained information from other LMIC countries. This comes with some advantages, as the findings from this paper should be applicable to other LMICs. Hence, including abstracts from other LMICs can be beneficial, as they might share similar challenges. However, it's important to acknowledge that each country has its unique political, social, geographical, and economic landscape. Finally, published articles are more likely to highlight effective interventions than unsuccessful ones. This may lead to an inaccurate representation of the difficulties and situations on the ground. This limitation was mitigated by using the Scopus database, which includes various types of peer-reviewed articles and is nondiscriminatory regarding whether interventions are successful.

Several research gaps have been identified in this study that warrant further exploration. Can the same result be obtained when other bibliometric databases, such as Web of

Science and PubMed, are used? Can the same result be obtained when other development partners other than GAVI are studied? Can topic modeling give the same result? Can the same results be obtained when the search country is another LMIC? Will the document analysis of GAVI's report on Nigeria yield the same result as the ones in this paper? Hence, to what extent does this research match GAVI's guidelines?

Three (3) Sustainable Development Goals (SDGs) are addressed by this paper: SDG 10 (Reduced Inequalities), SDG 17 (Partnerships for the Goals), and SDG 3 (Good Health and Well-Being). Through a thematic evaluation of GAVI's immunization interventions in Nigeria, the study provides a thorough framework emphasizing the impact, effectiveness, and economic assessment of vaccination programs. This helps achieve SDG 3, which guarantees healthy lives and advance wellbeing for people of all ages. Through immunization programs, GAVI's intervention lowers disease prevalence and death rates in Nigeria, improving public health outcomes (SDG 3.3). To ensure equitable access to vaccines (SDG 3.8), the paper also examines how these interventions affect community health resilience by fostering herd immunity (SDG 3.b). It also addresses obstacles like poverty and geographic disparities.

Additionally, since international partnerships and local engagement are essential to GAVI's success, the study emphasizes the significance of global and local collaborations (SDG 17). The paper is in line with SDG 10, which focuses on decreasing inequalities both within and between countries, by addressing issues

related to vaccine accessibility and equity. Insights and themes derived from this research can help achieve these important SDGs by influencing policymakers, improving immunization programs, and promoting sustainable health systems.

The methodology of this paper could be adapted as the first phase of research in future endeavour, and the themes obtained could then inform future or more detailed analysis. This innovative approach has generated evidence that policymakers could use to optimize the benefits accruing from GAVI interventions before the transition takes place. Additionally, the thematic investigation underscores the importance of sustainable financial models, robust policy frameworks, and collaborative institutional roles in achieving broad vaccination coverage and improved health outcomes, especially for marginalized populations. This research has revealed the state of GAVI's interventions from a neutral perspective, and the themes could serve as a basis for GAVI to take stock and identify areas that warrant further support. The recommendations provided herein should serve as a guiding framework for future interventions in vaccination endeavors, fostering a more resilient health infrastructure in Nigeria and beyond. These efforts are crucial not only for meeting current health challenges but also for preparing for future global health emergencies and attaining the anticipated SDGs.

Conflicts of Interest: The authors have declared no conflicts of interest.

Authors' Contributions: HIO, IEA, OWS, DD, AC, and AJ conceived and designed the methodology. IEA, OWS, SA, SS, and DCO analyzed the data and interpreted the data (thematic analysis). HIO, IEA, DD, AC, AJ, and DCO: drafted the manuscript. HIO, OWS, AUJ, SA, and SS: reviewed and supervised the research. All the authors approved the final version.

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