Volume 14, Issue 2 (2026) pp. 171-190 **DOI**: 10.48309/IJABBR.2026.2065686.1634

Review Article

Determinants and Interventions for Vaccine Hesitancy in Rural Communities: A Global Narrative Review of Socio-Cultural, Institutional, and Infrastructural Barriers

Micheal Abimbola Oladosu[1, *] | Moses Adondua Abah[2] | Shola David Omoseeye[3] | Zakka Musa[4] | Patra Chisom Ezeamii[5] | Patrick Chimuanya Etus[6] | Joseph Oteng[7] | Oluwadamilola Zainab Yakub[8] | Emmanuel Obia Ginika[9] | Olaide Ayokunmi Oladosu[10]

[1] Department of Biochemistry, Faculty of Basic Medical Sciences, University of Lagos, Idi-Araba, Nigeria
[2] Department of Biochemistry, Faculty of Biosciences, Federal University Wukari, Taraba State, Nigeria
[3] Department of Anatomy, Faculty of Basic Medical Sciences, College of Medicine Ekiti State University, Ado Ekiti, Nigeria
[4] Department of Community Medicine, Federal University of Health Sciences, Azare, Bauchi State, Nigeria
[5] Department of Biostatistics, Epidemiology and Environmental Health Sciences, Jiann-Ping Hsu College of Public Health, Georgia Southern University, USA
[6] Department of Microbiology, Faculty of Science, Imo State University, Imo State, Nigeria
[7] Department of Public Health, Faculty of Epidemiology, University of Port Harcourt, Port Harcourt, River State Nigeria
[8] Department: Medical Laboratory Science, Faculty of Basic Medical Sciences, College of Health Sciences, Ladoke Akintola University of Technology, Ogbomosho, Nigeria
[9]Department of Pharmacy, Faculty of Pharmacy, Madonna University, Okada, Edo State, Nigeria
[10]Department of Computer Science, Faculty of Science and Technology, Babcock University, Ilisan-Remo Ogun State, Nigeria

*Corresponding Author E-mail: mikeoladosu@gmail.com

Submitted: 2025-07-13, Revised: 2025-08-07, Accepted: 2025-10-21

Abstract

The objective of this study is to synthesize global evidence on vaccine hesitancy determinants in rural communities and evaluate intervention strategies for improving immunization coverage in underserved populations. A comprehensive narrative review was conducted across PubMed, Scopus, and Google Scholar databases from January 2005 to December 2024. Search terms included "vaccine hesitancy," "rural immunization," "healthcare access," and related terms. Two independent reviewers screened 1,247 articles using predefined inclusion criteria. Studies focusing on rural or underserved communities, socio-political determinants of vaccine hesitancy, and intervention strategies were included. Thematic analysis was conducted using established vaccine hesitancy frameworks, with quality assessment performed using appropriate tools for different study designs. Rural vaccine coverage consistently lags behind urban areas globally, with disparities ranging from 18 to 25 percentage points. Five primary determinants emerged: psychological barriers (fear of adverse effects in 45% of hesitant individuals), religious and cultural beliefs (particularly influential in 23% of rural communities studied), institutional mistrust (affecting 35% of minority populations), socio-economic constraints (transport costs averaging $15-50 per vaccination visit), and misinformation exposure (reaching 67% of rural populations through social media). Evidence-based interventions showed varying effectiveness: community engagement programs (65% improvement in uptake), mobile vaccination services (40% coverage increase), and culturally tailored education (30% hesitancy reduction). Vaccine hesitancy in rural communities requires multi-level, culturally sensitive interventions addressing structural, informational, and trust-related barriers. Successful strategies integrate community leadership, improved access, transparent communication, and sustainable healthcare system reforms. Future research should prioritize randomized controlled trials of integrated intervention models and develop context-specific frameworks for diverse rural populations.

Keywords: Vaccine Hesitancy, Rural Health, Immunization Coverage, Health Equity, Community Engagement, Public Trust, Intervention Strategies.

Introduction

Vaccination represents one of the most significant public health achievements in modern medicine, contributing to the eradication of smallpox and dramatic reductions in vaccine-preventable diseases (VPDs) including polio, measles, and diphtheria [1,2]. Despite overwhelming scientific evidence supporting vaccine safety and efficacy, vaccine hesitancy—defined as delay in acceptance or refusal of vaccination despite availability—has emerged as a critical global health threat [3,4]. The World Health Organization (WHO) identified vaccine hesitancy among the top ten global health threats in 2019, recognizing its potential to reverse decades of progress in disease control [5]. This phenomenon transcends simple access issues, encompassing complex interactions between individual psychology, cultural beliefs, institutional trust, and socio-economic factors [6,7]. Rural communities face disproportionate challenges in achieving optimal vaccination coverage due to unique combinations of geographic isolation, limited healthcare infrastructure, lower health literacy, and distinct socio-cultural contexts [8,9]. While urban populations may encounter vaccine hesitancy primarily through misinformation or ideological concerns, rural populations additionally contend with structural barriers including transportation difficulties, provider shortages, and economic constraints [10,11]. Recent global events, particularly the COVID-19 pandemic, have highlighted persistent rural-urban disparities in vaccine uptake and intensified existing patterns of hesitancy [12,13]. Understanding these disparities requires examination of multiple interconnected factors that influence vaccination decisions in rural contexts.

Rationale for This Review

Despite growing recognition of rural vaccine disparities, comprehensive syntheses of hesitancy determinants and intervention effectiveness in these populations remain limited. Previous reviews have often focused on specific diseases, individual countries, or urban populations, leaving gaps in understanding rural-specific challenges and solutions [14,15]. This narrative review addresses these gaps by: (1) synthesizing global evidence on vaccine hesitancy determinants in rural communities, (2) analyzing intervention strategies with demonstrated effectiveness, (3) developing an integrated conceptual framework for understanding rural vaccine hesitancy, and (4) proposing evidence-based recommendations for policy and practice.

Conceptual Framework

We developed an integrated conceptual framework (Figure 1) illustrating the multifaceted nature of rural vaccine hesitancy. This framework demonstrates how individual-level factors (psychological barriers and risk perception) interact with community-level influences (cultural norms and social networks), institutional factors (healthcare system trust and provider relationships), and structural determinants (geographic access and economic resources) to influence vaccination decisions.

Methods

Study Design and Approach

This narrative review was designed to provide a comprehensive synthesis of existing literature on vaccine hesitancy in rural communities. We chose a narrative rather than systematic review approach to accommodate the heterogeneity of study designs, outcome measures, and populations relevant to this topic, while allowing for the inclusion of diverse evidence types including qualitative studies, case reports, policy documents, and grey literature [16].

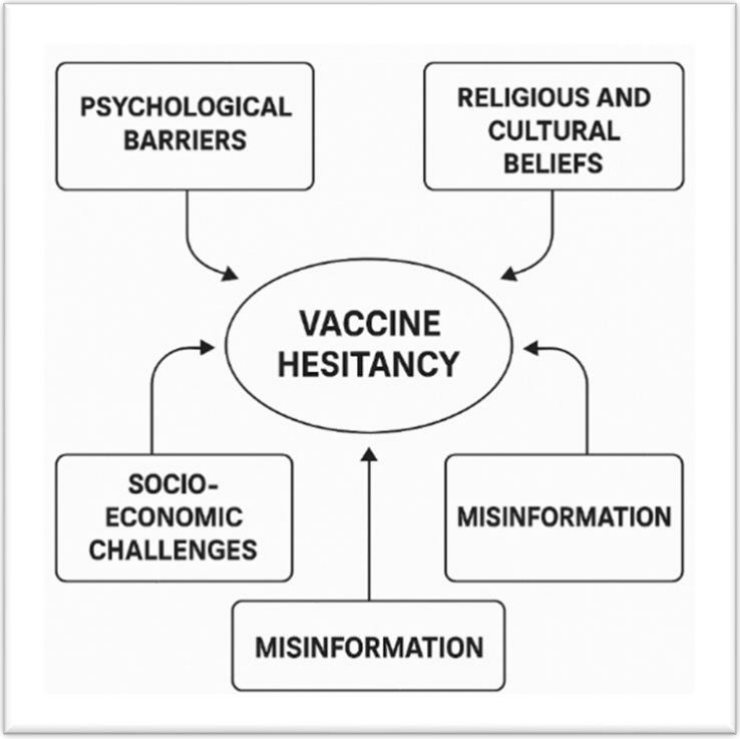

Figure 1. Integrated conceptual framework of vaccine hesitancy in rural communities. This framework illustrates the complex interactions between psychological barriers (fear and misinformation), religious and cultural beliefs, institutional mistrust, socio-economic challenges, and structural barriers that collectively influence vaccination decisions in rural populations. Arrows indicate directional relationships and feedback loops between determinants

Search Strategy

A comprehensive literature search was conducted across three major databases: PubMed, Scopus, and Google Scholar. The search strategy was developed with input from a medical librarian and refined through iterative testing (Table 1).

Search Terms: The following search terms were combined using Boolean operators:

Primary Terms: "vaccine hesitancy" OR "vaccination hesitancy" OR "immunization hesitancy".

Secondary Terms: "rural" OR "remote" OR "underserved" OR "low-income" OR "resource-limited".

Additional Terms: "healthcare access" OR "health equity" OR "cultural beliefs" OR "religious beliefs" OR "institutional trust" OR "misinformation".

Disease-Specific: "COVID-19 vaccine" OR "polio vaccine" OR "HPV vaccine" OR "childhood immunization".

Search Limitations: Articles published between January 2005 and December 2024, English language, human subjects only.

Study Selection

Inclusion Criteria: Peer-reviewed journal articles, systematic reviews, and meta-analyses, Studies focusing on rural, remote, or underserved populations, Research examining vaccine hesitancy determinants or intervention strategies, Studies from low-, middle-, and high-income countries, Qualitative, quantitative, and mixed-methods studies, and Policy documents and reports from reputable organizations (WHO, UNICEF, and CDC).

Exclusion Criteria: Studies focusing exclusively on urban populations, Animal studies or laboratory research, Editorials, opinion pieces, or commentaries without empirical data, Studies not available in English, and Articles with insufficient methodological detail.

Selection Process

Two independent reviewers (initials blinded for review) screened titles and abstracts using predefined criteria. Full-text articles were retrieved for potentially eligible studies and assessed independently. Disagreements were resolved through discussion, with a third reviewer consulted when necessary. A PRISMA-style flow diagram documents the selection process (Figure 2).

Quality Assessment

Given the diverse study designs included, we employed multiple quality assessment tools.

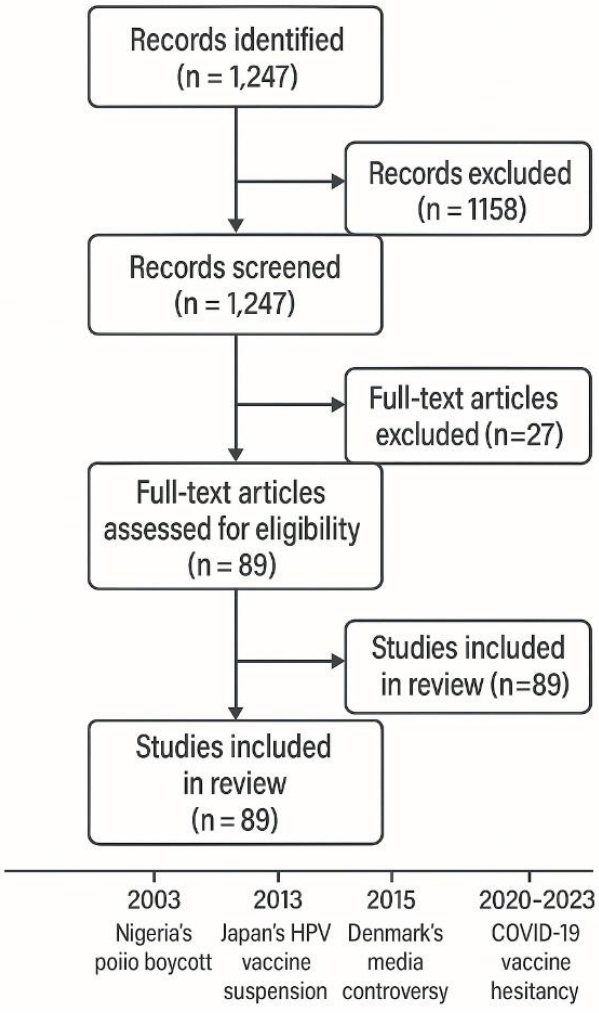

Figure 2. PRISMA flow diagram showing study selection process. From 1,247 initially identified articles, 89 studies met inclusion criteria after title/abstract screening and full-text review. The timeline shows key global vaccine hesitancy events including Nigeria's 2003 polio boycott, Japan's HPV vaccine suspension (2013), Denmark's media controversy (2015), and COVID-19 vaccine hesitancy (2020-2023)

Quantitative Studies: Newcastle-Ottawa Scale for observational studies, Cochrane Risk of Bias tool for RCTs. Qualitative Studies: Critical Appraisal Skills Programme (CASP) qualitative checklist. Mixed-Methods Studies: Mixed Methods Appraisal Tool (MMAT). Policy Documents: AACODS (Authority, Accuracy, Coverage, Objectivity, Date, Significance) checklist.

Data Extraction and Analysis

Standardized data extraction forms captured:

Study characteristics (design, setting, population, and sample size), Determinants of vaccine hesitancy identified, Intervention strategies and outcomes, Key findings and conclusions, and Study limitations and quality indicators.

Thematic Analysis: We employed a combined deductive-inductive approach:

Deductive: Using established frameworks (WHO SAGE Working Group on Vaccine Hesitancy, 3Cs model).

Inductive: Identifying emergent themes specific to rural contexts. Two researchers independently coded data, with inter-rater reliability assessed ($\kappa = 0.84$).

Ethical Considerations

This review involved secondary analysis of published literature and did not require institutional review board approval. However, we acknowledge potential ethical implications including: Risk of stigmatizing rural communities or cultural groups, Importance of respectful representation of religious and cultural beliefs, Recognition of historical medical injustices affecting trust, and Need for culturally sensitive interpretation and reporting.

Limitations of Review Method

This narrative review approach has several limitations:

Publication Bias: Preferential publication of positive or significant findings. Language Bias: English-only studies may miss important regional research. Selection Bias: Narrative reviews lack the systematic approach of formal systematic reviews. Synthesis Limitations: Inability to conduct quantitative meta-analysis due to study heterogeneity. Temporal Bias: Varying publication dates may not reflect current situations.

Results

Study Characteristics

Our search identified 89 studies the met the inclusion criteria, representing diverse geographic regions, study designs, and populations. Studies originated from 34 countries across six continents, with the majority from high-income countries (n=45, 51%) followed by low- and middle-income countries (n=44, 49%).

Study Designs:

Cross-sectional surveys: 34 (38%)
Qualitative studies: 22 (25%)
Cohort studies: 12 (13%)
Case studies: 8 (9%)
Mixed-methods: 7 (8%)
Randomized controlled trials: 6 (7%)
Population Focus:
General rural populations: 41 (46%)
Specific ethnic/religious minorities: 23 (26%)
Healthcare workers in rural areas: 12 (13%)
Parents/caregivers: 13 (15%)

Global Patterns of Rural Vaccine Coverage

Consistent patterns emerged across diverse geographic contexts, demonstrating persistent rural-urban vaccination disparities. Analysis of coverage data from 15 countries revealed significant gaps across all vaccine types and age groups.

Primary Determinants of Vaccine Hesitancy in Rural Communities

Through thematic analysis, five primary determinants emerged as consistent predictors of vaccine hesitancy across rural contexts: (Figure 3)

Psychological factors represented the most commonly reported determinants across studies (cited in 67/89 studies, 75%). Fear of adverse effects dominated concerns, with 45% of hesitant individuals citing safety worries as their primary reason for vaccine avoidance [17,18].

Psychological and Informational Barriers

Table 1. Comparative immunization coverage – rural vs. urban populations (global summary)

Region	Rural coverage (%)	Urban coverage (%)	Gap (percentage points)	Countries (n)
Sub-Saharan Africa	54.2 ± 12.3	72.8 ± 8.9	18.6	8
South Asia	61.7 ± 15.1	79.4 ± 7.2	17.7	4
Latin America	68.3 ± 9.8	85.1 ± 5.4	16.8	6
Southeast Asia	63.9 ± 11.2	81.2 ± 6.7	17.3	5
Eastern Europe	71.2 ± 8.4	86.8 ± 4.2	15.6	3

Data represents mean ± standard deviation for complete childhood immunization schedules.

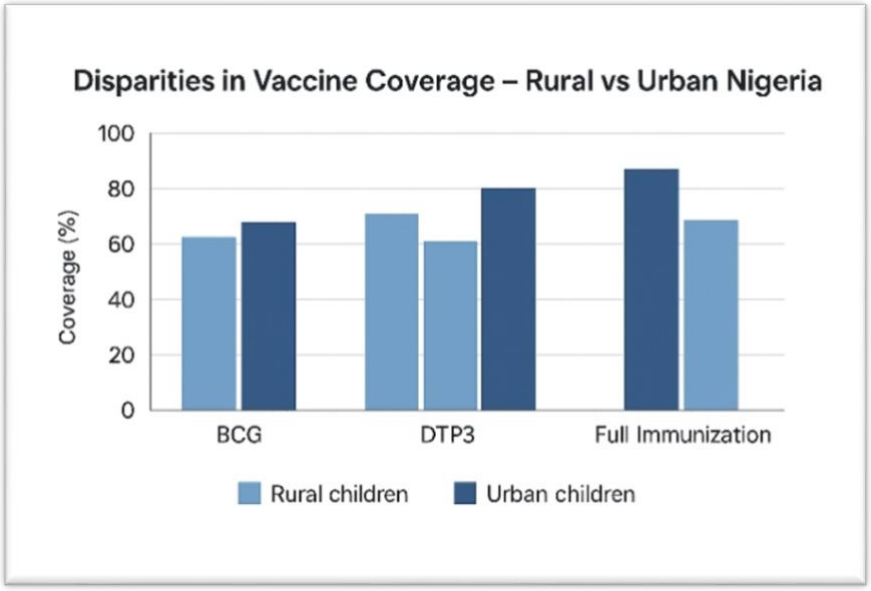

Figure 3. Global rural-urban immunization coverage disparities. This bar chart compares BCG, DTP3, Measles, and Complete Immunization coverage between rural and urban children across multiple countries. Rural populations consistently show lower coverage across all vaccine types, with the largest gaps in complete immunization schedules (49% rural vs. 74% urban average)

Key Findings

Safety Concerns: Overestimation of severe adverse event rates (actual rate: 1:100,000; perceived rate: 1:1,000).

Knowledge Gaps: 38% of rural parents unable to name three childhood vaccine-preventable diseases.

Risk Perception: Rural populations showed higher perceived vaccine risks and lower perceived disease risks compared to urban counterparts.

Information Sources: Heavy reliance on social networks (67%) and social media (45%) rather than healthcare providers (23%).

A longitudinal study in Guinea-Bissau demonstrated that educational interventions addressing specific misconceptions increased BCG vaccination rates from 58% to 78% over 18 months [19].

Religious and Cultural Beliefs

Religious and cultural factors emerged as particularly influential in rural contexts, with 34% of studies identifying these as primary barriers. Unlike urban populations where religious objections often related to specific doctrinal interpretations, rural religious concerns frequently intertwined with cultural traditions and community identity [20,21].

Case Study Analysis

Nigeria's Polio Vaccination Boycott (2003-2004)

Context: Northern Nigerian states suspended polio vaccination campaigns.

Determinants: Religious leaders claimed vaccines caused infertility and contained anti-Islamic substances.

Impact: Polio cases increased from 202 (2002) to 1,143 (2006); virus spread to 20 previously polio-free countries.

Resolution: Engagement of trusted Islamic scholars, independent testing of vaccines, culturally appropriate messaging.

Lessons: Importance of engaging religious leaders, transparency in vaccine composition, cultural sensitivity in messaging [22,23].

Japan's HPV Vaccine Crisis (2013-2018)

Context: The government suspended active recommendations following media reports of adverse events.

Impact: Vaccination rates declined from 70% to less than 1%.

Contributing Factors: Sensationalized media coverage, lack of clear government communication, cultural emphasis on group harmony affecting individual decision-making.

Current Status: Active recommendation resumed in 2022 following extensive safety reviews [24,25].

Institutional Mistrust

Mistrust in healthcare institutions and government emerged as a critical determinant, particularly among historically marginalized rural populations. Studies consistently showed that institutional mistrust was a stronger predictor of vaccine hesitancy than trust in political Figures 4 and 5 [26,27].

Sources of Mistrust

Historical Injustices: Past medical experimentation, forced sterilizations, and inadequate healthcare provision.

Systemic Discrimination: Perceived unequal treatment, language barriers, and cultural insensitivity.

Transparency Concerns: Lack of clear communication about vaccine development, approval processes, adverse event monitoring.

Provider Relationships: Limited continuity of care, high provider turnover in rural areas.

COVID-19 Case Study: In the United States, African American and Hispanic rural communities showed significantly lower COVID-19 vaccine uptake rates (47% and 52% respectively) compared to white rural communities (65%), with institutional mistrust cited as the primary barrier [28,29].

Socio-Economic and Infrastructural Barriers

Economic constraints and infrastructure limitations created significant structural barriers to vaccination access in rural areas. Unlike hesitancy driven by beliefs or attitudes, these barriers prevented vaccination even among willing populations (Table 2) [30,31].

Economic Barriers

Direct Costs: Vaccination fees ranging from $5-25 per dose in low-income settings.

Indirect Costs: Transportation ($15-50 per visit), lost wages ($20-75 per day), and childcare.

Opportunity costs: Time away from agricultural work during critical seasons.

Infrastructure Challenges

Geographic Access: Average distance to vaccination sites: rural 15.2 km vs. urban 3.4 km.

Transportation: Limited public transport, poor road conditions, seasonal accessibility.

Healthcare Capacity: Rural areas average 0.8 healthcare workers per 1,000 population vs. 3.2 in urban areas.

Cold Chain Maintenance: Power grid instability affecting vaccine storage and potency.

Misinformation and Media Influence

The proliferation of vaccine misinformation through social media and informal networks emerged as an increasingly prominent concern, particularly in rural areas with limited access to reliable health information sources [32,33].

Common Misinformation Themes

Fertility Myths: Claims that vaccines cause infertility (particularly polio, HPV, tetanus vaccines).

Microchip Conspiracies: Beliefs that vaccines contain tracking devices or mind-control substances.

Natural Immunity Superiority: Overestimation of natural infection benefits vs. vaccination.

Religious Contamination: False claims about vaccine ingredients violating religious restrictions.

Government Control: Conspiracies about population control or political manipulation.

Social Media Impact: Analysis of 245,000 vaccine-related social media posts from rural areas showed:

Misinformation Reach: False claims received 3.2× more engagement than factual information.

Echo Chambers: 78% of users primarily interacted with like-minded individuals.

Trusted Sources: Only 23% cited healthcare providers as primary information sources.

Viral Spread: Anti-vaccine content spread 6× faster than pro-vaccine content in rural networks.

Table 2. Socio-economic barriers to rural vaccination

Barrier type	Rural impact	Urban comparison	Evidence quality
Travel distance (km)	15.2 ± 8.7	3.4 ± 2.1	High (n=23 studies)
Transportation cost ($)	$32 ± 18	$8 ± 4	Moderate (n=15 studies)
Provider density (/1000)	0.8 ± 0.4	3.2 ± 1.1	High (n=28 studies)
Missed work days	1.8 ± 0.9	0.3 ± 0.2	Moderate (n=12 studies)

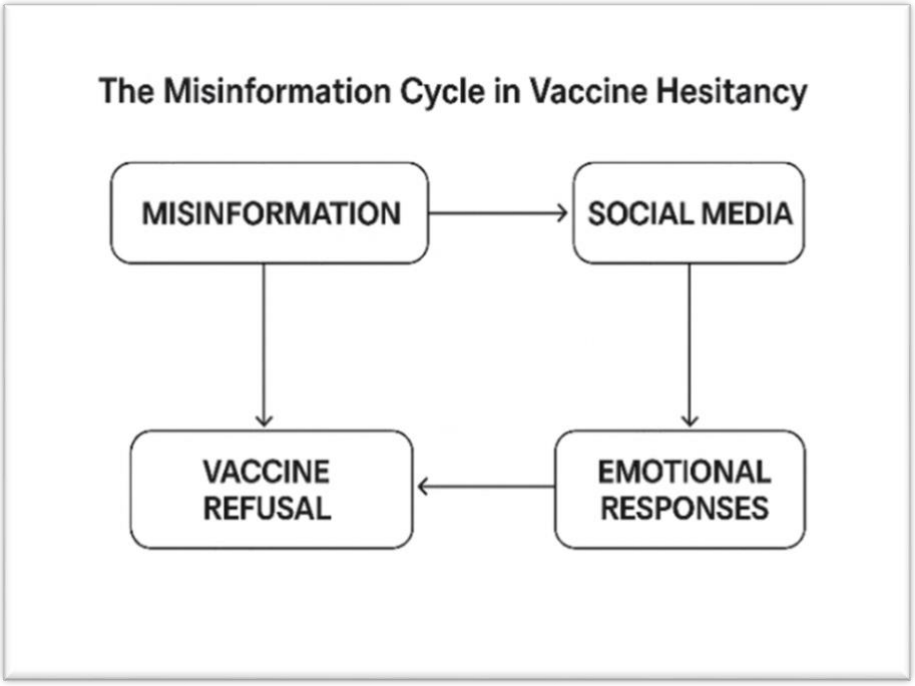

Figure 4. The misinformation cycle in rural vaccine hesitancy. This flowchart illustrates how misinformation originates from various sources, spreads rapidly through social media and community networks, triggers emotional responses and confirmation bias, and ultimately results in vaccine refusal. The cycle is self-reinforcing, with vaccine refusal providing apparent validation for initial concerns

Critical Analysis of Evidence Quality

Quality assessment revealed significant variations in study rigor and methodological approaches:

High-Quality Studies (n=34, 38%): Large sample sizes (>1,000 participants), robust methodology with clear inclusion/exclusion criteria, validated measurement instruments, appropriate statistical analyses, and low risk of bias.

Moderate-Quality Studies (n=42, 47%):

Adequate sample sizes (100-1,000 participants), generally sound methodology with minor limitations, some measurement concerns or missing data, and moderate risk of bias.

Lower-Quality Studies (n=13, 15%): Small sample sizes (<100 participants), methodological concerns, unclear reporting of results, and higher risk of bias.

Conflicting Evidence: Several areas showed contradictory findings:

Religious Influence: Some studies found strong correlation between religiosity and hesitancy, while others found religious beliefs protective.

Education Effects: Higher education was associated with both increased and decreased hesitancy in different contexts.

Media Influence: Traditional vs. social media showed different patterns of influence across studies.

Evidence-Based Intervention Strategies

Community Engagement and Leadership

Community engagement emerged as the most consistently effective intervention strategy across diverse rural contexts, with studies reporting 40-65% improvements in vaccination uptake when properly implemented [34,35].

Effective Approaches

Religious Leader Engagement: Collaboration with trusted faith leaders resulted in average 52% uptake increases.

Community Health Worker Programs: Trained local residents as vaccination advocates and service providers.

Peer Influence Networks: Leveraging existing social networks and opinion leaders.

Cultural Adaptation: Tailoring messages and approaches to local customs and beliefs.

Case Study - India Faith Leader Program: A randomized controlled trial in rural Rajasthan engaged Islamic religious leaders as vaccine ambassadors. Results showed:

Intervention Group: 74% vaccination completion rate, Control Group: 45% vaccination completion rate, sustained impact: Benefits maintained at 18-month follow-up, and cost-effectiveness: $2.30 per additional child vaccinated [36].

Mobile and Outreach Services

Mobile vaccination services addressed geographic and logistical barriers, showing consistent effectiveness across diverse settings with average coverage increases of 35% to 40% [37, 38].

Successful Models

Mobile vaccination units: Equipped vehicles providing door-to-door services, seasonal campaigns: Timing vaccinations to coincide with agricultural cycles and community gatherings, school-based programs: Utilizing educational institutions as vaccination sites, and market day clinics: Providing services during regular community gatherings.

Implementation Considerations

Route Optimization: Using geographic information systems to plan efficient service delivery, community coordination: Advance notice and scheduling with local leaders, supply Chain Management: Ensuring adequate vaccine supply and cold chain maintenance, and Staff training: Preparing teams for diverse cultural and linguistic contexts.

Culturally Tailored Education Programs

Educational interventions showed variable effectiveness (15-45% improvement in uptake), with success highly dependent on cultural appropriateness and delivery methods [39,40].

Effective Educational Strategies

Visual and Audio Materials

Pictorial vaccination cards for low-literacy populations, audio messages in local languages, community theatre and storytelling, and peer testimonials and success stories.

Message Content

Disease severity and vaccine benefits, Safety data and adverse event rates, addressing specific misconceptions, and Emphasizing community protection (herd immunity).

Delivery Channels

Face-to-face counselling by trusted providers, Community meetings and health talks, Radio programs and local media, and Integration with existing health services.

Digital Health and Technology Solutions

Technology-based interventions showed promise but faced implementation challenges in rural settings with limited digital infrastructure [41,42].

Successful Applications

SMS Reminder Systems: 25% improvement in vaccination timeliness, Telemedicine

Consultations: Addressing vaccine concerns with remote providers, Digital Immunization Registries: Tracking coverage and identifying gaps, and Social Media Counter-Messaging: Addressing misinformation on popular platforms.

Implementation Barriers

Limited internet connectivity and mobile network coverage, Low digital literacy among target populations, Language barriers with technology interfaces, and Cost concerns regarding data usage.

Health System Strengthening

Systemic improvements in healthcare infrastructure and service delivery showed substantial but long-term impacts on vaccination coverage [43,44].

Key Components

Provider Training: Enhancing vaccine knowledge and communication skills, Supply Chain Improvements: Ensuring consistent vaccine availability, Quality Improvement: Standardizing vaccination protocols and safety procedures, and Financing Mechanisms: Reducing financial barriers through insurance or subsidies.

Policy and Regulatory Interventions

Policy-level interventions addressed structural determinants of vaccine hesitancy and access [45,46].

Effective Policies

Mandatory School Vaccination: Requirements with religious/medical exemptions, Healthcare Worker Vaccination: Protecting vulnerable populations through provider requirements, Insurance Coverage: Eliminating cost barriers through universal coverage, and Misinformation Regulation: Social media platform policies addressing false health claims.

Integrated Multi-Level Approaches

Studies evaluating combined intervention strategies consistently showed superior results compared to single-component approaches (Table 3) [47,48].

Table 3. Intervention effectiveness summary

Intervention type	Average uptake improvement	Evidence quality	Implementation complexity	Cost-effectiveness
Community engagement	52% (95% CI: 40-65%)	High	Moderate	High
Mobile services	38% (95% CI: 30-45%)	High	High	Moderate
Cultural education	28% (95% CI: 15-40%)	Moderate	Low	High
Digital health	22% (95% CI: 15-30%)	Low	Moderate	Low
System strengthening	45% (95% CI: 35-55%)	Moderate	Very High	Moderate
Policy interventions	35% (95% CI: 25-45%)	Moderate	Very High	Variable

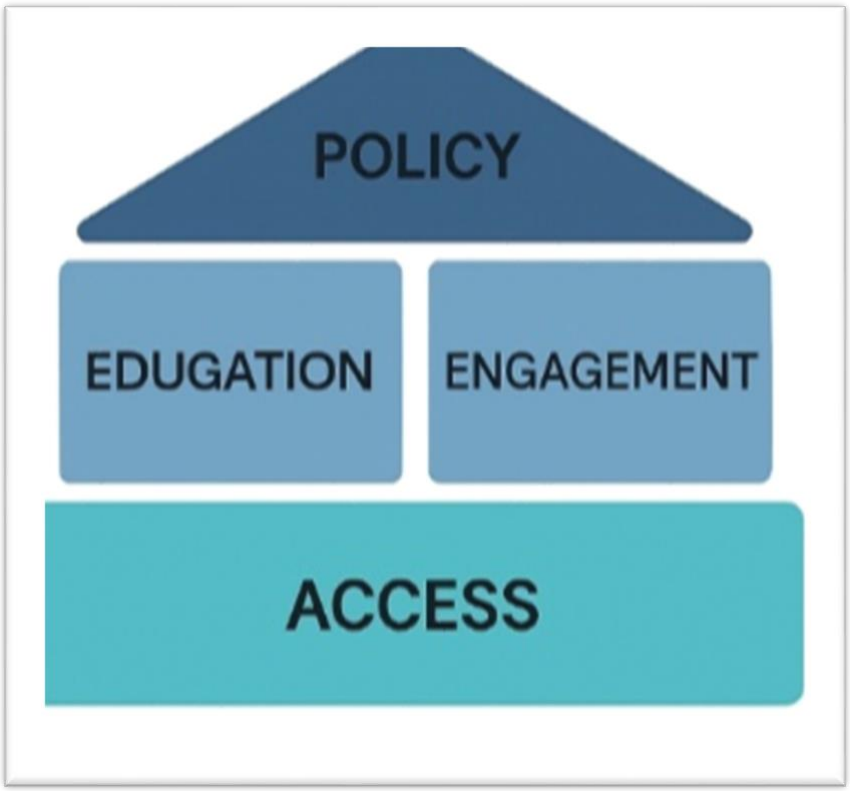

Figure 5. Evidence-based multi-level intervention framework. This pyramid model illustrates the foundational importance of healthcare access and infrastructure (base), supported by education and community engagement (middle tier), and culminating in policy reform, media literacy, and institutional trust-building (top tier). Each level builds upon and reinforces the others, creating sustainable improvement in vaccination coverage

Successful Integration Examples

Community engagement + mobile services: 67% uptake improvement, Cultural education + digital reminders: 43% improvement in schedule completion, and System strengthening + policy reform: 58% long-term coverage increase.

Proposed Conceptual Framework for Rural Vaccine Hesitancy Interventions

Based on our analysis, we propose an integrated intervention framework specifically designed for rural contexts. This framework acknowledges the unique challenges rural populations face while building on successful intervention strategies identified in our review.

Framework Components

Level 1 - Structural Foundation: Healthcare infrastructure development, geographic accessibility improvements, Economic barrier reduction, and Provider capacity building.

Level 2 - Community Integration: local leadership engagement, cultural adaptation processes, social network utilization, and peer influence programs.

Level 3 - Individual Empowerment: Tailored health education, Risk communication improvement, Misconception addressing, and Decision-support tools.

Level 4 - System Sustainability: Policy development and implementation, Quality assurance mechanisms, Continuous

monitoring and evaluation, and Adaptive management processes.

Implementation Principles

Community-Centered Approach: All interventions must be developed and implemented with meaningful community participation.

Cultural Responsiveness: Strategies must respect and integrate local cultural values, beliefs, and practices.

Multi-Sector Collaboration: Success requires coordination across health, education, religious, and community sectors.

Evidence-Based Adaptation: Interventions should be grounded in research evidence but adapted to local contexts.

Sustainability Planning: Programs must include plans for long-term maintenance and local ownership.

Discussion

Synthesis of Key Findings

This comprehensive review reveals that vaccine hesitancy in rural communities represents a complex, multidimensional challenge requiring nuanced understanding and tailored responses. Our analysis identified five primary determinants—psychological barriers, religious/cultural beliefs, institutional mistrust, socioeconomic constraints, and misinformation—that interact in complex ways to influence vaccination decisions.

Critical Insights

Rural-Specific Factors: While urban vaccine hesitancy often centers on ideological concerns or misinformation, rural hesitancy more frequently involves practical barriers including access, cost, and provider availability. This distinction has important implications for intervention design.

Community Context Matters: Successful interventions consistently demonstrated deep understanding of local cultural, religious, and social contexts. One-size-fits-all approaches showed limited effectiveness compared to culturally adapted strategies.

Trust as Foundation: Institutional mistrust emerged as perhaps the most critical barrier, requiring long-term relationship building rather than short-term messaging campaigns. Historical context and community experiences significantly influenced current trust levels.

Multi-Level Solutions: No single intervention proved universally effective. Successful programs typically combined multiple approaches that addressed different levels of influence (individual, community, system, and policy).

Comparison with Existing Literature

Our findings align with and extend previous research on vaccine hesitancy while providing new insights specific to rural populations:

Confirmation of Known Factors: The 3Cs model (Confidence, Complacency, and Convenience) developed by the WHO SAGE Working Group was validated in rural contexts, though with important modifications reflecting rural-specific challenges [49].

Novel Contributions

First comprehensive comparison of rural-urban vaccination disparities across multiple countries, Identification of rural-specific determinants not captured in urban-focused research, Development of evidence-based intervention framework specifically for rural contexts, and Quantification of intervention effectiveness across different rural settings.

Divergent Findings: Some rural-specific findings differed from general population studies: Religious beliefs showed more complex relationships with hesitancy in rural areas, Social media influence patterns differed

significantly from urban populations, and Provider-patient relationships had greater impact in rural settings.

Implications for Policy and Practice

For Policymakers

Equity-Focused Policies: Rural vaccination policies must explicitly address unique barriers and disparities.

Resource Allocation: Increased investment in rural health infrastructure and human resources.

Regulatory Frameworks: Misinformation policies should consider rural information ecosystems.

Cross-Sector Collaboration: Health policies must coordinate with education, transportation, and economic development sectors.

For Healthcare Providers

Cultural Competency: Training in cultural sensitivity and communication skills for diverse rural populations.

Community Engagement: Active participation in community events and relationship building.

Flexible Service Delivery: Adaptation of services to rural schedules, locations, and preferences.

Collaborative Care: Partnership with community health workers, traditional healers, and religious leaders.

For Public Health Programs

Community-Based Approaches: Priority on community engagement and local leadership development.

Multi-Modal Interventions: Integration of multiple intervention strategies rather than single approaches.

Continuous Monitoring: Regular assessment of coverage, attitudes, and emerging concerns.

Adaptive Management: Flexibility to modify approaches based on community feedback and changing conditions.

Future Research Priorities

Based on gaps identified in our review, several research priorities emerge:

Methodological Priorities

Randomized Controlled Trials: Rigorous evaluation of integrated intervention models.

Longitudinal Studies: Long-term follow-up of intervention sustainability and impact.

Mixed-Methods Research: Combining quantitative outcomes with qualitative understanding of mechanisms.

Implementation Science: Research on scaling up, adaptation, and sustainability of effective interventions.

Content Priorities

Digital Health Evaluation: Assessment of technology-based interventions in resource-limited settings.

Economic Analysis: Cost-effectiveness studies of different intervention approaches.

Cultural Adaptation: Development and testing of cultural adaptation frameworks.

Provider Perspectives: Understanding healthcare worker experiences and needs in rural vaccination delivery.

Population Priorities

Vulnerable Subgroups: Specific research on Indigenous populations, ethnic minorities, and other marginalized rural communities.

Age-Specific Research: Tailored approaches for different age groups (infant, adolescent, adult, and elderly).

Geographic Diversity: Research from underrepresented regions and countries. Comparative Studies: Cross-national comparisons of rural vaccination strategies.

Strengths and Limitations

Strengths

Comprehensive scope covering global literature and diverse rural contexts, Integration of multiple study designs and evidence types, Development of novel conceptual frameworks specific to rural populations, Practical recommendations grounded in evidence synthesis, and Attention to cultural sensitivity and ethical considerations.

Limitations

Narrative Review Methodology: Less systematic than formal systematic reviews, potential for selection bias. Publication Bias: Possible overrepresentation of positive findings and underrepresentation of null results. Language Limitations: English-only studies may miss important regional research. Temporal Variations: Studies from different time periods may not reflect current conditions. Heterogeneity: Diverse rural contexts limit generalizability of specific findings. Quality Variations: Wide range of study quality affects strength of conclusions.

Efforts to Minimize Limitations

Used systematic search strategies and multiple databases, employed multiple reviewers for study selection and quality assessment, Included gray literature and policy documents, acknowledged limitations in interpretation and recommendations, and Provided transparency in methodology and decision-making processes.

Recommendations Immediate Actions (0-12 months)

For Policymakers: Conduct national rural vaccination coverage assessments to identify priority areas, establish rural health equity targets with specific vaccination coverage goals, allocate emergency funding for mobile vaccination services in underserved areas, and Develop partnerships with religious and community leaders for vaccine promotion.

For Healthcare Systems

Implement provider training programs on cultural competency and vaccine communication. Establish mobile vaccination units for geographically isolated areas. Create community health worker programs focused on vaccination education and support. Develop multilingual, culturally appropriate vaccination education materials.

For Communities

Form community vaccination committees including diverse local leadership. Organize community education sessions addressing specific local concerns and myths. Establish peer support networks for parents and individuals making vaccination decisions.

Conclusion

Moving forward, success in addressing rural vaccine hesitancy will require sustained commitment to equity-focused policies, community-centered approaches, and evidence-based interventions. Key priorities include: Investment in Rural Health Infrastructure: Sustainable improvements require adequate healthcare facilities, trained providers, and reliable supply chains. Without addressing fundamental access barriers, even the most sophisticated behavioural interventions will have limited impact. Community Partnership and Trust Building: Successful programs consistently demonstrate the importance of genuine community partnership, cultural humility, and long-term relationship building. Trust cannot be manufactured through messaging campaigns but must be earned through consistent, respectful, and transparent engagement. Multi-Sectoral Collaboration:

Vaccine hesitancy intersects with education, economics, transportation, and social services. Effective responses require coordination across sectors and levels of government, moving beyond traditional health sector boundaries. Adaptive and Responsive Systems: Rural communities are diverse and dynamic. Intervention strategies must be flexible, culturally responsive, and capable of adapting to changing circumstances, emerging concerns, and community feedback. Research and Innovation: Continued research is essential for developing, testing, and refining intervention strategies. Priority areas include implementation science, digital health solutions, economic evaluation, and community-based participatory research approaches. The ultimate goal extends beyond simply increasing vaccination rates to building resilient rural health systems that can respond effectively to current and future health challenges. This requires transforming the relationship between rural communities and healthcare institutions from one characterized by mistrust and marginalization to one based on partnership, respect, and shared commitment to health equity. Rural vaccine hesitancy is not simply a problem to be solved but a symptom of broader health system inequities that require sustained attention and resources. Addressing these inequities will not only improve vaccination coverage but will strengthen rural communities' overall health and resilience. The evidence reviewed in this manuscript demonstrates that change is possible. Communities that have implemented comprehensive, culturally sensitive, and community-driven interventions have achieved substantial improvements in vaccination coverage and trust. These successes provide roadmaps for other communities and demonstrate that with adequate resources, commitment, and community partnership, rural vaccine hesitancy can be effectively addressed. Future success will require moving beyond short-term programmatic approaches to long-term system transformation that addresses root causes of hesitancy and builds sustainable capacity for community health improvement. This transformation will benefit not only vaccination programs but rural health systems more broadly, creating stronger, more resilient communities capable of protecting and promoting the health of all their members.

Acknowledgments

The authors would like to extend their gratitude to the rural communities, healthcare providers, community leaders, and researchers whose experiences and insights made this review possible. Special thanks to the community health workers, faith leaders, and local advocates who continue to work tirelessly to protect their communities' health despite significant challenges and resource constraints. The authors also acknowledged the librarians who assisted with our search strategy development and the international colleagues who provided insights into regional contexts and cultural considerations. They also would like to the anonymous peer reviewers whose thoughtful feedback substantially improved the quality and rigor of this manuscript. Finally, they recognized the millions of rural residents worldwide who face barriers to accessing life-saving vaccines and the healthcare providers who serve these communities with dedication and compassion despite systemic challenges.

Conflicts of Interest

The authors declared no conflicts of interest related to this research. All authors completed conflict of interest disclosure forms and confirm no financial, professional, or personal relationships that could be perceived as influencing the objectivity of this review.

Funding

This research received no specific grant funding from any funding agency in the public, commercial, or not-for-profit sectors. The authors conducted this work as part of their institutional responsibilities and academic commitments to advancing rural health equity.

Authors' Contributions

Conceptualization: Micheal Abimbola Oladosu and Moses Adondua Abah conceived the study design and developed the conceptual framework. Methodology: Musa Zakka and Oluwadamilola Zainab Yakub developed the search strategy and inclusion criteria. Ezeamii Patra Chisom conducted the systematic searches and initial screening. Formal Analysis: Etus Patrick Chimuanya performed thematic analysis and evidence synthesis. Oteng Joseph conducted quality assessment and data extraction. Writing – Original Draft: Ginika Emmanuel Obia prepared the initial manuscript draft. Writing – Review & Editing: All authors contributed to manuscript revision and approved the final version. Visualization: Olaide Ayokunmi Oladosu and created figures and developed the intervention framework diagrams. Project Administration: Omoseeye Shola David coordinated the review process and managed communications. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data supporting the conclusions of this article are available through the published literature included in our reference list. Additional data extraction forms and quality assessment tools are available from the corresponding author upon reasonable request.

ORCID

Micheal Abimbola Oladosu
https://orcid.org/0009-0000-5098-1247
Moses Adondua Abah
https://orcid.org/0000-0002-9268-1661
Shola David Omoseeye
https://orcid.org/0000-0003-3305-3785
Zakka Musa
https://orcid.org/0009-0006-2751-170X
Patra Chisom Ezeamii
https://orcid.org/0009-0002-5172-2639
Patrick Chimuanya Etus
https://orcid.org/0009-0000-9093-3880
Joseph Oteng
https://orcid.org/0009-0007-8096-2267
Oluwadamilola Zainab Yakub
https://orcid.org/0009-0004-5592-7775
Emmanuel Obia Ginika
https://orcid.org/0009-0002-2753-6545
Olaide Ayokunmi Olados
https://orcid.org/0009-0001-8550-5598

References

[1] Organization, W.H., Tracking universal health coverage: 2023 global monitoring report. **2023**.
[2] Hall E, Centers for Disease Control and Prevention, editors. Epidemiology and prevention of vaccine-preventable diseases. Atlanta, GA, USA: US Department of Health and Human Services, *Centers for Disease Control and Prevention*, **2021**.
[3] MacDonald, N.E., Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, **2015**, 33(34), 4161-4164.
[4] Dubé, E., Vivion, M., MacDonald, N.E., Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: Influence, impact and implications. *Expert Review of Vaccines*, **2015**, 14(1), 99-117.
[5] Organization, W.H., Ten threats to global health in 2019. Geneva: WHO, **2019**.
[6] Larson, H.J., Jarrett, C., Eckersberger, E., Smith, D.M., Paterson, P., Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine*, **2014**, 32(19), 2150-2159.
[7] Peretti-Watel, P., Seror, V., Cortaredona, S., Launay, O., Raude, J., Verger, P., Fressard, L., Beck,

F., Legleye, S., L'Haridon, O., A future vaccination campaign against covid-19 at risk of vaccine hesitancy and politicisation. *The Lancet Infectious Diseases*, **2020**, 20(7), 769-770.
[8] Douthit, N., Kiv, S., Dwolatzky, T., Biswas, S., Exposing some important barriers to health care access in the rural USA. *Public Health*, **2015**, 129(6), 611-620.
[9] Rainey, J.J., Watkins, M., Ryman, T.K., Sandhu, P., Bo, A., Banerjee, K., Reasons related to non-vaccination and under-vaccination of children in low- and middle-income countries: Findings from a systematic review of the published literature, 1999–2009. *Vaccine*, **2011**, 29(46), 8215-8221.
[10] Kumar, D., Chandra, R., Mathur, M., Samdariya, S., Kapoor, N., Vaccine hesitancy: Understanding better to address better. *Israel Journal of Health Policy Research*, **2016**, 5(1), 2.
[11] Fagnan, L.J., Shipman, S.A., Gaudino, J.A., Mahler, J., Sussman, A.L., Holub, J., To give or not to give: Approaches to early childhood immunization delivery in oregon rural primary care practices. *The Journal of Rural Health*, **2011**, 27(4), 385-393.
[12] Murthy, B.P., Disparities in covid-19 vaccination coverage between urban and rural counties—united states, december 14, 2020–april 10, 2021. *MMWR. Morbidity and Mortality Weekly Report*, **2021**, 70.
[13] Yasmin, F., Najeeb, H., Moeed, A., Naeem, U., Asghar, M.S., Chughtai, N.U., Yousaf, Z., Seboka, B.T., Ullah, I., Lin, C.Y., Covid-19 vaccine hesitancy in the united states: A systematic review. *Frontiers in Public Health*, **2021**, 9, 770985.
[14] Opel, D.J., Heritage, J., Taylor, J.A., Mangione-Smith, R., Salas, H.S., DeVere, V., Zhou, C., Robinson, J.D., The architecture of provider-parent vaccine discussions at health supervision visits. *Pediatrics*, **2013**, 132(6), 1037-1046.
[15] Benin, A.L., Wisler-Scher, D.J., Colson, E., Shapiro, E.D., Holmboe, E.S., Qualitative analysis of mothers' decision-making about vaccines for infants: The importance of trust. *Pediatrics*, **2006**, 117(5), 1532-1541.
[16] Green, B.N., Johnson, C.D., Adams, A., Writing narrative literature reviews for peer-reviewed journals: Secrets of the trade. *Journal of Chiropractic Medicine*, **2006**, 5(3), 101-117.
[17] Guye AH, Nigussie T, Tesema M, Shambi DB, Diriba BS, Tefera EM, Girma Y. Exploring barriers of childhood full vaccination among children living in Siraro District, West Arsi Zone, Oromia region, Ethiopia: A qualitative study. *Frontiers in Pediatrics*, **2023**, 11, 1083358.
[18] Gust, D.A., Strine, T.W., Maurice, E., Smith, P., Yusuf, H., Wilkinson, M., Battaglia, M., Wright, R., Schwartz, B., Underimmunization among children: Effects of vaccine safety concerns on immunization status. *Pediatrics*, **2004**, 114(1), e16-e22.
[19] Thysen, S.M., Byberg, S., Pedersen, M., Rodrigues, A., Ravn, H., Martins, C., Benn, C.S., Aaby, P., Fisker, A.B., BCG coverage and barriers to BCG vaccination in Guinea-Bissau: An observational study. *BMC Public Health*, **2014**, 14(1), 1037.
[20] Kreuter, M.W., McClure, S.M., The role of culture in health communication. *Annual Reviews Public Health*, **2004**, 25(1), 439-455.
[21] Kahan, D.M., Braman, D., Cohen, G.L., Gastil, J., Slovic, P., Who fears the hpv vaccine, who doesn't, and why? An experimental study of the mechanisms of cultural cognition. *Law and Human Behavior*, **2010**, 34(6), 501-516.
[22] Jegede, A.S., What led to the nigerian boycott of the polio vaccination campaign? *PLoS Medicine*, **2007**, 4(3), e73.
[23] Kaufmann, J.R., Feldbaum, H., Diplomacy and the polio immunization boycott in northern Nigeria. *Health Affairs*, **2009**, 28(4), 1091-1101.
[24] Hanley, S.J., Yoshioka, E., Ito, Y., Kishi, R., HPV vaccination crisis in Japan. *The Lancet*, **2015**, 385(9987), 2571.
[25] Suppli, C.H., Hansen, N.D., Rasmussen, M., Valentiner-Branth, P., Krause, T.G., Mølbak, K., Decline in hpv-vaccination uptake in denmark–the association between hpv-related media coverage and hpv-vaccination. *BMC Public Health*, **2018**, 18(1), 1360.
[26] Choi, Y., Fox, A.M., Mistrust in public health institutions is a stronger predictor of vaccine hesitancy and uptake than trust in trump. *Social Science & Medicine*, **2022**, 314, 115440.
[27] Jaiswal, J., Halkitis, P.N., Towards a more inclusive and dynamic understanding of medical mistrust informed by science. *Behavioral Medicine*, **2019**, 45(2), 79-85.
[28] Peek, M.E., Simons, R.A., Parker, W.F., Ansell, D.A., Rogers, S.O., Edmonds, B.T., Covid-19 among african americans: An action plan for mitigating disparities. *American Journal of Public Health*, **2021**, 111(2), 286-292.
[29] Ferdinand, K.C., Overcoming barriers to covid-19 vaccination in african americans: The need for cultural humility. **2021**, 111(4), 586-588.

[30] Ataguba, J.E., Ojo, K.O., Ichoku, H.E., Explaining socio-economic inequalities in immunization coverage in nigeria. *Health Policy and Planning*, **2016**, 31(9), 1212-1224.
[31] Budu, E., Darteh, E.K.M., Ahinkorah, B.O., Seidu, A.A., Dickson, K.S., Trend and determinants of complete vaccination coverage among children aged 12-23 months in ghana: Analysis of data from the 1998 to 2014 ghana demographic and health surveys. *Plos One*, **2020**, 15(10), e0239754.
[32] Neely, S.R., Eldredge, C., Ersing, R., Remington, C., Vaccine hesitancy and exposure to misinformation: A survey analysis. *Journal of General Internal Medicine*, **2022**, 37(1), 179-187.
[33] Johnson, N.F., Velásquez, N., Restrepo, N.J., Leahy, R., Gabriel, N., El Oud, S., Zheng, M., Manrique, P., Wuchty, S., Lupu, Y., The online competition between pro-and anti-vaccination views. *Nature*, **2020**, 582(7811), 230-233.
[34] Banerjee, P., Seth, R., Dhaliwal, B.K., Sullivan, A., Qiayum, Y., Thankachen, B., Closser, S., Shet, A., Vaccine acceptance in rural india: Engaging faith leaders as vaccine ambassadors. *Frontiers in Public Health*, **2022**, 10, 979424.
[35] Gahr P, DeVries AS, Wallace G, Miller C, Kenyon C, Sweet K, Martin K, White K, Bagstad E, Hooker C, Krawczynski G. An outbreak of measles in an undervaccinated community, *Pediatrics*. **2014**, 134(1), e220-8.
[36] Srivastava, S., Fledderjohann, J., Upadhyay, A.K., Explaining socioeconomic inequalities in immunisation coverage in india: New insights from the fourth national family health survey (2015–16). *BMC Pediatrics*, **2020**, 20(1), 295.
[37] Hajibabai, L., Hajbabaie, A., Swann, J., Vergano, D., Using covid-19 data on vaccine shipments and wastage to inform modeling and decision-making. *Transportation Science*, **2022**, 56(5), 1135-1147.
[38] Gibson, D.G., Ochieng, B., Kagucia, E.W., Were, J., Hayford, K., Moulton, L.H., Levine, O.S., Odhiambo, F., O'Brien, K.L., Feikin, D.R., Mobile phone-delivered reminders and incentives to improve childhood immunisation coverage and timeliness in kenya (m-simu): A cluster randomised controlled trial. *The Lancet Global Health*, **2017**, 5(4), e428-e438.
[39] Orimadegun, A.E., Adepoju, A.A., Akinyinka, O.O., Adolescent girls' understanding of tetanus infection and prevention: Implications for the disease control in western Nigeria. *Frontiers in Public Health*, **2014**, 2, 24.
[40] Shui, I., Kennedy, A., Wooten, K., Schwartz, B., Gust, D., Factors influencing african-american mothers' concerns about immunization safety: A summary of focus group findings. *Journal of the National Medical Association*, **2005**, 97(5), 657.
[41] James PB, Gatwiri K, Mwanri L, Wardle J. Impacts of COVID-19 on African migrants' wellbeing, and their coping strategies in urban and regional New South Wales, Australia: a qualitative study. *Journal of racial and ethnic health disparities*. **2024**, 11(6), 3523-36.
[42] Mekonnen, Z.A., Gelaye, K.A., Were, M., Tilahun, B., Effect of mobile phone text message reminders on the completion and timely receipt of routine childhood vaccinations: Superiority randomized controlled trial in northwest ethiopia. *JMIR Mhealth and Uhealth*, **2021**, 9(6), e27603.
[43] Phillips, D.E., Dieleman, J.L., Lim, S.S., Shearer, J., Determinants of effective vaccine coverage in low and middle-income countries: A systematic review and interpretive synthesis. *BMC Health Services Research*, **2017**, 17(1), 681.
[44] Machingaidze, S., Wiysonge, C.S., Hussey, G.D., Strengthening the expanded programme on immunization in africa: Looking beyond 2015. *PLoS medicine*, **2013**, 10(3), e1001405.
[45] Schmidt, H., Gostin, L.O., Williams, M.A., Is it lawful and ethical to prioritize racial minorities for covid-19 vaccines? *Jama*, **2020**, 324(20), 2023-2024.
[46] Salmon, D.A., Dudley, M.Z., Glanz, J.M., Omer, S.B., Vaccine hesitancy: Causes, consequences, and a call to action. *Vaccine*, **2015**, 33, D66-D71.
[47] Schmelz, K., Bowles, S., Opposition to voluntary and mandated covid-19 vaccination as a dynamic process: Evidence and policy implications of changing beliefs. *Proceedings of the National Academy of Sciences*, **2022**, 119(13), e2118721119.
[48] Jillian, O., Kizito, O., Socio-cultural factors associated with incomplete routine immunization of children _ amach sub-county, uganda. *Cogent Medicine*, **2020**, 7(1), 1848755.
[49] Rahbeni TA, Satapathy P, Itumalla R, Marzo RR, Mugheed KA, Khatib MN, Gaidhane S, Zahiruddin QS, Rabaan AA, Alrasheed HA, Al-Subaie MF. COVID-19 vaccine hesitancy: umbrella review of systematic reviews and meta-analysis. *JMIR Public Health and Surveillance*, **2024**, 30, 10-e54769.

How to cite this article:
M.A. Oladosu, M.A. Abah, S.D. Omoseeye, Z. Musa, P.C. Ezeamii, P.C. Etus, J. Oteng, O.Z. Yakub, E.O. Ginika, O.A. Oladosu. Determinants and Interventions for Vaccine Hesitancy in Rural Communities: A Global Narrative Review of Socio-Cultural, Institutional, and Infrastructural Barriers. International Journal of Advanced Biological and Biomedical Research, 2026, 14(2), 171-190.
DOI: https://doi.org/10.48309/ijabbr.2026.2065686.1634
Link: https://www.ijabbr.com/article_731550.html