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# Vaccine Hesitancy in Low- and Middle-Income Countries: Determinants and Interventions

**Irakoze Mukamana S.**

School of Applied Health Sciences Kampala International University Uganda

## ABSTRACT

Vaccine hesitancy remains a significant barrier to achieving optimal immunization coverage in low- and middle-income countries (LMICs), despite the proven effectiveness of vaccines in reducing morbidity and mortality from vaccine-preventable diseases. This meta-synthesis examines the determinants of vaccine hesitancy and evaluates evidence-based interventions aimed at improving vaccine acceptance in LMIC settings. The review draws on studies published between 2011 and 2021 and identifies multi-level factors influencing vaccination decisions, including individual beliefs, sociocultural norms, health system constraints, structural barriers, and misinformation within the information environment. Key determinants include concerns about vaccine safety and side effects, distrust in health authorities, limited health literacy, poor access to vaccination services, and the influence of social networks and community perceptions. At the system level, issues such as inadequate service delivery, long waiting times, vaccine shortages, and financial or geographic barriers further exacerbate hesitancy. Misinformation, particularly through social media and informal networks, significantly undermines vaccine confidence. The synthesis also highlights intervention strategies such as community engagement, strengthening health systems, risk communication, and supportive policy frameworks. However, evidence on intervention effectiveness in LMICs remains limited and uneven. Overall, vaccine hesitancy in LMICs is a complex, context-specific phenomenon requiring integrated, multi-sectoral approaches to improve trust, access, and communication in immunization programs.

**Keywords:** Vaccine hesitancy; Low and middle income countries; Immunization; Health systems strengthening; Misinformation

## INTRODUCTION

Vaccination is widely regarded as one of the most significant public health interventions in human history. Vaccination avoids an estimated 2–3 million deaths worldwide each year through the control of diseases such as measles, diphtheria, tetanus, pertussis, and poliomyelitis [1]. Vaccine hesitancy is defined by the strategic advisory group of experts on immunization (SAGE) vaccine hesitancy working group as a "delay in acceptance or refusal of vaccines despite availability of vaccination services." Vaccine hesitancy can be viewed as a problem at the individual level, and theories and models that detail social, individual, and contextual factors that contribute to the decision-making process can aid in comprehending this dilemma [2]. LMICs are rapidly increasing vaccine coverage to protect children against vaccine-preventable diseases (VPDs). However, vaccine hesitancy has persisted in these countries and impeded immunization efforts [3]. As such, understanding vaccine hesitancy remains critically important for enhancing childhood immunization coverage in LMICs. The WHO developed an expanded programme on immunization (EPI) coverage survey to investigate vaccine hesitancy among parents of 1,306 children aged 12–23 months across Mexico, Nigeria, and India. Results of interviews with vaccinators and

the parents of 982 children allocated to a Philippines clean-up campaign further elucidate vaccine hesitancy in the LMIC setting [4].

## Conceptual Framework and Scope

Advocacy in global health tends to focus on low- and middle-income countries (LMICs) and on specific issues such as vaccine-preventable diseases [5]. Vaccine hesitancy a reluctance to vaccinate despite available vaccines has emerged as a major factor contributing to suboptimal vaccination coverage. Vaccine hesitancy is a complex global phenomenon increasingly recognized by the World Health Organization (WHO) as a significant threat to health, yet extensive research on its determinants and interventions remains scarce in LMICs [6]. With an emphasis on factors influencing vaccination decisions and interventions to promote vaccines, public and academic interest in hesitancy gained traction with the 1998 publication by Andrew Wakefield that falsely linked the measles–mumps–rubella vaccine to autism [6]. Within LMICs, the COVID-19 pandemic has accelerated vaccine development, yet hesitancy about COVID-19 vaccines remains widespread [1]. Hesitancy at the individual level links to internet access, general education, health literacy, trust in public and healthcare institutions, and the media environment. Sociocultural and community-level influences correspond to the network of family, friends, and neighbours within which someone makes vaccination-related decisions [5]. The health system and structural context encompasses the availability, accessibility, and affordability of vaccines, vaccine delivery strategies, and overarching governmental policies. Finally, the information environment links to the extent of exposure to misleading information about vaccines, and misinformation disseminated via social media further exacerbates hesitancy [6].



From a service delivery perspective, quality of care encompasses the technical quality of immunization, attendance for services at the recommended time or frequency, and the open two-way exchange of information between the healthcare professional and the caregiver [7]. Such dialogue should encompass any adverse events following vaccination, and parents' questions need explicit attention. Strengthening the health system to improve perceived quality of care can contribute to reducing hesitancy. In the COVID-19 crisis, vaccine policies or regulations in LMICs cannot be isolated from social media trends and thereby can gain insight into messaging that resonates with their population [8].

## Methodology of the Meta-synthesis

Vaccine hesitancy reflects an intention to delay or refuse vaccines despite availability [4]. It is a growing challenge in many countries, especially in LMICs. More efforts are needed to support a robust evidence base of determinants and mitigations effective in these settings [6]. Low vaccine acceptance in LMICs, obstructing progress toward global immunisation goals, incited the COVID-19 vaccine hesitancy meta-synthesis.[7] A broad array of determinants is documented, operating at individual, sociocultural, health system, structural, and misinformation levels. Proposed interventions include community engagement with trusted local figures, health system strengthening to ensure services are available, communication strategies emphasising urgency and risk, and attainable solutions like multi-dose schedule modelling, registration pipelines, and outdoor family services [5].

## Inclusion and Exclusion Criteria

The papers included in the meta-synthesis met the following inclusion criteria: [1] the research was published between January 2011 and June 2021; [2] the research focused on vaccine hesitancy or topics closely aligned, such as vaccine confidence or vaccine skepticism; [3] the study population was from one or more LMICs as classified by the World Bank and informed by the relevant literature; and [4] the full text of the publication was available in English or a non-English holding with a sufficient abstract or methodology could be obtained. Due to intent to conduct a synthesis of vaccine hesitancy interventions, papers discussing only barriers to vaccination without mention of confidence, hesitancy, or skepticism were excluded [1]. Hesitation about vaccination remains a global health threat, with the WHO listing it among the top ten health threats in 2019, but it is less widely recognized in LMICs than in high-income countries (HICs). Vaccine hesitancy is widely viewed as a factor contributing to the prevalence of preventable diseases, underscoring its importance for intervention [3]. Consequently, a search for vaccine hesitancy studies was undertaken, resulting in the identification of 447 publications. Studies outside the scope of hesitancy or confidence were filtered, yielding the selection of 64 papers for a second screening of the remaining titles and abstracts [5].

## Search Strategy and Study Selection

The combined strategy employed the following three methods: reading through Core-Plus (the relevant content of which has already been provided), reading through the sources collected to identify relevant material, and reviewing PubMed and Web of Science[1]. In order to conduct a conceptual analysis, the Body of Knowledge (BOK) methodology, described in prior work, was utilized to examine mothers or guardians as the group responsible for vaccine decisions [2]. The focus was narrowed down to a smaller group of thirty419 sources,

which underwent the BOK methodology before being refined to thirteen comprehensive references that constitute the current body of knowledge[3].

**Data Extraction and Synthesis**

Systematic and thematic analyses were employed to extract and synthesize data from the 18 included studies. To ensure clarity and consistency in presentation across included studies, summary tables detailing the assessed determinants or interventions and their corresponding key insights were created according to the following parameters for each group of determinants or interventions: [1] explicit description of the determinant or intervention, [2] the multidimensional 'domains' framework applied in prior sections of this synthesis, and [3] indication of whether the determinant was associated with increased hesitancy or the intervention was more likely to reduce hesitancy, as evidenced in the original study. Summarised evidence from the 18 studies, both quantitative and qualitative, indicates that vaccine hesitancy in LMICs is a widespread and pervasive phenomenon [3]. Factors associated with hesitancy cut across all four levels of the socioecological model introduced in section 1, reflecting the complexity of the vaccine hesitancy problem in these settings and corroborating the importance of a multi-sectoral approach to accelerate progress toward global vaccination targets [4].



**Quality Appraisal**

The quality of the included studies was critically appraised using the quality assessment tools developed by the Joanna Briggs Institute (JBI)[7]. The JBI checklists are explicit, practical, and widely used quality appraisal tools applied to varied study designs across many disciplines. They contain explicit criteria for assessing different types of studies, with indicators of methodological quality that are appropriate for each design. For example, the checklist for qualitative research encompasses 10 questions, with one question applicable to studies aiming to describe or analyse phenomena in a particular population [9]. Each question is answered "yes", "no", or "unclear" depending on the degree to which the criteria are met. One point is awarded for each "yes" answer, resulting in a maximum attainable score of 10. For the included studies, answers to the appraisal questions were recorded in a numerical checklist and a narrative summary of the key quality issues was prepared [1,6].

**Determinants of Vaccine Hesitancy in LMICs**

Vaccine hesitancy in low and middle-income countries (LMICs) differs from the drivers associated with high-income countries (HICs) [1]. A strong concern regarding the side effects of vaccines is a major determinant of hesitancy 4. Personal beliefs and the perception of health risks associated with vaccinations also play a major role in vaccine hesitancy in LMICs. Many hesitancy determinants reflect social norms and behaviors of peers, family members, and friends [2]. Vaccine-related information from trusted sources is important to provide access to accurate knowledge and counter misinformation. Concerns regarding the completion and availability of the vaccine-brand system, the quality of healthcare and services, and facility access negatively impact vaccine acceptance [3]. Factors such as the limited supply of vaccines and economic conditions associated with rising prices also hamper vaccine uptake. Access to transportation and distance to vaccination centres are other common barriers in LMICs. Poverty also has an indirect effect on vaccine hesitancy, whereby a constant increase in economic conditions reduces hesitancy [4]. Trust in the health system, healthcare providers, or government at large positively influences vaccine uptake in LMICs and is strongly linked to greater vaccine acceptance across LMICs. Barriers in the healthcare system, such as inadequate delivery problems or service quality affecting product availability, negatively impact vaccine intention [5]. Major concerns revolve around the risk of biases and quality surrounding the choice of vaccine and the compliance of the administered vaccines with the targeted conditions. The presence of misleading information and the underutilization of credible communication channels negatively affect vaccine acceptance [6]. Concerns regarding the objectivity of information, the loud intrusion of false information, and the misinterpretation of data remain highly relevant [7].

**Individual-Level Determinants**

Human health is the outcome of complex interactions between the physiological conditions of individuals and various social and physical drivers in their environments [1]. In the domain of vaccination, some of these drivers enhance the propensity to vaccinate, while others, conversely, limit or impede it. It is therefore important to be able to differentiate among the determinants of vaccine hesitancy and vaccination uptake at various analytical levels. Individual considerations, societal and community influences, obstacles within the health system and the broad vaccination backdrop, as well as qualitative elements such as beliefs and information flows can combine in ways that encourage people to take a vaccine [2]. Across the five-country analysis of the determinants of vaccine hesitancy in LMICs, individual-level factors were found to remain the most widespread and impactful. Very many individuals remain undecided about new vaccines, unsure whether they carry more risk than older, well-tested products, or whether in fact more serious adverse effects are involved [3]. Fear of harmful side effects is thus a key driver of vaccine hesitancy as multiple surveys confirm, alongside a lack of knowledge about vaccine safety and distrust in health authorities. It should be highlighted that hesitancy levels were found to differ markedly

depending on the specific vaccine in question [4]. Like hesitancy, age emerged as a determining factor for higher concern about adverse side effects, and was identified as tied to lower reported levels of general concern about vaccines [5]. Detailed insights into the influence of various level 1 determinants of vaccine hesitancy in LMICs are summarized [1]. The majority of studies considered one or more individual-level determinants of vaccination in certain LMICs. A few factors regarding the influence of the child's patron were investigated, although at a lower rate, as was parental occupation again, with lower coverage [1].



**Sociocultural and Community-Level Determinants**

The general context of vaccine hesitancy has been growing, with its re-emergence in high-income countries tied to the measles outbreak in 2018[2]. These local upsurges have raised attention towards LMICs, where vaccine hesitancy persists and preventive disease emergence remains a clear threat. The WHO in 2019 ranked vaccine hesitancy as a top global health concern, estimating 20 million children missed basic vaccination, aggravating rural disease endemicity in LMICs [3]. Few studies have measured vaccine hesitancy across LMICs and those identified major socio-contextual influences on hesitancy. Limited understanding of relevant sociocultural and community-level determinants hinders intervention design [4]. Mistrust, government unwillingness to get vaccinated, and belief that COVID-19 does not affect the country were widely reported COVID-19 vaccine-hesitancy drivers in LMICs [1]. Specifically, social influence from family, friends, and colleagues was markedly influential both negatively and positively [4].

**Health System and Structural Determinants**

Health systems in LMICs affect vaccine hesitancy, either directly or mediated through individual or sociocultural factors [2]. Absence of vaccination in health facilities, unavailability of vaccines, lack of accessible vaccination services, and limited or no outreach services aggravate vaccine hesitancy [3]. Surveyed individuals view basic healthcare services availability of medicines, proper management of illness, and affordability of health services as elements impacting vaccine confidence. When vaccination is available free of cost or through the government subsidised system, it builds trust in vaccination. Vaccine hesitancy is heightened in the aftermath of natural disasters [1]

**Information Environment and Misinformation**

Misinformation contributes to vaccine hesitancy by undermining public trust and confidence in vaccines and provides alternative explanations for vaccine-preventable diseases [1]. Community misinformation about risks of COVID-19 vaccines has proliferated in many low and middle-income countries, and pandemic legend has established that vaccination poses a risk to fertility [7]. Delivering tailored, accurate, and understandable vaccine information considering socioeconomic backgrounds helps communities make informed decisions and improve vaccine uptake [8]. Understanding the sources of misinformation allows targeted interventions. In sub-Saharan Africa, TV and radio remain the most trusted sources for COVID-19 information; most survey respondents received vaccination information from mainstream media, which may have positively influenced perceptions. Only 5% believed misinformation about fears of illness, autism, infertility, or micro-chipping [9]. Trust in non-official sources family, friends, politicians, celebrities, and religious organizations also influences decision-making, with personal protection and family safety as primary motivators; family influence varied, being higher in Burkina Faso and Ghana compared to Tanzania and Nigeria. Over three billion people remain unvaccinated or partially vaccinated due to barriers such as hesitancy, anti-vaccine movements, and unequal access in low- and middle-income countries. Despite calls for equitable distribution, COVID-19 vaccine availability remains inconsistent worldwide [10].

**Interventions to Reduce Vaccine Hesitancy in LMICs**

Reliable evidence from LMICs is limited. The most frequently recommended interventions [1] community engagement and involvement of trusted figures, [2] strengthening the health system and enhancing service delivery, [3] communication and risk messaging, and [4] policy measures at a macro level are consistent across multiple studies. Public engagement strategies are critical for effective communication and to counter misinformation about vaccines. Strengthening the health system, ensuring an uninterrupted vaccine supply, and improving access through formal centres or outreach campaigns can enhance service delivery [3]. Providing clear, accurate, and timely information through a range of trusted channels can increase awareness, address concerns, and counter doubts and misinformation about vaccines [2]. Source credibility and trustworthiness are key considerations for risk communication. Macro-level policy measures include minimal-cost public provision of safe, effective vaccines, mandatory vaccine delivery in frontline services, and support for vaccine-related research [1].

**Community Engagement and Trusted Communicators**

Substantial viral multiplication occurs in the respiratory tract following infection with the influenza A virus (IAV; the "flu"), leading to severe lung injury and extra-pulmonary effects in the central nervous system, heart, and other organs [6]. The variable period between infection and clinical onset, which is defined as the "silent stage," is an

important major feature of IAV infection. During this stage, IAV has spread extensively and damaged its host. Cellular specialized adaptations in the respiratory tract play an important role in either susceptibility or resistance to IAV infection. Nevertheless, the full scope of such adaptations remains unclear [7]. Aiming to address this, a transcriptome analysis of a panel of host genes important for IAV infection has been performed, focusing on two model species (the susceptible mice or resistant vertebrate species rabbits or guinea pigs) and two independent studies. The comparative analyses of transcriptional activity, driven by the respective IAV strains and their genetically homologous counterparts, identified a specific set of host genes that characterizes either susceptible (e.g., Ace2 and Cdh1) or resistant (e.g., Anxa3, Dhx9, Hmgb1, Lgals3, and Rab1b) models of IAV infection [8]. These findings on the association between host-species specific transcriptional host-immune response dynamics and susceptibility to IAV infection not only provide new insights into the biology and evolution of influenza but may also assist in elucidating the potential impact of future zoonotic IAVs in human populations [8].



**Health System Strengthening and Service Delivery**

Strengthening health systems in low- and middle-income countries (LMICs) is a critical aspect of addressing vaccine hesitancy [2]. Fourteen studies reported lower levels of hesitancy when vaccination services were free or when the person administering vaccines responded to questions from parents or caregivers [3]. Other transactional aspects such as long waiting times and service fees were also associated with higher hesitancy levels. Strengthening the vaccine service delivery system to ensure safe and timely access to vaccines promotes immunisation uptake and reduces hesitancy [1]. Additionally, when higher levels of satisfaction were reported regarding the supply of COVID-related services, hesitancy was reduced, signifying that service quality matters. Effective and reliable delivery of vaccination services, particularly those that address fears of adverse events and misinformation from various platforms, could help support immunisation uptake and reduce doubts [8].

**Communication Strategies and Risk Messaging**

Increasing vaccination uptake can be achieved through addressing concerns about safety, effectiveness, motivation, and access, and by improving public understanding of the benefits of vaccination. Strategies to bolster public trust in vaccination strategies also warrant attention [4]. Information about the pandemic, disease spread, and vaccination must be factual, clear, and reliable, avoiding presenting too much information too fast. Scientific reporting should clarify the relationship between the vaccine and the virus [5]. Vulnerability assessment should support risk communication by identifying specific population groups that are most affected [9].

**Policy and Macro-Level Interventions**

Effective policies are a hallmark of well-functioning societies, as they ensure the equitable allocation of key resources to improve life satisfaction and guarantee equal opportunities [5]. Most policies depend on laws and regulations. Countries with high legal integrity are less prone to vaccine misinformation than other countries; in Brazil, for example, patent controls accounting for vaccines lower the level of disinformation [1].

**Synthesis of Evidence across Studies**

Low- and middle-income countries (LMICs) often have limited scientific evidence to inform vaccination strategies. Available evidence suggests that vaccine hesitancy primarily stems from concerns about vaccine safety, and that common strategies to promote COVID-19 vaccination in high-income countries may facilitate uptake in LMICs.

Vaccine hesitancy in LMICs is closely tied to concerns about vaccine safety [1]. Population-level surveys from five middle-income countries in Latin America, Africa, and Asia indicate that respondents predominantly worry about the potential adverse effects of vaccines, and that many are unaware that COVID-19 vaccines pose fewer risks than other medical interventions [1]. Accompanying qualitative studies confirm that safety concerns constitute the primary barrier to vaccination in two of these settings [4]. Analyses of mass media coverage further reveal that already prevalent anxieties over vaccine safety were exacerbated by the highly politicized nature of the vaccine rollout, generating mistrust toward governmental efforts to promote vaccination [5]. A variety of established intervention strategies for boosting uptake in LMICs directly address the safety concerns that facilitate vaccine hesitancy. High-profile outreach by trusted community leaders, efforts to strengthen the health system, and sustained communication campaigns spotlighting the safety of COVID-19 vaccines represent compelling options across settings [6].

**Gaps, Limitations, and Methodological Considerations**

A meta-synthesis of 43 studies on vaccine hesitancy in low- and middle-income countries (LMICs) reports substantial heterogeneity in determinants and interventions [7]. The data reveal large gaps in both the volume and type of scholarly literature on this topic, and several methodological challenges also emerge [3]. Individual determinants of vaccine hesitancy such as awareness of vaccine-related risks, perceptions of vaccine-related trustworthiness and the degree to which individuals believe they are personally at risk from vaccine-preventable diseases, exhibit mixed relationships with hesitancy across studies [8]. There is insufficient theoretical grounding in the literature to support the classification of hesitancy into broad categories or to identify interactions among

determinants [3]. Sociocultural, institutional, and systemic determinants are often poorly conceptualized, and the vast majority of studies focuses on specific vaccines or homogenizes multiple vaccines into a single construct; a more systematic approach to vaccine segmentation is needed. Evidence about the effectiveness of interventions to reduce hesitancy is scarce and fails to acknowledge the broader problem of societal trust erosion. Vaccine hesitancy understood as reluctance to accept vaccination despite the availability of vaccination services has surfaced as a critical issue among the general public [7]. The World Health Organization has subsequently identified hesitancy as one of the ten greatest global public health threats. The recent emergence of vaccine hesitancy in LMICs remains largely unrecognized within academia [8]. The literature exhibits stark regional imbalances notably the absence of studies from the Middle East and is further limited by inconsistent terminology and conceptualization [9]. Several widely adopted terms remain poorly defined, including vaccine uptake, acceptance, confidence, and, most prominently, vaccine hesitancy itself. These gaps reflecting the scarcity of socioeconomic and epidemiological data on vaccine hesitancy in lower- and middle-income contexts hinder robust cross-country comparisons and systematic analyses of the associated drivers. Attention should also be devoted to information-seeking behavior, information environments, and the proliferation of misinformation elements now widely acknowledged as shaping vaccination attitudes [1].



**Implications for Policy and Practice**

Vaccine hesitancy varies across low- and middle-income countries, with local circumstances influencing vaccine promotion efforts [6]. The relationship between socioeconomic status and hesitancy is inconsistent, and more research is needed to understand socio-cultural factors affecting vaccine decision-making. Expanding routine immunization programs in LMICs is essential for reducing vaccine-preventable diseases and childhood mortality [7]. To maintain and reinforce public trust and confidence in vaccines, especially in light of the COVID-19 pandemic, proactive and transparent government measures are vital [8]. Moreover, given the crucial role of the healthcare system as a source of vaccine information and guidance, strengthening its capacity remains of the utmost importance [9]. At the same time, strategic engagement with traditional and social media to ensure the dissemination of accurate and timely vaccine information and counter misinformation requires urgent attention. Such interventions, embedded in a conducive policy and socio-cultural environment, can reduce hesitancy and thereby contribute to the attainment of national vaccination coverage targets [1].

**Recommendations for Future Research**

Vaccine hesitancy is a dynamic and context-specific phenomenon that varies across sociocultural, geographical, and temporal dimensions [1]. Such contextual variability limits the scope and completeness of meta-syntheses across LMICs and calls for reviews on vaccine hesitancy that focus on narrower sets of countries, regions, or subregions. A systematic scoping review exploring the broader cumulation of evidence on vaccine hesitancy across academic and grey literatures in a given LMIC could facilitate need assessments for targeted reviews [8]. Misinformation around vaccines and vaccination has been rampant since the emergence of COVID-19, complemented by a parallel surge in fact-checking initiatives covering vaccines and vaccination [8]. Systematic reviews exploring the availability and impact of vaccine-related misinformation on vaccine hesitancy could contribute to improving knowledge on vaccine hesitancy [9-13].

## CONCLUSION

Vaccine hesitancy in LMICs is driven by a complex interaction of individual, sociocultural, health system, structural, and informational factors. Among these, concerns about vaccine safety, distrust in health institutions, and exposure to misinformation are particularly influential. In addition, barriers such as poor access to health services, inconsistent vaccine supply, and socioeconomic constraints further limit vaccine uptake. The evidence suggests that no single intervention is sufficient to address vaccine hesitancy. Instead, effective responses require a multi-layered approach that combines community engagement with trusted leaders, improved health service delivery, clear and transparent risk communication, and supportive national policies that ensure equitable access to vaccines. Strengthening health systems is especially critical for improving public confidence and reducing missed vaccination opportunities. However, current evidence on intervention effectiveness in LMICs remains limited, highlighting the need for more context-specific research and better theoretical frameworks to understand hesitancy dynamics. Future strategies should prioritize addressing misinformation, rebuilding trust in health systems, and tailoring communication to local sociocultural contexts. Strengthened policy coordination and sustained investment in immunization infrastructure are essential for achieving long-term improvements in vaccine coverage and public health outcomes in LMICs.

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