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# Beyond the Personal Choice Paradigm: A Multidisciplinary Review of Vaccine Hesitancy as a Complex Health System Phenomenon in the Post-Pandemic Era

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## Abstract

**Background:** Vaccine hesitancy was identified by the World Health Organization as one of the top ten threats to global health prior to the COVID-19 pandemic, yet the pandemic has fundamentally transformed its landscape. Global measles-containing-vaccine coverage fell from 86% in 2019 to 81% in 2021, with unvaccinated children rising to 18 million. Despite extensive research, vaccine hesitancy persists as a wicked problem resistant to unidimensional interventions.

**Aim:** This narrative review aims to synthesize evidence on vaccine hesitancy through multiple disciplinary lenses—psychological, social, epidemiological, clinical, administrative, and ancillary health professions—to develop an integrated conceptual framework for understanding and addressing hesitancy as a complex health system phenomenon.

**Methods:** A narrative review methodology was employed, searching PubMed, CINAHL, PsycINFO, Scopus, and Web of Science for literature published between 2010 and 2025.

**Results:** The review highlights that vaccine hesitancy operates on multiple levels, including individual psychological factors, social and structural determinants, epidemiological consequences, clinical communication dynamics, and administrative systems. It concludes that multicomponent, context-specific interventions addressing both psychological and structural barriers are more effective than singular strategies.

**Conclusions:** Vaccine hesitancy in the post-pandemic era cannot be adequately understood as merely individual reluctance; it is an emergent property of interactions between psychological states, social contexts, health systems, and communication environments. Effective responses require integrated multidisciplinary strategies that rebuild trust, reduce structural barriers, and engage trusted messengers across all points of the healthcare delivery continuum.

**Keywords:** Vaccine Hesitancy; Post-Pandemic; Health Behavior; Health Systems; Multidisciplinary.

## Introduction

The coronavirus disease 2019 (COVID-19) pandemic exposed the fragility of global immunization programs and intensified vaccine hesitancy across diverse populations (Larson et al., 2016). While vaccine hesitancy was already recognized by the Chan (2018) as one of the top ten threats to global health in 2018, the pandemic fundamentally transformed its landscape. Global measles-containing-vaccine first-dose (MCV1) coverage fell from 86% in 2019 to 81% in 2021, with the number of unvaccinated children rising to 18 million globally (World Health Organization & United Nations Children's Fund, 2023). As of 2024, global MCV1 coverage remains around 84%, well below the 95% required to achieve herd immunity, indicating that passive recovery will not prevent future outbreaks (World Health Organization, 2024).

Vaccine hesitancy is formally defined as "delay in acceptance or refusal of vaccines despite availability of vaccine services" (MacDonald, 2015, p. 4161). It is a complex and context-specific behavior positioned on a continuum from total acceptance to complete refusal (Dubé et al., 2021). Importantly, vaccine hesitancy must be distinguished from vaccine resistance—the small proportion of the population firmly opposed to vaccination—as hesitant individuals


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are potentially amenable to change through appropriate interventions (Brewer et al., 2017).

The pandemic context has introduced new complexities. The rapid development and deployment of COVID-19 vaccines, while a scientific triumph, also affected public trust in vaccine safety and efficacy (Larson et al., 2016). Politicization of pandemic responses blurred perceptions of vaccine safety, while misinformation proliferated through social media channels (Dunn et al., 2015). Simultaneously, routine immunization services were disrupted, creating backlogs of under-immunized children and communities (World Health Organization, & United Nations Children's Fund, 2023).

This review addresses a critical gap: while extensive research exists on vaccine hesitancy within individual disciplines—psychology, epidemiology, public health, clinical medicine—there is limited synthesis that integrates perspectives across fields. Furthermore, the roles of ancillary health professions, including radiology (in vaccine safety communication through imaging), medical secretarial staff (in patient education and reminder systems), and health administration (in policy implementation and equitable distribution), remain underexplored in the hesitancy literature. This review aims to synthesize evidence across these multiple disciplinary lenses to develop an integrated conceptual framework for understanding and addressing vaccine hesitancy as a complex health system phenomenon in the post-pandemic era.

**Methods**

A narrative review methodology was selected for this study, as it is ideally suited for synthesizing a broad and evolving body of literature across multiple disciplines to explore a complex phenomenon and develop integrated conceptual understanding (Green et al., 2006). Unlike systematic reviews designed to answer narrowly focused clinical questions, narrative reviews allow for the integration of diverse theoretical perspectives and empirical findings from both qualitative and quantitative traditions across multiple fields (Sukhera, 2022).

The literature search encompassed five major databases—PubMed, CINAHL, PsycINFO, Scopus, and Web of Science—to ensure comprehensive coverage of pertinent medical and psychological literature on vaccine hesitancy. A systematic search utilized Boolean operators to combine keywords including "vaccine hesitancy," "trust," and "health communication," focusing on peer-reviewed articles in English from 2010 to 2025, yielding 1,847 potential studies. After relevancy screening, 45 articles were selected for synthesis. Thematic analysis was employed to develop a conceptual framework that encapsulates individual psychological processes, social determinants, and clinical communication dynamics, fostering a multidisciplinary understanding of vaccine hesitancy.

**Results and Synthesis**

**Defining Vaccine Hesitancy in the Post-Pandemic Context**

The foundational definition of vaccine hesitancy, established by the WHO Strategic Advisory Group of Experts (SAGE) Working Group, characterizes it as a behavior influenced by a complex set of factors including confidence (trust in vaccine safety and effectiveness, and in the system that delivers them), complacency (perceived low risk of vaccine-preventable diseases), and convenience (accessibility, affordability, and acceptability of vaccination services)—the "3Cs" model (MacDonald, 2015).

However, the pandemic context has necessitated expansion of this framework. Salimović-Bešić et al. (2024) proposed the 7C model of vaccine readiness as a more comprehensive lens, incorporating additional dimensions: collective responsibility (understanding broader societal benefits of vaccination), risk calculation (individuals' engagement in extensive research weighing risks versus benefits), compliance (attitudes toward vaccination policies and adherence to public health guidelines), and conspiracy beliefs (susceptibility to misinformation and conspiracy theories).

This expanded framework is essential for understanding post-pandemic hesitancy. Research demonstrates that confidence eroded as politicization of the pandemic blurred perceptions of vaccine safety (Larson et al., 2016). Complacency rose when perceived disease risk was low, particularly in regions where vaccine-preventable diseases were previously well-controlled (de Figueiredo et al., 2020). Constraints in physical and information access reduced readiness to vaccinate, including geographical accessibility, affordability, and awareness of service availability (Wagner et al., 2019).

A critical distinction emerging from the literature is between vaccine hesitancy and vaccine resistance. Brewer et al. (2017) emphasized that hesitant individuals are positioned in the middle of the continuum from total acceptance to complete refusal and may be amenable to change through appropriate interventions, whereas resistant individuals represent a smaller proportion with low probability of behavior change. This distinction has important implications for intervention design, suggesting that resources should be targeted toward the hesitant majority rather than the resistant minority.

**Psychological Dimensions: Health Beliefs, Trust, and Information Processing**

Multiple behavioral change theories have been applied to understand vaccine hesitancy. The Health Belief Model (HBM) emphasizes individuals' perceptions of disease susceptibility, disease severity, vaccine benefits, and barriers to vaccination, along with cues to action (Pan, 2024). Research consistently demonstrates that perceived susceptibility to vaccine-preventable diseases and perceived vaccine effectiveness are significant predictors of vaccine

acceptance (Bacon et al., 2025). The Theory of Planned Behavior (TPB) suggests that attitudes toward vaccination, subjective norms (perceptions of what others think), and perceived behavioral control shape intentions and subsequent behavior (Pan, 2024). Meta-analytic evidence supports the application of TPB to vaccination behavior, with attitudes emerging as the strongest predictor (Bacon et al., 2025). Confidence encompasses beliefs about vaccine safety and effectiveness, as well as trust in the systems that deliver them. Karafillakis and Larson (2017) found that perceived adverse effects remain the leading reason for delay or refusal, with evidence suggesting that parents who reject vaccination overestimate side-effect risk.

**Trust as a Central Mediator**

Trust emerges as a central mediating variable across multiple studies. Institutional trust—confidence in healthcare systems, public health authorities, and government—significantly predicts vaccine acceptance (Larson et al., 2016). Research using structural equation modeling by Pavić et al. (2023) demonstrates that perception of scientific credibility plays a significant role as a mechanism translating the impacts of literacy, religiosity, and political identification on vaccine hesitancy.

Higher institutional trust is associated with lower reactance to vaccine mandates and more positive attitudes toward vaccination policies (Pavić et al., 2023). Conversely, distrust—whether rooted in historical medical exploitation, contemporary political polarization, or exposure to misinformation—strongly predicts hesitancy (Gudina et al., 2024). In Africa, Gudina et al. (2024) documented that vaccine hesitancy occurs against a backdrop of historical inequities in global health research, social and cultural complexities, insufficient community involvement, and widespread public distrust.

**Misinformation and Conspiracy Beliefs**

Conspiracy beliefs persist as a significant driver of vaccine hesitancy. The misrepresentation linking measles-mumps-rubella (MMR) vaccine to autism spawned numerous conspiracy theories and fostered skepticism among the general population (Smith, 2017). Despite conclusive evidence disproving this claim, fear persists and spreads via social media, confirmed by inverse correlations between MMR vaccination coverage and internet search activity, tweets, and Facebook posts (Dunn et al., 2015).

The pandemic intensified this phenomenon, with the mondiale de la Santé & World Health Organization (2022) describing an "infodemic" of misinformation proliferating alongside the virus. Darbandi et al. (2024) identified factors associated with vaccine hesitance including relying on web/internet as a source of information, belief in conspiracy myths, and uncertainty about vaccine safety. Meta-analytic evidence from East Africa by Alie et al. (2024) identified belief in conspiracy myths as a significant predictor of hesitancy (pooled prevalence 40.4%).

**Experience of Adverse Events and the Nocebo Effect**

Fear of side effects is the primary motive for vaccine refusal (Karafillakis & Larson, 2017). However, before the COVID-19 pandemic, little attention had been paid to the actual experience of adverse events and its relationship with vaccine hesitancy. Yin (2022) conducted a scoping review identifying significant correlations between experience of adverse events and vaccine hesitancy, with social cognitive models explaining the influence of adverse event experiences on hesitancy.

The converse relationship—hesitancy influencing perception of adverse events—is explained by the nocebo effect, where negative expectations lead to experiencing negative outcomes even from inert substances. This bidirectional relationship complicates both research and intervention, as self-reported adverse events may be influenced by pre-existing hesitancy. de Albuquerque Veloso Machado et al. (2021) concluded that a more comprehensive consideration of individual experience, both objective and subjective, would help develop more effective vaccine communication strategies and improve pharmacovigilance.

**Health Literacy and Scientific Literacy**

Scientific literacy—the ability to understand and evaluate scientific information—demonstrates complex relationships with vaccine hesitancy (Table 1). Pavić et al. (2023) found that lower scientific literacy is associated with hesitancy for both COVID-19 vaccines and vaccines in general, suggesting connections to deeply rooted value dispositions. However, the relationship is not linear; some highly literate individuals may engage in extensive risk calculation that paradoxically leads to delayed acceptance or selective vaccination (Bacon et al., 2025). Health literacy specifically related to vaccination—understanding vaccine benefits, risks, and schedules—is consistently associated with higher acceptance. Almansour (2024) found that interventions targeting health literacy through structured, appropriate, and interactive educational materials show effectiveness, particularly among adolescents.

**Table 1: Psychological and Behavioral Factors Associated with Vaccine Hesitancy**

| Factor Category | Specific Factors | Evidence Strength | Intervention Implications |
|---|---|---|---|
| **Cognitive Beliefs** | Low perceived disease susceptibility | Strong (Bacon et al., 2025) | Education on disease severity and local epidemiology |

| | | | |
|---|---|---|---|
| | Low perceived vaccine effectiveness | Strong (Bacon et al., 2025) | Transparent communication of vaccine efficacy data |
| | Overestimation of side-effect risk | Strong (Karafillakis & Larson, 2017) | Risk comparison communication; fact boxes |
| **Trust-Related** | Low institutional trust | Strong (Larson et al., 2016) | Engagement of trusted messengers; transparency |
| | Distrust of pharmaceutical industry | Moderate (Prieto Campo et al., 2024) | Independent safety monitoring communication |
| | Low trust in healthcare providers | Strong (Kempe et al., 2011) | Provider communication training; continuity of care |
| **Information Processing** | Conspiracy beliefs | Strong (Alie et al., 2024) | Emotionally resonant pro-vaccine content; myth debunking |
| | Reliance on social media information | Moderate (Oană et al., 2024) | Strategic social media engagement; AI tools |
| | Low scientific literacy | Moderate (Pavić et al., 2023) | Health literacy programs; school-based education |
| **Experiential** | Personal adverse event experience | Moderate (de Albuquerque Veloso Machado et al., 2021) | Sensitive communication; pharmacovigilance |
| | Vicarious adverse event exposure | Moderate (de Albuquerque Veloso Machado et al., 2021) | Contextualizing rare events; probability communication |
| | Nocebo susceptibility | Emerging (de Albuquerque Veloso Machado et al., 2021) | Positive framing; expectation management |

**Social Service Perspectives: Access Barriers, Community Engagement, and Equity**

Vaccine hesitancy cannot be understood in isolation from the social contexts in which vaccination decisions occur. Social determinants of health—including income, education, housing, employment, and social support—significantly shape both access to vaccination services and attitudes toward vaccines (Wagner et al., 2019). Research across multiple contexts identifies consistent patterns: vaccine hesitancy is more pronounced among women, individuals with lower levels of education, low-income populations, Black adults, those with comorbidities, and people residing in rural or semi-urban areas (Darbandi et al., 2024). In East Africa, Alie et al. (2024) found factors associated with hesitancy included female sex, under 40 years old, inadequate prevention practices, and negative attitudes toward vaccines.

Constraints encompass systemic and individual barriers, including physical availability, geographical accessibility, affordability or willingness to pay, and language literacy in multiethnic contexts (Wagner et al., 2019). During the pandemic, Kirtland et al. (2022) documented that the United Kingdom experienced a significant drop in timely MMR vaccine receipt, increasing geographical clustering of measles susceptibility, especially in areas with historically low coverage. Information about vaccination service availability represents a distinct constraint. One in ten parents in the UK was unaware of ongoing vaccination appointments at the start of the pandemic. In Israel, ineffective official communication increased mistrust, demonstrating that service information must be paired with clear communication strategies (Gallant et al., 2023).

Affordability issues create barriers to higher immunization coverage when vaccines require out-of-pocket payment. In China, approximately 20% of parents reported cost of out-of-pocket vaccines as a primary reason for hesitancy (Wagner et al., 2019). In Sudan, approximately 12% of parents partially vaccinated or did not vaccinate their children due to vaccine availability or uncooperative vaccine providers (Gudina et al., 2024).

Community engagement emerges as a critical strategy for addressing hesitancy, particularly among marginalized populations. The socio-ecological model emphasizes factors at individual, relationship, community, and societal levels, suggesting that interventions must address multiple levels simultaneously (Dubé et al., 2021). Trusted messengers—individuals and institutions with established credibility within communities—play a crucial role in vaccine communication. Healthcare workers are the cornerstone of vaccination, as they can move undecided populations not only toward vaccination but also toward non-vaccination based on their communication approach (Prieto Campo et al., 2024).

Parents consistently identify pediatricians and primary care providers as their primary source of vaccination information (Kempe et al., 2011). Community-based interventions, including outreach

programs, mobile vaccination units, and engagement with community leaders, demonstrate effectiveness in reaching underserved populations (Jarrett et al., 2015). These approaches acknowledge that vaccine decisions are made within social networks and cultural contexts, not in isolation.

In many communities, vaccine hesitancy is embedded in historical experiences of medical exploitation and systemic discrimination. In Africa, Gudina et al. (2024) documented that hesitancy occurs against a backdrop of historical inequities in global health research and widespread public distrust. Similarly, among Black communities in the United States and Europe, memories of unethical research (such as the Tuskegee syphilis study) and contemporary experiences of healthcare discrimination contribute to lower vaccine confidence (Bacon et al., 2025). Addressing this dimension requires acknowledgment of historical harms, transparency about current safeguards, and engagement with community representatives in vaccine program design and implementation. It also requires addressing contemporary inequities in healthcare access and quality that reinforce distrust.

**Epidemiological Dimensions in Population Immunity and Outbreak Dynamics**

Epidemiological perspectives on vaccine hesitancy focus on population-level consequences. Herd immunity—the threshold at which sufficient population immunity prevents disease transmission—requires vaccination coverage of 95% for highly contagious diseases like measles (World Health Organization, 2024). Current global MCV1 coverage of 84% falls substantially below this threshold, creating conditions for sustained transmission and outbreaks (World Health Organization & United Nations Children's Fund, 2023). The clustering of under-immunized populations creates particular vulnerability. Even when national coverage appears adequate, geographic pockets of low coverage enable outbreaks to ignite and spread. In the UK, Kirtland et al. (2022) found that pandemic-related disruptions increased geographical clustering of measles susceptibility, especially in areas with historically low MMR coverage.

Meta-analytic evidence provides estimates of hesitancy prevalence across regions. Globally, COVID-19 vaccine acceptance has varied from 36% in Africa to 83% in Oceania (Darbandi et al., 2024). The prevalence of COVID-19 vaccine hesitancy ranges from 23.6% to 97% globally (Darbandi et al., 2024). In East Africa, Alie et al. (2024) found a pooled prevalence of vaccine hesitancy of 40.40% (95% CI: 35.89%–47.47%), indicating that approximately four out of ten individuals express hesitancy toward vaccination.

Country-specific estimates include 42.2% in Uganda, 53.9% in Ethiopia, 48% across 16 African countries, 49.8% in Nigeria, 37.6% in Arab countries, 19.1% in Canada, 20% in Mexico and India, 33% in Italy, and 21.4% in India (Alie et al., 2024; Darbandi et al., 2024). These variations underscore the context-specific nature of hesitancy and the importance of locally tailored interventions.

Epidemiological studies identify consistent factors associated with hesitancy across populations. Socioeconomic and demographic characteristics include age (younger adults more hesitant), sex (women more hesitant in some contexts), residence (rural and semi-urban areas), income (lower income associated with hesitancy), occupation, and marital status (Darbandi et al., 2024; Alie et al., 2024). Vaccine-related factors include knowledge about vaccines, attitudes toward vaccination, conspiracy beliefs, trust and confidence, information sufficiency, perceived side effects, and COVID-19 preventive behaviors (Darbandi et al., 2024). Alie et al. (2024) found that uncertainty about vaccine safety, fear of adverse effects, uncertainty about contracting COVID-19, and belief in conspiracy myths are consistently associated with hesitancy.

The epidemiological consequences of hesitancy are visible in outbreak patterns. Measles cases doubled in 2022 compared to 2021, reflecting accumulated susceptibility from pandemic-related immunization disruptions (World Health Organization, 2024). Countries like the United Kingdom and Brazil, where measles vaccination coverage drastically fell, exemplify how swiftly gains in disease control can be reversed when public confidence decreases (Kluberg et al., 2017). Modeling studies demonstrate that even small declines in vaccine uptake can precipitate outbreaks, particularly for highly contagious diseases. The concentration of under-immunized individuals in social and geographic networks amplifies transmission risk, creating conditions for sustained outbreaks even when average coverage appears adequate (Kirtland et al., 2022).

**General Medicine's Role in Clinical Communication and Provider-Patient Relationships**

In terms of vaccination, people trust healthcare professionals more than any other source of information (Kempe et al., 2011). They are the cornerstone of vaccination as they can move undecided populations not only toward vaccination but also toward non-vaccination based on their communication approach (Prieto Campo et al., 2024). Systematic review evidence by Prieto Campo et al. (2024) identified factors cited by healthcare professionals that may contribute to vaccine hesitancy among their patients and potentially among themselves: concerns regarding safety or efficacy of vaccines (23 articles), time constraints (21 articles), lack of knowledge about vaccination/vaccines (19 articles), costs (13 articles), distrust of pharmaceutical industry (8 articles), considering oneself insusceptible (7 articles), stock shortage (7 articles), lack of personnel (5 articles), and feelings of unnecessary vaccination (5 articles).

Effective vaccine conversations in primary care require specific communication skills. The literature emphasizes the importance of presumptive announcements ("We have some vaccines due today") rather than participatory introductions ("What do you want to do about vaccines?"), as presumptive formats are associated with higher acceptance rates (Opel et al., 2013). When hesitancy is encountered, respectful dialogue that elicits and addresses specific concerns is more effective than didactic information provision. Leask et al. (2012) described motivational interviewing techniques—exploring ambivalence, reflecting concerns, supporting autonomy—as showing promise in addressing hesitancy while preserving the therapeutic relationship.

Healthcare professional vaccination status influences patient attitudes. When healthcare providers are vaccinated themselves and communicate this openly, it signals confidence in vaccine safety and effectiveness. Conversely, hesitancy among healthcare professionals—documented in systematic reviews—undermines their ability to recommend vaccines convincingly (Gallant et al., 2023; Prieto Campo et al., 2024). Interventions to combat vaccine hesitancy should increase healthcare professional education on vaccine efficacy and safety, as well as address health system factors such as cost and time per visit (Prieto Campo et al., 2024). This dual approach—enhancing provider knowledge while enabling sufficient time for vaccine conversations—is essential for effective clinical communication.

Parents are primary decision-makers for childhood vaccinations, making pediatric and family medicine settings crucial for addressing hesitancy (Edwards et al., 2016). Karafillakis and Larson (2017) found that parents who reject vaccination overestimate side-effect risk and may have never witnessed vaccine-preventable diseases, contributing to complacency. In China, 20.5% of 2,178 caregivers identified complacency as a driver of vaccine hesitancy (Wagner et al., 2019). In the USA, a significant number of parents under-recognized the potential severity and fatality of measles (Kluberg et al., 2017). These findings underscore the importance of communicating disease risk alongside vaccine safety information.

**Health Administration' s Policy, Systems, and Equitable Distribution**

Health administrators employ various policy instruments to address vaccine hesitancy and improve uptake. Mandates—requirements for vaccination as a condition of school attendance, employment, or other activities—represent one approach with demonstrated effectiveness. In Italy, the threat of school exclusion and financial penalties for non-compliance with vaccination mandates positively impacted vaccination rates (Adeagbo et al., 2022).

However, mandates can have unintended consequences. In Germany, the 2020 measles vaccination mandate increased overall coverage but had unintended consequences; parents with lower socioeconomic status were less likely to comply (Adeagbo et al., 2022). Pavić et al. (2023) found that higher institutional trust was associated with lower reactance and more positive attitudes toward the mandate, suggesting that trust mediates responses to mandatory policies.

Equitable vaccine distribution requires administrative strategies that identify and reach underserved populations. This includes geographic mapping of coverage gaps, mobile vaccination units for remote areas, outreach programs in underserved communities, and flexible scheduling to accommodate diverse work and family obligations (Cataldi et al., 2020). Cost removal is essential; vaccines must remain free at the point of care (Sadaf et al., 2013). In systems with out-of-pocket costs, affordability barriers disproportionately affect low-income populations, exacerbating inequities in coverage.

Reminder and recall systems—using mail, telephone, text messaging, or electronic health records to notify individuals when vaccinations are due or overdue—are evidence-based administrative interventions for improving uptake (Vann et al., 2018). These systems address constraints related to awareness and memory, ensuring that individuals know when vaccinations are needed. Effective reminder systems are tailored to population preferences (e.g., text messages for younger adults, phone calls for older adults), culturally and linguistically appropriate, and integrated with appointment scheduling to reduce friction (Cataldi et al., 2020). Medical secretarial and administrative staff play crucial roles in implementing and maintaining these systems.

Transparent communication of vaccination data at local levels increases individual and group accountability. Sharing dashboards with vaccination coverage at district or community level enables identification of gaps and targeting of resources (de Figueiredo et al., 2020). Publicly available data also enables communities to monitor their own coverage and motivates action to reach targets. However, data transparency must be paired with communication strategies that avoid stigmatizing communities with lower coverage. Framing that emphasizes shared responsibility and support rather than blame is essential for maintaining trust (Table 2).

**Table 2: Multilevel Intervention Strategies for Vaccine Hesitancy**

| Level | Intervention Strategies | Key Actors | Evidence Base |
|---|---|---|---|
| **Individual** | Health literacy programs; risk communication; motivational interviewing | Healthcare providers; health educators | Strong for risk communication (Bacon et al., 2025); moderate for |

| | | | |
|---|---|---|---|
| | | | motivational interviewing (Leask et al., 2012) |
| **Interpersonal** | Provider-parent communication training; peer navigation; family engagement | Physicians; nurses; community health workers | Strong for presumptive announcements (Opel et al., 2013); moderate for peer navigation (Jarrett et al., 2015) |
| **Community** | Community engagement; trusted messenger campaigns; mobile vaccination units | Community leaders; social workers; outreach staff | Strong for community engagement (Dubé et al., 2021); moderate for mobile units (Jarrett et al., 2015) |
| **Organizational** | Reminder/recall systems; extended hours; walk-in access | Administrative staff; practice managers | Strong for reminder/recall (Vann et al., 2018); moderate for access improvements (Cataldi et al., 2020) |
| **Policy/System** | School mandates; cost removal; transparent data dashboards | Health administrators; policymakers | Strong for mandates with trust-building (Adeagbo et al., 2022); strong for cost removal (Sadaf et al., 2013) |
| **Media/Digital** | Social media engagement; AI myth detection; emotionally resonant content | Communications staff; digital health teams | Emerging evidence (Oană et al., 2024); promising for reach |

**The Role of Radiology in the Contributions to Vaccine Safety Communication**

Radiology contributes to vaccine safety communication through imaging studies that demonstrate absence of vaccine-attributed pathology. For example, neuroimaging studies have consistently shown no association between vaccines and autism spectrum disorders, providing visual evidence that counteracts misinformation (Gidengil et al., 2021). When concerns arise about potential vaccine effects on organs or tissues, imaging studies can provide objective evidence of safety. Angrand et al. (2022) conducted a nationwide cohort study examining aluminum-adsorbed vaccines and found no association with chronic diseases in childhood, including those that might be detected through imaging. This radiological evidence, communicated effectively, can address specific fears and reinforce vaccine confidence.

The management of incidental findings in radiology—unexpected abnormalities detected during imaging for other purposes—has indirect relevance to vaccine hesitancy. When incidental findings are discovered, clear communication about their significance (or lack thereof) and appropriate follow-up is essential to maintain trust in the healthcare system (Brown et al., 2018). Parents who receive unclear or alarming communication about incidental findings may generalize distrust to other healthcare interventions, including vaccination. This underscores the importance of radiology communication training and integration with primary care follow-up.

Radiologists and radiologic technologists interact with patients and families during imaging procedures, providing opportunities for vaccine-related conversations. While not primarily responsible for vaccine counseling, these professionals can reinforce messages about vaccine safety and address questions when they arise. Integration of radiology into multidisciplinary vaccine communication strategies—for example, through patient education materials in imaging departments—represents an underexplored opportunity for addressing hesitancy.

**Medical Secretarial and Administrative Support Roles**

Medical secretarial and administrative staff serve as initial points of contact for patients and families, providing information about appointment scheduling, vaccination services, and basic vaccine education (Shen & Dubey, 2019). Their accessibility and continuity of contact position them to build relationships and address practical questions about vaccination. Training administrative staff in basic vaccine communication—including how to answer common questions, when to escalate to clinical staff, and how to convey empathy—enhances the overall patient experience and supports vaccine acceptance (Shen & Dubey, 2019).

Administrative staff implement reminder and recall systems that are critical for vaccine uptake. This includes generating reminder lists, making reminder calls, sending text messages, and coordinating follow-up for missed appointments (Vann et al., 2018). Effective scheduling systems reduce barriers by offering convenient appointments, minimizing wait times, and accommodating work and family obligations. Administrative staff who understand vaccine schedules and can answer scheduling questions contribute to seamless vaccination experiences.

Accurate documentation of vaccination status in electronic health records enables identification of under-immunized individuals and populations. Administrative staff maintaining these

records play a crucial role in population health management and outreach efforts (Cataldi et al., 2020). Follow-up for incomplete vaccination series—tracking when subsequent doses are due and contacting patients—depends on administrative systems and staff. This continuity of care is essential for achieving full immunization. Administrative staff with cultural competence and language skills can bridge communication gaps with diverse populations. When staff share patients' language or cultural background, they can build trust and ensure that vaccine information is accurately transmitted and understood (Wagner et al., 2019).

**Cross-Cultural Variations in Vaccine Attitudes**

Vaccine attitudes vary significantly across cultural contexts. Global vaccine acceptance ranges from 36% in Africa to 83% in Oceania (Darbandi et al., 2024). Within Africa, hesitancy varies from 42.2% in Uganda to 53.9% in Ethiopia (Alie et al., 2024). These variations reflect differences in historical experiences, healthcare systems, religious and cultural values, and exposure to misinformation.

Religious beliefs influence vaccine attitudes in complex ways. While most major religions support vaccination, specific interpretations and minority religious groups may express opposition (Larson et al., 2014). Research from Croatia by Pavić et al. (2023) identified higher religiosity as a determinant of hesitancy for both COVID-19 vaccines and vaccines in general, suggesting connections to deeply rooted value dispositions. Philosophical beliefs about natural immunity, bodily autonomy, and medical intervention also shape vaccine attitudes. These beliefs are often embedded in broader worldviews and may be resistant to change through information provision alone (Dubé et al., 2014).

Political ideology emerged as a significant predictor of vaccine attitudes during the pandemic. Pavić et al. (2023) found that right-wing political orientation was associated with hesitancy for both COVID-19 vaccines and vaccines in general in multiple studies. Political polarization of pandemic responses—with different political figures and media outlets taking divergent positions—amplified these associations. Addressing politically charged hesitancy requires engagement with trusted messengers within political and ideological communities, rather than relying solely on public health authorities who may be distrusted by some groups.

**Collectivism versus Individualism**

Cultural dimensions of collectivism versus individualism shape vaccine attitudes through the mechanism of collective responsibility. The altruistic impulse to protect others—particularly vulnerable populations—significantly improves willingness to vaccinate. In more collectivist cultures, appeals to community protection may be more effective than individual risk-benefit framing. The concept of herd immunity can motivate uptake but may dampen collective responsibility where local coverage is far from the threshold (Salimović-Bešić et al., 2024). Communicating both individual and community benefits addresses both collectivist and individualist value orientations.

**Discussion**

This narrative review synthesized evidence on vaccine hesitancy across multiple disciplinary lenses—psychological, social, epidemiological, clinical, administrative, radiological, and medical secretarial—to develop an integrated understanding of this complex phenomenon in the post-pandemic era. The findings demonstrate that vaccine hesitancy cannot be adequately understood as merely individual reluctance or ignorance; it is an emergent property of interactions between psychological states, social contexts, health systems, and communication environments.

The synthesis reveals that each disciplinary lens captures essential but partial dimensions of vaccine hesitancy. Psychological perspectives illuminate individual-level processes—health beliefs, trust, information processing, and decision-making heuristics (Bacon et al., 2025; Pavić et al., 2023). These are essential for understanding why individuals accept or reject vaccines and for designing communication strategies that address cognitive and emotional factors. Social service perspectives reveal the structural and contextual dimensions—access barriers, historical marginalization, community dynamics, and social determinants that shape both opportunities and attitudes (Gudina et al., 2024; Wagner et al., 2019). These perspectives explain why hesitancy clusters in particular populations and why individual-level interventions alone are insufficient.

Epidemiological perspectives quantify population-level consequences—coverage gaps, outbreak risks, and the public health burden of hesitancy (Kluberg et al., 2017; World Health Organization, 2024). These provide the rationale for intervention and enable monitoring of progress. Clinical and administrative perspectives identify actionable intervention points—provider-patient communication, reminder systems, policy instruments, and service delivery innovations (Cataldi et al., 2020; Opel et al., 2013). These translate understanding into practice. Radiology and medical secretarial perspectives, though less developed in the hesitancy literature, reveal additional points of contact and influence within healthcare systems. Imaging provides objective evidence countering misinformation (Angrand et al., 2022), while administrative staff enable the infrastructure of vaccination programs (Vann et al., 2018; Shen & Dubey, 2019).

The pandemic fundamentally transformed the vaccine hesitancy landscape. Rapid vaccine development, while scientifically remarkable, also fueled concerns about safety and testing adequacy. Politicization of public health measures eroded trust in authorities. Disruptions to routine immunization

created backlogs of under-immunized children. Misinformation proliferated through social media at unprecedented scale (Larson et al., 2016; Oană et al., 2024). These changes require updated conceptual frameworks. The 7C model—adding collective responsibility, risk calculation, compliance, and conspiracy to the traditional 3Cs—better captures post-pandemic realities (Salimović-Bešić et al., 2024). The distinction between hesitancy and resistance becomes more critical as polarized minorities resist vaccination while larger populations remain ambivalent (Brewer et al., 2017).

**Implications for Intervention**

The multidisciplinary synthesis supports several conclusions about effective intervention. First, multicomponent interventions addressing both psychological and structural barriers are more effective than single-strategy approaches (Jarrett et al., 2015; Sadaf et al., 2013). Combining community engagement, provider communication training, reminder systems, and policy supports addresses hesitancy at multiple levels simultaneously. Second, tailoring to context and population is essential. Strategies effective in one cultural or demographic context may fail in another (Dubé et al., 2014). Understanding local reasons for hesitancy—whether access barriers, misinformation exposure, historical distrust, or religious concerns—enables targeted responses.

Third, trusted messengers are critical. Healthcare providers remain the most trusted source of vaccine information (Kempe et al., 2011). Community leaders, religious figures, and peer navigators extend reach into populations where institutional trust is low (Jarrett et al., 2015). Fourth, transparency and humility in communication build trust over time. Acknowledging uncertainty where it exists, communicating about vaccine development and monitoring processes openly, and admitting past mistakes in public health (including historical injustices) create foundations for credible communication (Larson et al., 2016). Fifth, addressing structural barriers is inseparable from addressing attitudinal barriers. Even the most motivated individual cannot overcome lack of access, cost barriers, or inconvenient services. Conversely, reducing friction in vaccination services can convert hesitant individuals into accepting ones (Wagner et al., 2019).

**Limitations**

This review has several limitations inherent to narrative methodology. The search, while comprehensive across multiple databases, was not exhaustive in the systematic review sense. The synthesis is inevitably influenced by the author's selection and interpretation of literature. The inclusion of multiple disciplinary lenses, while a strength for integration, means that depth within any single discipline may be less than in discipline-specific reviews. Some fields—particularly radiology and medical secretarial—have limited direct research on vaccine hesitancy, requiring extrapolation from related literatures.

**Future Research Directions**

Several priority areas for future research emerge from this review. First, intervention effectiveness research should compare multicomponent strategies across contexts, identifying which combinations work best for which populations. Second, implementation science should examine how to integrate evidence-based strategies into routine practice across diverse healthcare settings. Third, health system research should explore how administrative structures—reminder systems, scheduling, documentation—can be optimized to support vaccine uptake. Fourth, communication research should investigate how to counter misinformation effectively without amplifying it, and how to engage hesitant populations in productive dialogue. Fifth, equity-focused research should examine how interventions affect disparities in vaccine coverage and whether strategies need to be tailored for marginalized populations.

**Conclusion**

Vaccine hesitancy post-pandemic poses a significant public health challenge, necessitating a multi-disciplinary approach incorporating psychological, social, and systemic perspectives. Key findings indicate that the 7C model—confidence, complacency, constraints, collective responsibility, risk calculation, compliance, and conspiracy—offers valuable insights into this hesitancy. Trust, especially in institutions and healthcare providers, is crucial in shaping vaccine attitudes. Structural barriers like access and affordability must be addressed alongside attitudinal factors. Effective strategies require trained healthcare professionals and context-specific interventions. Moving forward, the aim is to build resilient immunization systems while engaging communities to foster trust and counter misinformation, ensuring sustained vaccination coverage for future challenges.

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