



Strengthening Risk Communication and Community Engagement in Public Health Emergencies: A Public Health Framework with Biological Science Insights for Trust, Misinformation Management, and Community Resilience

Abayizye Remy Patient¹ , Abdussalam Khattak²

¹ College of Civil Engineering Construction and Management, Chengdu University of Technology, 610059 Chengdu, China

² College of Environmental and Civil Engineering, Chengdu University of Technology, 610059 Chengdu, China

*Email any correspondence to: Abdussalam Khattak (abdussalamkhattak@stu.cdut.edu.cn)

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Abstract

Background: Public health emergencies do not unfold through biology alone. The course of an outbreak is shaped by how a pathogen spreads, who is susceptible, how immunity develops, and what resources a health system can mobilize. Yet these factors operate within communities whose trust, beliefs, access to services, and daily constraints influence whether control measures are accepted. Effective risk communication and community engagement (RCCE) is therefore part of disease control, not an optional communication layer.

Aim: This review examines how RCCE can be strengthened in public health emergencies and develops a practical framework that links community-facing communication with basic biological concepts such as transmission, vaccination, immunity, and exposure reduction.

Methods: A structured narrative review was conducted across foundational and recent literature on risk perception, crisis communication, community participation, Ebola, COVID-19, vaccine confidence, health literacy, and infodemic management. Fifty peer-reviewed sources with DOI links were synthesized thematically, with additional attention to how biological

evidence is translated for public use.

Results: Across the literature, six recurring areas shaped RCCE performance: trust and credibility, early and transparent communication, two-way participation, culturally and linguistically accessible messaging, social listening and misinformation response, and institutional readiness. A further cross-cutting issue was the translation of biological evidence into explanations that people can use in everyday decisions.

Conclusion: RCCE should be designed as part of emergency preparedness and response rather than activated only after confusion or resistance appears. Strong systems invest in trained staff, standing community partnerships, rapid rumor tracking, feedback that changes practice, and clear communication about uncertainty. Their performance should be judged not only by reach, but also by whether people understand the guidance, trust the response, can act on recommendations, and are reached equitably.

Keywords: risk communication; community engagement; public health emergency; biological science; disease transmission; vaccination; infodemic management; trust; health literacy; emergency preparedness; COVID-19; Ebola

1. Introduction

Public health emergencies are managed in clinics, laboratories, emergency operations centres, and households at the same time. Surveillance can identify cases and vaccines can reduce risk, but these measures only reach their full value when people understand the advice, trust those delivering it, and can act within the constraints of ordinary life. Recent Ebola outbreaks and the COVID-19 pandemic made this plain: uncertainty,

misinformation, and distrust affected the response alongside the pathogen itself [1,2,3].

This interaction is especially clear when biological evidence must be turned into decisions. Transmission may occur through aerosols, direct contact, vectors, contaminated environments, or animal-human interfaces, and the consequences vary with incubation period, infectiousness, immunity, vaccination coverage, comorbidity, and environmental exposure.



Communities do not need every technical detail, but they do need an accurate explanation of what changes their risk. In this sense, RCCE links scientific evidence to practical choices about testing, vaccination, isolation, exposure reduction, and early reporting.

Risk communication concerns the exchange of information about hazards, uncertainty, recommended action, and the reasons behind response decisions. Community engagement adds a different element: communities help shape how interventions are planned, delivered, monitored, and adapted. The distinction matters. A message can be technically correct and still fail if it ignores local barriers or arrives through a source that people do not trust. RCCE brings these functions together and treats affected populations as participants in the response rather than as a passive audience [4,5,6].

Risk research helps explain why technically accurate information does not always produce the expected behaviour. People judge danger through more than probability. Familiarity, fairness, control, emotion, previous experience, social identity, and institutional credibility all influence how a warning is understood. The social amplification of risk framework describes how media, institutions, and interpersonal networks can heighten or dampen concern [7]. Other work on risk perception shows why public judgments may diverge from expert assessments, particularly when uncertainty, dread, voluntariness, or moral concerns are involved [8,9].

Crisis and emergency risk communication (CERC) translated many of these insights into operational guidance. The model stresses speed, accuracy, empathy, credibility, respect, and clear action [10]. Related work by Seeger [13] emphasizes openness, listening, coordination, consistency, and learning across crises. These are not merely communication preferences. In an emergency, they can influence care seeking, symptom reporting, acceptance of vaccination, and willingness to follow measures that reduce transmission [11,12].

Experience from the West African Ebola response shows what happens when communication is separated from community realities. Early interventions often met fear and resistance, especially where response teams were unfamiliar or practices around care and burial were changed without sufficient dialogue. As the response became more locally grounded, social mobilization, religious and community leadership, safer burial arrangements, and household-level problem solving became increasingly important [14,15,16]. Evidence from Liberia and North Kivu also linked trust and misinformation with willingness to cooperate with the response [17,3].

COVID-19 brought similar problems into a much larger and more digital information environment. Guidance changed as evidence developed, while economic pressures and political conflict shaped how messages were received. Social media carried useful information

at extraordinary speed, but it also spread conspiracy claims, false treatments, stigma, and anti-vaccine narratives [18,19,20]. Experimental and cross-country studies further showed that misinformation could weaken vaccination intentions and that trust in science and numerical reasoning were associated with greater resistance to false claims [21,22].

Earlier work on pandemic influenza had already shown that protective behaviour and anxiety vary with demographics, prior beliefs, access to communication, and vulnerability [23,24,25]. Reviews of Ebola, Zika, and yellow fever responses similarly point to the value of pre-tested messages, trusted channels, and local adaptation [26]. For biological hazards, local adaptation also requires explanation: what the organism is, how exposure occurs, which symptoms matter, why vulnerability differs, and why a specific measure can reduce harm. Yet many RCCE systems remain reactive. They are activated after rumours have spread, staffed as temporary projects, and assessed by outputs such as posters or media reach. This review addresses that gap by treating RCCE as a preparedness function and by linking communication practice with the translation of biological evidence into community action.

1.1 Aim of the Study

The study examines how risk communication and community engagement can be strengthened across public health emergencies. It seeks to bring together evidence on trust, misinformation, participation, and the communication of biological risk, and to translate that evidence into a practical framework for preparedness and response.

1.2 Research Objectives

- Clarify how risk communication, community engagement, and RCCE are used in emergency settings.
- Examine how trust, uncertainty, credibility, and social networks shape public interpretations of risk.
- Draw practical lessons from Ebola, COVID-19, vaccine communication, and infodemic research.
- Show how transmission, immunity, vaccination, and other biological concepts can be explained within a public-health-focused RCCE approach.
- Develop measurable indicators of RCCE readiness for use before and during emergencies.
- Propose a framework for embedding RCCE within routine preparedness and emergency response.

2. Methodology

2.1 Study Design

A structured narrative review was chosen because RCCE research sits across several fields that use different methods and forms of evidence. The literature includes health communication, risk analysis, anthropology, behavioural science, implementation research, emergency preparedness, and digital misinformation studies, alongside work on infectious disease transmission, immunity, vaccination, and outbreak control. The purpose was not to estimate a pooled effect. It was to bring these strands together and identify

findings that can inform emergency planners, health authorities, humanitarian organisations, and community partners.

2.2 Search Strategy and Sources

The search covered peer-reviewed empirical studies, systematic and rapid reviews, conceptual papers, and outbreak case studies. Foundational work on risk perception and crisis communication was considered alongside more recent evidence from pandemic influenza, Ebola, COVID-19, vaccine hesitancy, health literacy, community participation, and infodemic management. Search combinations included terms related to risk communication, CERC, community engagement, social mobilization, public health emergencies, Ebola, COVID-19, trust, misinformation, vaccine hesitancy, health literacy, disease transmission, immunity, vaccination, and infection prevention.

2.3 Inclusion and Exclusion Criteria

A source was retained when it made a clear conceptual or empirical contribution to at least one of seven areas: risk perception and trust; emergency risk communication; community participation; RCCE practice during outbreaks; misinformation and correction; vaccine confidence and health literacy; or communication of transmission, immunity, vaccination, infection prevention, and related disease-control concepts. Papers were excluded when the connection to public health risk communication was weak, the contribution was not sufficiently substantive for the synthesis, or no DOI was available. The final review included 50 DOI-supported references.

2.4 Data Extraction and Synthesis

Each paper was reviewed for its year, context, study type, main RCCE finding, relevant biological or disease-control concept, and practical implication. The material was compared iteratively rather than counted mechanically. Six recurring domains emerged: trust and credibility; timing and transparency; two-way participation; cultural and health-literacy adaptation; social listening and misinformation response; and institutionalization. A biological translation lens was then applied across these domains to examine how evidence on pathogens, transmission, immunity, vaccination, and prevention can be turned into public guidance without displacing the paper's main public health focus.

2.5 Ethical Considerations

The review did not involve recruitment, intervention, or collection of personal data from human participants; it

relied on published literature. Formal institutional ethical approval was therefore not required. Ethical considerations nevertheless remain central to RCCE practice, particularly respect, inclusion, cultural sensitivity, transparency, confidentiality of community feedback, and the avoidance of stigmatizing language.

3. Results

Reading across the 50 sources produced a consistent message: effective RCCE is not mainly a question of how many messages are issued. Performance depends on whether relationships already exist, whether information is released early, whether communities can question and influence the response, and whether misinformation is detected before it hardens into distrust. The synthesis also showed that biological evidence must be explained in ways that connect with concrete protective behaviour. The findings are organized around four outputs: the main RCCE domains, recurrent implementation bottlenecks, a set of readiness indicators, and an action framework for different emergency phases.

3.1 Thematic Domains of Effective RCCE

Six domains recurred often enough to form the core of the synthesis. Trust was the first. People were more likely to cooperate when communicators were seen as competent, honest, concerned, and fair [27]. Timing came next: silence or delay created space for speculation, whereas early communication that separated known facts from uncertainty gave communities something credible to act on [11,10]. Participation was equally important because local actors could identify routines, fears, language needs, and exposure patterns that were not always visible to external response teams [28,29].

The remaining domains concerned whether information could be used and whether the system could sustain the work. Health-literacy and cultural adaptation determined whether messages were understandable, relevant, and feasible for different groups [30,31]. Social listening mattered because rumours moved between social media, households, workplaces, and community networks rather than staying in a single channel [32,19,33]. Finally, the literature repeatedly pointed to institutional capacity: trained staff, dedicated resources, standing community relationships, monitoring systems, and links with surveillance, laboratory, vaccination, and infection-prevention teams [4,6]. Across all six domains, biological risk translation functioned as a cross-cutting task.

Table 1: Evidence-Based RCCE Domains and Operational Implications

Domain	Evidence pattern	Operational implication
Trust and credibility	Cooperation is more likely when the source is viewed as knowledgeable, honest, concerned, and fair [27,17].	Use messengers who already carry trust; explain decisions, state uncertainty plainly, and show concern before seeking compliance.
Transparent early messaging	Long silences and inconsistent updates leave room for speculation and can erode confidence [10,11].	Communicate early, separate confirmed facts from uncertainty, give immediate actions, and state when the next update

		will come.
Two-way participation	Local participation improves acceptability and reveals barriers, routines, and risks that outside teams may miss [14,2].	Use advisory groups, feedback channels, co-design sessions, and local action teams.
Cultural and health-literacy adaptation	Messages are more usable when language, literacy, culture, power, and practical constraints are considered [30,31].	Test messages with intended audiences; simplify wording, use suitable visuals, translate carefully, and address barriers to action.
Social listening and rumor response	Rumours and false claims can alter risk perception and vaccination decisions [20,21].	Track questions across online and offline channels, keep a rumour log, and respond through credible local messengers.
Institutionalization	RCCE is more durable when it is part of preparedness structures rather than assembled during each crisis [4,6].	Fund permanent capacity, train staff, maintain community networks, and include RCCE measures in emergency dashboards.
Biological risk translation	Biological information is more useful when transmission, incubation, infectiousness, immunity, variants, reservoirs, vectors, and exposure are linked to everyday decisions [11,10,34].	Explain the route of exposure, why a recommendation works, who faces greater risk, and how specific actions reduce transmission or harm.

Note. The table summarizes the thematic synthesis; it does not report pooled effect estimates.

3.2 Key RCCE Lessons from Ebola and COVID-19

The Ebola evidence shows why a command-and-control approach can break down. Measures that seemed technically necessary were sometimes experienced as unfamiliar, coercive, or disrespectful of social and religious practice. In Liberia and Sierra Leone, response activities became more workable when local leaders, burial teams, health workers, anthropologists, and civil society organisations helped adapt the guidance [14,15]. Listening was operational, not symbolic: it informed surveillance, care seeking, contact tracing, safer burial practices, and efforts to reduce fear [35,16].

COVID-19 carried the same problem into a faster and more contested information environment. Authorities had to explain changing evidence, defend difficult public health measures, and correct false claims without pretending that uncertainty had disappeared. Evidence from the pandemic describes engagement through community health workers, local organisations, faith leaders, volunteers, and participatory problem solving [2]. At the same time, the scale of the infodemic made routine monitoring, correction, science literacy, and

community dialogue part of the response itself [18,19,33].

3.3 Common RCCE Bottlenecks

Several weaknesses appeared repeatedly across the literature. Engagement often started after key decisions had been made, leaving communities to react to a finished plan rather than influence it. One-way campaigns sometimes increased awareness but did little to resolve mistrust, practical barriers, or confusion about biological risk. Communication also failed when materials were not adapted for people with low literacy, minority languages, disabilities, migration-related barriers, or limited access to digital media. Rumour response was frequently fragmented, especially when false claims about pathogens, vaccines, immunity, symptoms, or treatments were treated as a media issue rather than a problem of behaviour and trust. Evaluation was another weak point: programmes often counted products and impressions while giving less attention to comprehension, trust, service use, protective behaviour, equity, or response time to community concerns.

Table 2: Common Barriers in RCCE Programming and Practical Corrective Actions

Barrier	How it affects emergency response	Corrective action
Late community consultation	People may resist measures they had no opportunity to question or shape.	Bring community representatives into preparedness and consult them before major changes are announced.
One-way messaging	Awareness may increase while fears, rumours, and practical obstacles remain unresolved.	Combine mass communication with dialogue, hotlines, household outreach, and regular feedback meetings.
Low trust in institutions	People may avoid testing, vaccination, isolation, contact tracing, or treatment even when services are available.	Work through trusted local figures, explain how decisions are made, and make accountability visible.
Fear-based communication without efficacy	Severe warnings can prompt avoidance, stigma, panic, or fatalism when no realistic action is offered.	Pair the seriousness of the risk with specific, achievable steps and an empathetic explanation of support.
Poor health-literacy	A person may remember the headline but	Use plain language, local languages, tested

design	still be unsure what action to take or why it matters.	visuals, and message pre-testing with intended audiences.
Fragmented rumor response	False claims can circulate long before an official correction reaches the same audience, reducing trust or care-seeking.	Maintain a rumour log, define rapid response responsibilities, engage relevant platforms, and use credible community voices.
Weak RCCE evaluation	Teams cannot tell which messages worked, for whom, or what needs to change.	Track comprehension, trust, behaviour, rumour trends, response time, and community experience.
Poor translation of biological science	Confusion about transmission, symptoms, immunity, variants, vaccines, or treatment can produce fear, stigma, unsafe practice, or refusal.	Use plain explanations, visuals, familiar examples, and trusted health workers to connect biological evidence with a clear next action.

Note. The barriers draw on evidence from Ebola, COVID-19, vaccine hesitancy, risk perception, and misinformation research.

3.4 Proposed RCCE Readiness Indicators

The synthesis also suggested that RCCE readiness should be assessed before a crisis starts. The existence of a press office, social media account, or stockpile of messages says little about whether an authority can listen, adapt, and respond under pressure. A more useful assessment asks whether community

relationships are already in place, staff are trained, rumours can be tracked, messages can be tested, feedback reaches decision-makers, biological evidence can be translated quickly, and RCCE is linked to incident management. Table 3 converts these questions into indicators that can be adapted at national, provincial, district, or institutional level.

Table 3: Proposed RCCE Readiness Indicators

Indicator	Suggested measurement	Preparedness interpretation
Dedicated RCCE team	Named personnel, defined responsibilities, recent training records, and documented activation roles.	Indicates that RCCE has an institutional home before an emergency begins.
Community partnership map	A current map of community leaders, civil society organisations, faith networks, youth and women's groups, and representatives of populations at risk of exclusion.	Shows whether authorities know whom to contact quickly and whether the network is broad enough.
Social listening system	Routine collection and review of questions, rumours, misinformation narratives, and sentiment from both digital and face-to-face channels.	Indicates whether emerging concerns can be detected before they develop into sustained resistance.
Message testing mechanism	Records showing that draft messages are checked with intended audiences, when time permits, before wider release.	Shows whether the system can test clarity, cultural fit, and feasibility.
Feedback response time	Median time from receipt of a community concern to an official response, service change, or communication adjustment.	Distinguishes responsive engagement from feedback that is only collected.
Trusted messenger network	Number, diversity, location, and readiness of trained spokespeople and community messengers.	Shows whether communication can reach beyond official briefings and central media channels.
RCCE monitoring dashboard	A dashboard covering reach, comprehension, trust, rumour trends, protective behaviour, service uptake, and community satisfaction.	Shows whether communication is linked to learning and accountability rather than activity counts alone.
Equity adaptation plan	Availability of materials and delivery options for different languages, literacy levels, disabilities, genders, migrant groups, and access conditions.	Indicates whether people at greatest risk of exclusion can receive and use the guidance.
Biological evidence translation protocol	Prepared templates and an expert-review pathway for explaining pathogen type, transmission, incubation, symptoms, vaccine evidence, and prevention in public language.	Shows whether new scientific evidence can be converted quickly into accurate and usable guidance.

Note. These indicators are intended as a starting point for operational use and require local validation.

3.5 RCCE Action Framework across Emergency Phases

RCCE needs to change as an emergency changes. Before a crisis, the work is relational: build partnerships, identify trusted messengers, and prepare ways to explain likely hazards. When the first cases appear,

communication must be quick enough to be useful but honest enough to distinguish evidence from uncertainty. As pressure increases, social listening and community problem solving become more important because guidance that worked in the first week may fail later. At the peak of a crisis, authorities must continue

explaining why difficult measures are being used and adapt them when feedback reveals avoidable harm. Recovery is not the end of RCCE; it is the period for

accountability, learning, service restoration, and rebuilding preparedness.

Table 4: RCCE Action Framework across Emergency Phases

Emergency phase	Core RCCE objective	Priority activities
Preparedness	Establish relationships and practical communication capacity before a crisis.	Map community networks; train spokespeople; agree rumour-response procedures; test message templates; form advisory groups; prepare multilingual materials and simple explanations for likely biological hazards.
Early warning / first cases	Give useful guidance while being honest about what remains uncertain.	Issue early alerts; separate confirmed facts from open questions; give immediate protective steps; activate hotlines and feedback channels; explain transmission, symptoms, incubation, and exposure reduction.
Escalation	Support protective action while limiting fear, stigma, and rumour.	Provide regular updates; target outreach to affected groups; brief local leaders; correct high-risk false claims; adapt guidance for households, schools, workplaces, and faith settings; explain the biological reason for each recommendation.
Peak response	Preserve trust while difficult measures and service pressures intensify.	Explain the basis for decisions; acknowledge hardship; change measures when feedback identifies avoidable problems; track misinformation; keep service information current; update the public as evidence on variants, vaccines, or treatment changes.
Transition / recovery	Restore services, account for decisions, and learn with affected communities.	Share results; listen to grievances; review RCCE indicators; document failures and successes; support social and mental health recovery; revise preparedness plans; clarify remaining risks and continuing prevention needs.
After-action preparedness	Turn lessons from the crisis into permanent readiness.	Revise plans, maintain community relationships, secure RCCE budgets, repeat training, and update dashboards and social listening systems.

Note. The framework combines CERC principles with evidence on community engagement and infodemic management.

4. Discussion

Taken together, the findings place RCCE at the intersection of four functions. It is technical because it requires trained staff, message design, monitoring, and coordination. It is biological because the advice people receive depends on transmission routes, exposure pathways, host vulnerability, immunity, and changing evidence about vaccines, diagnostics, and treatment. It is social because the same message can be interpreted differently according to trust, language, identity, memory, and everyday constraints. It is also ethical: people living through an emergency are entitled to truthful information and a meaningful role in decisions that affect their lives.

Trust was the most persistent thread across these bodies of evidence. It cannot be manufactured through slogans. It is accumulated when institutions communicate early, acknowledge what they do not know, correct errors, show competence, and demonstrate that community concerns can change practice. Peters et al. [27] linked credibility with perceived knowledge, openness, honesty, and concern. The Ebola literature adds a practical dimension: cooperation improved when responders listened, adapted procedures, and worked through local relationships rather than relying only on formal authority [14,36,15].

The same evidence cautions against using fear as the

main persuasive tool. A severe warning may attract attention, but it can also produce denial, stigma, fatalism, or anger when people do not see a realistic way to protect themselves. Risk communication research therefore supports pairing the seriousness of a threat with clear, achievable action and an empathetic explanation of what support is available [11,10,13]. In practice, a useful message does more than state that a disease is dangerous. It explains what a person can do next, why that step matters, where help can be obtained, and what options exist when cost, transport, stigma, or family responsibilities make the recommendation difficult.

Community engagement improves response quality because it exposes problems that a technical plan may overlook. A team may understand the biological pathway of infection while missing the livelihood pressure that prevents isolation, the burial obligation that shapes exposure, the language gap that changes meaning, or the political history that affects trust. Participation brings these constraints into the design of the intervention. It also creates opportunities to explain biological reasoning in ways that are tied to lived decisions—for example, why transmission before symptoms changes testing advice, why isolation can interrupt a chain of infection, how vaccination changes immune protection, or why safer burial practices reduce contact risk. Evidence from participatory research supports this emphasis on power sharing, partnership,

and local ownership [37,38,39,40,29].

The pandemic also made clear that RCCE can no longer be separated from the digital information environment. Social media can distribute public health advice quickly, but the same networks can amplify false treatments, conspiracy claims, stigma, and anti-vaccine narratives. Chew and Eysenbach [44] had already shown during H1N1 that social media could offer a real-time view of public discussion. During COVID-19, the volume and persistence of misinformation made timing, repetition, social sharing, and the location of correction especially important [18,20,32,41,42]. Corrections are more useful when they arrive promptly, come from credible sources, and appear in the information spaces where the false claim is circulating [33,43].

Vaccination is a particularly demanding test of RCCE because decisions are shaped by both immunological evidence and social judgment. Hesitancy cannot be reduced to an information deficit. Confidence, convenience, complacency, risk calculation, collective responsibility, history, trust, and social norms all matter [34,45,46]. The wide variation in potential acceptance of COVID-19 vaccines across countries reinforces the need for local rather than generic communication [47]. Experimental evidence that misinformation can reduce vaccination intent further supports the use of social listening and rapid, targeted response in immunization programmes [48,21].

Health literacy should also be treated as a property of the communication system, not only of the audience. People may fail to act on accurate advice because the information is difficult to understand, hard to remember, poorly matched to their circumstances, or inaccessible through the channels they use. Authorities therefore have a responsibility to make guidance usable as well as correct [30,31]. This is especially important for migrants, minority-language groups, rural populations, older adults, people with disabilities, and those with limited digital access.

Evaluation needs the same shift from activity to effect. Counting posters, press conferences, broadcasts, or social media impressions can describe what a programme produced, but not whether the public understood the message or changed behaviour. A stronger approach combines process measures, such as time to release and time to respond to feedback, with measures of reach, comprehension, trust, perceived risk, protective action, service use, and equity. Operational RCCE work increasingly supports readiness indicators and dedicated capacity that can be tested before an emergency rather than improvised during one [4,6].

4.1 Proposed TRUST Framework for RCCE

The synthesis led to the TRUST framework as a compact guide for emergency planners. The acronym refers to Transparency, Responsiveness, Understanding, Social listening, and Two-way participation. Transparency requires a clear distinction between what is known,

what remains uncertain, and what is changing. Responsiveness means that feedback has consequences: plans, messages, or services are adjusted when community experience shows a problem. Understanding focuses attention on language, health literacy, culture, practical constraints, and the public interpretation of biological risk. Social listening tracks questions, rumours, and information needs across both digital and offline settings. Two-way participation gives communities a role in planning, delivery, and evaluation instead of limiting them to compliance.

4.2 Strengths of the Paper

The paper's main strength lies in bringing together bodies of evidence that are often discussed separately. Risk communication theory, community engagement, Ebola and COVID-19 experience, vaccine hesitancy, health literacy, infodemic management, and the communication of biological risk are considered within one applied framework. The use of DOI-supported sources improves traceability, while the tables translate the synthesis into operational domains, barriers, readiness indicators, and phase-specific actions. The TRUST framework and indicator set are intended to be adaptable across local health authorities, hospitals, humanitarian organisations, universities, and community-based organisations.

4.3 Limitations

Several limitations should be kept in view. This is a narrative synthesis rather than a systematic review or meta-analysis, so it does not provide pooled effect estimates and may not capture every relevant publication. The proposed indicators have not yet been validated in the field. The requirement that all final references include a DOI improved traceability but also narrowed the evidence base; useful operational experience is often reported in grey literature, programme documents, and community records that do not have DOI identifiers. These choices make the paper practical and auditable, but they also limit comprehensiveness.

4.4 Future Perspectives

Future work should test the proposed readiness indicators prospectively and ask whether stronger RCCE capacity is associated with faster uptake of protective behaviour, lower rumour prevalence, greater use of services, higher trust, improved vaccine confidence, or better disease-control outcomes. Evidence is especially needed from low- and middle-income countries, humanitarian and conflict-affected settings, migrant communities, zoonotic and vector-borne outbreaks, antimicrobial resistance threats, and climate-related health emergencies. Research should also examine how artificial intelligence, genomic and epidemiological surveillance, social media analytics, and community-led monitoring can support social listening without compromising privacy or widening inequity. RCCE financing deserves similar attention: preparedness funding should be studied as a sustained investment, not simply as a temporary communication expense.

5. Conclusion

Public health emergencies are not controlled by biomedical capacity alone. Laboratories, surveillance, clinical care, vaccines, and regulation remain essential, but their effect depends partly on whether people understand the risk, trust the response, and can act on the guidance. Across the literature reviewed here, effective RCCE consistently involved early communication, credible messengers, genuine participation, attention to health literacy and culture, social listening, timely responses to misinformation, and the ability to explain biological evidence in practical terms. These functions are most useful when they are built into preparedness rather than added after confusion or resistance has already emerged.

The central lesson is simple but operationally

demanding: communication without listening is incomplete. Health authorities may increase awareness and still fail to build trust if community concerns do not influence decisions. Likewise, technically accurate explanations of transmission or immunity will have limited value when they ignore cost, access, language, stigma, or daily obligations. Strong RCCE systems build relationships before a crisis, communicate honestly when evidence is uncertain, explain why recommendations make sense, adapt through feedback, and measure more than message reach. Communities are not peripheral to emergency response; they are part of the response capacity itself. Systems that recognize this before the next outbreak or disaster are likely to enter it better prepared.

Authors Contributions

ARP and AK contributed equally to this study.

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