Engaging Communities in Emergency Risk and Crisis Communication: A Systematic Review and Evidence Synthesis

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ABSTRACT

The World Health Organization (WHO) commissioned systematic reviews to assist with the development of new emergency risk communication guidelines that will impact responses and distribution of resources at all levels. This mixed-method evidence synthesis, guided by Cochrane principles and methods, examined the extant research in countries throughout the world, published from 2003 to 2016, related to the best practices to engage communities in preparing for and responding to emergency events with public health implications. Although few studies directly examined which strategies or tactics effectively engage public participation, many studies reinforced the importance of community participation. The findings support the perspective that emergency events are communicatively understood by all publics and that they benefit from emergency risk communication before, during, and after such events, especially when grounded in local contexts. Although the importance of local context limits the generalizability of risk communication, it is important to continue studying strategies and tactics to cultivate participation among all stakeholders.

KEYWORDS: Community engagement; crisis; emergency risk communication

Disaster and emergency events with public health implications are identified and understood by publics through communication, messages, and interactions (words label and help define concrete realities) and, therefore, are powerfully shaped by emergency risk communication before, during, and after such events (Centers for Disease Control

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and Prevention [CDC], 2014, 2018). Many public health agencies at multiple levels—local, state, regional, national, and international—operate organizational divisions dedicated to planning, preparedness, response, and recovery related to emergency events. These hierarchical agencies directly communicate and interact with relevant publics and must effectively coordinate efforts within their organizations as well as interorganizationally (CDC, 2014, 2018). Thus, the World Health Organization (WHO), as an agency of the United Nations (UN), commissioned 12 systematic reviews and evidence-based syntheses to inform the development of WHO Risk Communication Guidelines on Emergency Risk Communication. The question of interest for this systematic review-synthesis was, *what are the best ways to engage communities in emergency risk communication activities to respond to events/contexts*?

Prior to identifying data-based primary studies, we conducted a search for related literature reviews. The search uncovered 12 existing reviews regarding the focus of inquiry. All were narrative; none were quantitative meta-analyses. Although we did not conduct a structured review of these existing reviews nor extract detailed findings from them, we appraised their relevancy using the criteria in Noyes et al. (2019) and quality using a modified Assessment of Multiple Systematic Reviews (AMSTAR) checklist (Shea et al., 2007). Seven were of moderate quality and subsequently analyzed for summary findings (Gurabardhi, Gutteling, & Kuttschreuter, 2005; Lettieri, Masella, & Radaelli, 2009; Levac, Toal-Sullivan, & O'Sullivan, 2012; McCaffrey, 2015; Savoia, Lin, & Viswanath, 2013; Schiavo, Leung, & Brown, 2014; Wachinger, Renn, Begg, & Kuhlicke, 2013).

These existing reviews focused on risk communication (*n* = 3), emergency/disaster preparedness (*n* = 2), disaster management (*n* = 1), and risk perception (*n* = 1) for a variety of emergency events, including disasters in general, emergent infectious diseases, natural disasters, industrial hazards, and technological hazards. They predominantly drew from studies on events in the developed world, particularly in the United States/Canada, Western Europe, and Australia. Only one review focused on low- to moderate-income countries and reported inconclusive findings due to a paucity of studies.

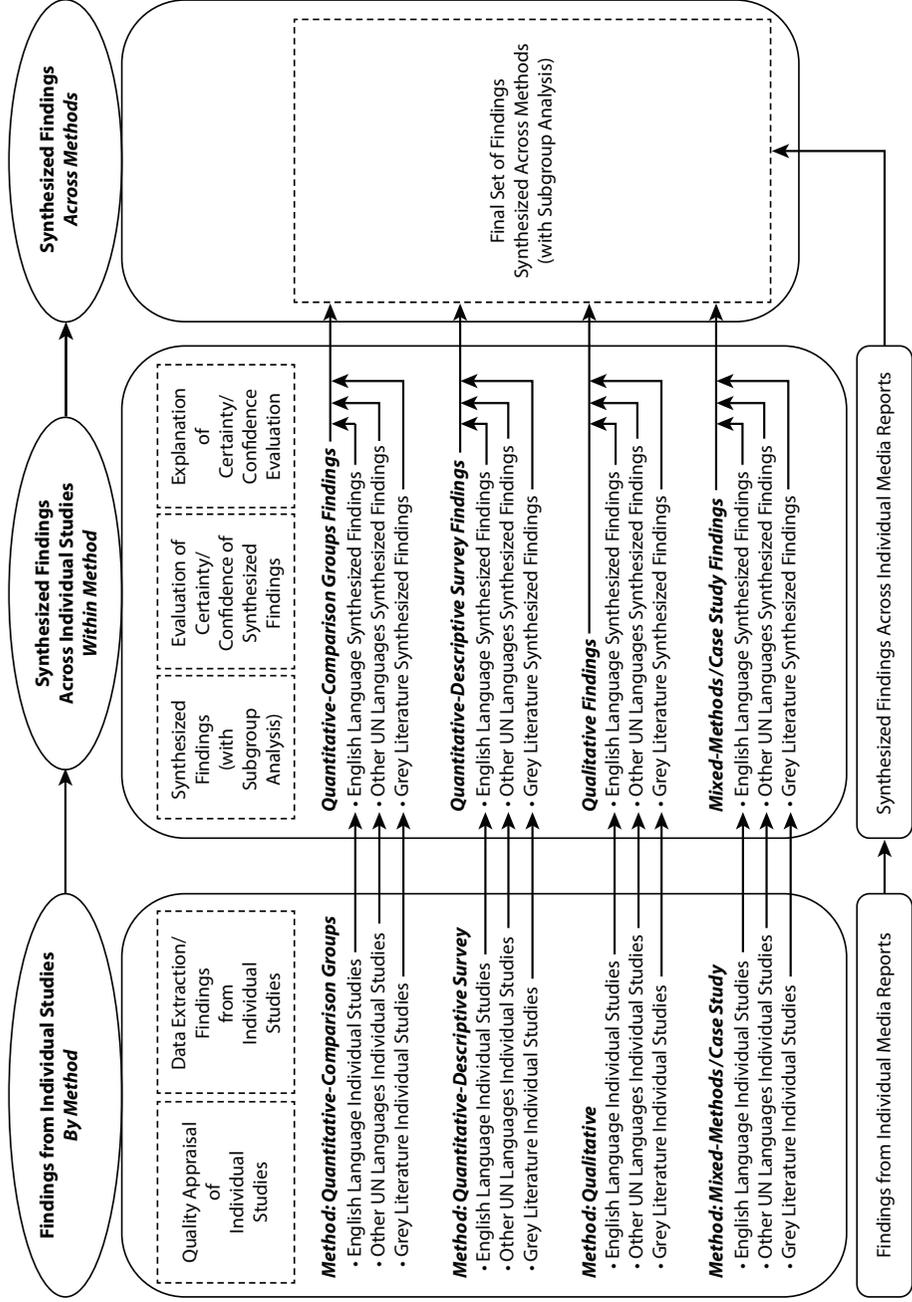The summary of review findings revealed first that how best to en-

gage communities in activities is rarely of *direct* focus of inquiry and minimally examined. Second, community is not a universally defined concept. Third, public participation, in general, is associated with improved preparedness/response actions. And, fourth, most studies continue to place extensive focus on individual and contextual factors in relation to household/community emergency preparedness rather than community engagement/participation in emergency activities. Therefore the purpose of this systematic review is to identify evidence-based studies published since 2003 that query the best ways to engage communities in emergency risk communication activities to respond to disaster/emergency events. We provide an extensive explanation of the methodology employed to conduct the systematic review, and following a discussion of the results, we identify gaps in the literature, practice recommendations that are grounded in the evidence synthesis, and suggestions for future research that will enhance and extend practice guidelines.

Method

This systematic review-synthesis includes data-based primary studies of quantitative, qualitative, and mixed-method/case study approaches conducted throughout the world and reported in English as well as other UN languages, including Arabic, Chinese, French, Russian, and Spanish, from 2003 to 2016, as specified by WHO. Our approach and process drew from principles and guidelines in the *Cochrane Handbook* and by the Cochrane Qualitative and Implementation Methods Group (Higgins & Green, 2011). Figure 1 presents the overall design for the evidence synthesis.

Systematic Review Process

Literature search. We employed a two-phase strategy for literature searching. We conducted a general search, intentionally broad in scope, followed by a narrow search focused on the WHO question. Figure 2 shows the wide range of search terms. After a general search using the Wayne State University Library Summon function, we searched within individual databases (e.g., Web of Science, PubMed/Medline-

Findings from Individual Studies *By Method*

Synthesized Findings Across Individual Studies *Within Method*

Synthesized Findings *Across Methods*

Quality Appraisal of Individual Studies | Data Extraction/ Findings from Individual Studies

Method: Quantitative-Comparison Groups
• English Language Individual Studies
• Other UN Languages Individual Studies
• Grey Literature Individual Studies

Method: Quantitative–Descriptive Survey
• English Language Individual Studies
• Other UN Languages Individual Studies
• Grey Literature Individual Studies

Method: Qualitative
• English Language Individual Studies
• Other UN Languages Individual Studies
• Grey Literature Individual Studies

Method: Mixed-Methods/Case Study
• English Language Individual Studies
• Other UN Languages Individual Studies
• Grey Literature Individual Studies

Findings from Individual Media Reports

Synthesized Findings (with Subgroup Analysis) | Evaluation of Certainty/ Confidence of Synthesized Findings | Explanation of Certainty/ Confidence Evaluation

Quantitative-Comparison Groups Findings
• English Language Synthesized Findings
• Other UN Languages Synthesized Findings
• Grey Literature Synthesized Findings

Quantitative–Descriptive Survey Findings
• English Language Synthesized Findings
• Other UN Languages Synthesized Findings
• Grey Literature Synthesized Findings

Qualitative Findings
• English Language Synthesized Findings
• Other UN Languages Synthesized Findings
• Grey Literature Synthesized Findings

Mixed-Methods/Case Study Findings
• English Language Synthesized Findings
• Other UN Languages Synthesized Findings
• Grey Literature Synthesized Findings

Synthesized Findings Across Individual Media Reports

Final Set of Findings Synthesized Across Methods (with Subgroup Analysis)

FIGURE 1 Process design of synthesis of evidence from data-based primary studies.

Disaster*	Community/community at large
Disaster plan*	Emergency management
Communication	Trust
Risk communication	Resilience
Emergenc*	Mental health
Hazard*	Public health
eRisk*	Non-government (various)
Threat*	Disaster/emergency/crisis response
Emergency preparedness	Public response
Emergency management	Awareness (public)
Cris!s (or other truncation used in a specific database: ?, #) Crisis communication	Activity, action
Disaster preparedness	Risk prevention
Hazard communication	Participation (public, community)
Emergency communication	Response/responsiveness
Catastrophe communication	Preparedness
Health communication	Decision/decision making

FIGURE 2 Search terms.

National Library of Medicine [NLM]). Similarly, the article selection process occurred in two stages. First, all literature that was related to disaster/emergency risk communication, the WHO question, and the WHO phenomenon of interest was selected. There were no preliminary conceptual definitions for "best ways" (neither strategy nor tactic), community, or participation. Instead, WHO guided us with documents and ongoing consultation to keep the scope broad. They requested, reviewed, and provided feedback on periodic reports and rapid knowledge maps that documented the literature search process in real time. Second, this literature was narrowed to select only relevant data-based primary study articles using quantitative, qualitative, or mixed-method/case study methodologies.

The search for grey literature, in all languages, used Google Scholar and general Google search as the primary information sources. Grey literature similarly had to be relevant data-based primary study articles using quantitative, qualitative, or mixed-method/case study methodologies. Such articles, however, were not published in academic, refereed journals or indexed by library databases. In addition, an experienced librarian at the National Hazards Center library at the University of Colorado–Boulder, United States, conducted a search specifically for grey literature in close consultation with a team member who was physically present. As shown in Figure 1, these grey literature studies were treated similarly to the academic primary studies.

For articles in English, the search and selection stages were conducted by an experienced librarian with subject-matter expertise and primary members of the research team. For articles in other UN languages, fluent readers and writers of these languages assisted with respective search and selection. Additionally, searches utilized some language-specific databases. All team members participated in norming and training sessions, which were done in a group setting, for search, selection, appraisal, and extraction tasks.

For all resultant articles in the literature search, relatively broad inclusion criteria were employed. Research related to the practice of risk communication and the process of disaster management—with no preference for any specific emergency or health hazards—was included. Additionally, research within the viewpoint or scope set by the risk communication field (e.g., trust, uncertainty, communities, health, misinformation, social/media, and messages) was included. Exclusion criteria consisted of research published previous to 2003, research in organizational risk communication and disaster management (e.g., technological failures), and research outside of the scope of the study, like laboratory studies.

Article appraisal. We appraised the quality of individual quantitative primary studies by using the Effective Practice and Organization of Care (EPOC; 2015) risk of bias tool. This tool provides nine criteria for assessing randomized control trials, nonrandomized control trials, and control before–after studies. Detailed information on the definitions of levels of risk used in this tool is available in Section 12.2.2 of

the *Cochrane Handbook*. An adapted version of Davids and Roman's (2014) quality appraisal criteria was also used to appraise quantitative primary studies. This tool assessed on a 2-point scale ranging from 0 (*not reported*) to 1 (*reported*) the following areas: sampling, response rate, validity and reliability, sources of data, content and focus of study, and relevancy to the corresponding question. Final ratings were determined by percentage: weak (0%–33.9%), moderate (34%–66.9%), and strong (67%–100%). We appraised individual qualitative studies by using the Critical Appraisal Skills Programme (CASP; 2013). CASP assesses appropriateness of qualitative methodology, data collection, relationship between researcher and participants, ethics, rigor of data analysis, clarity of findings, and value of research. Each area in CASP is assessed using "yes," "no," or "can't tell." Studies received a final rating of high (no significant flaws), moderate (minor flaws impacting credibility/validity), low (some flaws likely to impact credibility/validity), or very low (significant flaws impacting credibility/validity). For mixed-method/case studies, we utilized Pluye and colleagues' (2011) Mixed Methods Appraisal Tool (MMAT), which assesses the employed methods and methodological quality. Each area in MMAT is assessed using "yes," "no," or "can't tell." Studies received a final rating of high (no significant flaws), moderate (minor flaws impacting credibility/validity), low (some flaws likely to impact credibility/validity), or very low (significant flaws impacting credibility/validity).

Two team members (the two lead authors) individually assessed the quality of all relevant articles. After the appraisals were complete, they were reviewed by the principal investigator (the third author). Assessing team members reviewed any conflicts by revisiting the article under question together and discussing each part of the applicable appraisal tool in relation to the article. Conflicts and general results of quality appraisals also were discussed as a team at weekly meetings.

Data extraction. The following study characteristics were extracted from individual data-based primary studies of all method types: method, country focus, disaster/emergency type, disaster/emergency phase, and any at-risk/vulnerable populations. To extract the findings, we used the general process of reading and rereading the abstract, results/findings/analysis, and discussion and conclusion sections to

isolate the findings of interest. We did this process for all methodological streams: quantitative-comparison groups (QN-CG), quantitative-descriptive survey (QN-DS), qualitative (QL), and mixed-method/case study (MM, CS).

A quantitative meta-analysis was not suitable due to the very small number of studies that used comparison groups (randomized or non-randomized). As such, as recommended in Section 11.7.2 of the *Cochrane Handbook*, dealing with results without meta-analyses, we followed a narrative summary approach to extract findings from studies in all four methodological streams. Quantitative and qualitative evidentiary support for each finding was extracted. The two lead authors completed data extraction, which was also reviewed by the third author. Any disagreements between team members and extracted findings were reviewed by team members by revisiting the article/extraction under question together. A codebook for extracting study characteristics and findings was developed and revised with expert input and feedback.

Data synthesis. The synthesis of findings was done in two stages, as presented in the process design (see Figure 1). In the first stage, findings from individual studies were synthesized within method-ological streams, and then these within-method synthesized findings were evaluated for certainty/confidence using appropriate tools (e.g., GRADE, GRADE-CERQual). In the second stage, the within-method synthesized findings were synthesized across methodological streams, taking into account the certainty/confidence evaluations. Whenever the findings from within yet different methodological streams supported and amplified each other, they were combined into higher order findings that represented synthesis across the method streams. The evaluation of certainty in the within-method synthesized findings was kept in mind during this process. Very few synthesized findings within a methodological stream provided evidence that countered the synthesized findings from other methodological streams. Whenever this happened, we strived to retain this finding as a separate finding in the final set of across-method findings or used it to modify an existing across-method finding. In both the within-method and across-method stages, the synthesis of findings included subgroup analyses. These subgroup analyses included examination of type of emergency event,

phase of emergency event, country of emergency event, and presence of vulnerable population. The last two subgroups allowed considerations of equity in the synthesized findings.

Results

Study Characteristics

The summary study characteristics draw from 71 total studies (including 8 from grey literature) of all UN languages (6 in Arabic, 3 in Chinese, 21 in French, 34 in English, 5 in Russian, and 2 in Spanish). Thirty-three of the studies employed quantitative methods, 12 employed qualitative methods, and 26 employed mixed methods/case study approaches. Of this total, 39 were directly/partially relevant, and 32 were indirectly relevant. Given greater team expertise in English versus other UN languages, relevance assessments could not be made similarly across all studies. Nonetheless, even those deemed directly relevant most often compared/discussed community participation to no participation in relation to knowledge or action outcomes rather than comparing/discussing types of strategies or tactics employed in relation to community engagement.

In summary, the studies included disasters in countries distributed throughout the world, which widened the geographical scope (compared to previous reviews) and extended to disaster/emergency events with public health implications. The studies also focused on multiple configurations of phases, although the preparedness phase predominated. There appeared to be an increase in attention to at-risk groups (see Appendixes A and B for characteristics of studies included).

Findings Synthesis

For the findings synthesis on the best ways to engage communities in emergency risk communication activities to respond to events/contexts, 71 studies were included, appraised for quality, and used for data extraction and formulating synthesized statements within methodological streams, which, in turn, were evaluated for certainty and then synthesized across methodological streams. Again, and extremely noteworthy, the studies rarely examined which ways (including strategies or tactics)

are most effective for engaging communities. Some studies employed a type of community participation and affirmed its importance yet fell short of rigorously studying the strategy/tactic or testing the efficacy of various strategies/tactics employed to achieve said engagement.

Three related synthesized findings represent findings across all four methodological streams (see Appendix C for a table of all synthesized findings with reference citations). First, meetings prior to an event garner better attendance than those during or after an event. Moreover, meetings prior to an event appear to influence actions related to preparedness and response more effectively than meetings during or after an event. (Note that *meetings* as an activity is the term used here for all gatherings, including community members, regardless of purpose and implemented agenda.) Second, many studies emphasized and concluded the importance of including some community members in meetings as both planners and attendees. Credible community members as planners are important to include. The purpose of the meetings varied across studies, including plan development, information dissemination, training on roles and responsibilities, and conducting preparedness activities. Third, social relationships and networks stand out in their importance on preparedness and response/recovery actions and are a positive outcome of effective meetings. Meetings secondarily help to develop and sustain relationships characterized by perceptions of credibility, trust, understood role responsibilities, and actions characterized by collaboration and coordination.

Meetings may well be a strategy for achieving a goal of community engagement. Meetings in the reviewed studies varied in purpose and composition of planners, facilitators, and attendees. Example meetings ranged from engaging communities in discussion groups, open forums, educational presentations, and sessions during which families mapped household evacuation routes. Some interventions noted the success of engaging primary and lay health care workers and other credible, trusted community members as planners/facilitators. Of note, training on the roles and responsibilities of each community group (e.g., households, neighborhoods, volunteer groups, organizations) and governmental group appeared to help coordination of efforts. Such focus on differing roles and responsibilities optimally included considerations of

different (as well as similar) lived contexts and past experiences. Training of this nature also may have helped resolve issues of risk paradox tied to perception and experience, while relationship building and bonding not only served to create trust and confidence in community leaders but also served to create social connectedness and networks.

There are three synthesized findings across three of the four methodological streams. First, disaster/emergency events happen locally. While important for engaging communities in activities, local context also needs to be considered throughout all agenda items and features of an event and at all levels of perspective (QN-DS, QL, MM, CS). Second, risk perception corresponds to individual actions of preparedness for and response to disasters/emergency events. Although the correspondence is frequently positive, there do exist inverse relationships for individuals within a community (QN-CG, QN-DS, MM, CS). Third, when communicating messages to individuals about potential/actual events, the messages are more likely to be persuasive if they are framed and targeted for a specific public, congruent in content, and disseminated through many channels (QN-CG, QN-DS, MM, CS). This also appears true for messages that encourage publics to attend meetings related to potential/actual events.

One synthesized finding across two of four methodological streams (QL, MM, CS) relates partially to the question of study. Access to material resources and technologies impact infrastructure/capacity, participation in activities as well as preparedness and response actions, and innovation/learning from past events.

For more details on individual study findings and synthesized findings within and across methodological streams, see the full report submitted to WHO (2018). The report cites the related studies on which findings are grounded. Additionally, the report contains the certainty/confidence assessments of the synthesized findings within methodological streams.

Discussion

The present review-synthesis in comparison to the seven preexisting reviews includes evidence-based research conducted in the field

throughout the world and published in all UN languages. Results from study characteristics reveal an increased scope in relation to the geographical countries of disaster/emergency onset. Most of the studies cited in this review were done in the context of general/multiple types of events ($n = 25$) or floods ($n = 19$). All of the event types in the existing reviews (and more) are represented. Similarly, there is more evidence about the phase(s) of the events studied and multiple configurations of the phases. Like the existing reviews, the studies cited in this review usually approached risk communication as a multidisciplinary phenomenon. The consideration of high-risk and vulnerable populations is more evident in the articles yet still limited as related to the level of need in practice and society.

Emergency events with public health implications happen locally. Including communities is vital. To include community members as planners/facilitators of activities and to engage as many as possible in activities appears to be evidence supported and a best practice. Based on the preceding evidence-based findings synthesis, WHO now guides practitioners responding to potential/actual public health emergencies "to identify people that the community trusts and build relationships with them. Involve them in decision-making to ensure interventions are collaborative, contextually appropriate and that communication is community-owned" (a strong recommendation with moderate quality evidence) (WHO, 2018).

At present, however, there is insufficient evidence as to the "best ways" to engage any local community. The understudied comparison of ways to include the local community or assessments as to what constitutes engagement (participation) during activities likely limits the guideline's utility. Similarly, it is important to note that the undifferentiated concept of "community" remains problematic by not separating findings specifically related to communities-at-large (official leaders) versus community sectors (formal or informal) or community individuals/households (see WHO, 2018, for details on studies with precisely defined community members).

When parsing the question and the phenomenon of interest, it became apparent that concept and word choice matter. Conceptual and semantic differences exist between disciplines as well as research

and practice paradigms. The creation/use of a typology, prompting more precise classification of the extant research, would (a) provide a visual perspective of the framing of the phenomenon/a of interest, (b) reveal the current knowledge findings/claims, and (c) identify areas in need of future research. Movement toward shared typologies would facilitate more effective and efficient transfer of knowledge and recommendations.

The paucity of directly relevant and high-quality studies likely relates to the preference for publishing outcomes related to community actions after engagement in activities. If such studies had sufficient success in engaging communities, more descriptive detail on the way researchers did engage communities would help to provide rich examples with greater utility. Additionally, WHO's goal for identifying the best ways to engage communities should prompt more researchers to conduct multiples ways of engaging communities within one study. Although the importance of local context may conflict with the goal of generalizable, best ways, descriptive detail about any and all ways of community participation may allow practitioners to better transfer evidence-based findings.

Gaps in the Literature

The most apparent gap in the literature is the paucity of studies directly related to the phenomenon of interest, *effective ways to engage communities in planning activities and activities for preparedness and response actions.* As discussed, this becomes even more problematic if recommendations differ for different community levels or different types of engagement because the evidence becomes even sparser. More nuanced definitions of community, such as our proposed categorization of "communities-at-large," "community sectors," and "community individuals/households," would help target and evaluate the pragmatic utility of activities. The gaps only widen when also considering potential differences in optimal activities related to the temporal phases of before, during, and after disaster/emergency events. These gaps require separate attention.

Limitations of the Present Review

As noted, there is a paucity of studies directly relevant to the purpose of studying the best ways to engage communities in activities related to disaster/emergency events with public health implications. Therefore much of the search for literature entailed identifying articles partially or indirectly relevant. Three factors clearly obfuscated the search. One, the more detailed explanation of the question for this review provided by the WHO extensions of the question, introduced more ambiguity, rather than less, as to the question's essence. We are uncertain whether parsing through the ambiguities transfers to any theoretical or practical utility for practice. Two, when searching for partially and indirectly related literature, the initial keywords continue to influence the identified literature even with the addition of more keywords. Thus some partially or indirectly relevant bodies of literature may or may not be identified if they have a unique and distinct nomenclature. Finally, the identification/selection of partially or indirectly relevant bodies of literature is impacted by the researchers' judgment as to what constitutes an indirect relationship. For example, the body of accumulating research on the concept and utility of resilience (not included) is arguably indirectly related and potentially as insightful to the question of this review as those of risk perception and risk communication messaging. Additionally, research in other disciplines regarding community-based participatory research, entertainment education, and engaged scholarship is not included. By conducting and reporting on this review in a transparent manner, these limitations are made explicit.

If the objective of this review had been written from a practitioner perspective, some of the difficulties in identifying and reviewing relevant literature may have indicated a lack of translational fluency in phenomena of interest and approaches to address them between practitioners and researchers. Moreover, to the extent that researchers examine problems and phenomena emergent from the field, they may be adding to the problem by code switching in ways that do not improve the two-way transfer of knowledge.

Conclusions

Public health emergency events always happen locally in communities. The resulting WHO guideline, informed by this review and synthesis, stresses the need to include community members and to "involve them in decision-making to ensure that interventions are collaborative and contextually appropriate and that the community owns the process of communication" (WHO, 2018, p. 14).

Nevertheless, extant, empirical research has rarely examined the ways (strategies or tactics) that are most effective for engaging community participation. Moreover, attention to and examination of the operational concepts for engagement (participation) and community are limited. Future research is needed to query such topics. Likewise, practitioners will do well to consider WHO guidelines in their entirety and document the many aspects of how they plan for, respond to, and evaluate potential/actual emergency events with public health implications.

For engagement to occur on the local level, participatory research, action research, community organizing, and bottom-up strategies should be explored, especially as they relate to longitudinal outcomes and evaluations. As risks, emergencies, and crises perpetually surround us and are occurring at greater frequencies, building a foundation of evidence-based research on the best ways to engage communities in emergency risk communication activities to respond to crisis and/or emergency events is necessary to protect health and safety. Whenever possible, collaborations between researchers and practitioners may effectively and efficiently maximize resources and coordinate learning from/in the field.

Appendix A: Study Characteristics for English Language Studies

Relevancy	Method general	Country focus	Disaster/emergency type	Disaster/emergency phase	At-risk groups
Direct: 8	QN-CS:5	Australia: 3	General/multiple:14	All phases:1	Children:2
Indirect:17	QN-DS:14	Belgium:1	Bushfire/wildfire: 2		Immigrants: 2
Partial: 9	QL: 5	Caribbean:1	Earthquake: 4	Preparation:10	Indigenous:1
Unclear: 0	MM, CS:10	Canada: 2	Flood:5	Recovery:1	Latinos:1
		China: 2	Food safety:	Evaluation:1	
		Congo:1	Hurricane:1		
		El Salvador:1	Industrial:1	Preparation and onset:2	
		India:1	Infectious disease:1	Preparation and recovery:1	
		Indonesia:1	H*N1:1	Preparation and evaluation:3	
		Iran:3	Monkey pox:1	Onset and containment:2	
		Israel:1	SARS:2	Onset and evaluation:1	
		Japan:1	Storm:1		
		Netherlands:2	Volcano:1	Preparation, onset, and containment:2	
		Singapore:1		Onset, containment, and recovery:1	
		Spain:1			
		Sweden:1		Preparation, onset, containment, and recovery: 1	
		Thailand:1			
		Taiwan:2			
		USA:11			
		Not Specified: 2			

Note. Total English language data-based primary studies: 34 (includes 1 grey literature). Some categories are not mutually exclusive, and so the frequencies do not sum to 34. Methods were quantitative-comparison groups (QN-CG); quantitative-descriptive survey (QN-DS); qualitative (QL); mixed-method/case study (MM, CS).

Appendix B: Study Characteristics for Other UN Languages Language Studies

Relevancy	Method general	Country focus	Disaster/emergency type	Disaster/emergency phase	At-risk groups
Directly relevant: 22	QN-CS: 0	Algeria: 1	General: 11	All phases: 2	Yes: 15 (children, low SES status, older adults, rural households, immigrants, people with disabilities)
Indirectly relevant: 15	QN-DS: 14	China: 3	Arsenic/lead: 1		
	QL: 7	Czech Republic: 1	Chikungunya: 1	Preparation: 6	
	MM, CS: 16	Egypt: 4	Earthquake: 2	Onset: 2	
		Ethiopia: 1	Electromagnetic fields: 1	Containment: 1	
		France: 10	Epidemic diseases: 1	Recovery: 2	
		Germany: 1	Flood: 14	Evaluation: 5	
		Islands of Mayotte and Reunion: 1	Food safety: 1	Preparation and onset: 1	
		Japan: 1	H*N*: 3	Preparation and evaluation: 5	
		Madagascar: 1	Illegal immigrants: 1	Onset and recovery: 1	
		Mexico: 1	Nuclear: 1	Recovery and evaluation: 1	
		Morocco: 1	Volcano: 2	Recovery and preparation: 1	
		Philippines: 2			
		Poland: 1		Preparation, onset, and containment: 6	
		Russia: 5			
		Saudi Arabia: 2		Preparation, recovery, and evaluation: 3	
		Spain: 1			
		United States: 1		Onset, containment, and recovery: 1	
		Not specified: 2			

Appendix C: Synthesis of Findings Across Methodological Streams

TABLE C.1 *Four Methodological Streams*

Phenomenon of interest/outcome	Synthesized finding across all four method streams (with country, type, and phase of disaster; vulnerable population contexts)	Citations (first author) supporting synthesized finding across method streams[a]	Evaluation of certainty/ confidence[b]
Activities	Meetings prior to an emergency event appear to be more effective than meetings during an emergency event. [This synthesized finding emerges when separating out from the following two synthesized findings the aspect that the activities/ gatherings are directed toward outcomes of preparedness rather than response.]	Ardalan (2010); Ardalan (2013); Cretikos (2008); Falconi (2012); Kapucu (2008); Jahangiri (2010); Kapucu (2008); Linnell (2014); McComas (2003); Mei (2013); Perry (2008); Tuerk (2013) AR; Al-Shahri (2014) AR; Al-Tuwairqi (2003) AR; Xie (2013) CH; Affletranger (2003) FR; Chahraoui (2003) FR; Duchêne (2004) FR; Gaillard (2002) FR; Gaillard (2008) FR; Gondard-Delacroix FR; Heitz (2013) FR; Rode (2008) FR; Setbon (2009) FR; Tamru (2002) FR; Vinet (2005) FR; Gabrichidze (2013) RU, Podkorytov (2014) RU	QN-CG (GRADE): Moderate QN-DS (GRADE Adapted): Moderate to Low QL (CERQual): Moderate to Low MM, CS (as appropriate): Moderate
Activities	When leaders, with formal responsibilities related to emergencies, include community individuals (as planners and attendees) in preevent meetings for 1) plan/s development, 2) information dissemination, 3) training on who is responsible for what and what to do—social responsibility, 4) conducting preparedness actions, and 5) relationship bonding/building, there are increases in preparedness and response actions.	Ardalan (2010); Ardalan (2013); Asharose (2015); Cretikos (2008); Falconi (2012); Jahangiri (2010); Karan (2007); McComas (2003); Mei (2013); Mitchell (2013); Perry (2008); Tuerk, (2013); Al-Sayed (2010) AR; Al-Shahri (2014) AR; Al-Tuwairqi (2003) AR; Ouda (2010) AR; Zahraan (2006) AR; Xie (2013) CH; Affletranger (2003) FR; Chahraoui (2003) FR; Duchêne (2004) FR; Gaillard (2002) FR; Gaillard (2008) FR; Gondard-Delacroix (2004) FR; Heitz (2013) FR; Kingdom of Morocco (2005) FR; Rode (2008) FR; Setbon (2009) FR; Tamru (2002) FR; Vinet (2005) FR; Gabrichidze (2013) RU; Podkorytov (2014) RU	QN-CG (GRADE): Moderate QN-DS (GRADE Adapted): Moderate to Low QL (CERQual): Moderate MM, CS (as appropriate): Moderate
Activities	Events with credible public officials and experts help to build relationships of trust and confidence that transfers into coordination and social connectedness. High levels of trust (and similarly low levels of trust) may be associated with increased and/or decreased risk perception, participation in and satisfaction with activities, and preparedness/response actions.	Eisenman (2009); Falconi (2012); Kapucu (2008); McComas (2003); Mei (2013); Paek (2010); Perko (2013); Terpstra (2011); Kurtovaya (2015) RU	QN-CG (GRADE): Low QN-DS (GRADE Adapted): Low QL (CERQual): Low MM, CS (as appropriate): Moderate

[a] English has no suffix. AR = Arabic. CH = Chinese. FR = French. RU = Russian. SP = Spanish.

[b] QN-CG (GRADE): high, moderate, low, very low; QN-DS (GRADE Adapted): high, moderate, low, very low; QL (CERQual): high, moderate, low, very low; MM, CS (as appropriate): high, moderate, low, very low. Only English language studies from Section 4.5 are considered.

TABLE C.2 *Three Methodological Streams: QN-DS, QL, MM, CS*

Phenomenon of interest/outcome	Synthesized finding across three method streams (with country, type, and phase of disaster; vulnerable population contexts)	Citations (first author) supporting synthesized finding across method stream[b]	Evaluation of certainty/confidence[a]
Activities	Local contexts and culture are very important and may impact willingness to participate in activities and engage in actions for disaster preparedness and response.	Asharose (2015); Masuda (2006); Mei (2013); Prior (2008); Roder (2016); Winters (2014); Al-Sayed (2010) AR; Al-Tuwairqi (2003) AR; LuftAllah (2010) AR; Ouda (2010) AR; Zaharan (2006) AR; Lu (2010) CH; Affletranger (2003) FR; Baggio (2006) FR; Bouaouili (2006) FR; D'Ercole (2002) FR; Erlich (2000) FR; Gaillard (2002) FR; Gaillard (2008) FR; Heitz (2013) FR; Kingdom of Morocco (2005) FR; Maret (2008) FR; WHO (2004) FR; WHO (2011) FR; Kingdom of Morocco (2005) FR; Maret (2008) FR; Kutovaya (2015) RU; Coronado Salas (2012) SP; Francescutti (2007) SP	QN-CG (GRADE): --- QN-DS (GRADE Adapted): --- QL (CERQual): Low MM, CS (as appropriate): Moderate
Activities	Perception of risk associates with many socio-demographic and geographic variables as well as past experiences. A perception of high risk is usually positively associated with preparedness actions; however, there are many instances of risk paradoxes.	Ardalan (2010); Ardalan (2013); Ashrose (2015); Muttarak (2013); Perko (2013); Perry (2008); Roder (2016); Shenhar (2015); Strawderman (2012); Terpstra (2011); Kurtovaya (2014) RU	QN-CG (GRADE): Moderate QN-DS (GRADE Adapted): Moderate QL (CERQual): --- MM, CS (as appropriate): Moderate to Low
Activities	Congruent messages (not simply repetitive use of same message) disseminated many times and through a myriad of media channels empower community individuals by enhancing knowledge and promoting preparedness/response actions. Targeting by attending to message framing for different audiences usually makes a difference on awareness, knowledge acquisition, and actions. Risk communication has a large impact on individual response actions, especially among prevention-focused people.	Chan (2007); Clerveaux (2010); Cretikos (2008); Glik (2014); Heath (2009); Jahangiri (2010); Paek (2010); Mei (2013); Roder (2008); Roess (2011); Shenhar (2015); Yen (2009); Al-Tuwairqi (2003) AR; Su (2008) CH; Affletranger (2003) FR; Baggio (2006) FR; Gaillard (2002) FR; Gaillard (2008) FR; Glatron (2009) FR; Heitz (2013) FR; Rode (2008) FR; Setbon (2009) FR; (2004) FR; Vinet (2005) FR; WHO (2004) FR; Durnev (2008) RU; Podkorytov (2014) RU	QN-CG (GRADE): Moderate QN-DS (GRADE Adapted): Moderate QL (CERQual): --- MM, CS (as appropriate): Moderate to Low

[a]English has no suffix. AR = Arabic. CH = Chinese. FR = French. RU = Russian. SP = Spanish.

[b]QN-CG (GRADE): high, moderate, low, very low; QN-DS (GRADE Adapted): high, moderate, low, very low; QL (CERQual): high, moderate, low, very low; MM, CS (as appropriate): high, moderate, low, very low. Only English language studies from Section 4.5 are considered.

TABLE C.3 *Two Methodological Streams: QL, MM, CS*

Phenomenon of interest/outcome	Synthesized finding across two method streams (with country, type and phase of disaster, vulnerable population contexts)	Citations (first author) supporting synthesized finding across method stream[a]	Evaluation of certainty/ confidence[b]
Activities	Access to material resources and technologies impact infrastructure/capacity of communities-at-large for preparedness, knowledge and activities of individuals for preparedness and response, and innovation and learning from past events.	Bird (2012); Falconi (2012); Mei (2013); Serra (2011); Chahraoui (2003) FR	QN-CG (GRADE): — QN-DS (GRADE Adapted): — QL (CERQual): Moderate to Low MM, CS (as appropriate): Moderate

[a]English has no suffix. AR = Arabic. CH = Chinese. FR = French. RU = Russian. SP = Spanish.

[b]QN-CG (GRADE): high, moderate, low, very low; QN-DS (GRADE Adapted): high, moderate, low, very low; QL (CERQual): high, moderate, low, very low; MM, CS (as appropriate): high, moderate, low, very low. Only English language studies from Section 4.5 are considered.

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