World Health Organization
Department of Communications

Evidence Syntheses to Support the Guideline on Emergency Risk Communication

Q5: What are the best and most generalizable emergency risk communication activities that build trust in health authorities as a source of health protection information among affected communities and other stakeholders?

Final Report

Submitted by
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1.0 INTRODUCTION

1.1 Background

The World Health Organization (WHO), as an agency of the United Nations (UN), commissioned systematic reviews and syntheses of existing evidence to support the development of new emergency risk communication guidelines. The systematic reviews were required to focus on emergency risk communication to inform the development of recommendations for the WHO Risk Communication Guideline on Emergency Risk Communication, which refers to any risk communication done before, during, and after health emergencies.

As defined by the WHO, risk communication refers to the real-time exchange of information, advice, and opinions between experts and/or officials and/or the publics who face a threat (hazard) to their survival, health, or economic or social wellbeing.

The purpose of the proposed guidelines is to assist the WHO as it communicates with multiple stakeholders, exchanging information that will enable everyone at risk to make informed decisions about protective and preventive actions that will mitigate the effects of a threat (hazard).

As noted by the WHO, emergency health risk communication is distinguished from non-emergency health risk communication exchanges by a combination of the following characteristics: The existence of a perceived public health threat; a dramatically increased demand for information to protect health that often outstrips the ability of health authorities to provide it; a need to communicate with potentially at-risk populations before recommendations are certain; a rapidly evolving situation in which information about the health threat and how to prevent its continuation or spread is incomplete and changing as public health investigation proceeds.

A public health emergency event, such as an earthquake, wildfire, flood, and emergent infectious disease, is usually characterized as having four major phases: Preparation; onset; containment, which includes the peak of the emergency event; and recovery. Another characterization, also with four phases, but conceptualized slightly differently, includes: Prevention; readiness/preparedness; response; and recovery. A fifth phase, evaluation, generally follows the recovery phase although it commonly occurs along with the earlier four phases as well.

The WHO sought systematic reviews and syntheses of existing evidence regarding twelve questions of interest related to emergency risk communication. Of these, the Wayne State University team was responsible for six questions, and this report presents the findings for one of them.

1.2 Rationale

Communication with the public during public health emergency events is a complex process involving multiple stakeholders. The messages from authorities to the general public, specific communities, and other stakeholders, must be carefully designed to successfully influence health protection behaviors. In particular, messages and other activities must be thoughtfully created to establish and enhance trust in the authorities, as well as the information being conveyed, during the course of an emergency event. Public health emergency events tend to be both local and regional or global problems; thus, to fully know how communication in these situations can establish and enhance trust, the political and cultural context in which the messages and other activities will be received and understood must also be taken into account.

1.3 Objective

1.3.1 Question

The objective was to conduct a systematic review of the extant literature on best practices to enhance trust in health authorities during emergency health risk communication. Specifically, the purpose of the systematic review is to address the following question:

What are the best and most generalizable emergency risk communication activities that build trust in health authorities as a source of health protection information among affected communities and other stakeholders?

1.3.2 SPICE Framework Question Explication

As provided by the WHO, the question is explicated using the SPICE (Setting, Perspective, Phenomena of Interest, Comparison, Time Scope) framework as follows:

As provided by the WHO, the question is explicated using the SPICE (Setting, Perspective, Phenomena of Interest, Comparison, Time Scope) framework as follows:

Setting: In the context of preparing for and responding to national and international events/emergencies with public health implications in high, low, middle income and fragile states.
Perspective: National governments and relevant subnational authorities (e.g., local/district health departments), responding and implementing partners; at-risk communities and stakeholders.
Phenomena of Interest: Emergency risk communication activities that build trust in health authorities as a source of health protection information among affected communities and other stakeholders.
Comparison: Listening (acknowledging and responding to audience concerns/questions), early announcements, consistency of messages, strength of pre-existing relationships, use of skilled/credible spokespersons, admitting mistakes, acknowledging uncertainties, public release of evaluations and reviews, use of local spokespersons and influences. Variations in trust-building activities related to equity considerations such as local contextual and population characteristics.
Evaluation: Impact on levels of accurate knowledge and compliance with health recommendations among affected populations, perceptions of credibility of health authorities among affected populations and other stakeholders.
Time Scope: 2003 to present.

1.3.3 Review Question and Rapid Knowledge Map

To ascertain the availability of existing reviews and primary studies relevant to the question, we conducted a preliminary literature search and created a Rapid Knowledge Map. The map showed existing reviews were available as were sufficient number of primary studies with a sufficient coverage of type, phase, and country of emergency public health events. The Rapid Map also allowed us to refine the objective of and the approach to the present review as noted below.

1.3.4 Phenomena of Interest and Outcomes/ Effects Associated with Review Question

The phenomena of interest are emergency risk communication activities that build trust in health authorities as a source of health protection information among affected communities and other stakeholders. The broader phenomenon of interest is trust in health-related authorities during public health emergency events.

To foreground the phenomena of interest that could potentially be measured, observed, or described in affected populations (communities/ publics, stakeholders, etc.), we parsed the phenomena of interest and review question to focus on messages and activities that were effective or in the absence of evidence of effect appeared to work best as follows:

Messages and activities
→ Increase/decrease in trust in health and related authorities.

1.3.5 Phenomena of Interest and Comparison Category for Outcomes/ Effects/ Impacts and Best Practices

Given the corpus of research studies relevant to the objective for this systematic review, the SPICE framework descriptions (as noted above) of the setting, perspective, phenomena of interest, and time scope categories do not require any clarification.

However, the description of the comparison category requires additional interpretation for studies that are not group comparisons. We have interpreted the comparison descriptors not as comparison conditions/ groups in a research study, but as concepts/ variables that may have an association with the concepts/ variables contained in the questions. The SPICE description for the comparison category includes concepts/ variables such as acknowledging and responding to audience concerns/ questions), early announcements, consistency of messages, strength of pre-existing relationships, use of skilled/ credible spokespersons, admitting mistakes, acknowledging uncertainties, public release of evaluations and reviews, use of local spokespersons and influences, as well as variations in trust-building activities related to equity considerations such as local contextual and population characteristics. Instead of seeing these terms as comparison groups, as may be the case in a randomized trial, we are taking these concepts/ variables to be potentially associated with level of trust to identify what works and for whom and in what contexts.

As such, when we extracted data from individual studies that were not group comparisons (randomized or nonrandomized), we did not compare (or contrast) the key concepts/ variables in a question with the concepts/ variables in the comparison category; instead, we checked for associations between the question concepts/ variables and comparison category concepts/ variables and focused on identifying best practices as directed by the review objective.

1.3.6 Data and Population of Interest

The primary data of interest were from field studies of populations that were *directly* affected by a relevant public health emergency event. Of interest were also data from studies of populations who may be likely to be affected by a relevant public health emergency event, particularly studies that focused on questions promoting individual preparedness for such events. Also of some interest were data from studies that addressed how organizations, predominantly government organizations or individuals employed by governments, respond to or work to develop risk communication messages.

2.0 EXISTING SYSTEMATIC REVIEWS

2.1 Approach to Existing Systematic Reviews

We did not conduct a structured review of the existing reviews and did not extract detailed findings from this literature. We appraised the quality of these reviews, and then identified key relevant findings from the reviews that were judged as high and moderate quality.

2.2 Quality Rating and Relevant Findings

The literature search for the present review revealed 11 existing systematic reviews that were relevant to the review objective. All were narrative reviews and none were quantitative meta-analyses.

The relevancy was assessed using the criteria in Noyes et al. (in press) that provides four categories, direct, indirect, partial, and uncertain. Two coders assessed the relevancy independently and there was very little agreement between them for the indirect, partial, and uncertain categories. As such, we combined indirect, partial, and uncertain assessments and labeled them as indirect; thus, we ended with two categories for relevance, direct and indirect.

The quality of the reviews was rated using a modified Assessment of Multiple Systematic Reviews (AMSTAR) quality appraisal checklist (Shea et al., 2007). AMSTAR consists of 11 elements that address the reviews' design (i.e., a priori), data extraction, details of the literature search, inclusion of grey literature, characteristics, methods, and scientific quality of included studies, publication bias, and acknowledgement of conflict of interest(s). Each area in AMSTAR is assessed using "yes," "no", "can't answer," or "not applicable." Studies received a final rating of "high" (no significant flaws), "moderate" (minor flaws impacting credibility/validity), or "low" (some flaws likely to impact credibility/validity). Two coders did the coding independently with high agreement. The final quality assessment was judged after the coders resolved any differences.

Reviews that were rated as low quality were "unpacked" for their data-based primary studies, which were added to the literature for the present review. Existing reviews that were appraised as high or moderate quality were read for key relevant findings. The quality ratings and key findings are noted in Section 2.2.1.

2.2.1 Existing Reviews: Ratings and Findings Summary

Notes for Table
. All reviews are narrative synthesis.
. Relevancy judged as only direct and indirect (see above).

Review Citation (first author) and Review Purpose	***Modified AMSTAR Quality Rating***	***Relevancy***	***Key Relevant Findings***
Cairns (2013). *Reputation, relationships, risk communication, and the role of trust in the prevention and control of communicable disease.*	Moderate	Direct	Organizational reputation, quality of stakeholder relationships, and risk information provision strategies are trust moderating factors, whose impact is strongly influenced by the content, timing and coordination of communications. Good practice and policy elements identified are: crisis and risk communications require different strategies; preemptive dialogue and planning;

The purpose of the review was to synthesize the current evidence for, and insights on, communication good practice and how to integrate it with biomedical functions from two literature reviews—on trust and reputation management and risk communication—with the aim of identifying good practice, underpinning theories and paradigms, and evidence gaps.			evidence-based approaches to media relations and messaging; and building credibility for information sources. Trust determination theory explains the tendency of people to distrust authority when upset. Building trust before a tangible threat arises is, thus, paramount. Social constructionist approaches emphasize audience assessment of the messenger to listen and empathize, as well as other indicators of trustworthiness. Advance planning—risk messages, warnings, preparation—directly impacts on the trustworthiness of an organization. Social marketing, strategic plans, risk perceptions of stakeholders can help to manage pre-crisis to crisis stages and unanticipated outcomes. Participatory dialogue helps with modifying messages if circumstances change. Trust emerges as relationships are built. Strategically understanding and managing media relations are important because the media impact publics' perceptions of risk. Activities such as disseminating press kits and articles and letters about an organizations awards and achievements during times of low risk may serve as reputation – and trust-building exercises. Building relationships with and providing timely, accurate, and comprehensive information to the media impact crisis actions and outcomes. Authoritative organizations and individuals need pre-established reputation for integrity and being known for consistency. The review affirms the importance of credibility and consistency of message source as well as transparency, even of difficult content. The literature was focused on population perspectives of organizations. It did not explicitly examine specific type and location of disaster, or individuals affected by the disaster.
Gesser-Edelsburg (2015). *Emerging infectious disease communication during H1N1. What were risk communication channels, content and strategies used?* The objective "was to conduct a systematic literature review of the methodology used by studies that examined emerging infectious disease communication during the 2009 H1N1 pandemic outbreak	Moderate	Indirect	Studies in risk communication have made a turn from predominantly using quantitative methods before 2013 to using more often qualitative methods. Research shows that studies should use triangulation based on input from different stakeholders via interviews and discussions to understand questions and needs of all in the population. Studies conclude that health agencies need to collaborate with media to ensure evidence-based coverage and make key information available. Previous studies have found that trust in government organizations is key and, perhaps, the most important variable when the general public feel they have no control over the situation. In this review three of 61 articles addressed two issues regarding trust: "the public's trust in the government in situations in which the public feels it has no control over the situation and the connection between

through different communication channels or by analyzing contents and strategies."			positive/negative affect and the relationship between trust and information-seeking on H1N1." There are no more specifics about the nature and role of trust nor ways to build trust. Moreover, its presence in the original articles is limited. There is no discussion of disaster phase.
Kraut (2013). *Public response to alerts and warnings using social media.*	Low	---	---
Lettieri (2009). *Disaster management: Findings from a systematic review.* The aim is to contribute to the knowledge on disaster management through a systematic review methodology that has been used in the medical sciences over the last 15 years.	Moderate	Indirect	The disaster management literature from 1980-2006 examined by four cluster areas: theoretical frameworks, phases of disaster management, actors involved, and technology/ informational support. The four actor roles are formal agents, researchers, population, and media. Insights about formal agents such as official organizations include trust between employees and their superiors that goes beyond hierarchy reliance. This helps to minimize employees' responses during crises that might compromise operations outcomes. The literature was not examined by specific type of disaster, location of disaster, or individuals affected by the disaster.
Lin (2014). *What have we learned about communication inequalities during the H1N1 pandemic: A systematic review of literature.* The aims of this review are to: Characterize the literature that examined communication to the public during the H1N1 pandemic; and summarize knowledge regarding social determinants and their association with communication inequalities in the preparedness and response to an influenza pandemic.	Moderate	Indirect	Of 118 empirical studies, 78% were population-based studies and 22% were articles that employed information environment analyses techniques. Trust in public officials and source of information, quality of information, fairness of treatment, and government's ability to respond to a public health emergency were related to greater likelihood of adoption of recommended infection prevention practices. Addressing trust in communication interventions can increase the effectiveness of the response to pandemics. No activities as to building trust were suggested. The review focused on the H1N1 pandemic in 2009 and utilized the Structural Influence Model of Communication Inequalities.
McCaffrey (2015). *Community wildfire preparedness: A global state-of-the-knowledge summary of social science research.*	Moderate	Indirect	Literature on wildfire preparedness published from 2011 to 2014 was examined to find out what has been learned about public response. Prior to 2011, a fairly substantial number of studies were US-based studies on pre-fire mitigation. Since then, roughly half have been conducted outside of the US, the majority of which in Australia, and focused on dynamics during the after a fire.

This review builds on a previous review by looking at the articles that have been published by since 2010. Specifically, it examines the social dynamics of fire management.			In this and the previous review, trust in those implementing fuel management on public lands is one of two variables most associated with social acceptability of the practice. No meaningful differences found in Australia versus the US in regards to trust dynamics. Increasingly, studies have begun to study the full set of temporal phases related to wildfires.
McComas (2006). *Defining moments in risk communication research.*	Low	---	---
Ruggiero (2013). *Terrorism communication: Characteristics and emerging perspectives in the scientific literature 2002-2011.* This review aims "to clarify current knowledge on the contribution of communication to crisis management in the case of terrorism incidents."	Moderate	Indirect	Trust and credibility is one characteristic of communication discussed in the literature on terrorism crises. Disparities exist in perceptions and communication and, therefore, point to the importance of ethical decisions and tailored information disseminated with sincerity by credible sources. One of the themes related to communication focused on trust; aspects associated with trust include: provision of accurate and consistent information, credible and trusted sources and spokespersons, having local officials demonstrate sincerity in helping people, providing people with all the relevant information available, and involving people in the communication process. Most of the literature studied the anthrax attacks after 9/11 and biological terrorism. Studies touch on and the review discusses implications for all phases of a crisis.
Siegrist (2014). *The role of public trust during pandemics.*	Low	---	---
Vaughan (2008). *Effective health risk communication about pandemic influenza for vulnerable populations.*	Low	---	---
Wachinger (2013). *The risk perception paradox: Implications for governance and communication of natural hazards.* The aim of this review "lies on the discussion of results from an interdisciplinary review of previous studies about risk perception and behavioral response regarding natural hazards."	Moderate	Direct	Literature on risk perception, particularly in relation to natural hazards is examined. The 25 empirical, Europe-only studies focused on risk perception and individual preparedness for action. Direct experience with the natural hazard, trust in authorities and experts, and confidence in proactive measures were the information/ personal/ contextual factors associated with risk perception. The authors note a Risk Perception Paradox, whereby, a high perception of risk usually associated with protective intentions/ behaviors many have an unintended, opposite reaction. To counteract this paradox, the review suggests participatory exercises and involvement in the design and testing of emergency plans are probably most helpful when trying to create awareness, build trust, and foster personal responsibility; individuals will better differentiate what authorities can and cannot do to self-protect and manage crises.

2.3 Summary of Relevant Findings From Existing Systematic Reviews

Of the 11 existing reviews, seven were of high or moderate (and not of low) quality. These reviews focused on a variety of public health emergency events, including communicable and emergent infectious disease, disaster in general, natural hazards, terrorist attacks, and wildfire. The reviews approached risk and crisis communication as a multi-disciplinary phenomenon. They predominantly drew from studies on events in high income countries; particularly the United States, Canada, Western Europe, and more recently Australia (specifically for wildfires). Two reviews were judged to directly relate to the phenomenon of interest; the remaining five were indirectly related. With this context in mind, the following findings span the reviews:

- Trust in public officials and the governments' ability to respond to a public health emergency are related to greater likelihood of adoption of recommended actions.
- Trust in authorities and experts is usually associated with a high perception of risk and protective intentions/ behaviors; however Risk Perception Paradox may result in unintended, opposite intentions/ behaviors.
- Trust is especially important when publics feel they have no control over risk/ crisis situation.
- Disparities exist in perceptions and communication related to terrorism crises. Provision of accurate and consistent information, credible and trusted sources and spokespersons, having local officials demonstrate sincerity in helping people, providing people with all the relevant information available, and involving people in the communication process.
- Trust between employees and supervisor within authority organizations minimizes employees' responses that could undermine operations.
- Building trust and trustworthiness through participatory dialogue and involvement in pre-event planning, exercises, and the design and testing of communication plans will help build trust and counter risk perception paradox.
- Activities during low risk time periods may help trust building.
- Trust is influenced by organizational reputation; quality of stakeholder relationships; understanding and managing media relations; risk information provision strategies; accuracy, timeliness, and comprehensive information; transparency about available information; fairness in treatment of populations.

2.4 Summary of Research Gaps Identified by Existing Systematic Reviews

The existing reviews note the following gaps in the literature:

- Studies on activities that build trust and the aspects constitutive of / associated with trust.
- High quality studies that compare different activities for building trust and its associated aspects.
- Evidence on which activities help to build trust for differing types of events/ disasters and different phases of events/ disasters.
- Evidence on activities that build trust among at-risk and vulnerable populations.

2.5 Use of Existing Systematic Reviews

The findings from the existing reviews were used to contextualize the present systematic review. Where appropriate, the findings from the high or moderate quality existing reviews were mapped against the findings from the present review in the discussion section and were used to underpin the Evidence to Decision (DECIDE) frameworks (Alonso-Coello et al., 2016).

3.0 METHOD

3.1 Protocol and Process Design for Evidence Synthesis

A detailed protocol for the review was developed. It is available on request from the contact persons for the report.

The process design for the evidence synthesis for the review is presented in Section 3.3. Findings were extracted only from data-based primary studies. The design shows that the findings were grouped and processed within the type of study methodology stream and then brought together in an overarching synthesis of the findings across the methodology streams. Details of the process are presented below in Sections 3.9 to 3.15.

3.2 Determining Study Methodology of Data-based Primary Studies

The WHO Minimum Methodological Expectations document in Section 2.2 required production of a knowledge map and noted the following categories for data-based primary studies: Quantitative randomized control trials; qualitative (ethnographic research, case studies, process evaluations, and mix-methods designs); mixed-method studies (combining different types of designs to explore a phenomenon of interest); observational and cross-sectional surveys; and grey literature reports.

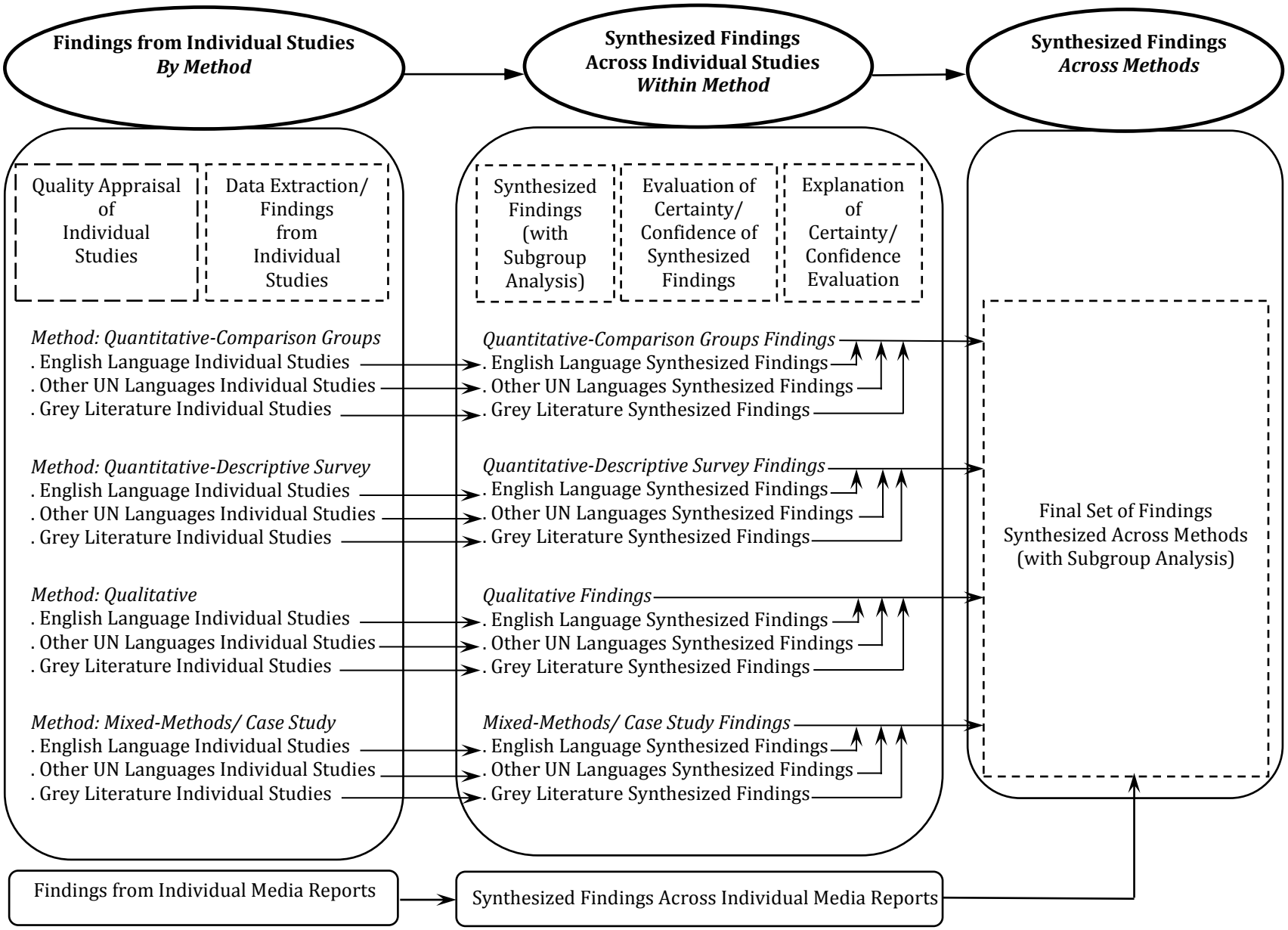
Using the above methodological groupings as a starting point, we initially identified five methodological streams that best covered the method types found in the primary studies selected for the review:

- Quantitative – randomized group comparison and non-randomized group comparison.
- Quantitative – descriptive survey and similar designs.
- Qualitative – open-ended questionnaire survey, interview, focus group, ethnography/ participant observation, and textual analysis.
- Mixed-method – use of both quantitative and qualitative methods, where the different methods usually address different hypotheses and/ or research questions.
- Case study – use of several methods, where usually all methods address the same research question and focus on one particular event/person/location.

After a more in-depth perusal of the mixed-method and case study article/ reports, we did not find any appreciable methodological differences as both types utilized quantitative and qualitative methods with similar procedures. In consultation with the WHO methodologist consultant, we combined these two methodological streams. Thus, we ended up with four methodological streams:

- Quantitative-Comparison Groups (QN-CG)
- Quantitative-Descriptive Survey (QN-DS)
- Qualitative (QL)
- Mixed-Method and Case Study (MM, CS).

3.3 Process Design of Synthesis of Evidence from Data-based Primary Studies



3.4 Existing Reviews, Guidelines, Media Reports, and Grey Literature

As noted in Section 2.1, we did not conduct a systematic review of the existing reviews. We identified key findings and used them to contextualize the findings of the present review.

We did not include guidelines, recommendations, and other such literature in the present review. Only data-based primary studies were selected for data extraction and synthesis of evidence.

English language media reports that included some type of risk communication relevant "data," such as direct quotations or detailed descriptions of events, from populations affected by an emergency event were included. As shown in Section 3.3, the findings from media reports served as a separate input for the final synthesized set of findings.

Grey literature non-academic reports were included only if they were data-based primary studies. Academic unpublished data-based primary study masters theses and doctoral dissertations were treated as grey literature. As shown in Section 3.3, these grey literature studies were treated similar to the academic primary studies.

3.5 English and Other UN Languages

3.5.1 Languages Included in Review

The primary search was for literature in the English language. Additionally, we conducted searches for studies published in the other UN languages as well, which included Arabic, Chinese, French, Russian, and Spanish.

3.5.2 Review Process for Other UN Languages

As seen from Section 3.3, we followed the same process for both English and other UN languages articles/ reports for data extraction from individual studies and synthesis of findings within methodological streams. That is, the individual studies from Arabic, Chinese, French, Russian, and Spanish were grouped into the four methodological streams, irrespective of the language, after which synthesized findings were generated within each methodological stream.

We did not completely translate Arabic, Chinese, French, Russian, and Spanish language studies into English. Portions of the studies were translated into English as needed to meet the requirements of the review. As the other UN language findings from individual studies came from studies that were only partially translated into English, we treated these findings as a separate "sub-stream" at the time of synthesis of findings within methodological streams.

3.6 Information Sources for Literature Search

3.6.1 Information Sources for English Language Literature

We conducted a general search using the Wayne State University Library Summon function, which indexes all holdings in the library, Google Scholar, and general Google search.

We also searched within individual databases including: Web of Science; PubMed/Medline-National Library of Medicine (NLM); Cumulative Index of Nursing and Allied Health Literature (CINAHL); CINAHL Complete; Communication and Mass Media Complete (CMMC); PsychInfo; and WHO databases.

3.6.2 Information Sources for Other UN Languages Literature

Native readers of Arabic, Chinese, French, Russian, and Spanish who were fluent in English conducted the search. The following information sources were searched.

For Arabic, the information sources were: Al-Manhal, Dar-Al-Manduma, Google Scholar, general Google search, Wayne State library, and WHO databases.

For Chinese, the information sources were: CNKI (China National Knowledge Infrastructure), Wanfang Patent Database, Google Scholar, general Google search, Wayne State library, and WHO databases. In addition, contact persons suggested by the WHO were solicited for suggestions for relevant studies.

For French, the information sources were: Archive ouverte UNIGE, Cairn.info, Google Scholar, general Google search, Government of Canada publications, HAL archives ourvertes, JSTOR, La Houille Blanc, Persee.fr, Revues.org, Wayne State library, and WHO databases.

For Russian, the information sources were: Cyberleninka.ru, Google Scholar, general Google search, Mgimo.ru/library/ehd, Msu.ru/info/struct/dep/library, Nbmgu.ru, Wayne State library, and WHO databases.

For Spanish, the information sources were: CONACYT, Cuiden, Elsevier, Google Scholar, general Google search, Public Health institute Mexico, Wayne State library, and WHO databases.

3.6.3 Information Sources for Grey Literature

The search for grey literature in all languages used Google Scholar and general Google search as the primary information sources. 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. The search was conducted in close consultation with a team member who was physically present on location.

3.7 Literature Search Strategy, Search Terms, and Search Inclusion and Exclusion Criteria

3.7.1 Search Strategy

We adopted a two-phase strategy for literature searching. In the first phase we did a general search that was intentionally broad in scope. In the second phase, a search focused narrowly on the objective of the present review was conducted.

3.7.2 Search Terms

We used the search terms noted below. Not all terms worked in all databases; therefore, thesauri were consulted for each database to find synonyms, if they existed, for each term, or any functionality that allowed the word to be "exploded" or "expanded."

Disaster*	Trust
Disaster plan*	Spokesperson
Communication	Public information officer
Risk communication	Credibilit*
Emergenc*	Confidence
Hazard*	Official
Risk*	Public Official
Threat*	Ambiguity
Emergency preparedness	Uncertaint*
Emergency management	Protection (health)
Cris!s (or other truncation used in a specific database:?,#)	Authorities (health)
Disaster preparedness	Safety
Hazard communication	Reliance/Reliabilit*
Emergency communication	Governmen*; Governance (health/risk)
Catastrophe communication	Public (communities/stakeholders)
Health communication	Public trust

3.7.3 Search Inclusion Criteria

The following broad inclusion criteria were used in the search for literature:

- Research related to the practice of risk communication and the process of disaster management with no preference for any specific emergency or health hazards.
- Research within the viewpoint or scope set by the risk communication field including, but not limited to: trust, uncertainty, communities, health, misinformation, health protection, media (including social media), messages, and stakeholders.

3.7.4 Search Exclusion Criteria

The following exclusion criteria were used in the search for literature:

- Research in organizational risk communication and disaster management such as technology failures.
- Research outside of the specified scope of the study, such as laboratory studies and those related to chronic disease, lifestyle, or personal living/ attributes (such as personal health, mental health, etc.).
- Pre-2003.

3.8 Article/ Report Selection

3.8.1 General Process

The hits generated by the literature search process were narrowed to select data-based primary articles and reports. The general process for selection of the articles/ reports for all languages was in two stages.

In the first stage:

- The hits obtained using a search were scanned by reading their title and abstract or summary;
- After scanning, the hits that were judged as related to risk communication during disaster/ emergency events were quickly read as full-texts and downloaded if found still broadly related;
- The downloaded full-texts were read carefully and selected if found related to the objective and phenomena of interest of the present review. These included, both academic and grey literature, data-based studies, reviews, guidelines, and media reports.

In the second stage:

- The full-texts of the selected articles and reports were again read and this time categorized as a data-based primary study or not. This included the grey literature.
- If an article/ report was a data-based primary study, it was further judged for relevancy to the review objective and phenomena of interest. A study that was judged as directly, indirectly, partially, or uncertainly relevant (as opposed to not relevant at all), was selected for extraction of its key findings. *Only these relevant primary study articles/ reports were directly used to generate the systematic review for this report.* These included studies used quantitative, qualitative, mixed-method, and case study methods.

To summarize, the article/ report selection process occurred in two broad stages. In the first stage, all literature that was related to disaster/ emergency risk communication, and review objective and phenomena of interest was selected. In the second stage, this literature was narrowed to select only relevant data-based primary study articles/ reports using quantitative, qualitative, mixed-method, and case study methodologies.

3.8.2 Quality Assurance of Selection Process

The first stage of the search and selection for English language articles/ reports was conducted by an experienced librarian with subject-matter expertise in the discipline of communication. Two training and norming sessions were conducted with the librarian. The second stage selection was done by all primary members of the research team, who had gone through a training and norming session.

Both the first and second search and selection stages for other UN languages were done by fluent readers and writers of Arabic, Chinese, French, Russian, and Spanish who were also fluent in English. Four norming and training sessions were conducted with this group in a group setting. In addition, individual training sessions were provided as needed.

3.9 Quality Appraisal of Selected Individual Studies

The individual data-based primary studies selected for the review were appraised for their quality. The quality appraisal for primary studies for all languages was done using the following tools:

- Quantitative-Comparison Groups (QN-CG) done by EPOC Risk of Bias
- Quantitative-Descriptive Survey (QN-DS) done by adaptation of Davids & Roman (2014)
- Qualitative (QL) done by CASP
- Mixed-method and case study (MM, CS) done by McGill University MMAT.

Quantitative control/ comparison groups were individually appraised using the Effective Practice and Organisation of Care (EPOC) (2015) Risk of Bias tool. This tool provides nine criteria for assessing randomized control trials, non-randomized 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.

Quantitative descriptive survey studies were individually appraised using an adapted version of Davids and Roman's (2014) quality appraisal criteria. This tool assessed on a 0 to 1 scale (0-not reported, 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%).

Qualitative studies were individually appraised using Critical Appraisal Skills Programme (CASP) (2013) checklist. Areas of the study appraised by CASP include appropriateness of qualitative methodology, data collection, relationship between research 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).

Mixed method and case study studies were appraised using Pluye et al.'s (2011) Methods Appraisal Tool (MMAT). Studies were assessed for the employed methods and methodological quality (i.e., qualitative, quantitative randomized control trials or non-randomized control trials, quantitative descriptive, and overall implementation of mixed methods). 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).

Individual media reports were appraised for their quality using the Authority, Accuracy, Coverage, Objectivity, Date, and Significance (AACODS) tool (Tyndall, 2008). Each area in AACODS 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). An important factor in weight with AACODS is given to aspects of authority.

3.10 Extraction of Data from Selected Individual Studies

3.10.1 Extraction of Data: Study Characteristics

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 whether at-risk/ vulnerable population.

3.10.2 Extraction of Data: Study Findings

The purpose of extraction of findings from the individual data-based primary studies was to identify and note evidence of interest that mapped onto the phenomena of interest and the outcomes/ effects related to the review question. To extract the findings, we used the general process of reading and re-reading the abstract, results/ findings/ analysis, and discussion and conclusion sections to isolate the findings of interest. We did this process for all four methodological streams.

A quantitative meta-analysis was not suitable for the review 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 extraction of findings from studies in all four methodological streams.

Narrative findings were, thus, extracted from primary studies of all method types. The findings focused on the phenomena of interest and the outcomes/ impacts of the review objective. Each finding was written as a statement. The findings were extracted separately for each outcome.

Quantitative and qualitative evidentiary support for each finding was also extracted. From quantitative studies we extracted numerical data, such as means, standard deviations, and probability values. While extracting these data we kept in mind whether the study was a group comparison (randomized, non-randomized) or descriptive. From qualitative studies we extracted key phrases, sentences, and direct quotations. From mixed-method and case study studies we extracted numerical data and key phrases, sentences, and direct quotations as appropriate related to each method. The extraction included page and paragraph numbers for the supporting evidence for every finding for all methodological streams.

3.10.3 Quality Assurance of Extraction of Data

An initial codebook for extracting study characteristics and findings was developed based on examples provided by the WHO. After receiving feedback on a draft from team members and the WHO, the document was suitably revised. Training sessions for the use of the codebook were conducted with the research team.

A pilot test of the codebook portion for extracting study characteristics was conducted with approximately 1% of the English language articles/ reports. For the pilot test, three team members coded each article. An analysis of the coding showed high agreement (approx. 80%) between the three coders.

For the codebook portion for extracting findings, a pilot test was conducted with approximately 1% of the English language articles/ reports with two readers. Results showed high agreement (approx. 80%) between the two readers.

The two pilot tests generated suggestions for refinement from the team members. The final codebook was created after incorporating this feedback.

3.11 Synthesis of Findings

3.11.1 General Process of Synthesis of Findings

The synthesis of findings was done in two stages as presented in the process design in Section 3.3. In the first stage, findings from individual studies were synthesized within methodological streams and then these within-method synthesized findings were evaluated for certainty/ confidence using appropriate tools. In the second stage, the within-method synthesized findings were synthesized across methodological streams, taking into account the certainty/ confidence evaluations.

3.11.2 Subgroup and Equity Analyses

In both the within-method and across-method stages, the synthesis of findings included subgroup analyses. These 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.

3.11.3 Quality Assurance of Synthesis of Findings

The synthesis of findings was done by the lead author of the report. The synthesis process and the synthesized findings were discussed with all team members in weekly meetings. One team member closely read the synthesized findings and offered critique. The synthesized findings were developed based on the discussion and critique.

3.12 Synthesis of Findings Within Each Methodological Stream

For each methodological stream, the synthesized findings were created by building explanatory and higher level analytical statements supported by quantitative and qualitative evidence from individual studies.

For the two quantitative methodological streams, we again took directions from Section 11.7.2 of the Cochrane Handbook dealing with results without meta-analyses and followed a narrative summary approach to synthesis of findings.

For the qualitative methodological stream, we broadly followed the framework synthesis model (Barnett-Page, & Thomas, 2009; Pope, Ziebland, & Mays, 2000). We found this model suited to organize and analyze large amounts of data, which for us was represented by the corpus of findings and supporting evidence. The model is a mix of deductive-inductive processes. We started with a list of a priori framework categories generated from review objectives and phenomena of interest concepts, and modified the list as appropriate based on prior subject matter knowledge and reading of individual studies. Our goal was to synthesize the findings by identifying themes that emerged across the findings from individual studies and fit the framework categories.

For the mixed-method and case study methodological stream, the individual studies typically did not differentiate their overall findings based on type of methodology. For this stream, thus, we looked at the findings holistically and followed a broadly narrative summary approach.

3.13 Evaluation of Certainty/ Confidence in Synthesized Findings Within Methodological Stream

The assessment of certainty/ confidence of synthesized findings was done separately for each methodological stream using the following tools:

- Quantitative-Comparison Groups (QN-CG) (randomized, non-randomized) done by GRADE
- Quantitative-Descriptive Survey (QN-DS) done by applying the principles of GRADE
- Qualitative (QL) done by GRADE-CERQual
- Mixed-Method and Case Study (MM, CS) done by applying the principles of GRADE and GRADE-CERQual.

Quantitative-comparison groups within methodological stream synthesized findings were assessed for certainty using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach (GRADE Working Group, 2004; Guyatt et al., 2010; Higgins & Green, 2011). Findings were assessed on allocation sequence and concealment, baseline outcomes and characteristics, protections against contamination(s), presence of selective outcome reporting, and other possible forms of bias. Each category was given a rating of "low risk," "high risk," or "unclear risk." Detailed information on the definitions of levels of risk used in this tool available in section 12.2.2 of the Cochrane Handbook. Findings received a final rating of "high quality" (it is highly likely that new research will not modify the finding substantially), "moderate quality" (it is somewhat likely that new research will not modify the finding substantially), "low quality" (it is somewhat likely that new research will modify the finding substantially), or "very low quality" (it is highly likely that new research will modify the finding substantially).

Quantitative-descriptive survey within methodological stream synthesized findings were assessed for certainty using a tool developed for the present review that was based on the principles of Grading of Recommendations Assessment, Development, and Evaluation (GRADE) as noted above. Adjustments were made to the GRADE process to create the tool for evaluation of certainty of findings from quantitative cross-sectional surveys that did not have comparison groups for outcomes of interest. There were four evaluation categories: High quality (highly likely that new evidence will *not* substantially modify the study findings); moderate quality (somewhat likely that new evidence will *not* substantially modify the study findings); Low quality (somewhat likely that new evidence will substantially modify the study findings); and very low quality (highly likely that new evidence will substantially modify the study findings). The evaluation categories were based on factors that can reduce the quality of study findings: Limitations in study design or execution; inconsistency of results; indirectness of evidence; imprecision of results; and publication bias for findings collated across multiple quantitative studies. See Appendix 8.1 for the tool.

Qualitative within methodological stream synthesized findings were assessed for confidence using GRADE-CERQual (Lewin et al., 2015). Findings were assessed on methodological limitations, relevance, coherence, and adequacy of data supporting the finding. Each finding was then given a rating of "high confidence" (it is highly likely that the finding is a representation of the phenomena), "moderate confidence" (it is likely that the finding is a representation of the phenomena "low confidence" (it is possible that the finding is a representation of the phenomena), or "very low confidence" (it was not clear if the finding is a representation of the phenomena).

Mixed method and case study within methodological stream synthesized findings were assessed for certainty/ confidence using GRADE and GRADE-CERQual approaches.

3.14 Synthesis of Findings Across Methodological Streams

We synthesized the findings across the four methodological streams to develop an overarching synthesis of findings. The synthesized findings within a methodological stream were compared and contrasted with findings from the other methodological streams. Whenever the findings 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.

All methodological streams did not yield the same kind or similar number of synthesized findings. We did not consider this a problematic issue as we were seeking to find the points of alignment of the findings across the method streams rather than simply merging them together, which would have given some methodological streams more importance than others.

Within-method findings that did not contribute to an across-method higher order finding were analyzed thematically. These thematic analyses were used to uncover a nuance or modification to the across-method findings, which were then either used to create a new higher order across-method finding or incorporated into an existing across-method finding.

A 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.

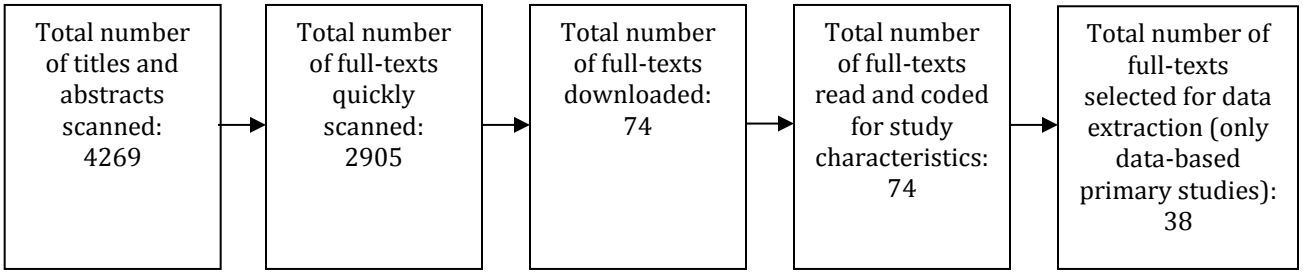
3.15 Media Reports

We extracted findings from individual media reports and then synthesized these findings across the individual reports. We used these across-media reports synthesized findings as another input for the final set of synthesized findings. A modified version of the AACODS tool was used for quality appraisal of the media reports as noted above.

4.0 RESULTS

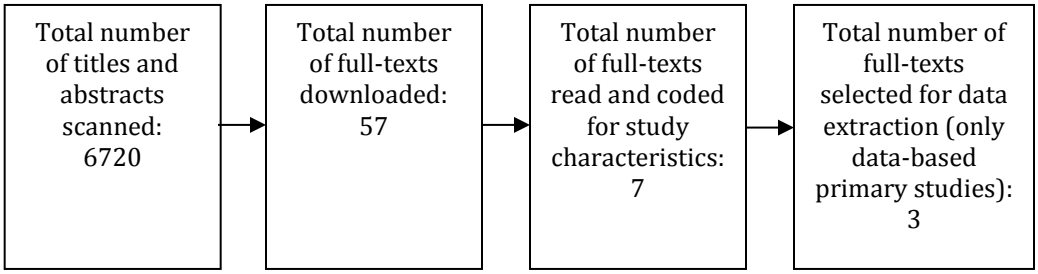
4.1 Study Selection

4.1.1 English Language

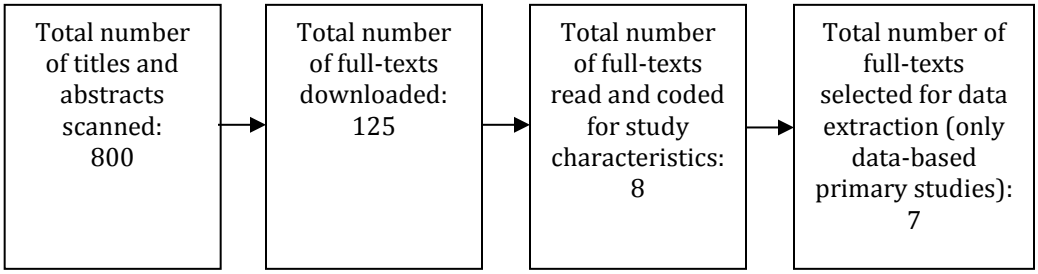


4.1.2 Other UN Languages

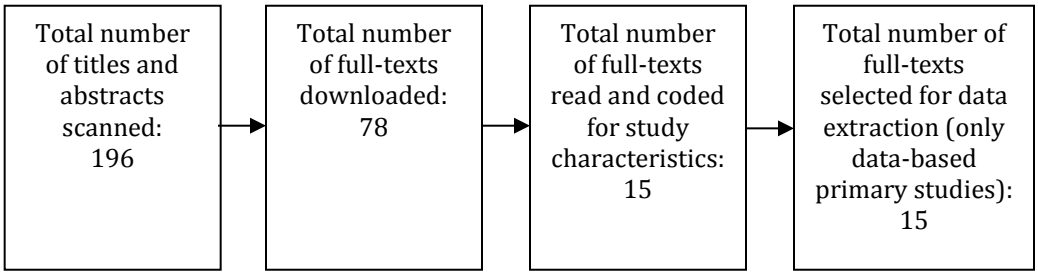
Arabic:



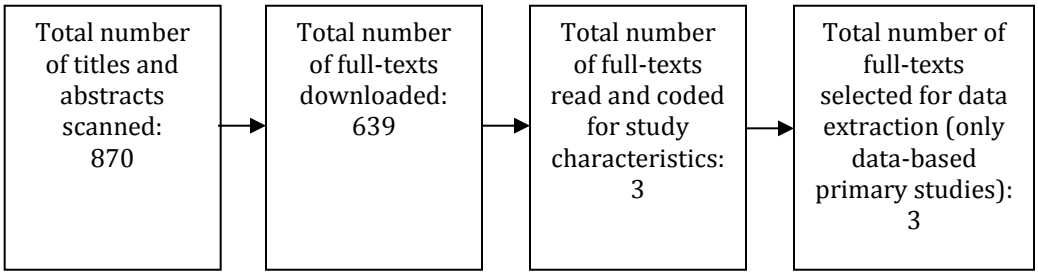
Chinese:



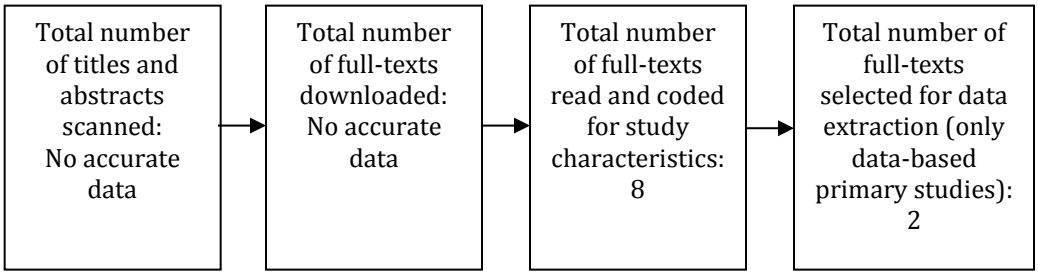
French:



Russian:



Spanish:



4.2 Study Characteristics

A knowledge map of the study characteristics is provided in Section 4.2.1 for English language studies and in Section 4.2.2 for other UN languages studies.

4.2.1 Characteristics of Studies-English Language

Key to Table
. Total English language data-based primary studies (includes grey literature): 38
. Grey literature studies: 0
. Some categories are not mutually exclusive and so the frequencies will not sum to the total of 38.
. Method: Quantitative-Comparison Groups (QN-CG); Quantitative-Descriptive Survey (QN-DS); Qualitative (QL); Mixed-Method/Case Study (MM, CS)

Relevancy	***Method General***	***Country Focus***	***Disaster/ Emergency Type***	***Disaster/ Emergency Phase***	***At-risk Groups***
Direct: 18 Indirect: 13 Partial: 7 Unclear: 0	QN-CG: 2 QN-DS: 21 QL: 8 MM, CS: 7	Australia: 2 Belgium/ Netherlands: 2 Canada: 1 Caribbean: 1 China: 1 European Union: 1 France: 2 Germany: 1 India: 1 Indonesia: 2 Iran: 1 Japan: 3 New Zealand: 1	General: 2 Bioterrorism: 5 Cyclones: 1 Earthquake: 2 Flood: 2 Foodborne Illness: 4 Industrial: 1 Infectious Disease: 9 Natural Disasters General: 1 Public Health: 2 Radiological: 5	All phases: 4 Preparation: 22 Onset: 11 Containment: 9 Onset & Containment: 1 Recovery: 5 Evaluation: 1 Unclear: 1	Yes: 5 (Low SES: 2 Minorities: 3 Mothers of young children: 1 Underserved: 1)

		Norway: 1 Singapore: 1 Slovenia: 1 Spain: 1 Sweden: 1 Switzerland: 2 Thailand: 1 United Kingdom: 5 United States: 14	Tsunami: 1 Volcanic: 3 Water Contamination: 1 Wildfire: 1		

Of the 38 English language studies examined for the present review (see Section 7.1 for the references), 18 were directly relevant, 13 were indirectly relevant, seven were partially relevant, and none were unclearly relevant. Two studies used quantitative-comparison groups method, 21 studies used quantitative descriptive survey methods, eight studies used qualitative methods, and seven employed mixed methods/ case study methods.

Regarding countries, majority of all the studies were situated in the United States (14) and the United Kingdom (5). Another large proportion of studies were located in Australia (2), New Zealand (1), Canada (1), and different countries of Europe, including Belgium/ Netherlands (2), France (2), Germany (1), Norway (1), Slovenia (1), Spain (1), Sweden (1), Switzerland (2), and European Union in general (1). The rest of the studies were spread over the Caribbean (1), China (1), India (1), Indonesia (2), Iran (1), Japan (3), Singapore (1), and Thailand (1).

Regarding the types of disasters/ emergencies, the event studied most often was infectious diseases (9). Other relatively common events included bioterrorism (5), foodborne illnesses (4), radiological/ radiation (5), and volcanic (3). Other events were cyclones (1), earthquake (2), flood (2), industrial (1), public health (2), tsunami (1), water contamination (1), wildfire (1), natural disasters in general (1), and disaster events general (2).

The disaster/ emergency event phase most examined was preparation (22), distantly followed by onset (11) and containment (9) phases. Onset and containment phase was examined once, recovery phase five times, and the evaluation process once. All phases were examined in four studies and the phase was unclear in one study.

Regarding populations studied, the majority of the studies focused on the general population or officials and professionals at health and associated organizations. Only five studies explicitly focused on at-risk/ vulnerable populations. These included low socio-economic status (2), minorities (3), new parents/ mothers (1), and underserved populations (1).

4.2.2 Characteristics of Studies-Other UN Languages

Key to Table
. Total other UN languages data-based primary studies: 30
. Some categories are not mutually exclusive and so the frequencies will not sum to the total of 30.
. Method: Quantitative-Comparison Groups (QN-CG); Quantitative-Descriptive Survey (QN-DS); Qualitative (QL); Mixed-Method/Case Study (MM, CS)

Relevancy	***Method General***	***Country Focus***	***Disaster/ Emergency Type***	***Disaster/ Emergency Phase***	***At-risk Groups***
Direct: 19 Indirect: 11	QN-CS: 0 QN-DS: 12 QL: 7 MM, CS: 11	General: 1 Austria: 1 Belgium: 1 Canada: 5 China: 7 France: 5 Japan: 1 Norway: 1 Oman: 1 Philippines: 1 Russia: 3 Saudi Arabia: 2 Spain: 2 Switzerland: 1 United Kingdom: 1 Vietnam: 1	General: 10 Cyclone: 1 Earthquake: 3 Flood: 5 Food Safety: 1 Infectious Diseases: 10 Petroleum Spill: 1	All Phases: 1 Preparation: 5 Onset: 2 Containment: 2 Recovery: 4 Evaluation: 3 Preparation, & Evaluation: 4 Preparation, & Onset: 2 Preparation, Onset, & Containment: 1 Preparation, Recovery, & Evaluation: 2 Onset, & Containment: 1 Onset, & Evaluation: 1 Onset, & Recovery: 1 Onset, Containment, & Evaluation: 1	Yes: 4 (Children: 2 Chronic Disease: 1 Low-SES: 3 Minorities: 1 Older People: 1 Pregnant Women: 1)

Of the 30 other UN languages (i.e., not English) data-based primary studies (see Section 7.2 for the references), there were three Arabic, seven Chinese, 15 French, three Russian, and two Spanish studies. Total 19 articles were directly relevant and 11 were indirectly relevant. The relevancy was judged as only direct and indirect due to lack of sufficient clarity for the partial and unclear categories for the coders.

Thirteen of the articles used quantitative-descriptive survey methods to investigate the review question, seven employed qualitative methods, eight employed mixed methods, and three employed a case study approach.

The studies focused on a wide variety of countries that included Austria (1), Belgium (1), Canada (5), China (7), France (5), Japan (1), Norway (1), Oman (1), Philippines (1), Russia (3), Saudi Arabia (3), Spain (2), Switzerland (1), the United Kingdom (1), and Vietnam (1). In addition, one study had a general focus and did not specify a particular country.

The types of disasters were also varied. The studies focused on cyclone (1), earthquake (3), fire (1), flood (5), food safety (1), infectious diseases (10), and petroleum spill (1). In addition, 10 studies took a general focused approach on emergency public health events.

Only one study focused on all phases of an emergency event. Five studies focused on the preparation phase, two studies on the onset phase, two studies on the containment phase, four on the recovery phase, and three on the evaluation process. Several studies (14) focused on a mixture of phases, with the majority (9) addressing the preparation phase.

Regarding at-risk/ vulnerable groups, most of the studies focused on general populations, with only three explicitly examining such specific groups. The identified at-risk/ vulnerable groups included children, people with chronic disease, people with low socio-economic status (SES), minorities, older people, and pregnant women.

4.3 A Note About the Grey Literature

There was no English language grey literature used in the present review. All the grey literature identified relevant to the review question did not include any data-based primary studies; instead, the literature either was best practices that related the practices to the existing research or it was theoretical essays, that referenced data-based studies and other essays.

4.4 Quality Appraisal of Individual Studies

Of the 38 English language studies used in the present review, two were placed in the quantitative-comparison group stream, 21 in the quantitative-descriptive survey stream, eight in the qualitative stream, and seven in the mixed methods/ case studies stream. Within the quantitative-comparison groups stream, both studies were trials and were rated to be of moderate quality. In the quantitative-descriptive survey stream, seven studies were rated to be strong quality, 10 were rated to be moderate quality, and four were rated to be of weak quality. In the qualitative methods stream, two studies were rated to be of high quality, five of moderate quality, and one of low quality. In the mixed methods/case studies methods stream, two studies were rated to be of high quality, three of moderate quality and two of low quality.

See Appendix 8.2 and Appendix 8.3 for tables for English language studies that present the quality rating, as well as relevancy and extracted findings, for each study.

For the other UN languages individual studies, a quality appraisal could not be determined for all the studies. This is noted as needed when evaluating the certainty/ confidence of the synthesized findings (see Section 4.5).

4.5 Synthesis of Findings Within Methodological Stream and Evaluation of Certainty/ Confidence

Key to Table
Method: Quantitative-Comparison Groups (QN-CG); Quantitative-Descriptive Survey (QN-DS); Qualitative (QL); Mixed-Method/ Case Study (MM, CS)
Citations-Language: English has no suffix; Arabic (AR); Chinese (CH); French (FR); Russian (RU); Spanish (SP)
Certainty/ Confidence Evaluation: 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

Outcome/ Phenomenon of Interest	***Method***	***Synthesized Finding Statement (with subgroup analysis of type, phase, and country of disaster, and vulnerable population)***	***Citations (first author) Supporting Synthesized Finding Within Method Stream***	***Evaluation of Certainty/ Confidence of Synthesized Finding Within Method Streams***	***Explanation of Evaluation***
Trust in health-related authorities	QN-CG	In the United States for an infectious disease event for onset and containment phases, trust in authorities may show a slight decrease as a result of openly acknowledging uncertainties in messages. However, this decrease is only for a small proportion of the total number of message recipients; for the vast majority of message recipients, there is no change in their level of trust.	Johnson (2015)	Low to Moderate	Two studies reported in article, one not a randomized group comparison. Some evaluation categories not applicable or 'cannot tell'.
Trust in health-related authorities	QN-CG	In Japan for a radiological event for recovery phase, crisis communication via Facebook (compared to Twitter and print newspaper) can result in a more positive perception of organizational reputation. Social media users mainly talk about news from traditional media because they interpret traditional media as more credible in general. Hence, organizations should not neglect traditional media and should aim for an integrated communication strategy.	Utz (2013)	Moderate	Some evaluation categories not applicable of 'cannot tell'.
Trust in health-related authorities	QN-DS	In the United States, Switzerland, and the Netherlands, for bioterrorism and infectious disease events, for all four event phases, and for urban minority African American and Hispanic populations, trust is found to have	Paek (2008); Siegrist (2005); Vaughan (2012); Weerd	Moderate	Overlapping findings by 4 studies, individually appraised as strong (2),

		several components/ aspects. Thus, looking at general trust in government agencies will not be as helpful to improve communication as evaluations of specific components of trust.	(2011)		moderate (1), and weak (1).
Trust in health-related authorities	QN-DS	In India, Thailand, and France, for floods, cyclones, and industrial events, and for preparation, onset, and recovery phases, including evaluation, trust in authorities can be enhanced by communication of uncertainty. Credibility of warning messages can also be improved by communicating uncertainty. This is particularly important as the experience about the credibility of the message in a current hazard event can affect the response to the next future event.	Janmaimool (2014); Sharma (2012); Glatron (2009) FR	Moderate	Overlapping findings by 3 studies, individually appraised as moderate (2), and weak (1).
Trust in health-related authorities	QN-DS	In the United States, Australia, New Zealand, Japan, and Vietnam, for infectious disease, wildfire, earthquake, and volcanic activity events, and for preparation, onset, and containment phases, trust as an outcome is predicted by several person-factors. Authorities should account for individual-difference factors when developing strategies for enhancing trust.	Freimuth (2014); Johnson (2016); Maeda (2003); Paton (2008); Figuié (2010) FR	Moderate	Overlapping findings by 5 studies, individually appraised as strong (1), and moderate (4).
Trust in health-related authorities	QN-DS	In Japan, Oman, and France, for cyclone and flood events, and for preparation, onset, and recovery phases along with evaluation, trust as an outcome is predicted by characteristics of messages sent by organizations.	Maeda (2003); Al-Shaqsi (2013) AR; Glatron (2009) FR	Moderate	Overlapping findings by 3 studies, individually appraised as strong (1), and moderate (2).
Trust in health-related authorities	QN-DS	In the United Kingdom and the Kingdom of Saudi Arabia, for water contamination and general natural disaster events, and for all four phases, trust as an outcome is predicted by characteristic of media relations of authorities.	Rundblad (2010); Al-Douwihi (2004) AR; Al-Khayli (2007) AR	Moderate	Overlapping findings by 3 studies, individually appraised as strong (2), and moderate (1).
Trust in health-related authorities	QN-DS	In Canada, France, and in general globally, for food contamination, floods, and general natural disaster events, for preparation, onset, and containment phases, including evaluation, and for low-SES groups, trust as an outcome can be predicted by public engagement and participation.	Government of Canada (2002) FR; Ruin (2010) FR; UNFAO (2011) FR;	Moderate	Overlapping findings by 3 studies, individually appraised as strong (1), and moderate

					(2).
Trust in health-related authorities	QN-DS	In the United States, several European countries, and the United Kingdom, for foodborne illness, infectious disease, cancer clusters, climate change related severe weather, and water contamination, and for all four phases, trust varies across different information sources. Local public health officials are usually near the top of the trust rankings whereas there is a low trust for local elected officials. Also trusted are personal health professionals, and family, friends, and neighbors. Generally people do not trust media or government communication relative to communication from scientists.	Boon (2016); Freimuth (2014); Frewer (2003); Kjaernes (2006); Rundblad (2010); Trumbo (2003)	High	Consistent findings by 6 studies, individually appraised as strong (3), moderate (1), and weak (2).
Trust in health-related authorities	QN-DS	In China, for infectious disease, earthquake, and general public health emergency events, and for containment and recovery phases, trust varies across media sources. Trust for information from traditional media is higher than information from the Internet. However, trust for information from Weibo/ social media and the Internet can sometimes be higher than from television.	Liu (2014) CH; Su (2008) CH; Xie (2005) CH	Low	Not overlapping and inconsistent findings by 3 studies, all individually appraised as strong.
Trust in health-related authorities	QN-DS	In the United Kingdom, the United States, Netherlands, and China, for infectious disease and foodborne illness, and for all four phases, trust varies across the course of an event. Usually trust is higher in the early phases of an event, after which it declines.	Freimuth (2014); Frewer (2003); Weerd (2011); Liu (2014) CH	High	Overlapping findings by 4 studies, individually appraised as strong (3), and moderate (1).
Trust in health-related authorities	QN-DS	In the United States and the United Kingdom, for infectious disease and water contamination events, and for all four phases, trust varies across public demographics.	Freimuth (2014); Paek (2008); Rundblad (2010)	Moderate	Overlapping findings by 3 studies, individually appraised as strong (1), moderate (1), and weak (1)
Trust in health-related authorities	QN-DS	In the United Kingdom, for foodborne illness event, and for preparation phase, trust varies across hazards even within hazard event type.	Frewer (2003)	Low	Finding based on one study, appraised as weak.
Trust in health-related authorities	QN-DS	In Switzerland, the Netherlands, and the United States, for infectious disease event, and for onset, containment, and recovery phases, trust can lead to higher	Freimuth (2014); Gilles (2011);	Moderate	Not overlapping findings by 3 studies, all

		vaccination and health protection behaviors.	Weerd (2011)		individually appraised as strong.
Trust in health-related authorities	QN-DS	In Australia, New Zealand, Norway, and China, for wildfire, earthquake, volcanic activity, floods, and tsunami events, and for preparation phase, trust can lead to higher preparation and evacuation behaviors.	Paton (2008); Rod (2012); Su (2015)	Moderate	Overlapping findings by 3 studies, individually appraised as strong (1), and moderate (2).
Trust in health-related authorities	QN-DS	In the United States, Belgium, and Slovenia, for infectious disease and radiological events, and for preparation, onset, and containment phases, trust can lead to attention to news but may not be associated with message acceptance.	Johnson (2016); Perko (2012)	Low	Not overlapping findings by 2 studies, both individually appraised as moderate.
Trust in health-related authorities	QN-DS	In Thailand and the United States, for bioterrorism and industrial accident events, for all four phases, and for urban minority African American and Hispanic populations, trust can be associated with negative affect. If individuals believe that officials will be honest and forthcoming with negative information, they will tend to feel less reassured/ more fearful by the acknowledgment of risk uncertainties.	Janmaimool (2014); Vaughan (2012); Kutovaya (2014) RU	Moderate	Overlapping findings by 3 studies, individually appraised as strong (1), moderate (1), and weak (1)
Trust in health-related authorities	QN-DS	In India, for cyclone event, and for preparation and onset phases, experience about the credibility of the message in a current hazard event can affect credibility of and the response to warning in the next future event. Greater the experience of false alarms, lesser is the tendency to respond to warnings in the future.	Sharma (2012)	Moderate	Finding based on one study, appraised as moderate.
Trust in health-related authorities	QN-DS	In the United States, for general public health events, and for preparation phase, public health agencies frequently use public meetings for spreading risk communication information to the general public. Views about public meetings and willingness to attend public meetings are associated with credibility of local health department, citizen groups, and news media.	Besley (2012)	Moderate	Finding based on one study, appraised as moderate.
Trust in health-related authorities	QN-DS	In the United States, United Kingdom, France, Sweden, Spain, Switzerland, Australia, China, and Thailand, for general public health, general severe weather, radiological, flood, infectious	Boon (2016); Janmaimool (2014); Johnson	Moderate to High	Overlapping findings by 7 studies, individually appraised as

		disease, and industrial accident events, and for preparation, onset, and containment phases, generally there is a linear negative relationship between trust in authorities and perceived risk of a hazard (higher trust, lower perceived risk). The relationship between trust and risk perceptions may be more complex. Perceiving high credibility for industry and state health departments, and perceiving low credibility for citizen groups, may promote heuristic processing, which in turn may lead to perception of lower risk; in contrast, perceiving low credibility for industry and state health departments may promote greater systematic processing, which in turn may lead to perception of greater risk.	(2016); Siegrist (2005); Su (2015); Trumbo (2003); Viklund (2003)		strong (3), moderate (3), and weak (1)
Trust in health-related authorities	QN-DS	In Thailand, the United Kingdom, France, Sweden, and Spain, for radiological and industrial accident events, and for preparation phase, trust can lead to risk perceptions but can explain only a small proportion of variation in it.	Janmaimool (2014); Viklund (2003)	Moderate	Overlapping findings by 2 studies, individually appraised as moderate (1), and weak (1)
Trust in health-related authorities	QN-DS	In China, for flood events, and for preparation phase, trust can lead to both positive and negative attitudes towards disaster alleviation.	Su (2015)	Moderate	Finding based on one study, appraised as moderate.
Trust in health-related authorities	QL	In Iran and the United States, for earthquake and bioterrorism events, for preparation and recovery phases, and for underserved urban and rural communities, past experience with authorities contributes to perceptions of trust for current events.	Alipour (2015); Wray (2006)	Moderate	Overlapping findings by 2 studies, individually appraised as high (1), and moderate (1).
Trust in health-related authorities	QL	In the United States, China, France, Canada, and Russia, for foodborne illnesses, bioterrorism, earthquake, floods, and infectious disease events, for all four phases along with evaluation, and for at-risk/ vulnerable populations (pregnant women, children, people with chronic disease, low-SES), there are several reasons for high and low trust of authorities that should be noted when developing trust enhancing strategies.	Anthony (2013); Quinn (2008); Sun (2009) CH; Zhong (2009) CH; Duchêne (2004) FR; Massé (2011) FR; Gryzunova (2012) RU	High	Overlapping findings by 7 studies, individually appraised as high (4), moderate (1), and low (2)
Trust in	QL	In the United States, for foodborne	Anthony	Moderate	Overlapping

health-related authorities		illnesses and bioterrorism events, for preparation phase, and for low-SES rural residents and urban low SES minorities, people engage in a thoughtful process of considering the credibility of multiple sources offering information and recommendations. People avoid rushing to judgment and remain "in waiting" for what they consider the most accurate account of the crisis and of the best actions to take to protect themselves. In general, source credibility serves as a primary means of resolving among the multiple voices.	(2013); Meredith (2007)		findings by 2 studies, individually appraised as high (1), and moderate (1).
Trust in health-related authorities	QL	In the United States, for foodborne illness and bioterrorism events, for preparation, onset, and containment phases as well as evaluation, and for urban minorities and underserved urban and rural communities, professionals and agencies in disagreement should join together to discuss in public the rationale and processes by which they come to their conclusions to build trust instead of just issuing conflicting statements.	Anthony (2013); Quinn (2008); Meredith (2007); Malet (2014); Wray (2006)	Low to Moderate	Not overlapping findings by 5 studies, individually appraised as high (1), and moderate (4).
Trust in health-related authorities	QL	In the United States and China, for bioterrorism, radiological, infectious disease, and floods events, for preparation phase, and for mothers of young children, urban low SES minorities, and underserved urban and rural communities, there are variations in trust across different sources. There is greater receptiveness to information delivered by local agencies. There can be deep distrust for government agencies, police, and local elected officials.	Bass (2015); Malet (2014); Meredith (2007); Petts (2004); Wray (2006); Zhong (2009) CH	Moderate	Overlapping findings by 6 studies, individually appraised as high (1), moderate (4), and low (1).
Trust in health-related authorities	QL	In the United States and the United Kingdom, for bioterrorism and infectious disease events, for preparation phase, and for urban minorities and mothers of young children, trust in authorities has several components/ aspects.	Meredith (2007); Petts (2004); Wray (2006)	Moderate	Overlapping findings by 3 studies, individually appraised as moderate (2), and low (1)
Trust in health-related authorities	QL	In the United States, for bioterrorism event, for preparation phase, and for urban minorities, patterns of trust vary according to the event stage.	Meredith (2007)	Moderate	Finding based on one study, appraised as moderate.
Trust in health-related authorities	QL	In the United States, for bioterrorism event, and for preparation phase, people can also have critical trust, which is that	Petts (2004)	Low	Finding based on one study,

		people can rely on a person or institution for knowledge and information but combine this with a healthy skepticism. Trust in this case is a combination of competence and care with a vested interest dimension.			appraised as low.
Trust in health-related authorities	QL	In the United States and China, for bioterrorism, radiological, and infectious disease events, for preparation and containment phases, and for urban low SES minorities and underserved urban and rural communities, lower trust in information or government is associated with concerns about preparedness and increased anxiety. On the other hand, higher trust in media coverage may be related to greater unwillingness to contact health authorities such as doctors to get information.	Bass (2015); Wray (2006); Xie (2010) CH; Xie (2013) CH	Low	Not overlapping findings by 4 studies, individually appraised as high (2), and moderate (2).
Trust in health-related authorities	QL	In the United States, for bioterrorism event, and for preparation phase, even among members of the public with high levels of trust in government, a public communication announcing minor level of risk for an event may be rejected as insufficient by the public. This is because the public generally tends to perceive higher risk levels than is warranted by the scientific evidence. Thus, there will always be a gap between the public perception of risk and the scientific estimation of risk.	Malet (2014)	Moderate	Finding based on one study, appraised as moderate.
Trust in health-related authorities	MM, CS	In the Caribbean, for a volcanic event, and for onset, containment, and recovery phases, trust has several components.	Haynes (2008)	High	Finding based on one study, appraised as high.
Trust in health-related authorities	MM, CS	In Singapore, Canada, and several European countries, for infectious disease and petroleum spill events, and for all four phases as well as evaluation, when health professionals, experts, and politicians, have clear coordination among themselves and with the traditional and social/ digital media, and all relayed a uniform communication strategy, there is higher trust.	Karan (2007); Rousseau (2008); Fernandez Souto (2012) SP; Jakubowski (2004) FR	Moderate	Overlapping findings by 4 studies, individually appraised as high (2), and moderate (2).
Trust in health-related authorities	MM, CS	In the Caribbean, Indonesia, Canada, and France, for volcanic, flood, and infectious disease events, and for all four phases, different information sources are trusted differently. In general, local health care workers, personal doctors,	Haynes (2008); Rousseau (2008); Voorst (2015)	Moderate	Overlapping findings by 3 studies, individually appraised as high (1), and

		friends and relatives, local self-help groups, and scientists are the more trusted sources. In general, local elected authorities and politicians, outside aid institutions, and world press are less trusted sources.			moderate (2).
Trust in health-related authorities	MM, CS	In the United States and Indonesia, for foodborne illness and volcanic events, for all four phases, when there is trust in governmental authorities, people alter their purchasing habits of food and successfully evacuate from volcano eruption zones,	Bitsch (2014); Mei (2013)	Low	Not overlapping findings by 2 studies, individually appraised as moderate (1), and low (1)
Trust in health-related authorities	MM, CS	In Canada and several European countries, for infectious disease and flooding, and for preparation, onset, and containment phases along with evaluation, trust in governmental authorities can be increased by: quickly educating the public and rapidly intervening; developing new information systems to respond quickly and efficiently; create scientific communication (e.g., flood plain maps) in an easy to understand manner; seek input from the public and encourage a dialog; ensure coordination between different health authorities and the media along with a uniform message; avoid rapid changes in information and prevent conflicting information; disseminate information through multiple platforms; and provide information about uncertainties and dangers.	Rousseau (2008); Deshaies (2004) FR; Hechmati (2004) FR; Heitz (2013) FR; Jakubowski (2004) FR; Lord (2009) FR	High	Overlapping findings by 6 studies, individually appraised as high (2), moderate (3), and low (1)
Trust in health-related authorities	MM, CS	In the Caribbean, Japan, Canada, France, Spain, Russia, for volcano eruption, petroleum spill, radiological, and infectious disease events, and for all four phases, trust fluctuates during the course of an event. The fluctuation is influenced by: history; political factors; inefficient response especially for recovery; poor communication; and changing nature of the event.	Haynes (2008); Maeno (2014); Rousseau (2008); Fernandez Souto (2012) SP; Kutovaya (2015) RU	Moderate	Overlapping findings by 5 studies, individually appraised as high (2), moderate (2), and low (1)
Trust in health-related authorities	MM, CS	In Singapore, Japan, the United States, Germany, Canada, France, and Spain, for infectious disease, radiological, foodborne illness, and petroleum spill events, and for all four phases, the traditional media continue to play a very important and credible role in health	Bitsch (2014); Karan (2007); Maeno (2014); Rousseau	Moderate	Overlapping findings by 6 studies, individually appraised as high (1), moderate

		communication; despite the use of new media (Internet, social/ digital media) and mobile telephones, traditional media such as newspapers, news on television, and radio continue to be the channels that people depend on heavily.	(2008); Fernandez Souto (2012) SP; Francescutti (2007) SP		(2), and low (3)
Trust in health-related authorities	MM, CS	In Canada, France, and Indonesia, for infectious disease and flood events, and for preparation, onset, and containment phases, mistrust in authorities is shaped by negative experiences during past events.	Rousseau (2008); Voorst (2015)	Moderate	Overlapping findings by 2 studies, both individually appraised as moderate,
Trust in health-related authorities	MM, CS	In Indonesia, Philippines, Japan, and France, for floods and earthquake events, and for preparation and recovery phases along with evaluation, and for low-SES populations, there is a need to take into account the whole living environment which is uncertain due to poverty; a particular risk may be just one among many other risks. In such living circumstances, it would be unrealistic to interpret a behaviour just as a direct response to a single, acute hazard. Similarly, the life circumstances include people's local knowledge and cultural traditions (e.g., respect for volcanos). The government should take all these into account when creating plans in order to inspire trust.	Voorst (2015); D'Ercole (2002) FR; Gaillard (2008) FR; Affletranger (2003) FR	Moderate	Overlapping findings by 4 studies, all individually appraised as moderate.

Findings from individual studies, both English and other UN languages, were put into four method streams, quantitative comparison group, quantitative descriptive survey, qualitative, and mixed method/ case study. The findings within each method stream were synthesized using thematic analysis. An individual study could support more than one synthesized finding. Most synthesized findings were supported by multiple studies though a few were supported by only one study.

There were two synthesized findings in the quantitative comparison group stream. Each was supported by a single study. The countries covered included Japan and the United States. Infectious disease and radiological events were covered; the phases covered were onset, containment, and recovery. No vulnerable populations were studied. The evaluation of certainty in the findings ranged from low to moderate.

There were 20 synthesized findings in the quantitative descriptive survey stream. Four findings were supported by only a single study whereas the rest were supported by multiple studies. The countries covered included Australia, Belgium, Canada, China, France, India, Japan, the Kingdom of Saudi Arabia, Netherlands, New Zealand, Norway, Oman, Slovenia, Spain, Sweden, Switzerland, Thailand, the United Kingdom, several European Union countries, the United States, and Vietnam. Bioterrorism, climate change related severe weather, cyclone, earthquake, flood, foodborne illness, infectious disease, general natural disaster, industrial accident, radiological, tsunami, volcanic, water contamination, and wildfire events were covered. All four phases of an event were covered along with evaluation. Vulnerable populations were

covered in three findings. The evaluation of certainty in the findings ranged from low to high, with the majority being moderate.

There were 10 synthesized findings in the qualitative stream. One finding was supported by only a single study whereas the rest were supported by multiple studies. The countries covered included Canada, China, France, Iran, Russia, the United Kingdom, and the United States. Bioterrorism, earthquake, floods, foodborne illnesses, infectious disease, and radiological events were covered. All four phases of an event were covered along with evaluation. Vulnerable populations were covered in three findings. The evaluation of confidence in the findings ranged from low to high, with the majority being moderate.

There were nine synthesized findings in the mixed methods/ case study stream. Three findings were supported by only a single study whereas the rest were supported by multiple studies. The countries covered included Canada, the Caribbean, France, Germany, Indonesia, Japan, Philippines, Russia, Singapore, Spain, several European Union countries, and the United States. Bioterrorism, earthquake, floods, foodborne illnesses, infectious disease, and radiological events were covered. All four phases of an event were covered along with evaluation. Vulnerable populations were covered in one of the findings. The evaluation of certainty/ confidence in the findings ranged from low to high, with the majority being moderate.

4.6 Synthesis of Findings Across Methodological Streams

Key to Table
Citations-Language: English has no suffix; Arabic (AR); Chinese (CH); French (FR); Russian (RU); Spanish (SP)
Certainty/ Confidence Evaluation: 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

Phenomenon of Interest/ Outcome	***Synthesized Finding Across Method Streams (with subgroup analysis of type, phase, and country of disaster, and vulnerable population)***	***Citations (first author) Supporting Synthesized Finding Across Method Stream***	***Evaluation of Certainty/ Confidence*** ***Note: Only English language studies from Section 4.5 considered***
Trust in health-related authorities	Trust in authorities is a multi-component construct. It is important to distinguish among and account for these components, and not treat trust as a singular concept, to fully explicate the processes through which trust may be enhanced. Some examples of components are: reliability, competence, openness, and integrity; fiduciary responsibility, honesty, competency, consistency, and faith; and confidence in government preparedness; allocation of resources; expectations	Haynes (2008); Meredith (2007); Paek (2008);Petts (2004); Siegrist (2005); Vaughan (2012); Weerd	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Moderate to

	of government; honesty; disclosure; dedication/ commitment; and caring/ empathy. Trust can also be conceptualized as critical trust, which is that people can trust a person or institution for information and action but combine this with a healthy skepticism. Countries covered include the Caribbean, the Netherlands, Switzerland, the United Kingdom, and the United States. Events include bioterrorism, infectious disease, and volcano eruption. All four event phases are included with emphasis on preparation. Vulnerable populations include low SES urban African American and Hispanic minorities and mothers of young children.	(2011); Wray (2006)	High *QL (CERQual):* Low to Moderate *MM, CS:* Moderate to High
Trust in health-related authorities	High trust in authorities can lead to both positive and negative psychological and behavioral outcomes. The positive outcomes of high trust include higher: investment in event warning and control; health protection behaviors; vaccination behaviors; preparation, but only if benefits clear; evacuation; attention to news; message acceptance; and willingness to attend public meetings. The negative outcomes of high trust include higher: fearfulness; uncertainty; and discounting of probability estimates of event occurrence, if event control mechanisms are effective. On the other hand, low trust can lead to negative outcomes such as anxiety and lack of preparation. Countries covered include Australia, Belgium, China, Indonesia, the Netherlands, New Zealand, Norway, Slovenia, Switzerland, Thailand, and the United States. Events include earthquake, floods, foodborne illness, industrial accident, infectious disease, radiological, tsunami, volcanic activity, and wildfire. All four phases of an event are covered with an emphasis on preparation and containment. Vulnerable populations include urban low SES minority African American and Hispanic populations and underserved urban and rural communities.	Bass (2015); Besley (2012); Bitsch (2014); Freimuth (2014); Gilles (2011); Janmaimool (2014); Johnson (2016); Mei (2013); Paton (2008); Perko (2012); Rod (2012); Su (2015); Vaughan (2012); Weerd (2011); Wray (2006); Kutovaya (2014) RU; Xie (2010) CH; Xie (2013) CH	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Low to High *QL (CERQual):* Low to Moderate *MM, CS:* Low to Moderate
Trust in health-related authorities	Trust in authorities is a strong predictor of risk perceptions. Generally there is a linear negative relationship between trust in authorities and perceived risk of a hazard/ event (higher trust, lower perceived risk) although the strength of the relationship may change based on component of trust (e.g., trust, confidence), type of organization (e.g., CDC, industry, state health departments, scientists), event type (food contamination, industrial accidents), demographics (in the United States African Americans, Hispanics), and type of risk (e.g., personal, global). The trust-risk perception relationship can be a positive one (higher trust, higher perceived risk) for citizen groups and climate change induced severe weather. However, the relationship between trust and risk perceptions may be more complex. For example, perceiving high credibility for industry and state health departments, and perceiving low credibility for citizen groups, may promote heuristic processing, which in turn may lead to perception of lower risk; in contrast, perceiving low credibility for industry and state health departments may promote greater systematic processing, which in turn may lead to perception of greater risk. It is also important to note that although trust in authorities can be a significant source of variation in perceived risk, the amount of variation in perceived	Bass (2015); Boon (2016); Janmaimool (2014); Johnson (2016); Siegrist (2005); Su (2015); Trumbo (2003); Viklund (2003); Wray (2006); Xie (2010) CH; Xie (2013) CH	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Low to High *QL (CERQual):* Low to Moderate *MM, CS:* ---

	risk explained by trust is small and most of the variation remains unexplained or can be explained by other factors. Countries covered include Australia, China, France, Spain, Sweden, Switzerland, Thailand, the United Kingdom, and the United States. Events include flood, industrial accidents, infectious disease, general public health, radiological, and general severe weather. The event emphasized is preparation with some little coverage of onset and containment. Vulnerable populations include urban low SES minority African American and Hispanic populations and underserved urban and rural communities.		
Trust in health-related authorities	Trust varies greatly across different message sources, which should be kept in mind when developing trust enhancing strategies. People usually assess the credibility of three information sources, industry, citizen groups, and health-related departments, and find them different. In general, local health care workers and agencies; personal health professional (doctors, nurses); friends, neighbors, and relatives; local self-help and community groups; and scientists are the more trusted sources. In general, local elected authorities and politicians; government officials; industry; religious leaders; and media are relatively less trusted sources. It is important to note that there may be different levels of trust in different modes and agencies of the government, with higher trust in those arms of the government that are perceived as non-biased and not related to enforcement, such as the CDC in the United States. Within different media sources, trust varies between traditional and digital/ social media sources, with trust in traditional media (e.g., television news), especially in local television news and newspapers, relatively higher than social media (e.g., Twitter). For social media, Facebook (compared to Twitter and print newspaper) can result in a more positive perception of organizational reputation. Countries covered include Canada, Caribbean, China, France, Germany, Indonesia, Japan, Singapore, Spain, the United Kingdom, and the United States. Events include bioterrorism, climate change related severe weather, earthquake, flood, foodborne illness, infectious disease, petroleum spill, general public health, radiological, volcanic, and water contamination. All four event phases are covered with emphasis on preparation. Vulnerable populations include mothers of young children, urban low SES minorities, and underserved urban and rural communities.	Bass (2015); Bitsch (2014); Boon (2016); Freimuth (2014); Frewer (2003); Karan (2007); Kjaernes (2006); Maeno (2014); Malet (2014); Meredith (2007); Petts (2004); Rousseau (2008); Rundblad (2010); Trumbo (2003); Utz (2013); Wray (2006); Fernandez Souto (2012) SP; Francescutti (2007) SP; Liu (2014) CH; Su (2008) CH; Xie (2005) CH; Zhong (2009) CH	*QN-CG (GRADE):* Moderate *QN-DS (GRADE Adapted):* Low to High *QL (CERQual):* Low to Moderate *MM, CS:* Low to High
Trust in health-related authorities	Trust in authorities varies across the course of an emergency event, demographics, and type of hazard. Trust in different information sources may be dependent upon time/ phase of an event. Generally, trust is usually high at the start of an event but can get eroded as the event progresses. The fluctuation is influenced by several factors such as history and politics; inefficient response especially for recovery; poor communication; and changing nature of the event. Trust in the government and individual spokespersons also varies considerably across demographic groups. For example, generally a highly trusted source is one's own physician but minorities may trust their own physicians less than majority groups. Similarly, trust in the early stages of an infectious disease event predicts vaccine acceptance later in the event, but only for	Freimuth (2014); Frewer (2003); Haynes (2008); Maeno (2014); Meredith (2007); Paek (2008); Rousseau (2008); Rundblad (2010); Weerd (2011); Fernandez	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Low to High *QL (CERQual):* Moderate to High

	White, non-Hispanic individuals. Trust in different information sources may also be dependent upon the nature of a specific hazard itself and the extent to which the particular hazard is perceived to be threatening at different points in time during a crisis. Countries covered include Canada, Caribbean, China, France, Japan, Netherlands, Russia, Spain, the United Kingdom, various other European Union countries, and the United States. Events include bioterrorism, foodborne illness, infectious disease, petroleum spill, radiological, volcano eruption, and water contamination. All four phases of an event are covered with emphasis on preparation and onset. Vulnerable populations include urban minorities.	Souto (2012) SP; Kutovaya (2015) RU; Liu (2014) CH	*MM, CS:* ---
Trust in health-related authorities	People engage in a thoughtful process of considering the credibility of multiple sources offering information and recommendations in an emergency event. People generally avoid rushing to judgment when considering the multiple arguments surrounding crises; people remain in a "wait and watch" mode for what they consider the most accurate account of the crisis and of the best actions to take to protect themselves. In general, credibility of information source serves as a primary means of resolving the contest among multiple voices typical in crisis communication. Countries covered include the United States. Events include bioterrorism and foodborne illness, and event phase includes preparation only. Vulnerable populations include urban low SES minorities.	Anthony (2013); Meredith (2007)	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* --- *QL (CERQual):* Low to High *MM, CS:* ---
Trust in health-related authorities	Trust in authorities occurs in a life context and should not be seen in isolation for just a specific hazard. For example, people generally tend to perceive higher risk levels than is warranted by the scientific evidence; thus, for all hazards there will always be a gap between the public perception of risk and the scientific estimation of risk, even when the trust in government is high. Similarly, the whole living environment may be risky and uncertain due to poverty; thus, a particular risk may be just one among many other risks. In such living circumstances, it is unrealistic to interpret a behaviour just as a direct response to a single, acute hazard. Along the same lines, life circumstances include people's local knowledge and cultural traditions (e.g., respect for volcanos, traditional coping styles). Government and health authorities should take these life contexts into account when developing plans in order to inspire trust. Countries covered include France, Indonesia, Japan, Philippines, the United States, and Vietnam. Events include bioterrorism, earthquake, floods, and infectious disease. The emphasis is on the preparation phase with some coverage of recovery; evaluation is also considered. Rural low-SES vulnerable population included.	Malet (2014); Voorst (2015); D'Ercole (2002) FR; Gaillard (2008) FR; Affletranger (2003) FR; Figuié (2010) FR	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Low to Moderate *QL (CERQual):* Moderate *MM, CS:* ---
Trust in health-related authorities	Trust in authorities can depend on the extent of coordination among different agencies, institutions, and the media. Integration of local and national agencies in emergency response preparedness and communication, with an emphasis on full disclosure, action steps, and leadership, enhances trust. When health professionals, experts, and politicians have clear coordination among themselves and with the traditional and social/ digital media, and all relay a uniform communication	Anthony (2013); Bitsch (2014); Karan (2007); Maeno (2014); Malet (2014); Meredith (2007); Quinn	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* ---

	strategy, there can be higher trust in authorities. When there is a gap between information conveyed by health authorities and the media, this can lead to reduced trust. Collaboration with mass and digital media is important while dealing with crisis because media can take on the spokesperson role and put attention on political responsibilities and shortcomings rather than talking about the event itself. In times of great uncertainty and with highly diverse audiences, having multiple voices is useful; however, professionals or agencies in disagreement should jointly discuss in public the rationale and processes by which they come to their conclusions to build trust. If a coordinated effort is not undertaken, media can take the spokesperson role of presenting the doubts and disagreements about definitive recommendations expressed by various organizations and public health experts, which can lead to distrust. Countries covered include Canada, France, Germany, Japan, Singapore, Spain, various other European Union countries, and the United States. Events include bioterrorism, foodborne illness, infectious disease, petroleum spill, and radiological. All four event phases are covered with an emphasis on onset; evaluation was also covered. Vulnerable populations include urban minorities and underserved urban and rural communities.	(2008); Rousseau (2008); Wray (2006); Fernandez Souto (2012) SP; Francescutti (2007) SP; Jakubowski (2004) FR; Wilkinson (2016)	*QL (CERQual):* Low to High *MM, CS:* Low to High
Trust in health-related authorities	Past experience with authorities contributes to perceptions of trust. Distrust of the government and non-government aid groups is related to problems (e.g., mismanagement, inefficiency, incompetence) with recovery efforts in previous events. Distrust can also stem from questioning the intentions of authorities based on past experiences. Distrust in authorities is also shaped by past, disappointing experiences regarding minimization of health hazards, that turned out to be incorrect, in official communications during the early phases of previous events. Along the same lines, credibility of messages in a current hazard event can affect credibility of and the response to warnings in the next future event if sufficient uncertainty about the predictions is not included in the messages.. Countries covered include Canada, France, Iran, India, Indonesia, and the United States. Events include bioterrorism, cyclone, earthquake, floods, and infectious disease. All four phases of an event are covered with an emphasis on preparation and recovery. Vulnerable populations include underserved urban and rural communities.	Alipour (2015); Rousseau (2008); Sharma (2012); Voorst (2015); Wray (2006)	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Moderate *QL (CERQual):* Moderate *MM, CS:* Moderate to High
Trust in health-related authorities	Trust in authorities as an outcome is predicted by several person-level factors that should be taken into account when developing communication strategies. Some important factors are: exposure and attention to news about the event; self-reported knowledge of event; self-reporting of local impacts of event; previous experience of discrimination; ability to articulate problems and empowerment to achieve goals; involvement, engagement, and participation with issue; low political conservatism and being a Democrat (relative to other, non-Republican partisans); communitarianism (low individualism); concern with risk of hazard; and perception of consensual values with and sympathy for organization. Countries covered include Australia, Canada, France, general global, Japan, New Zealand, and the United States. Events include earthquake, floods, food contamination, infectious disease, general natural disaster,	Freimuth (2014); Johnson (2016); Maeda (2003); Paton (2008); Government of Canada (2002) FR; Ruin (2010) FR; UNFAO (2011) FR	*QN-CG (GRADE):* --- *QN-DS (GRADE Adapted):* Low to High *QL (CERQual):* --- *MM, CS:* ---

	volcanic activity, and wildfire. The preparation, onset, and containment phases were covered, with emphasis on preparation; evaluation was also covered. Low-SES vulnerable population was covered.		
Trust in health-related authorities	Trust in authorities as an outcome is predicted by several organizational message and action factors that should be taken into account when developing communication strategies. Health and related authorities can explicitly acknowledge uncertainty in their messages, including forecasts and warnings, as this will enhance trust during the event as well as for future events. Sometimes trust in authorities may show a slight decrease as a result of openly acknowledging uncertainties; however, this decrease is only for a small proportion of the total number of message recipients and for the vast majority there is no change in their level of trust. Along the same lines, with the proliferation of alternative information sources (e.g., social media), concealing information, such as reporting lower rates of casualties, backfires on efforts to manage events and leads to decrease in trust of authorities. Trust in authorities can be enhanced by the following actions: Create specialized groups; quickly inform the public and rapidly intervene; develop new information systems to respond quickly and efficiently; create scientific communication (e.g., area risk maps) in an easy to understand manner; seek input from the public and encourage a dialog; ensure coordination between different health authorities and the media along with a uniform message; avoid rapid changes in information and prevent conflicting information; disseminate information through multiple platforms; provide specific and clear information; provide information in a transparent manner about uncertainties and dangers; communicate competence, openness and honesty, concern and care (for both physical and psychological well-being), and commitment; and be impartial and rely on methodologies (such as scientific) that minimize bias. Regarding the list item, authorities may want to keep in mind that sometimes low trust may result from use of a consent form (required for investigational protocols) which provides information about risks. In their interactions with the media, authorities can take the following steps to maintain trust: Choose local and national media outlets (especially visual); proactively cooperate and follow up with media outlets to disseminate information; respond to rival media outlets; prevent an information gap from occurring where the media have to rely on other sources for full information on all aspects of an event; assign official spokespersons who can provide information to news outlets efficiently and timely, and can dispel rumors and respond to criticism professionally; and prevent or efficiently manage conflicting official statements by multiple organizations. Countries covered include Canada, China, France, India, Japan, the Kingdom of Saudi Arabia, Oman, Russia, Thailand, the United Kingdom, various other European Union countries, and the United States. Events include bioterrorism, cyclone, earthquake, floods, foodborne illnesses, industrial events, infectious disease, general natural disasters, and water contamination. All four event phases were covered, with an emphasis on preparation; evaluation was also covered in a substantive manner. Vulnerable	Anthony (2013); Janmaimool (2014); Johnson (2015); Maeda (2003); Quinn (2008); Rousseau (2008); Rundblad (2010); Sharma (2012); Al-Douwihi (2004) AR; Al-Khayli (2007) AR; Al-Shaqsi (2013) AR; Deshaies (2004) FR; Duchêne (2004) FR; Glatron (2009) FR; Gryzunova (2012) RU; Hechmati (2004) FR; Heitz (2013) FR; Jakubowski (2004) FR; Lord (2009) FR Massé (2011) FR; Sun (2009) CH; Zhong (2009) CH;	*QN-CG (GRADE):* Low to Moderate *QN-DS (GRADE Adapted):* Moderate to High *QL (CERQual):* Low to High *MM, CS:* ---

	populations (children, pregnant women, people with chronic disease, low-SES) covered.		

There were total 11 synthesized findings across the four method streams. Of these, one synthesized finding was based on all four method streams, four synthesized findings were based on three method streams, four synthesized findings were based on two method streams, and two synthesized findings were based on just one method stream. The across-method synthesis sought to identify commonalities in themes across the method streams but at the same time it allowed for findings that were unique to not get subsumed under more general themes; this resulted in two synthesized findings that drew only from one method stream.

The quantitative comparison group within-method synthesized findings appeared in two across-method findings, quantitative descriptive survey within-method synthesized findings appeared in nine across-method findings, qualitative within-method synthesized findings appeared in 10 across-method synthesized findings, and mixed method/ case study within-method synthesized findings appeared in five across-method findings.

There was coverage of a large number of countries, but countries in Africa and South America were not represented at all. The coverage of different types of events was adequate and all four phases of an event (preparation, onset, containment, and recovery) along with evaluation were covered. Vulnerable populations appeared in all the findings.

The findings identify the following for the phenomenon of trust in authorities during public health emergency events: Trust in authorities is a multi-component construct and not a singular concept; high trust in authorities can lead to both positive and negative outcomes; trust in authorities is a strong predictor of risk perceptions, though there is a linear negative relationship between trust in authorities and perceived risk of a hazard/ event (higher trust, lower perceived risk); trust varies greatly across different message sources, the course of an emergency event, demographics, and type of hazard; people engage in a thoughtful process of considering multiple sources offering information and recommendations and use source credibility for resolving the conflict among pieces of information; trust in authorities occurs in a life context and should not be seen in isolation for just a specific hazard; trust in authorities can depend on the extent of coordination among different agencies, institutions, and the media; past experience with authorities contributes to perceptions of trust; trust in authorities as an outcome is predicted by several person-level and organizational message and action factors. All these findings need to be taken into account as a whole when developing communication strategies.

4.7 Media Reports

Two media reports were identified for the review objective in the search for English-language news stories. One report was a press releases and did not report any data. The other report (see Section 7.3 for the reference) examined a multi-platform health campaign in Sierra Leone during the Ebola outbreak. Lack of trust in governmental and health systems was the largest barrier to stopping the spread of the disease. Radio services, especially local radio stations, were a highly trusted communication channel. Specific radio programs that had a large following and were trusted were useful in conveying behavior change information. The editorial independence of the radio services also helped build the public's trust by questioning elements of the response when necessary. The main lesson learnt was that local media have a strong role in building community trust. The media report findings contributed to the across-method synthesized finding rust in authorities can depend on the extent of coordination among different agencies, institutions, and the media.

5.0 DISCUSSION

5.1 Summary of Results

5.1.1 Overall Summary

For the synthesis of evidence on trust in health-related authorities during public health emergency events, 68 studies (38 English language, 30 other UN languages) were included. The studies were appraised for quality, the data were extracted from them for constructing synthesized findings within four methodological streams, these findings were evaluated for certainty/ confidence and then synthesized across methods.

The country coverage of the reviewed literature showed mostly high and middle-income countries in Asia, Europe, North America, and Oceania. No studies covered countries in Africa (with the exception of a media report covering Sierra Leone), Central America (with the exception of the Caribbean), and South America. The event most covered was infectious disease, in both English language and other UN languages studies. Other relatively common events included floods, earthquake and volcanic, bioterrorism, foodborne illnesses, and radiological/ radiation, the last three perhaps reflecting more the concerns of North American and European countries. The other UN languages studies commonly focused on general, rather than specific, public health emergencies. All four event phases were covered though there was heavy emphasis on the preparation phase, followed by onset and containment phases; relatively there was much less coverage of the recovery phase. There were also very few studies that undertook evaluation.

Total eight studies (five English language, three other UN languages) explicitly examined at-risk/ vulnerable populations. In general, the individual-study findings from these populations did not differ from those generated from general populations. The individual-study findings do, however, point to not assuming that the pattern of trust in authorities in all vulnerable groups is similar. The findings note, for example, the differences between urban African American and Hispanic minorities in the United States with regards to judgements of trustworthiness of health and other related agencies.

The final set of 11 across-method synthesized findings provide an understanding of trust in health and related authorities during public health emergency events and the message and activities that can be undertaken to maintain and enhance the trust in this situation. Overall, the synthesized findings illuminate multiple aspects of the phenomenon of trust in health-related authorities during public health emergency events. The findings in various ways cover the following: structure/ components of trust (in the context of emergency health events); the life circumstances in which trust as a phenomenon is experienced; the role of trust in the common situation of multiple information sources; the variability in trust across contexts; trust as an outcome of different factors; and trust as a predictor of different outcomes. Although of most interest for the present review might be the findings related to factors that can lead to trust as an outcome, such as extent of coordination among agencies and the media, past experience with authorities, and organization action and messaging, it is important to note that all of the findings directly contribute to maintaining and enhancing trust in authorities.

To develop communication strategies for enhancing trust, there are several organizational message and action factors that can predict higher trust when developing communication strategies. Among these especially are: Acknowledging uncertainty in messages, including forecasts and warnings; being transparent and not concealing negative information, such as rates of casualties; creating groups with specialized skills and knowledge; speedily disseminating information and intervening; creating scientific communication in an easy to understand manner; seeking input from the public and encouraging a dialog; ensuring coordination between different health authorities and the media along with a uniform message;

avoiding rapid changes in information and preventing conflicting information dissemination from different agencies; and disseminating information through multiple platforms. It is again important to note that these actions occur in a larger context that includes factors such as different components of trust, history with authorities and life circumstances of the public, person/ individual differences, all of which can both strengthen or weaken the message-trust relationship.

5.1.2 Results Vis a Vis Findings from Existing Reviews

There were seven existing reviews of high and moderate quality whose findings were extracted . The results from the present review generally overlap with and extend these findings, and also provide new findings. In one case, the present results do not include a previous finding.

The present findings broadly replicate and extend the previous findings about organizational actions and messages that can enhance trust. These include: trust is influenced by organizational reputation; quality of stakeholder relationships; understanding and managing media relations; risk information provision strategies; accuracy, timeliness, and comprehensive information; transparency about available information; fairness in treatment of populations; building trust and trustworthiness through participatory dialogue and involvement in pre-event planning, exercises, and the design and testing of communication plans; and trust in public officials and the governments' ability to respond to a public health emergency are related to greater likelihood of adoption of recommended actions. In particular, the present review more comprehensively details what in the previous findings is called the risk perception paradox, which is that high trust can engender lower perceptions of risk. The present review also more clearly identifies that trust in authorities can depend on the extent of coordination among different agencies, institutions, and the media.

Some new findings are highlighted in the present review. These include that trust in authorities is a multi-component construct and not a singular concept, which needs to be kept in mind when developing any message strategies; people engage in a thoughtful process of considering multiple sources offering information and recommendations, and use source credibility for resolving the conflict among the many pieces of information; and trust in authorities occurs in a general life context and should not be seen narrowly in isolation for just a specific hazard or emergency event. The present review extends previous results and offers new findings regarding variation in trust across different message sources, the course of an emergency event, demographics, and type of hazard.

One finding from the existing reviews, that lack of trust between employees and supervisor within authority organizations minimizes employees' responses that could undermine operations, was not covered in the present review. Studies that examined within-organization communication were not included in the review; only studies that dealt with communication with the general public in some way were included.

5.2 Research Gaps

The present review identified five main gaps in the literature on trust in authorities during public health emergency events. First, there is insufficient coverage of low income countries. It could be that the characteristics of low income countries, especially in terms of infrastructure and history, influence trust processes differently enough for the practices of health authorities to be different. To address this, comparative research between countries needs to be undertaken. The review did not identify even a single study that compared countries, even those using a case study methodology.

Second, another gap in the literature is a comprehensive examination of the various components of trust along with concepts that substantially overlap with trust but may behave somewhat differently, such as confidence. There are studies that investigated different sets of components, but the review did not identify any study that comprehensively examined all relevant components and concepts, and tested their relationships with variables of interest, both as outcome, such as communication strategies that influence trust as an outcome, and as predictor, such as health protection behaviors that are influenced by trust as a predictor.

Third, also completely absent in the literature were longitudinal studies. It is not always necessary to have randomized comparison group research design, which may be precluded due to the nature of public health emergency events, to draw out causal relationships. Such linkages between variables of interest, such as trust as an outcome of certain communication strategies, can also be examined using a longitudinal research design where data of interest are measured at multiple time points. Such a research design can better reveal how trust dynamically varies during the phases of an event; even if say, preparation and recovery phases are only used for data collection, this will still provide insight into how trust in authorities varies across the phases. Such a design can also provide knowledge about how trust operates simultaneously as both an outcome and predictor.

Fourth, a research gap exists in how mass media and personal networks interact during events. Several studies talk about the importance of integration of traditional mass media (e.g., television news, newspapers) with personal networks that include both face-to-face and digital/social media (such as Facebook, Twitter). Communities, especially those that may identify themselves as marginalized or be considered vulnerable, often rely on personal networks for guidance to inform their decisions as they consider information from these sources more trustworthy than from media sources. Although there are studies that recommend authorities aim to integrate information disseminated through mass media and personal networks, the review did not identify any study that investigated how this integration may actually take place.

Fifth, there is an absence of integrative model building and theory construction. Trust in health authorities and other risk communication sources and trust in information from these sources varies across populations, especially that may be considered vulnerable, and hazards/ events, among other contexts. The present review identified very few models or theories that sought to provide insightful theoretical explanations of these variations. To develop effective communication strategies that enhance trust, effective theory development needs to take place as otherwise a set of empirical facts of relationships between trust and other variables will not add up to accurate predictions about these relationships that can assist with planning and management.

5.3 Limitations of the Present Review

The present review has two main limitations. First, the other UN languages articles and reports were not fully translated into English, which may have led to some information to be missed. Second, the coding, data extraction, and findings synthesis was done only by one person which prevented the calculation of inter-coder reliability as a check for consistency of these data. Additionally, presently there are no agreed upon quality appraisal or risk of bias tool for big data studies and so no quality assurance was done for such studies.

5.4 Authors' Conclusions

The public's trust in health-related authorities during times of emergency public health events is a complex phenomenon. Trust is a multi-faceted concept with multiple components and closely related concepts, all of which may be affected differently by the same message designed to enhance it. Trust is also dynamic. It changes across different message sources, the public's demographics, type of hazard/ event, and the course of the event. Thus, a message designed to enhance trust in a message source for a particular event affecting a particular population may be quite effective at one point in time but may fail to work at a different point in time. Thus, the specificity of each message situation needs to be carefully analyzed to create messages that work.

During an emergency event, people engage in a thoughtful process of considering multiple sources offering information and recommendations and use source credibility for resolving the conflict among sources. The careful sorting of information and its sources occurs in life circumstances that may include poverty and associated multitude daily hazards and risks, entrenched cultural beliefs and behaviors, and past history with authorities' response to events. Messages that disregard this broader social context outside of basic demographics will fail to work.

Irrespective of the difficulties for message and activities design posed by the above for health and related organizations, some cautious generalizations about what works to enhance trust are possible. Some of these include: coordination with other agencies, institutions, and the media; swift and uniform message dissemination and intervention; communicating uncertainties; being transparent and not concealing negative data; avoiding rapid changes in information and preventing conflicting information dissemination from different agencies; disseminating information through multiple platforms; and sustaining public involvement and dialog. However, it should be noted that although high trust in authorities can lead to positive outcomes such as higher vaccination and evacuation behaviors, it can also lead to negative outcomes such as lowered perceived risk for hazards.

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7.0 FULL LIST OF INCLUDED STUDIES, EXISTING REVIEWS, AND OTHER REFERENCES

7.1 Full List of Included Studies: English Language

Alipour, F., Khankeh, H., Fekrazad, H., Kamali, M, Rafiey, H., & Ahmadi, S. (2015). Social issues and post-disaster recovery: A qualitative study in an Iranian context. *International Social Work, 58*, 689-703.

Anthony, K. E., Sellnow, T. L., & Millner, A. G. (2013). Message convergence as a message-centered approach to analyzing and improving risk communication. *Journal of Applied Communication Research, 41*(4), 346-364.

Bass, S. B., Greener, J. R., Ruggieri, D., Parvanta, C., Mora, G., Wolak, C., Normile, R., & Gordon, T. F. (2015). Attitudes and perceptions of urban African Americans of a "dirty bomb" radiological terror event: Results of a qualitative study and implications for effective risk communication. *Disaster Medicine and Public Health Preparedness, 9*(01), 9-18.

Besley, J. C., McComas, K. A., & Trumbo, C. W. (2012). Citizen views about public meetings. *Journal of Risk Research, 15*(4), 355-371.

Bitsch, V., Koković, N., & Rombach, M. (2014). Risk communication and market effects during foodborne illnesses: A comparative case study of bacterial outbreaks in the US and in Germany. *International Food and Agribusiness Management Review, 17*(3), 97.

Boon, H. J. (2016). Perceptions of climate change risk in four disaster-impacted rural Australian towns. *Regional Environment Change, 16,* 137-149.

Freimuth, V. S., Musa, D., Hilyard, K., Quinn, S. C., & Kim, K. (2014). Trust during the early stages of the 2009 H1N1 pandemic. *Journal of Health Communication, 19,* 321-339.

Frewer, L. J., & Miles, S. (2003). Temporal stability of the psychological determinants of trust: Implications for communication about food risks. *Health, Risk & Society, 5*(3), 259-271.

Gilles, I., Bangerter, A., Clemence, A., Green, E. G. T., Krings, F., Staerkle, C., & Wagner-Egger, P. (2011). Trust in medical organizations predicts pandemic (H1N1) 2009 vaccination behavior and perceived efficacy of protection measures in the Swiss public. *European Journal of Epidemiology, 26,* 203-210.

Haynes, K., Barclay, J., & Pidgeon, N. (2008). The issue of trust and its influence on risk communication during a volcanic crisis. *Bulletin of Volcanology, 70*(5), 605-621.

Janmaimool, P., & Watanabe, T. (2014). Environmental concerns and uncertainty communication for building public trust in environmental risk management: A case study of Maptaphut municipality, Thailand. *International Journal of Development and Sustainability, 3,* 1152-1173.

Johnson, B. B. (2016). Explaining Americans' responses to dread epidemics: an illustration with Ebola in late 2014. *Journal of Risk Research,* DOI:10.1080/13669877.2016.1153507.

Johnson, B. B., & Slovic, P. (2015). Fearing or fearsome Ebola communication? Keeping the public in the dark about possible post-21-day symptoms and infectiousness could backfire. *Health, Risk & Society, 17*(5-6), 458-471.

Karan, K., Aileen, L., & Elaine, P. Y. L. (2007). Emerging victorious against an outbreak: Integrated communication management of SARS in Singapore - media coverage and impact of the SARS campaign in moving a nation to be socially responsible. *Journal of Creative Communications, 2*(3), 383-403.

Kjaernes, U. (2006). Trust and distrust: Cognitive decisions or social relations. *Journal of Risk Research, 9*, 911-932.

Maeda, Y., & Miyahara, M. (2003). Determinants of trust in industry, government, and citizen's groups in Japan. *Risk Analysis, 23,* 303-310.

Maeno, R. (2014). The Fukushima nuclear power plant disaster and perceptions of health risk communication : A case study. *Journal of Health Safety and Environment, 30*(1), 113-133.

Malet, D., & Korbitz, M. (2014). Accountability between experts and the public in times of risk. *Australian Journal of Public Administration, 73*(4), 491-500.

Mei, E. T. W., Lavigne, F., Picquout, A., de Bélizal, E., Brunstein, D., Grancher, D., Sartohadi, J., Cholik, N., & Vidal, C. (2013). Lessons learned from the 2010 evacuations at Merapi volcano. *Journal of Volcanology and Geothermal Research, 261*, 348-365.

Meredith, L. S., Eisenman, D. P., Rhodes, H., Ryan, G., & Long, A. (2007). Trust influences response to public health messages during a bioterrorist event. *Journal of Health Communication, 12*(3), 217-232.

Paek, H. J., Hilyard, K., Freimuth, V. S., Barge, J. K., & Mindlin, M. (2008). Public support for government actions during a flu pandemic: lessons learned from a statewide survey. *Health Promotion Practice, 9*(4 suppl), 60S-72S.

Paton, D. (2008). Risk communication and natural hazard mitigation: how trust influences its effectiveness. International *Journal of Global Environmental Issues, 8*(1-2), 2-16.

Perko, T., Železnik, N., Turcanu, C., & Thijssen, P. (2012). Is knowledge important? Empirical research on nuclear risk communication in two countries. *Health Physics, 102*(6), 614-625.

Petts, J., & Niemeyer, S. (2004). Health risk communication and amplification: learning from the MMR vaccination controversy. *Health, Risk & Society, 6*(1), 7-23.

Quinn, S. C., Thomas, T., & Kumar, S. (2008). The anthrax vaccine and research: Reactions from postal workers and public health professionals. *Biosecurity and Bioterrorism, 6,* 321-333.

Rød, S. K., Botan, C., & Holen, A. (2012). Risk communication and the willingness to follow evacuation instructions in a natural disaster. *Health, Risk & Society, 14*(1), 87-99.

Rousseau, C., Moreau, N., Dumas, M. P., Bost, I., Lefebvre, S., & Atlani-Duault, L. (2008). Public media communications about H1N1, risk perceptions and immunization behaviours: A Quebec-France comparison. *Public Understanding of Science, 24,* 225-240.

Rundblad, G., Knapton, O., & Hunter, P. R. (2010). Communication, perception and behaviour during a natural disaster involving a 'Do Not Drink' and a subsequent 'Boil Water' notice: a postal questionnaire study. *BMC Public Health, 10*(1): 1.

Sharma, U., & Patt, A. (2012). Disaster warning response: the effects of different types of personal experience. *Natural Hazards, 60,* 409-423.

Siegrist, M., Gutscher, H., & Earle, T. C. (2005). Perception of risk: the influence of general trust, and general confidence. *Journal of Risk Research, 8(*2), 145-156.

Su, Y., Sun, X., & Zhao, F. (2015). Trust and its effects on the public's perception of flood risk: a social science investigation of the middle and lower reaches of the Yangtze River. *Journal of Flood Risk Management,* DOI: 10.1111/jfr3.12138.

Trumbo, C. W., & McComas, K. A. (2003). The function of credibility in information processing for risk perception. *Risk Analysis, 23*(2), 343-353.

Twyman, M., Harvey, N., & Harries, C. (2008). Trust in motives, trust in competence: Separate factors determining the effectiveness of risk communication. Judgment and Decision Making, 3(1), 111.

Utz, S., Schultz, F., & Glocka, S. (2013). Crisis communication online: How medium, crisis type and emotions affected public reactions in the Fukushima Daiichi nuclear disaster. *Public Relations Review, 39*(1), 40–46.

van der Weerd, W., Timmermans, D. R. M., Beaujean, D. J. M. A., Oudhoff, J., & van Steenbergen, J. E. (2011). Monitoring the level of government trust, risk perception and intention of the general public to adopt protective measures during the influenza A (H1N1) pandemic in the Netherlands. *BMC Public Health, 11:* 575.

van Voorst, R. (2015). Risk-handling styles in a context of flooding and uncertainty in Jakarta, Indonesia: An analytical framework to analyse heterogeneous risk-behavior. *Disease Prevention and Management, 24,* 484-505.

Vaughan, E., Tinker, T. L., Truman, B. I., Edelson, P., & Morse, S. S. (2012). Predicting responses to reassurances and uncertainties in bioterrorism communications for urban populations in New York and California. *Biosecurity and Bioterrorism, 10,* 188-202.

Viklund, M. J. (2003). Trust and risk perception in western Europe: A cross-national study. *Risk Analysis, 23*(4), 727-738.

Wray, R., Rivers, J., Jupka, K., & Clements, B. (2006). Public perceptions about trust in emergency risk communication: qualitative research findings. International. *Journal of Mass Emergencies and Disasters, 24*(1), 45.

7.2 Full List of Included Studies: Other UN Languages

<u>*Arabic*</u>

Al-Douwihi, Abdul Aziz. (2004). *Role of Informative Planning in Facing Disasters and Crisis. Survey Study of Staff Members of General Directorate of Civil Defense and Ministry of Information in Riyadh.* Master's thesis, 1-198.
[الضويحي سلطان, العزيز عبد. (2004 م). التخطيط الإعلامي في دوره مواجهة الكوارث والأزمات. رسالة الماجستير, 1-198.]

Al-Khayli, Abdullah. (2007). *Relationship between media and the process of decision-making during disasters.* Master's thesis, 1-265.

[الكحيلي, عبدالله. (2007 م). الكوارث اثناء القرارات اتخاذ بعملية الاعلام وسائل علاقة .الماجستير رسالة, 265-1]

Al-Shaqsi, Obaid. (2013). Public attitudes towards Omani media's management of the Cyclone Gonu crisis. *Al- Manhal,* 1-17.
[الشقصي, عبيد. (2013 م). جونو إعصار أزمة مع العماني الإعلام تعامل نحو الجمهور اتجاهات .المنهل, 1-17.]

Chinese

Liu, Y., & Zeng, Y. (2014). Risk communication, Trust in government and consumers' recovery behavior: case study of the Melamine Incident. *Beijing Social Science. 3,* 52-62.
[刘媛媛，曾寅初. 风险沟通，政府信息信任与消费者购买恢复. 北京社会科学. 3, 52-62.]

Su, G., Ma, Z., etc. (2008). Examining the Characteristics of People's Response to and Perception of Wenchuan earthquake: case study of Deyang city in Sichuang Province. *Seismology and Geology, 30*(4), 877-891.
[苏桂武，马宗晋，等. (2008). 汶川地震灾区民众认知与响应地震灾害的特点及其减灾宣教意义，以四川省德阳市为例. 地震地质. 30(4), 877-891.]

Sun, J., Jin, S., & Cao, S. (2009). A qualitative psychological analysis of the rumors appeared after a disaster: the evidence from the rumors appeared after 5.12 Wenchuan Earthquake. *Advances in Psychological Science. 17*(3), 602-609.
[孙嘉卿，金盛华，曹慎慎. (2009). 灾难后谣言传播心理的定性分析：以5.12汶川地震谣言为例.心理科学进展. 17(3), 602-609.]

Xie, X., Wang H., Ren, J., & Yu, Q. (2005). Analyzing the risk communication in the outbreak of SARS. *Chinese Journal of Applied Psychology, 11*(2). 104-109
[谢晓菲, 王惠, 任静，于清源（2005）SARS危机中以受众为中心的风险沟通分析. 《应用心理学》. 11(2). 104-109.]

Xie, R., & Kan, J. (2010). Analysis of traits of the demand for information during public health. *China Health Education. 26*(1), 43-45.
[解瑞谦, 阚坚力. (2010). 公众对传染病突发公共卫生事件的信息需求特征分析. 《中国健康教育》. 26(1). 43-45.]

Xie R., Yang, C., Ou, J.m Chen, C., & Mao, Q. (2013). Qualitative study on health demands of community residents for human infection with H7N9 virus of two Cities of Fujian. *Chinese Journal of Health Education. 29*(7), 582-589.
[解瑞谦, 杨宠, 欧剑鸣, 陈彩粼, 毛群安. (2013). 福建两地市社区居民人感染H7N9禽流感疫情信息需求定性研究. 《中国健康教育》. 29(7), 582-589.]

Zhong , J., & Ye, L. (2009). Examining disaster risk communication based on regional flood perception of the public. *Journal of Institute of Disaster-Prevention Science and Technology, 11*(4), 16-20.
[钟景竱，叶琳. (2009). 基于公众对区域水灾感知的灾害风险沟通探讨.防灾科技学院学报.11(4),16-20.]

French

Affletranger, B. & de Richemond, N. M. (2003). Management of warning and information during floods: conditions and limitations of a local participatory approach. The example of Deux-Sèvres. *Flux. 1*, 16-27.
[Affletranger, B. & de Richemond, N. M. (2003). Gestion de l'alerte et de l'information lors des crues: conditions et limites d'une démarche participative locale. L'exemple des Deux-Sèvres. Flux. 1, 16-27.]

Deshaies, D., Pilon, P., Valiquette, L., & Carsley, J. (2004). Public health response during a case of human rabies in Quebec. *Canadian Journal of Public Health, 95*(2), March/April.
[Deshaies, D., Pilon, P., Valiquette, L., & Carsley, J. (2004). Intervention de la santé publique lors de la survenue d'un cas de rage humaine au Québec. Revue Canadienne de Santé Publique, Vol. 95, No. 2, mars/avril.]

D'Ercole, R. (2002). Forces and weaknesses of the risk management in Japan: a reflexion after the crisis provoked by the Usu, Hokkaidô eruption in 2000. *Annals of Geography,* 524-548.
[D'Ercole, R. (2002). Forces et faiblesses de la gestion des risques au Japon : une réflexion à partir de la crise liée à l'éruption du volcan Usu (Hokkaidô) de 2000. Annales de Géographie, 524-548.]

Duchêne, F., & Journel, C. M. (2004). Experience of the flood. *Annals of urban research* (pp. 71-77).
[Duchêne, F., & Journel, C. M. (2004). L'experience de la crue. Annales de la recherche urbaine (pp. 71-77).]

Figuié, M, & Fournier, T. (2010). Global health risks and national politics: the management of avian flu in Vietnam. *Journal of Agricultural and Environmental Studies, 91,* 3, 32-343.
[Figuié, M & Fournier, T. (2010). Risques sanitaires globaux et politiques nationales: la gestion de la grippe aviaire au Vietnam. Revue d'Etudes en Agriculture et Environnement, 91, 3, 327-343.]

Gaillard, J. C., Liamzon, C. C., & Maceda, E. A. (2008). Catastrophes considered "natural" and development: reflections on the origin of disasters in the Philippines. *Third World Review.* (2), 371-390.
[Gaillard, J. C., Liamzon, C. C., & Maceda, E. A. (2008). Catastrophes dites «naturelles» et développement: réflexions sur l'origine des désastres aux Philippines. Revue Tiers Monde, (2), 371-390.]

Glatron, S. (2009). *Cognitive and spatial representations of risks and nuisances for city dwellers.* (Doctoral dissertation, University of Strasbourg).
[Glatron, S. (2009). Representations cognitives et spatiales des risques et des nuisances pour les citadins. (Doctoral dissertation, Universite de Strasbourg).]

Government of Canada Office of the protection of critical infrastructure and emergency preparedness. (2002). *The road to a national strategy of disaster mitigation.* January.
[Gouvernement du Canada Bureau de la protection des infrastructures essentielles et de la protection civile. (2002). En route vers une strategie nationale d'attenuation des catastrophes document de travial. Janvier.]

[Hechmati, G. (2004). *Influenza epidemics: an information system for decision-making in public health* (Doctoral dissertation, University of Geneva).
Hechmati, G. (2004). Epidémies de grippe: système d'information pour la prise de décision en santé publique (Doctoral dissertation, University of Geneva).]

Heitz, C, & Glatron, S. (2013). I*nformational public tools on major risks: are the maps vector acculturation? Exploratory study of the perception of flood maps by individuals at risk* (Eurometropole of Strasbourg).
[Heitz, C. & Glatron, S. (2013). Outils d'information du public sur les risques majeurs: les cartes sont-elles un vecteur d'acculturation? Etude exploratoire de la perception de cartes de risque d'inondations par les individus exposés (Eurométropole de Strasbourg).]

Jakubowski, E. & Charpak, Y. (2004). Sixth forum on the future of crisis communication. Reykjavik Island. *World Health Organization.* May 10-11.
[Jakubowski, E. & Charpak, Y. (2004). Sixième Forum du futur sur la communication en cas de crise. Reykjavik (Islande), Organization Mondiale de la Sante, 10-11 mai.]

Lord, S. (2009). *Study of the impact of avian flu risk communication on social interpretation and creation of public opinion.* (Presented as partial requirement for Master's degree in communications, University of Quebec at Montreal).
[Lord, S. (2009). Etude de l'impact de la communication de risqué de grippe aviaire sur l'interpretation sociale et la creation de l'opinion publique. (Memoire presente comme exigence partielle de la maitrise en communication, Universite du Quebec a Montreal).]

Massé, R, Weinstock, D, Désy, M, & Moisan, C. (2011). Popular perceptions of risk and expert knowledge in the context of pandemic: the case of A (H1N1) in Québec. *Anthropology & Health. Francophone international journal of the anthropology of health,* 3.
[Massé, R, Weinstock, D, Désy, M, & Moisan, C. (2011). Perceptions populaires du risque et savoirs experts en contexte de pandémie: le cas du A (H1N1) au Québec. Anthropologie & Santé. Revue internationale francophone d'anthropologie de la santé, 3.]

Ruin, I. (2010). Driving against the currents of flash floods, everyday and exceptional conflict. 119, 674, July-August, 419-443.
[Ruin, I. (2010). Conduite à contre-courant et crues rapides, le conflit du quotidien et de l'exceptionnel. 119, 674, juillet-août, 419-443.]

United Nations food and agriculture organization and World Health Organization. (2011). *FAO/WHO guide for the implementation of the principles and procedures of risk analysis in food safety emergencies.* Rome.
[Organization des Nations Unies pour l'alimentation et l'agriculture et Organisation mondiale de la Sante. (2011). Guide FAO/OMS d'application des principes et des procedures d'analyse des risques lors des urgences en matière de sécurité aliments. Rome.]

Russian
Gryzunova E. A. (2012). Models of Governmental Crisis Communications and Information Management. *Vestnik MGIMO, 6,* 225-229.
[Грызунова Е. А. (2012). Модели кризисных коммуникаций и управления информацией в работе органов государственной власти. Вестник МГИМО, 6, 225-229.]

Kutovaya S. V. (2014). Flood 2013. Social Well-being of the Evacuated Residents. *4th Regional Reddevkiy Readings Conference.*
[Кутовая С. В. (2014). Наводнение 2013 года. Социальное самочувствие эвакуированных жителей. Четвертые областные РАДДЕВСКИЕ ЧТЕНИЯ.]

Kutovaya S. V. (2015). Flood in the Southern Far East of Russia. Social Well-Being of the Affected Population. *Fundamentalnye Issledovaniya,* 8-3, 572-575.
[Кутовая С. В. (2015) Наводнение на Юге Дальнего Востока России. Социальное самочувствие пострадавших. Фундаментальные исследования, 8-3, 572-575.]
Spanish

Fernandez Souto, A. B. (2012). Communication and crisis management. Comparative notes between Prestige case and Gulf of Mexico's tragedy. *Anagrams, 10*(21), 143-154.
[Fernandez Souto, A. B. (2012). La comunicación y gestión de crisis. Notas comparativas entre el Caso Prestige y la tragedia del Golfo de México. Anagramas, 10(21), 143-154.]

Francescutti, P. (2007). From cow disease to SARS: Risk Communication in Spain. (J. R. Gomez, Ed.) *Risk within information society,* 41-59. Retrieved from http://ruc.udc.es/dspace/bitstream/handle/2183/12807/CC-91_art_3.pdf?sequence=1
[Francescutti, P. (2007). De las vacas locas a la gripe aviar: La comunicación del riesgo en España. (J. R. Gomez, Ed.) El riesgo en la sociedad de la información, 41-59. http://ruc.udc.es/dspace/bitstream/handle/2183/12807/CC-91_art_3.pdf?sequence=1]

7.3 Full List of Included Studies: Media Reports

Wilkinson, S. (2016, June). *Practice briefing: Using media and communication to respond to public health emergencies: Lessons learned from Ebola.* BBC Action Media. Retrieved from http://downloads.bbc.co.uk/mediaaction/pdf/practicebriefings/ebola-lessons-learned.pdf

7.4 Existing Reviews

Cairns, G., de Andrade, M., & MacDonald, L. (2013). Reputation, relationships, risk communication, and the role of trust in the prevention and control of communicable disease: A review. *Journal of Health Communication, 18,* 1550-1565. doi: 10.1080/10810730.2013.840696.

Gesser-Edelsburg, A., Stolero, N., Mordini, E., Billingsley, M., James, J. J., & Green, M. S.(2015). Emerging infectious disease communication during the 2009 H1N1 influenza outbreak: Literature review (2009-2013) of the methodology used for EID communication analysis. *Disaster Medicine and Public Health Preparedness, 9,* 199-206.doi: 10.1017/dmp.2014.126.

Kraut, R. E., Acquisti, A., Kleinberg, J. M.,, Luke, L., Muth, R. G., Palen, L., Sellnow, T. L., & Wood, M. (2013). *Public response to alerts and warnings using social media: Report of a workshop on current knowledge and research gaps.* Washington DC: The National Academies Press.

Lettieri, E., Masella, C., & Radaelli, G. (2009). Disaster Management: Findings from a systematic review. *Disaster Prevention and Management, 18,* 117-136. doi: 10.1108/09653560910953207.

Lin, L., Savoia, E., Agboola, F., & Viswanath, K. (2014). What have we learned about communication inequalities during the H1N1 pandemic: A systematic review of the literature. *BMC Public Health, 14,* 1-13. doi: 10.1186/1471-2458-14-484.

McCaffrey, S. (2015). Community wildfire preparedness: A global state-of-the-knowledge summary of social science research. *Current Forestry Reports, 1*, 81-90. doi: 10.1007/s40725-015-0015-7.

McComas, K. A. (2006). Defining moments in risk communication research: 1996–2005. *Journal of Health Communication, 11,* 75-91. doi: 10.1080/10810730500461091.

Ruggiero, A., & Vos, M. (2013). Terrorism communication: characteristics and emerging perspectives in the scientific literature 2002–2011. *Journal of Contingencies and Crisis Management, 21,* 153-166. doi: 10.1111/1468-5973.12022.

Siegrist, M. & Zingg, A. (2014). The role of public trust during pandemics implications for crisis communication. *European Psychologist, 19,* 23-32. doi: 10.1027/1016-9040/a000169.

Vaughan, E., & Tinker, T. (2008). Effective health risk communication about pandemic influenza for vulnerable populations. *American Journal of Public Health, 99,* S324-S332.doi: 10.2105/AJPH.2009.162537.

Wachinger, G., Renn, O., Begg, C., & Kuhlicke, C. (2013). The risk perception paradoxImplications for governance and communication of natural hazards. *Risk Analysis, 33*,1049-1065. doi: 10.1111/j.1539-6924.2012.01942.x.

7.5 Other References

Alonso-Coello, P., Schünemann, H. J., Moberg, J., Brignardello-Petersen, R., Akl, E. A., Davoli, M., Treweek, S., Mustafa, R. A., Gabriel Rada,G., Rosenbaum, S., Morelli, A., Guyatt, G. H., Oxman, A. D. (2016). GRADE Evidence to Decision (EtD) frameworks: a systematic and transparent approach to making well informed healthcare choices. 1: Introduction. *BMJ,* 353:i2016. http://dx.doi.org/10.1136/bmj.i2016.

Barnett-Page, E., & Thomas, J. (2009). Methods for the synthesis of qualitative research: a critical review. BMC Medical Research Methodology, 9:59. DOI: 10.1186/1471-2288-9-59

Critical Appraisal Skills Programme (CASP). (2013). *CASP qualitative checklist.* Retrieved from http://www.casp-uk.net/casp-tools-checklists

Davids, E. L., & Roman, N. V. (2014). A systematic review of the relationship between parenting styles and children's physical activity. *African Journal for Physical, Health Education, Recreation and Dance, 2*(1), 228-246.

Effective Practice and Organisation of Care (EPOC). (2015). Suggested risk of bias criteria for EPOC reviews. EPOC Resources for review authors. *Norwegian Knowledge Centre for the Health Services.* Retrieved from http://epoc.cochrane.org/epoc-specific-resources-review-authors

GRADE Working Group. (2004). Grading quality of evidence and strength of recommendations. *BMJ, 328*(7454), 1490-1494.

Guyatt, G., Oxman, A. D., Aki, E. A., Kunz, R., Vist, G., Brozek, J., Norris, S., Falck-Ytter, Y., Glasziou, P., DeBeer, H., Jaeschke, R., Rind, D., Meerpohl, J., Dahm, P., & Schunemann, H. J. (2011). GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings table. *Journal of Clinical Epidemiology, 64*(4), 383-394. doi: 10.1016/j.jclinepi.2010.04.026

Higgins, J. P. T., & Green, S. (Eds). (2011). *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0* [updated March 2011]. The Cochrane Collaboration. Retrieved from www.handbook.cochrane.org.

Lewin, S., Glenton, C., Munthe-Kaas, H., Carlsen, B., Colvin, C. J., Gulmezoglu, M., Booth, A., Garside, R., & Rashidian, A. (2015). Using qualitative evidence in decision making for health and social interventions: An approach to assess confidence in findings from qualitative evidence syntheses (GRADE-CERQual). *PLOS Medicine*. doi:10.1371/journal.pmed.1001895

Noyes, J., Booth, A., Lewin, S., Carlsen, B., Glenton, C., Munthe-Kaas, H., Colvin, C. J., Garside, R., Bohren, M., Rashidian, A., Wainwright, M., Tuncalp, O., Chandler, J., Pantoja, T., & Tucker, J. D. (in press). *Applying the GRADE-CERQual approach: making a CERQual assessment of relevance of the data*.

Pluye, P., Robert, E., Cargo, M., Bartlett, G., O'Cathain, A., Griffiths, F., Boardman, F., Gagnon, M.P., & Rousseau, M.C. (2011). *Proposal: A mixed methods appraisal tool for systematic mixed studies reviews.* Retrieved September 24, 2016, 2016 from http://mixedmethodsappraisaltoolpublic.pbworks.com. Archived by WebCite® at http://www.webcitation.org/5tTRTc9yJ

Pope, C., Ziebland, S., & Mays, N. (2000). Analysing qualitative data. BMJ, 320, 114-116.

Shea, B. J., Grimshaw, J. M., Wells, G. A., Boers, M., Andersson, N., Hamel, C., Porter, A. C., Tugwell, P., Moher, D., & Bouter, L. M. (2007). Development of AMSTAR: A measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology, 7*(10). Retrieved from http://www.biomedcentral.com/1471-2288/7/10.

Tyndall, J. (2008). *How low can you go?: Towards a hierarchy of grey literature.* Presented at Dreaming 08: Australian Library and Information Association Biennial Conference, September 2008, Alice Springs. Retrieved from http://hdl.handle.net/2328/3326.

8.0 APPENDIXES

8.1 Adjustments to the GRADE Process for Quantitative Descriptive Surveys (Cross-sectional; No comparison groups for outcomes of interest)

A. Levels of quality of study findings

High quality: It is highly likely that new evidence will not substantially modify the study findings.
Moderate quality: It is somewhat likely that new evidence will not substantially modify the study findings.
Low quality: It is somewhat likely that new evidence will substantially modify the study findings.
Very low quality: It is highly likely that new evidence will substantially modify the study findings.

B. Factors that can reduce the quality of study findings

1. Limitations in study design or execution
We are more confident about the high quality of study results, when we have:
. High validity and reliability of measurement of variables
. Attention to minimization of confounding variables, through, for example, use of control variables

2. Inconsistency of results
We are more confident about the high quality of study results, when we have:
. Homogeneity in the results across disaster types, national/cultural boundaries, etc.
. Heterogeneity of results, if present, has a plausible explanation

3. Indirectness of evidence
We are more confident about the high quality of study results, when we have direct evidence, which is:
. Direct - data are from affected populations, currently or in the past.
  Less direct - data from populations who may be likely to be affected in the future.
  Least direct - data from populations unlikely to be affected in the future
. Study variables directly speak to question of interest and outcomes of interest

4. Imprecision of results
We are more confident about the high quality of study results, when results are more precise, which is:
. Results are statistically significant
. Sample size is at least 90 for single group

*5. Publication bias * (for a finding collated across multiple quantitative studies)*
We are more confident about the high quality of results collated as a finding across individual studies, when:
. There is at least one study that shows nonsignificant/null results

8.2 Quality Appraisal of and Extracted Findings from English Language Individual Data-based Primary Studies (Quantitative-Comparison Group Method)

Key to Table
Method: Quantitative-Comparison Groups (QN-CG)
Relevancy: Direct; Indirect; Partial; Unclear
Quality: QN-CG – High (low risk of bias); Moderate (minor risk of bias); Low (some risk of bias); Very low (significant risk of bias)

Citation (first author); Method; Relevancy; Quality Appraisal Rating; Study Description	***Findings***	***Statistical Information***
Citation: Johnson (2015) *Method:* QN-CG *Relevancy:* Direct *Quality Appraisal Rating:* Low (some risk of bias) to Moderate (minor risk of bias) *Study Description:* The general public has been informed that the quarantine period for Ebola-exposed people is 21 days. However, there is a small (12% maximum) likelihood that such people might exhibit symptoms, which indicates infectiousness, beyond 21 days. Two online experiments in the United States investigated whether openness in communication to the public about this post-21-day infection likelihood influences public's trust in authorities and risk perceptions. The results suggest that informing the research participants about the small likelihood of post-21-day Ebola	. Trust in authorities, as indicated by the mean of rating scales, decreased as a result of a message openly acknowledging uncertainty. However, the mean ratings remained above the midpoint of the rating scales, and the decrease was very small and was observed in both the treatment group that received the message noting the uncertainty and the control group that did not receive such a message. The level of decrease was slightly more in the treatment group relative to the control group. . The mean level of trust in CDC showed a significant decrease pre to post message in both treatment and control groups. In addition, only in the control group there was significant decreases in trust for local health authorities, the Obama administration, and Congress. . For over 80% of participants, in both treatment and control group, there was no change in level of trust in authorities pre to post message. . Overall, health authorities can provide nuanced messages, which acknowledges uncertainty, as the vast majority of message recipients trust in authorities will not be affected. Open communication about uncertainty can protect people against misperceptions about disease transmission.	<u>Study 1</u> Pre-post design with treatment (N = 1260) and control (N = 153) groups, but participants not randomly assigned to the two groups. Both groups read Message 1 about enhanced screening and monitoring for 21 days of anyone with close contact with Ebola patients in West Africa. The treatment group only read Message 2 that noted the risk that a person exposed to Ebola might develop symptoms after 21 days; control group did not see Message 2 or any substitute message. Risk perception and trust questions (scale 1-5, with 5 = higher trust) were collected after Message 1 in both groups, and then again after Message 2 in treatment group and same intervening time interval in control group. *Mean Change from Pre to Post:* . Trust CDC: Treatment pre to post change M = 3.28 to 3.18, p < .05; Control pre to post change M = 3.38 to 3.37, p > .05; Treatment vs. Control post only M = 3.18 vs. 3.37, p < .05 . Trust Local Health Authorities: Treatment pre to post change M = 2.89 to 2.86, p < .05; Control pre to post change M = 2.89 to 2.88, p > .05; Treatment vs. Control post only M = 2.86 vs. 2.88, p > .05 . Trust Obama Administration:

symptoms did not increase perceived risk and distrust. Thus, communication to the public may want to include unpleasant facts about infectious diseases before these are reported by the media.		Treatment pre to post change M = 2.61 to 2.58, $p < .05$; Control pre to post change M = 2.71 to 2.75, $p > .05$; Treatment vs. Control post only M = 2.58 vs. 2.75, $p > .05$ *Majority Response (% of N) Post Only* . Trust CDC: Treatment vs. Control - no change in response 86.3% vs. 94.8%, $p < .001$. Trust Local Health Authorities: Treatment vs. Control - no change in response 87.4% vs. 94.7%, $p > .05$. Trust Obama Administration: Treatment vs. Control - no change in response 91.6% vs. 95.4%, $p < .05$ <u>*Study 2*</u> Pre-post design with treatment (N = 224) and control (N = 201) groups, with participants randomly assigned to the two groups. Both groups answered questions about trust in authorities (scale 1-5, with 5 = higher trust) and risk perceptions as baseline. Treatment group only read Message 1, which was a proactive communication that explained reasoning behind the 21-day monitoring/ quarantine period and openly mentioned the small probability of post-21-day symptoms; control group did not see Message 1 or any substitute message. Only the treatment group answered the trust and risk questions again. After this, both groups read Message 2, which was a mock news article about a nurse who had experienced a 21-day quarantine without symptoms after treating an Ebola patient, then manifested symptoms on the 30th day, and returned to quarantine. After this both groups responded to the trust and risk questions again.

		Mean Change from Baseline to Post-Message 2 . Trust CDC: Treatment pre to post change *M* = 3.42 to 3.32, *p* < .05; Control pre to post change *M* = 3.24 to 3.05, *p* < .05 . Trust local health authorities: Treatment pre to post change *M* = 3.11 to 3.05, *p* > .05; Control pre to post change *M* = 2.98 to 2.87, *p* < .05 . Trust Obama administration: Treatment pre to post change *M* = 2.40 to 2.34, *p* > .05; Control pre to post change *M* = 2.19 to 2.11, *p* < .05 . Trust Congress: Treatment pre to post change *M* = 1.84 to 1.88, *p* > .05; Control pre to post change *M* = 1.79 to 1.73, *p* < .05 . Trust State Governor: Treatment pre to post change *M* = 2.19 to 2.20, *p* > .05; Control pre to post change *M* = 2.02 to 1.99, *p* > .05 There were no significant effects treatment vs. control. *Majority Response (% of N)* . Trust CDC: Treatment vs. Control - no change in response 79.9% vs. 80.1%, *p* > .05 . Trust local health authorities: Treatment vs. Control - no change in response 76.3% vs. 81.1%, *p* > .05 . Trust Obama administration: Treatment vs. Control - no change in response 82.6% vs. 87.1%, *p* > .05 . Trust Congress: Treatment vs. Control - no change in response 87.1% vs. 89.1%, *p* > .05 . Trust State Governor: Treatment vs. Control - no change in response 83.0% vs. 84.6%, *p* > .05
Citation: Utz (2013)	· Although crisis communication via Facebook resulted in a more positive organizational	A 3 (medium type: Twitter vs. Facebook vs. newspaper) x 2

Method: QN-CG *Relevancy:* Direct *Quality Appraisal Rating:* Moderate/ Minor Risk of Bias *Study Description* In an online experiment in Europe, the study used the crisis scenario of the Fukushima Daiichi nuclear disaster in Japan to investigate effects of medium type (Twitter vs. Facebook vs. newspaper) and crisis framing type (human error caused vs. non-human error caused). The results showed that in general the medium type effects were present more than crisis type effects on primarily perception of organizational reputation and willingness to share messages.	reputation, organizations should not neglect traditional ways of crisis communication. Journalists still fulfill an important gatekeeping function; news from (online) newspapers is perceived as more credible and consequently shared more often on social media. Organizations need an integrated communication strategy that spreads a consistent message across different channels. · Social media users mainly talk about news from traditional media because they interpret traditional media as more credible. Hence traditional media remain important for crisis communication strategy. · Use of social media is now seen as a cue for the willingness of an organization to quickly inform its stakeholders and to engage in dialog with them, and as such this use influences the effectiveness of crisis communication. · Social media will not replace traditional forms of hazard and risk communication but provide another tool to share responsibility of reducing risk, facilitate community involvement and empower people to take action. Social media allow agencies to tap into and review informal communication networks and correct conflicting and inaccurate information	(crisis framing type: human error caused vs. non-human error caused) ANOVA. Respondents in the Facebook condition (M = 3.19, SD = 1.06) and in the Twitter condition (M = 3.07, SD = 1.04) evaluated organizational reputation as more positive than respondents in the newspaper condition (M = 2.55, SD = 1.01), $F(2176) = 4.59$, $p < 0.05$. Participants in the newspaper condition were more willing to share the message (M = 2.88, SD = 1.70) than participants in the Facebook condition (M = 2.68, SD = 1.70) and in the Twitter condition (M = 2.17, SD = 1.61), $F(2176) = 2.84$, $p < 0.10$, with the pairwise difference between newspaper and twitter significant at $p < .05$ Effects of crises framing were not significant for both organizational reputation and willingness to share ($p > .05$).

8.3 Quality Appraisal of and Extracted Findings from English Language Individual Data-based Primary Studies (Quantitative-Descriptive Survey, Qualitative, and Mixed-Method/ Case Study Methods; Organized by Method)

Key to Table
Method: Quantitative-Descriptive Survey (QN-DS); Qualitative (QL); Mixed-Method/ Case Study (MM, CS)
Relevancy: Direct; Indirect; Partial; Unclear
Quality: QN-DS – Strong; Moderate; Low
QL – High; Moderate; Low; Very low
MM, CS – High; Moderate; Low; Very low

Citation (first author)	*Method*	*Relevancy*	*Quality Appraisal Rating*	*Findings*
Besley (2012)	QN-DS	Indirect	Moderate	. Public health agencies in the United States frequently use public meetings for spreading risk communication information to the general public. Thus, views about public meetings and willingness to attend public meetings are important variables to consider; these variables are associated with credibility of local health department, citizen groups, and news media. Health department credibility and citizen group credibility both are positive predictors of views about public meetings; news media credibility, however, is not associated with views about public meetings. . For willingness to attend public meetings, news media credibility was associated with lower intention to engage, suggesting that those who see the media as a useful source of information see less need for public meetings. However, the relationship was not strong. Credibility of health department and credibility of citizen groups did not play a role in predicting willingness to attend.
Boon (2016)	QN-DS	Indirect	Strong	. The strongest predictor of risk perceptions of climate change, including concern about the associated likelihood of severe weather events, in Australia, was trust in climate change communications (comprised of trust in government communication, trust in media communication, and trust in scientists). Across all three research sites, respondents did not trust media communications or government communications relative to communication from scientists.
Freimuth (2014)	QN-DS	Direct	Strong	. During a H1N1 outbreak, a national random survey of the general public in the United States showed that trust of government was low and varied across demographic groups; Blacks and Hispanics reported higher trust in government than did Whites. . Personal health professionals received the highest trust ratings and religious leaders the lowest. Trust in individual spokespersons, however, varied considerably across demographic groups. The most trusted source was one's own physician but even in this case, there were demographic differences; blacks and Hispanics trusted their own physicians less than did Whites. The same

				pattern emerged for the Centers for Disease Control and Prevention, which is the organization most likely to lead a public health response to an infectious disease crisis. Although religious leaders are trusted little in this kind of crisis in general, they are much more trusted by Blacks. . There was low level of trust for local elected officials such as mayors and county commissioners. These individuals almost always emerge as local spokespersons in any kind of crisis, yet these results suggest they may not be very effective in establishing trust and cooperation. Given that local public health officials were near the top of the trust rankings, it would be sensible to use them as local spokespersons, or, at the very least, have them appearing with local elected officials. . Attitudinal and experience variables predicted trust better than demographic characteristics. Closely following the news about the flu virus, having some self-reported knowledge about H1N1, self-reporting of local cases, and previously experiencing discrimination were the significant attitudinal and experience predictors of trust. . Trust in the early stages of the pandemic predicted vaccine acceptance later but only for White, non-Hispanic individuals.
Frewer (2003)	QN-DS	Direct	Weak	. In the United Kingdom for foodborne illness events, information sources were either trusted or distrusted by the general public, independent of the food hazard about which they were providing information: medical sources were highly trusted to communicate about food risks whereas government sources and environmental pressure groups were less trusted and the food industry was least trusted. . However, trust in different information sources may be dependent upon contextual factors, such as time of measurement and specificity of information source. In addition, the public's use of various information sources may also be affected by factors such as the hazard itself, and the extent to which a particular hazard is perceived to be threatening at any point in time during a crisis. This indicates a clear need to investigate trust in information and information sources for specific food hazards. It cannot be assumed that just because an information source is highly trusted to provide information about one hazard this source will be as trusted for another hazard.
Gilles (2011)	QN-DS	Direct	Strong	. During an infectious disease crisis (H1N1) in Switzerland, for the general public, trust in medical organizations, but not trust in government, longitudinally predicted actual vaccination status 6 months later. . Trust in medical organizations, but not trust in government, also predicted perceived efficacy of officially recommended health protection measures (getting vaccinated, washing hands, wearing a mask, sneezing into the elbow).
Janmaimool (2014)	QN-DS	Indirect	Weak	. In Thailand among the public living adjacent to an industrial area, trust in public authorities was related to

				lay understanding of risk assessment uncertainty and event outcome uncertainty. Trust in industrial agencies was related to only lay understanding of risk assessment uncertainty but not event outcome uncertainty. This might be because people do not rely on industrial agencies in terms of receiving health protection as industrial agencies do not have any direct responsibility for providing health care. . Trust in public authorities and trust in industrial agencies were negatively related to environmental and health concerns, indicating that respondents with high trust scores tend to have lower environmental and health concerns. However, trust explained a small proportion of the variance in environmental and health concerns. This can be explained by the fact that environmental and health concerns could also be predicted by other more influential factors, such as experiences, the knowledge and skill of the respondents, readiness to cope with adverse consequences, etc. However, trust still plays an important role in creating a collaborative risk management process and strengthening environmental risk communication. Without trust among stakeholders, public participation in the decision-making process as well as public support in the development of industrial activities cannot be achieved. . It was found that while information related to uncertainty is available to the public, it is not explicitly communicated to lay people. Explicit communication of uncertainty could increase perceived transparency of environmental risk management, thereby contributing to social trust.
Johnson (2016)	QN-DS	Partial	Moderate	. In the United States during an infectious disease (Ebola) event, for the general public, trust in CDC as a predictor showed that trust in CDC predicted attention to Ebola news and Ebola exposure knowledge. Trust in CDC did not predict perception of personal risk but did predict perception of US/global risk (lower trust, higher perception of risk). . Trust in CDC as an outcome showed that trust in CDC was predicted by attention to Ebola news, low political conservatism, and being a Democrat. In the subsample analysis, only being a Democrat (relative to other, non-Republican partisans) and exposure knowledge remained significant predictors of trust. Adding additional variables significantly increased explained variance, with communitarianism (low individualism) being significant predictor of trust.
Kjaernes (2006)	QN-DS	Partial	Weak	. In several European countries and the United Kingdom for a foodborne illness (salmonella in chicken), for the general public, the ranking of various actors in terms of trustworthiness was identical. From highly trusted to not trusted, the order was: consumer organizations, food experts, public authorities, the media, farmers, supermarkets, the processing industry, and politicians. The findings indicate that people have a very clear perception of roles, distinguishing basically between

				actors who have direct commercial interests and those who have a more independent role.
Maeda (2003)	QN-DS	Partial	Moderate	. In Japan for general public health events, for the general public, perceptions of trust with regard to industry, municipal government, and citizens groups showed the following: Competence shown by the organizations affects people's trust in them; openness and honesty shown by the organizations affects people's trust in them; concern and care shown by the organizations affect people's trust in them; and commitment shown by the organization indirectly affects trust in the organization. . People's concern with risks affects their trust of industry and trust of municipal government, but not trust in citizens groups; perceptions of consensual values affect trust in municipal government and trust in citizens groups, but not trust in industry; and sympathy for the organization indirectly affects trust in the organization.
Paek (2008)	QN-DS	Indirect	Weak	. In the United States for an infectious disease event, among the general public, showed trust in government has a multidimensional structure. About half of the respondents believed that the government will protect them from a flu pandemic (trust in general); about 60% of the respondents believed that the government's actions concerning a flu pandemic will be consistent with the respondents' own personal interest (benevolence); and less than half of the respondents were confident in the government's ability to handle a flu pandemic (confidence). . Males had a significantly higher level of trust in government than females; and Hispanics had a significantly higher level of trust in government than Whites and African Americans.
Paton (2008)	QN-DS	Direct	Moderate	. In Australia and New Zealand, for wildfire, earthquake, and volcanic activity, people have high/ low personal familiarity and high/ low information of these events. In the high familiarity/ high information situation, trust in civic agencies was not a significant predictor of intentions for protective behaviors; in contrast, in the low familiarity/ low information situation, trust was a significant predictor of intentions. . Trust in civic agencies was a predictor of intention to prepare along with community participation and perceived benefits of preparation. However, trust in civic agencies was less important when the perceived benefits of preparing for a hazard were low; if people held this belief about the perceived benefits of preparation, issues of trust were rendered redundant. . Trust in civic agencies was predicted by people's ability to articulate problems (articulate/ define issues that are salient to them; capacity to formulate problems and pertinent questions) and empowerment (past experience with a source of information has facilitated their ability to achieve their goals in the past).
Perko (2012)	QN-DS	Indirect	Moderate	. In Belgium and Slovenia, for the general public living in

				areas close to nuclear sites, confidence in the authorities to protect against radiation risks was not a significant predictor for the acceptance of messages communicated by the authorities. Higher prior knowledge and general radiation risk led to greater acceptance of communicated messages.
Rod (2012)	QN-DS	Direct	Strong	. In Norway, for the general public living in villages in the path of potential tsunami, trust in experts predicted willingness to adhere to evacuation instructions.
Rundblad (2010)	QN-DS	Partial	Moderate	. In the United Kingdom for a water contamination event , the local radio station was able to establish itself as a trustworthy information source by being pre-prepared and, during the event, by continuously updating in close cooperation with the water company and the local police. . Family, friends, and neighbors were the second most preferred source along with the local newspaper (which was significantly used by older consumers) and the water company. Personal dissemination networks have been shown to be particularly vital for vulnerable sub-populations, and interpersonal information is often perceived as more credible than official information sources by such populations, and as such message dissemination plans should be revised in order to tap into these networks.
Sharma (2012)	QN-DS	Direct	Moderate	. In India for a rural population in the path of annual cyclones, credibility of a warning message can be improved by communicating uncertainty. This is particularly important as the experience about the credibility of the message in a current hazard event can affect the response to warning in the next future event. . Greater the experience of false alarms, lesser is the tendency to respond to warnings. This normally happens because the forecasts and the associated warnings do not contain information about uncertainty of occurrence of the natural hazard. Forecasts and warnings often get communicated as ‘‘certainty’’ in predictions and when the event does not occur as predicted, it leads to a lack of trust and confidence in the warning or the forecast for the next time.
Siegrist (2005)	QN-DS	Indirect	Strong	. In Switzerland, for general public health events, perceptions of trust and confidence need to be seen as distinct. General trust is the belief that other people can be relied on.; general confidence is the conviction that everything is under control and uncertainty is low. High levels of general trust and general confidence independently reduced perception of risks for technological as well as for non-technological hazards. However, general confidence was a more significant predictor of risk perceptions than general trust.
Su (2015)	QN-DS	Direct	Moderate	. In China, for the public in rural areas in flood prone areas, higher trust in flood control projects and higher trust in monitoring and early warning led to both positive and negative changes in the public’s attitude towards disaster alleviation. Regarding positive changes, residents were

				more willing to invest in upgrading the local flood control projects and monitoring and early warning capability than before, and declared that they were willing to show greater initiative in post-disaster production recovery. . Regarding negative changes, respondents reduced their probability estimation of disaster risk and vigilance in facing the danger of flooding. They believed that having the protection of disaster-prevention measures meant that even hazard-prone areas (such as floodplains) could be used as normal living and production zones; some even trusted the protection projects to the degree that they believed there was a zero probability of a medium disaster and thus reduced their adoption of long-term preparation against disasters. Therefore, the public needs guidance in recognizing the limits and validity of scientific and technological capabilities.
Trumbo (2003)	QN-DS	Indirect	Strong	. In the United States for general public health events (cancer clusters), people living in the cancer cluster areas note three information sources whose credibility is to be assessed: Industry, citizen groups, and state health departments. Higher credibility for industry and state health departments predicts lower risk perception, whereas high credibility for citizen groups predicts greater risk perception. . A path analysis model showed that perceiving high credibility for industry and state health departments, and perceiving low credibility for citizen groups, promotes heuristic processing, which in turn leads to perception of lower risk. In contrast, perceiving low credibility for industry and state health departments promotes greater systematic processing, which in turn leads to perception of greater risk.
Vaughan (2012)	QN-DS	Direct	Moderate	. In the United States for a bioterrorism event scenario with urban minority African American and Hispanic populations showed preexisting trust in government officials to fairly and competently manage the consequences of a terrorist act (as well as prior risk perceptions about the terrorism threat in general) predicted whether individuals reported feeling reassured or fearful after hearing bioterrorism messages about uncertainties in decontamination efforts or reoccupancy decisions. If participants believed that officials would be honest and forthcoming with negative information, they tended to feel less reassured (i.e., more fearful) by the acknowledgment of risk uncertainties. . For African Americans, greater confidence/ trust that officials would provide accurate and timely information was associated with a greater likelihood of feeling reassured when government officials' messages openly referred to risk uncertainties. In contrast, among Hispanics/ Latinos, more confidence that risk information would be accurate and timely was associated with greater reported fear when risk messages acknowledged uncertainties. . A general question about current public trust in leaders

				and government agencies will not be as helpful to improve or modify communications as evaluations of specific components of trust such as confidence in officials' openness and honesty, competence, and expertise in providing accurate and timely information, and fairness in protecting all individuals regardless of social status or ethnic/ cultural background.
Viklund (2003)	QN-DS	Direct	Moderate	. In the United Kingdom, France, Sweden, and Spain, for radiological risk perceptions in the general public, there was a linear negative relationship between general trust in authorities and perceived risk (lower trust, higher perceived risk). However, in some countries (especially in the United Kingdom) trust was a significant variable in explaining perceived risk, while its contribution was close to negligible in other countries (i.e., in Spain and France). Furthermore, the strength of the relationship across the countries was dependent on the type of risk, with nuclear risks more affected by trust than other risks. . Although general trust in authorities was a significant source of variation in perceived risk across countries, most of the variation in perceived risk remained unexplained. Thus, although trust in authorities may be an element in models explaining risk perception, it is not as important as often as it is noted in the literature.
Weerd (2011)	QN-DS	Direct	Strong	. In the Netherlands, for an infectious disease pandemic event, for the general public, during the course of the pandemic, the public's trust in the government decreased significantly, but still remained in the higher range (greater than 60%). At the start of the pandemic, the most reported reason to not trust governmental information was the perception that information was incomplete, kept secret, or withheld. In later periods in the course of the pandemic, the majority believed that the situation was exaggerated; other reported reasons were the perceptions that the government provided unclear information and that the government's information contradicted itself. . Higher levels of government trust were positively related to an intention to accept vaccination, but not to an intention to adopt protective measures such as extra hygienic precautions. . Health care workers and municipal health services were perceived as the most trusted information sources during the course of the pandemic.
Alipour (2015)	QL	Indirect	High	. In Iran, for people living in earthquake prone rural areas, distrust of the government and non-government aid groups was related to problems with recovery efforts in previous earthquakes. Undermining of trust in government was due to mismanagement/ inefficiency/ incompetence (at both national and local levels) of aid in previous events. Similarly, non-targeted unorganized donations by non-government groups for previous earthquake events led to distrust of such efforts for future events; aid was given by such groups to easy-to-reach villages or people who pretended to need much more aid.

Anthony (2013)	QL	Direct	High	. In the United States as foodborne illnesses crises unfold, audiences engage in a thoughtful process of considering the credibility of multiple sources offering information and recommendations. Audiences avoid rushing to judgment when considering the multiple arguments surrounding crises; audiences remain "in waiting" for what they consider the most accurate account of the crisis and of the best actions to take to protect themselves. Source credibility serves as a primary means of resolving the contest among multiple voices typical in crisis communication. . The visibility, impartiality, and well-known dependence on the appropriate application of the scientific method made CDC the favored and credible information source.
Bass (2015)	QL	Direct	Moderate	. In the United States, for a radiological event scenario with urban low SES minorities, the possible responses to such an event were largely dependent on how much trust the participants had in the spokespersons responsible for communicating about the event. Most respondents expressed distrust for government agencies, police, and the city mayor. There was doubt about whether official spokespersons would tell them "the truth" about what was happening, or whether the spokespersons would tell them "what they want people to hear to just keep everyone calm." . More trusted information sources included the local hazardous materials teams on the scene, local news media (particularly for the older respondents), local health department, and President Obama. Many also indicated that they would trust their community center director and their neighbors more than the information they heard on the news. Most said they would check with family members or talk with others to get the "whole truth" because the most trusted information sources were neighbors and community leaders. . Resondents who communicated the greatest levels of distrust were also more likely to have doubts about whether they would follow recommendations to stay inside during an event.
Malet (2014)	QL	Indirect	Moderate	. In the United States, a bioterrorism event scenario with the general public, respondents indicated a greater receptiveness to information delivered by local agencies or familiar public figures who were presumed to be more invested in the fate of the community. . Even among members of the public with higher levels of trust in governmental responses, public risk communications announcing minor levels of risk would be rejected as insufficient as the public generally tends to perceive higher risk levels than is warranted by the evidence. . Respondents reacted uniformly negatively to any depiction of policymakers or scientific experts being uncertain or at odds over the most effective remediation approaches or how long it would take to certify that a site had been decontaminated. Rather than seeing an open

				debate as a sign of effective deliberation, respondents instead interpreted this type of transparency distrustfully as incompetence or politics at work.
Meredith (2007)	QL	Direct	Moderate	. In the United States, for a bioterrorism event (smallpox) scenario with urban minorities, five components of trust were noted: Fiduciary responsibility, honesty, competency, consistency, faith, and other. The most prevalent components of trust discussed were honesty and consistency; fiduciary responsibility and competency were discussed less often; and faith was discussed the least. . Honesty and consistency of information from public health officials were the components most frequently identified as determining trust or distrust. Patterns of trust varied according to the scenario stage; honesty was most important upon initially hearing of a public health crisis, whereas fiduciary responsibility and consistency were important upon confirmation of a smallpox outbreak and the ensuing public health response. . Respondents had strong concerns about the completeness of information as well as accuracy of information. Government and public health officials were viewed as withholding information, making them less trustworthy compared with personal health clinicians (nurses, doctors). . Respondent concerns about consistency centered on the need for obtaining information from multiple sources and on comparing different messages to see if they were similar. Most common behavioral response was watch and wait; most respondents opted to watch and wait for more information in order to trust it. For watch and-wait decisions, consistency was very important, though all components of trust were mentioned.
Petts (2004)	QL	Partial	Low	. In the United Kingdom, for an infectious disease, parents (mostly mothers) of young children displayed critical trust, which is that people can rely on a person or institution for knowledge and information but combine this with a healthy skepticism. While the parents relied on institutions for knowledge they combined this trust with healthy skepticism as to whether they were being given impartial, unbiased advice and hence they continued to constructively question the correctness of the information. Trust was not simply an issue of competence but a combination of competence and care and a vested interest dimension. . As long as a health department is not equated with 'the Government', i.e. in this case the body that curtailed choices, it might be viewed as trustworthy. Much trust research has tended to refer to 'government' with no distinction between different modes and agencies of government. . Doctors and general practitioners were seen as independent and knowledgeable trusted information sources. These health experts had a twin role: to be an up-to-date expert and to help translate the science into

				people's personal context.
Quinn (2008)	QL	Indirect	Moderate	. In the United States, a bioterrorism event with postal workers and public health professionals showed that the media presented the doubts about the vaccine expressed by various organizations and the disagreements about definitive recommendations among public health experts, which led to the respondents having a distrust of the vaccine. When the vaccine was offered to the respondents, many unanswered questions about the vaccine remained and public health officials had already lost trust and credibility. . The use of a consent form, which is required for an investigational protocol, also eroded confidence of respondents in accepting the vaccine. Respondents believed that they would be taking personal risks in using the vaccine without clear answers about the benefits to them. . In times of great uncertainty and with highly diverse audiences, having multiple voices may be useful. However, professionals or agencies in disagreement should join together to discuss in public the rationale and processes by which they come to their conclusions to build trust.
Wray (2006)	QL	Direct	Moderate	. In the United States, a bioterrorism event (anthrax) scenario with underserved urban and rural communities showed that public perceptions of the government can be classified into the following domains: Confidence in government preparedness; allocation of resources; expectations of government; honesty; disclosure; dedication/ commitment; and caring/ empathy. . General lack of confidence in the government's ability to respond was associated with concerns about preparedness, lack of disclosure, and dedication. . Past experience with authorities contributed to perceptions of trust. Local officials and emergency responders were more trusted than federal officials, and were associated with greater levels of disclosure and empathy. Also trusted were the United States Centers for Disease Control and Prevention (CDC), United States Federal Emergency Management Agency (FEMA) and the American Red Cross (ARC). . Urban communities were more concerned about officials' honesty; whereas rural communities were concerned about resource allocation. . There should be integration of local and federal agencies in emergency response preparedness and communication; and an emphasis on full disclosure, action steps, and leadership in emergency response communication.
Bitsch (2014)	MM, CS	Indirect	Low	. In the United States and Germany, for foodborne illnesses, the apparent association of high media coverage and reduction in purchases of the contaminated food items suggest that consumers trusted the governmental authorities, and followed their recommendations during the outbreaks of the foodborne illnesses.
Haynes	MM, CS	Direct	High	. In the Caribbean during a volcano eruption event, the

(2008)				public viewed friends and relatives as the most trusted source for volcanic information; high trust in this source allowed competing messages to reinforce beliefs of lower risk than were officially being described. Scientists were the second most trusted group by the public and considered significantly more competent, reliable, caring, fair and open than the local authorities. Local authorities and the world press were the least trusted. . Scientists were viewed by the authorities as a highly trusted expert source of volcanic information. Reliability (consistency and dependability), competence (the ability and skills to do a good job), openness (openness in providing all of the relevant information) and integrity (morality to do the job for honorable reasons) were the key dimensions for trust in scientists by local authorities and general public. . Trust was found to be dynamic over the course of the event, influenced by political factors and history, and the changing level of volcanic activity.
Karan (2007)	MM, CS	Partial	High	. In Singapore during an outbreak of an infectious disease (SARS), the traditional mass media continued to play a very important and credible role in health communication; despite the use of new media including social media, traditional media such as newspapers, news on television and radio continued to be the more popular channels that people depended heavily on for information and continuous updates.
Maeno (2014)	MM, CS	Direct	Low	. In Japan, for a radiological event (Fukushima), respondents initially trusted the Japanese government messages but as time went on, this trust was eroded. Trust might be unconditional in the beginning of an event, but can be eroded by poor communication as the event progresses. The main reasons for the loss of trust appeared to be: Lack of evidence to support claims there would be no health effects; conflicting information; delays in information; and messages changing. . Despite widespread access to the Internet, social media, and mobile telephones, most participants relied on television news for information about the health risks, and the negative television news coverage may also have contributed to low trust.
Mei (2013)	MM, CS	Indirect	Moderate	. In Indonesia, during an volcanic eruption, over 70% of evacuees believed or strongly believed in the government and volcanologists, which may have contributed to a largely successful evacuation from the eruption zone.
Rousseau (2008)	MM, CS	Indirect	Moderate	. In Canada and France, during an infectious disease event (H1N1), medical information phone line personnel noted that rapid changes in information, conflicting information, and gap between information conveyed by the media and the health authorities about immunization led to the public's distrust of information and authorities. Failure to involve family doctors in the immunization further reduced the trust. . The relative credibility of the different circulating

				discourses was directly linked to public trust in the immunization. When health professionals, experts, and politicians, had clear coordination among themselves and with the media, there was higher trust. However, exaggerating the risks and minimizing the population's agency can undermine health authority credibility. . Politicians and health authorities were generally distrusted in France; the main reason at the root of this distrust was the government's previous minimization of the health hazards associated with Chernobyl, indicating that shattering public trust in different health-related issues may have a crossover effect years later when facing a pandemic. . Levels of public trust were, however, highly variable and were context-specific between the two sites.
Voorst (2015)	MM, CS	Partial	Moderate	. In Indonesia, for low SES people living in flood prone areas, there are different ways/ styles for handling risk, and these risk-handling styles were influenced by trust in other actors and the government. Generally there was mistrust in aid institutions and local politicians, and trust in local groups and patrons. . Mistrust was shaped by past, disappointing experiences and also by a worldview that they developed on the basis of these experiences. They refused support that was offered to them by the local government not because they underestimated the threat that a flood poses to their well-being but because they highly distrusted the intentions of the government institution that offers them aid during and after a flood event. . Need to take into account the whole living environment which is uncertain due to poverty; risk for flood is just one among many other risks. In such uncertain living circumstances, it would be unrealistic to interpret their behaviour as a direct response to a single, acute hazard.