

The current state of the evidence: Mapping the evidence and systematic reviews

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2.6.1 Learning objectives

To understand the importance of the following when considering the current state of the evidence and systematic reviews as a source of information for research in health emergency and disaster risk management (Health EDRM):

1. The essential elements of Health EDRM as they pertain to various stages of the emergency management continuum.
2. The current level of research and available evidence to standardize the application and practice of these essential elements in Health EDRM.
3. The optimal modalities for generating additional evidence for elements currently deemed deficient.
4. The barriers and difficulties in conducting systematic reviews and research during emergencies and disasters.

2.6.2 Introduction

The impact of natural hazards in human and economic costs has increased considerably in the past two decades, raising a global alarm. Furthermore, there are concerns about the adverse effects of extreme weather and climate change, which call for an all-hazards approach to emergency and disaster risk management. The United Nations (UN) Secretary-General's Special Representative for Disaster Risk Reduction (DRR), Mami Mizutori, said on 23 July 2018: "Every year disasters cost the global economy an estimated US\$ 520 billion, displacing millions of people and pushing many of them into poverty. Reducing economic losses from disasters has the power to transform lives" (1). Health EDRM research has an important role to play in meeting these challenges and concerns.

The public health impact of emergencies and disasters includes direct and indirect mortality and morbidity, trauma, injuries and disability. Health systems are also adversely impacted through damage to health infrastructure (2) and over-burdening of health systems in the wake of increasing demand for a variety of health services. Due to the urgent nature of emergencies or disasters, health behaviours and actions surrounding them tend to be adaptations of regular practices during non-emergencies. Issues arise when the existing infrastructures, communications, and resources are disrupted, and application of those regular practices become unrealistic, impractical or unfeasible. While best practices should be the gold standard during times of crises, it is crucial to identify lessons learned and evaluate which are most beneficial (3).

Current literature is largely focused on individual emergency events and short-term consequences, and tends to be limited to only one sector. The shift in paradigm from reactive to proactive Health EDRM, applied through the lens of an all-hazards approach and multi-sectoral perspectives, means evidence has to be systematically generated and validated in order to support a whole-of-society and risk-based approach (2). Despite Health EDRM being at the intersection of health and DRR, it is still an emerging field in both practice and academia (Chapter 1.2). It encompasses emergency and disaster medicine, DRR, humanitarian response, health systems resilience and community health resilience (4). Furthermore, policies and programmes which cover the disaster management cycle are not always fully evidence-supported. For example, the Humanitarian Response Review (5) commissioned by the UN identified serious gaps in humanitarian action and made recommendations to ameliorate the situation.

Given that all humanitarian interventions occur in inadequate circumstances, a critical factor that compounds knowledge and evidence-generation is the partial or total collapse of the systems for routine information collection and analysis (Chapter 2.4). This is commonly observed in events of structural, social, and political instability (6). The poor reliability and validity of information coming from compromised or incomparable information systems within an affected area further hampers the ability to monitor trends to determine the effectiveness of interventions, and be able to prioritize reliably and allocate resources efficiently (Chapter 2.7). There is also rarely sufficient real-time evidence to show whether the humanitarian situation is improving at the level of the crisis as a whole (6). Table 2.6.1 gives an overview of health response topics which are currently supported by evidence; table categories are adapted from an invited paper published by the WHO Regional Office for the Eastern Mediterranean (7).

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Table 2.6.1 Delineated interventional areas across Health EDRM by current status of the evidence base

Status:	Essential element of Health EDRM programmes:
Operational and fully standardized	<ul style="list-style-type: none"> Water and sanitation Nutrition Communicable diseases/surveillance/EWARS Essential medicines Partners/cluster coordination Humanitarians accountability Surveillance EWARS/Outbreak investigation and control
Not fully operational	<ul style="list-style-type: none"> Assessments Sexual reproductive health Human rights and protection Mental health Education and training (humanitarian services providers) Emergency preparedness Risk prevention and mitigation Hazards/vulnerability analyses Emergency risk communication Sexual harassment in humanitarian programmes and service delivery (staff and services' beneficiaries) Psychosocial first aid All-hazards approach
Seriously deficient	<ul style="list-style-type: none"> Real-time evaluation Health systems resilience/recovery Operational readiness Ethics of research in health emergencies and disasters Inter-sectoral coordination (health sector with others)
Absent/Missing	<ul style="list-style-type: none"> International Health Regulations (IHR 2005) Disaster and development paradigm and linkages

Unfortunately, it is wrongly assumed that all disaster risk management has been, and will be, based upon scientific evidence (7). Further complicating the global application of knowledge is when the evidence generated is region-specific, the peculiarities may not be applicable to other cultures. Furthermore, where 'lessons learned' exercises and epidemiological research based on individual projects or crisis-led efforts do exist, and may be beneficial, a lack of systematic reviews makes it difficult to validate and assess the strength and direction of evidence for applicability in other disaster scenarios.

2.6.3 Research Rationale

Randomized trials are the most reliable way of generating evidence on the effects of interventions to guide and improve policy and outcomes in health (Chapter 4.1). Unfortunately, controlled experiments have inherent limitations and challenges for humanitarian settings, arising from, for example, the immediacy of urgent, life-saving health needs, security concerns, and marginalized status of affected populations make it difficult to gather informed consent. Nevertheless, repeated occurrence of humanitarian crises and use of remedial interventions do provide opportunities for 'practice-based evidence'. However, this does not guarantee learning or improvements for the next crisis because no two crises are exactly alike. Cultural variations may also render interventions with documented successes in one crisis, inapplicable in the next. Furthermore, without explicit practice and training to create change, people may resort to old practices, even when these are not supported by evidence.

Systematic reviews can help to identify the most efficient and effective practices during different phases of the disaster management cycle. Providing standardized summaries of the vast volume of existing studies can enable evidence-based practices for preparedness and operational readiness plans to be introduced for on-the-ground responders, field coordinators, funding bodies and policymakers to incorporate into action (6–8). This is especially relevant to disaster literature as it is largely made up of observational and descriptive studies (such as cross-sectional or case control studies) which may not determine causality (9–10). Traditional hierarchies of evidence are heavily influenced by biomedical experimental designs, but some of these study designs may be unsuitable for disasters due to the lack of a controlled environment and ethical implications (Chapter 3.4). Gaps in practices can also be identified to guide future research, establish standardized methods of data collection and seek out methods for information dissemination (6, 10). Systematic reviews can also help with the engagement of different sectors by identifying key roles in how they directly and indirectly impact health (11).

2.6.4 What are systematic reviews?

Systematic reviews are robust studies which identify existing research to comprehensively answer a research question. This is done by methodically identifying eligible studies through critical appraisal to distinguish high from low quality evidence. The use of stringent guidelines and checklists can reduce selection and publication bias, validate statistical associations and causality and identify research gaps. The overall balance of evidence is essential for good decision making because a single study may be too specific in terms of its sample population, context, and the time it was undertaken to provide a more general application.

Three main types of systematic review are discussed in this chapter: quantitative synthesis (via meta-analysis), narrative systematic reviews and qualitative synthesis. Whichever type of review is chosen, two important sources of methodological guidance should be considered: Cochrane (Case Study 2.6.1) and the Joanna Briggs Institute (12–13).

Case Study 2.6.1**Cochrane and the Cochrane Database of Systematic Review (CDSR)**

Cochrane (formerly known as the Cochrane Collaboration) is an international organization that promotes evidence-informed health decision-making. It is internationally recognized as one of the leaders in the production of high-quality systematic reviews. It does not accept commercial or conflicted funding for any of its reviews and has four goals: producing evidence; making evidence accessible; advocating for evidence; and building an effective and sustainable organization. It produces well-respected and widely used guidance on the conduct of systematic reviews (14).

As of January 2020, there were more than 8000 full systematic reviews available in the Cochrane Database of Systematic Reviews (CDSR) (15) which is available at www.cochranelibrary.com. There are five main types of Cochrane Review:

- Intervention reviews, which assess the benefits and harms of interventions used in health and social care and policy.
- Diagnostic test accuracy reviews, which assess how well a diagnostic test performs in diagnosing and detecting a particular disease.
- Methodology reviews, which address issues relevant to how systematic reviews and clinical trials are conducted and reported.
- Qualitative reviews, which synthesize qualitative evidence to address questions on aspects of interventions other than effectiveness.
- Prognosis reviews, which address the probable course or future outcomes of people with a health condition.

It is crucial that guidance is followed throughout the systematic review to maintain its rigor and to distinguish it from general or scoping reviews. Table 2.6.2 lists the key steps for a systematic review.

Table 2.6.2 Steps and tools for a systematic review

Process	Factors to consider	Common Tools and Resources
Defining the question	Specify the inclusion and exclusion criteria: population, intervention, exposure, outcome, methodology, time of publication, time of data collection, language, geographic location, etc.	PICO mnemonic: Problem/Patient/Population Intervention/Exposure Comparator Outcomes
Conduct the literature review	A search criterion: Search dates, language, location, study designs, synonyms, integrate/controlled vocabulary Information source (Chapters 3.7 and 6.2): Databases, funding agencies, trial registries, citation lists Paywalls Unpublished or grey literature Reference management	General: CENTRAL; EMBASE; EM-BIB; Google Scholar; MEDLINE; PubMed; PsycINFO; Scopus; Web of Science Disaster specific: DisDAT; EM-DAT; ReliefWeb Reference management: EndNote; Mendeley; RefWorks; Zotero
Apply inclusion and exclusion criteria	Remove duplicates Apply specific to titles and abstracts Obtain full articles for those potentially eligible Further apply criteria to the full articles	PRISMA flow chart ENTREQ ConQual COREQ JBI Review's Manual Cochrane Handbook (14)
Create data abstraction and analysis	Critically appraise the studies: internal validity; study methods; participant number, reliability, (comparison) interventions Analysis: effect measure, significance, certainty (such as confidence intervals, p-value), pooled estimates, subgroup analysis (if appropriate)	AGREE II (appraisal) R SAS SPSS STATA Qualitative tools
Presentation and findings	Risk of Biases within study Directness of evidence Heterogeneity Publication bias Journal, conference, oral presentations	GRADE Framework (Grading of Recommendations, Assessment, Development and Evaluations)

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2.6.5 Statistical meta-analysis

Quantitative synthesis (via meta-analysis) involves pooling the quantitative data from multiple independent studies to provide a *cumulative* aggregation of findings about, typically, the effects of an intervention compared with an alternative. In order to aggregate data, homogeneity is a crucial component, whether it is in terms of the population, intervention, comparators or outcomes covered. Regarding analysis, the results are often presented as a forest plot (16), which shows the precision of each independent study and the cumulative findings. Case Study 2.6.2 provides an example of a meta-analysis of mental health and psychosocial support, including forest plots (Figures 2.6.1 and 2.6.2).

Case Study 2.6.2**The impact of mental health and psychosocial support interventions on people affected by humanitarian emergencies (17)**

In 2017, a systematic review was commissioned by the Humanitarian Evidence Programme, a partnership between Oxfam Great Britain and the Feinstein International Center at the Friedman School of Nutrition Science and Policy, Tufts University in the USA. It describes the impact of mental health and psychosocial support (MHPSS) interventions on people affected by humanitarian emergencies, using both meta-analysis and qualitative synthesis methods.

Figure 2.6.1 shows the statistical meta-analysis of the impact of MHPSS on PTSD. Some studies show MHPSS interventions have a better impact than the control situation, while other studies suggest the reverse. The cumulative estimate of effect indicates that when the data from the 21 studies were pooled, the MHPSS programmes have a positive but small effect on PTSD. In contrast, Figure 2.6.2 shows that the cumulative estimate of effect of MHPSS interventions on anxiety, based on six evaluations, is neutral. This led the authors of the meta-analysis to conclude that these programmes have no impact on anxiety.

The review's narrative synthesis analysis on gender showed that "overall, the findings reported from these studies were mixed, with no clear pattern across types of intervention or outcome". It summarized eight studies narratively, comparing and contrasting their findings.

Qualitative synthesis was also conducted, and five themes were identified which can influence the effectiveness of MHPSS interventions: community engagement, sufficient number of trained MHPSS providers, experience of programme activities, benefits of group-based programmes, and building trust and supporting relationships. This identification of areas which are influential can help future interventions be better implemented and point out areas for greater emphasis by service providers.

Figure 2.6.1 Forest Plot and Pooled Standardized Mean Difference (SMDs), 95% confidence interval (CI) and weight (W) of 21 controlled evaluations of the impact of MHPSS interventions on PTSD amongst people affected by humanitarian emergencies

Measure: continuous: d (Hedges g)

Heterogeneity: $Q = 206$; $df = 27$; $p = 0$; $I^2 = 86.9\%$; tau-squared = 0.29

Random effects model: -0.463 (-0.689, -0.237)

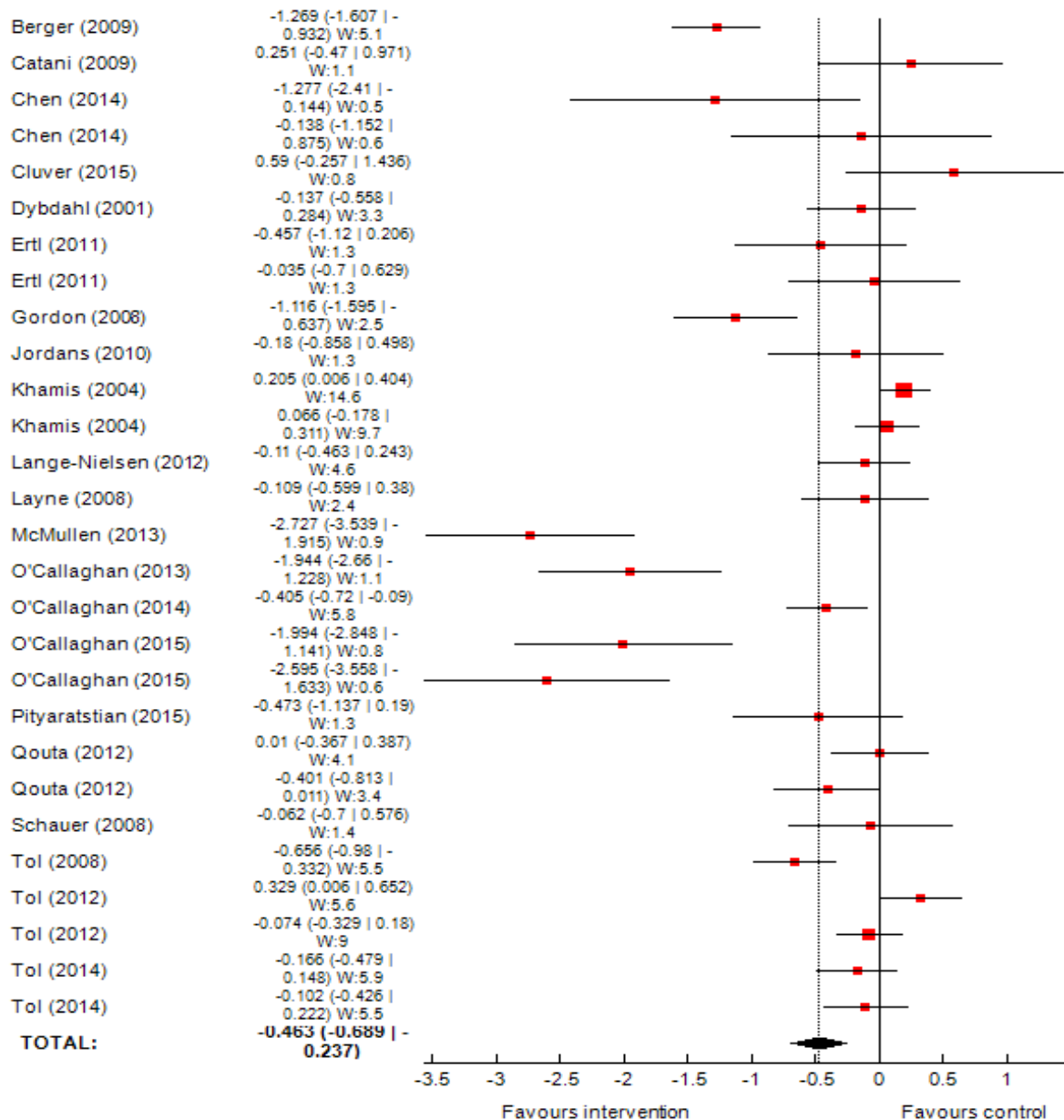
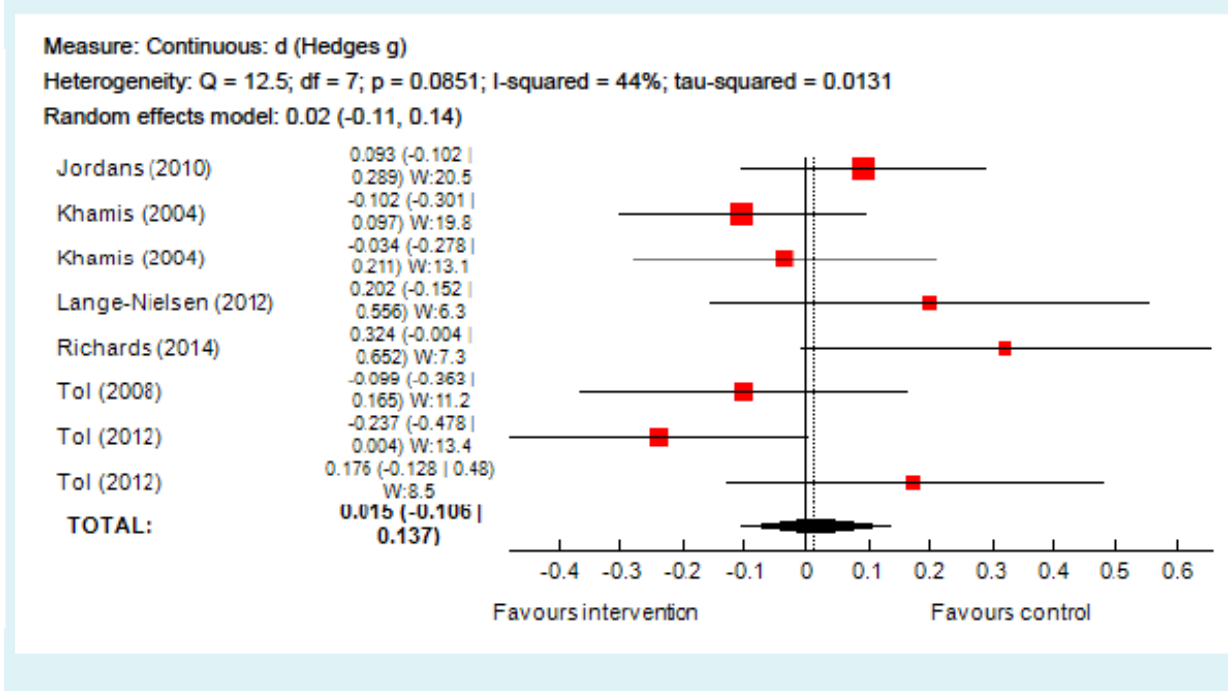


Figure 2.6.2 Forest Plot and Pooled Standardized Mean Difference (SMDs), 95% confidence interval (CI) and weight (W) of 8 controlled evaluations of the impact of MHPSS interventions on anxiety amongst people affected by humanitarian emergencies



In a forest plot (such as those in Figures 2.6.1 and 2.6.2), the solid vertical line represents no difference between the effects of the intervention and the comparator ('the trunk') and each study ('leaf') is shown to be either side of it. Each study is represented by a square to estimate the effect size for the intervention and a horizontal line for its 95% confidence interval. The cumulative estimate of effect, represented by the black diamond shape at the bottom of the figure, indicates the overall balance of the evidence from all pooled results of the individual studies.

Although most meta-analyses of the effects of interventions rely on randomized trials (Chapter 4.1), some use other evaluation designs that have varying risk of bias. These include quasi-experimental designs such as interrupted time series analysis, matched comparisons, regression discontinuity design, and difference-in-differences (Chapter 4.5) (18–19).

2.6.6 Narrative systematic reviews

If the studies collected for a systematic review do not meet the criteria of homogeneity, they are often analysed using more descriptive and narrative methods of synthesis. Narrative systematic reviews use words and text (rather than cumulative statistical estimation) to summarize and explain the findings of the included studies. In effect, they ‘tell the story’ of the available evidence by describing and analysing the population, intervention, comparator and outcomes measured, and by undertaking descriptive and inferential statistics on each study individually. They might also help to develop a theory of how the intervention works, why and for whom, and can often provide preliminary synthesis of the findings of included studies (20). This method of systematic review is prevalent in disaster literature due to the variety of stakeholders surrounding disasters, accessibility of data sources and a lack of comparable research tools.

2.6.7 Qualitative Synthesis

Evidence from qualitative studies are systematically reviewed using analytical methods of synthesis appropriate to qualitative methods and data (21–24). Qualitative synthesis reviews evidence that has been gathered using in-depth interviews, focus groups, observational studies, ethnography, documentary analysis, oral histories, and case studies (Chapters 4.12 and 4.13). Rather than seeking statistical generalizations, it identifies common themes, concepts and principles across different studies (25). It also gives detailed attention to the contexts in which studies were undertaken and tries to identify the contextual specificity of findings, including those that influence or determine the effectiveness of an intervention. By providing evidence from the viewpoints of providers and recipients of an intervention, local and cultural factors that influence the uptake, implementation, and impact of an intervention may be identified. Such information can help users to understand why, how, and under what conditions an intervention is likely to achieve the desired outcomes, as well as the barriers to, and facilitators of, achieving those outcomes.

2.6.8 Health elements: the current state of evidence

Most systematic reviews in Health EDRM use narrative or qualitative synthesis. This is largely because of the heterogeneity of the study methodologies and the small sample sizes, which limit the data available to be pooled. Even within the same topic, different definitions, measuring tools, and timeframes mean that studies cannot be directly compared (26–27). While the lack of high quality data is often attributed to the volatile nature of disasters, it may also be due to the sensitive nature of the contents (such as gender-based sexual violence) or limited by language, whether the definition of terminology or differences in the language spoken/written. Some of the common themes and barriers to researching violence in disaster and humanitarian settings are described in Case Study 2.6.3.

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Case Study 2.6.3**Existing evidence from systematic reviews on violence in disasters**

The topic of violence is complex, especially when the trauma may still be ongoing. Studies on physical violence have found that men have repeated exposure to violent acts, whereas women and children tended to witness the violence – although this relationship changes for sexual violence (28–29). Women are the main victims of gender-based sexual violence (GBV), but a scoping study showed there is insufficient evidence on how to support men who are sexually victimized (30).

Research on child abuse and family violence may provide suggestions on prevention and intervention strategies. For example, parental trauma experience, substance abuse, mental disorder and history of child abuse were found to be risk factors for parents abusing their own children. The intergenerational cycle of violence, such as the use of physical discipline, coupled with environmental stressors such as disruption of family structure, food and shelter insecurity, and poverty all contribute to abusive behaviour (31–33).

Common barriers for systematic reviews on violence are the lack of consensus and definition in terminology, which includes terms like ‘torture’, ‘(sex) trafficking’, ‘sexual exploitation’, and abuse (29–30). Studies tend to be small because of the associated stigma and willingness to disclose such events and there is inconsistent use of validated outcome measurement tools making it difficult to compare, contrast and combine studies. Health outcomes of violence are also mostly about mental health, and physical health outcomes such as injury or disabilities are rarely reported; there are few evaluations of GBV interventions (31, 34). A single study of sexual exploitation by humanitarian workers that studied peacekeepers across 36 international missions suggested that sexual exploitation and abuse was more likely to be reported for host countries with lower GDP per capita (35).

A scoping search of systematic reviews published after 2005 using the key words: health, disaster, and emergencies, found that most were carried out in the Global North and only included papers written in English. Exceptions were on earthquakes (Asia), armed conflicts/humanitarian crises (Middle East and Africa), and H1N1 (China) (36–38). Disasters that garnered wide media attention also dominated the available research, such as Hurricane Katrina, the 9/11 World Trade Center Attacks and the Wenchuan Earthquake. Reviews on natural hazards are largely focused on physical health outcomes, while human induced or complex humanitarian emergencies focus on mental health and psychosocial wellbeing. Only four meta-analyses were identified: two on mental health interventions; one on sexual exploitation and abuse among peacekeepers; and one on earthquake-related injuries (17, 35, 38–39).

The most common contents in the reviews are health epidemiology and outcome. These include prevalence and incidence of disease, injury and mortality, particularly for natural hazards such as earthquakes, floods, and storms (40–41). Mental health research has also seen a large increase in recent years, especially on the prevalence of PTSD. More attention has

also been given to disaster responders (42–43), and there has been a shift from research on refugees and internally displaced peoples in armed conflicts towards their health during seeking asylum and resettlement (28, 44–45). Reviews on topics which have established response protocols, such as communicable diseases, have fewer recent systematic reviews unless they are about disease outbreaks (such as Ebola). Topics highlighted by the Sendai Framework, such as non-communicable and chronic disease, have garnered more publications but few systematic reviews and a reliance on observational studies (46).

2.6.9 Barriers

One of the main barriers to conducting systematic reviews is the shortage of high-quality studies to review. A lack of transparent methodology, terminology definitions and rigorous criteria cause many studies to be excluded from the final analysis (47). The difficulty of doing large studies is a constant disadvantage for research in a disaster, and this coupled with inconsistencies in the reported outcomes makes meta-analyses difficult or impossible. The availability of personnel to conduct field research is another barrier. In many cases, those who are responding to the disasters are also the researchers. This division of labour often means that research becomes a secondary priority (9). To make it a top priority, dedicated research personnel should be established separately and well before a disaster's onset to ensure both priorities are met. As a field-based topic, Health EDRM should also consider publications from the grey literature, such as reports from non-governmental and inter-governmental organizations (Chapter 6.2).

This may be particularly true for research done within organizations, because the findings of such research are usually kept in-house. Dissemination through academic journals and conferences are primarily channels for researchers, and systematic reviewers will need to look for relevant evidence in other communication channels, including in languages other than their own.

2.6.10 The future of systematic reviews for Health EDRM

The future of systematic reviews for Health EDRM lies in identifying the most efficient methods of data collection, which includes having standardized data collection tools. Since systematic reviews provide a less biased and more statistically powerful analysis of currently available evidence, there should also be a consensus as to how often reviews on the same topic should be updated. Research should be tailored to the needs of the affected communities. For example, mental health is a broad topic that has international traction, and the focus on PTSD may exclude other aspects of mental health (such as anxiety-related diseases or other psychosocial comorbidities) that are associated with exposures to multiple hazards.

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2.6.11 Conclusions

Humanitarian crises are growing in frequency, magnitude, and scale, in addition to the increasing globalization connectivity, and premature urbanization. When coupled with warnings over the hastening of adverse impacts from climate change, there is an increasing imperative that remedial elements and corresponding interventions along the emergency continuum are evidence-based, predictable, standardized, and afford the maximum efficiency and effectiveness. There also needs to be accountability if and when the interventions are not properly implemented. However, the evidence base for Health EDRM is currently variable at best, affecting standardization and predictability and which hampers accountability. To have a standardized Minimum Data Set for core outcomes will greatly facilitate interoperability across different health systems and nations by hastening data availability. That in turn will lead to a more optimal application of sound and effective interventions in health emergencies, All of which should be based on reliable and timely evidence from systematic reviews of good quality research.

Despite limitations and challenges posed by paucity of information, and concerns over the reliability and validity of information available, a large body of literature has been produced on project and crises-specific interventions covering various elements of Health EDRM and their impact. Systemic reviews need to be done to assess the strength, relevance, and utility of this body of literature for improving Health EDRM.

2.6.12 Key messages

- o **Many challenges hamper the generation of evidence and its accurate and consistent application in Health EDRM. Practitioners who are aware of evidence limitations may not have the necessary training or skills to design, plan, implement and evaluate their programmes. They may also lack the training to discern programmatic and practice-based problems that could be turned into research questions for new studies (Chapter 3.5).**
- o **People in low-income, resource-poor countries and settings may disproportionately suffer from the 'double jeopardy' of lacking the critical mass of trained researchers and practitioners, coupled with limited or non-existent opportunities for interaction between researchers and practitioners in Health EDRM.**
- o **Strong leadership will be required from global and regional entities, including donors, with a strong stake in Health EDRM to bring together the main groups required for the generation and use of evidence: the Health EDRM practice community to identify needs and problems requiring research; the academic sector to conduct high quality research; and agencies and donors to bridge the science into practice and application gaps.**
- o **Systematic reviews provide the means to bring together existing evidence to inform these processes and to place the findings of new studies in the context of the totality of the evidence. They will allow decision makers in Health EDRM to make use of the best available evidence.**

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