Introduction

1.1 Introduction

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1.1.1 The rationale for this Guidance

As the world and its population face ever-increasing challenges from emergencies and disasters of all kinds, the policy-makers, practitioners and community actors involved in health emergency and disaster risk management (Health EDRM) need to be able to access, understand and use the relevant evidence in order to be able to make decisions, develop strategies, and take actions that are well informed, effective and efficient in reducing health risks and consequences, thus alleviating suffering, saving lives and reducing the associated social, economic, environmental and cultural impacts. This evidence needs to come from reliable research, which has been robustly designed, well conducted and properly reported. This evidence will inevitably also highlight the need for new research to resolve ongoing uncertainties and fill knowledge gaps, and so Health EDRM decision makers and practitioners will also need to become involved in the generation of research and build effective collaborations with the research community.

Developed following extensive peer-review by multi-national, multi-disciplinary teams of people, the aim of this book is to:

- improve the quality of research in Health EDRM
- improve the quality of the policy, practice and guidance that is supported by evidence from this research
- increase research capacity among researchers and the research community, including new researchers, experienced researchers and teachers of research, and

- strengthen the collaboration and engagement between the research community and policy-makers, practitioners and stakeholders for improved Health EDRM.

The unique collection of chapters contained in this book provide straightforward, practical guidance on how to plan, do and report a wide variety of studies that can answer quantitative and qualitative questions in different settings, with specific emphasis on health-related disasters. Case studies of direct relevance to Health EDRM provide real-life examples of research, to illustrate the methods and their impact.

1.1.2 The context to this Guidance

The main driver for this book – which arose from the work of the WHO Thematic Platform for Health Emergency and Disaster Risk Management Research Network (Health EDRM RN) – is the shared aim of Health EDRM stakeholders to reduce the risks and consequences for the many millions of people worldwide whose health is affected by emergencies and disasters each year.

The context to the book emanates from the WHO Health EDRM Framework and the identified need to strengthen research and the research community, as described in the aspirations of the Health EDRM RN (see Chapter 1.2): The Health EDRM RN recognized the need to promote high quality research methods to those who commission and conduct research on Health EDRM, as well as the wide range of decision makers practitioners and community actors who need to use this research to inform evidence-based policies, programs and practice. It reflects the need for evidence-based policy and practice to implement the Health EDRM Framework, Sendai Framework on Disaster Risk Reduction 2015–2030, the International Health Regulations (2005), the United Nations (UN) Sustainable Development Goals (SDGs) and other relevant global, regional and national frameworks in health and other sectors.

The book provides guidance across a wide range of research, taking a systematic approach to discuss the type of research that is needed to generate relevant evidence for managing risks and consequences of emergencies and disasters. This research includes observational and experimental studies, and those that use qualitative or quantitative data, or both. When using the book, readers are encouraged to take account of the specific setting of the health risks of any emergency or disaster, including national capacities and the impacts that are directly and indirectly health-related.

The chapters have been written by a wide range of more than 100 international authors with practical experience and expertise in a wide range of areas – including research, practice and policy making – and peer reviewed by experts with a similar breadth and depth of knowledge. Each chapter provides signposting to further reading or sources of information that go beyond the issues that can be covered in a single chapter.

1.1.3 What you will find in this book

The chapters of the book are organized into six sections:

1. Introduction
2. Identifying and understanding the problem
3. Determining the scope of your study
4. Study design
5. Special topics to demonstrate research processes and benefits
6. How to become a researcher.

The book begins with an overview of the Health EDRM framework and the role of research (Chapter 1.2) to explain the context, followed by a historical review of the impact of emergencies and disasters on public health and the development of Health EDRM policies, focusing on Japan as a case study (Chapter 1.3).

Sections 2, 3 and 4 cover three major aspects of the research process: (i) identifying and understanding the problem that needs to be studied; (ii) determining the research question and developing a scoping study; and (iii) designing and conducting the main study.

The book concludes with a section on the practicalities of becoming a researcher and a glossary to explain terms that might be unfamiliar to some readers.

The first step in identifying and understanding the Health EDRM problem that needs to be studied is to investigate the underlying epidemiology: Chapter 2.1 describes some common impacts of emergencies and disasters on deaths, injuries and other health problems. This is discussed in more detail in Chapter 2.2, in relation to measuring the health impacts of emergencies and disasters. Chapter 2.3 discusses the assessment of burden of disease in general, while Chapter 2.4 describes various databases and registers relevant to the study of disaster epidemiology. The challenge of identifying and obtaining data from high risk groups is discussed in Chapter 2.5, and Section 2 ends with a discussion of the use of systematic reviews to identify, appraise and synthesize existing, relevant research studies (Chapter 2.6).

Once we have a good understanding of the problem that needs to be studied, Section 3 leads us on to the planning of research process. This might include asset mapping to show what resources are available for the research or to help measure its impact (Chapter 3.1), identifying risk factors (Chapter 3.2) and designing an intervention to test (Chapter 3.3). It is also important to consider the ethical implications of conducting research (Chapter 3.4). Researchers then need to finalize their research question (Chapter 3.5) and, if necessary, conduct a scoping review (Chapter 3.6), drawing on the information available in existing collections of research relevant to disasters (Chapter 3.7).

When the research question is clear, the appropriate study design must be chosen to answer it. Chapter 4.1 discusses the importance of this, outlining some of the study designs that are available, with a particular focus on using randomized trials to assess the comparative effects of different interventions, actions and strategies. Chapter 4.2 provides an introduction to the statistics that are likely to be used in many of the studies. Some of

the more challenging issues related to study design and statistics that might be used when individual randomization is not possible are tackled in Chapter 4.3 (cluster randomized trials), Chapter 4.4 (collection and management of high quality data) and Chapter 4.5 (advanced statistical methods). The use of modelling techniques is discussed further in Chapters 4.6 and 4.7, with the focus of Chapter 4.7 being economic evaluations. Chapter 4.8 introduces the potential for geographic information systems to help with disaster health research and Chapter 4.9 does similar for real-time syndromic surveillance systems. Part of the planning for any research may include a need to understand the pathway from actions to outcomes (Chapter 4.10) and to plan for the communication and implementation of the findings of the research (Chapter 4.11). In some circumstances, the most appropriate type of research will be a qualitative study or one that employs both qualitative and quantitative methods in a mixed methods design; these are discussed in Chapters 4.12 and 4.13 respectively. Chapter 4.14 shows the potential advantages of taking the opportunities presented by natural variations, by using a natural experiment design. Section 4 concludes with a chapter on monitoring and evaluation studies (Chapter 4.15).

The special topics presented in Section 5 include disaster mental health research (chapter 5.1), the use of crowdsourcing to gather data (Chapter 5.2), and research with refugees and internally displaced populations (Chapter 5.3) or indigenous people (Chapter 5.4).

Section 6 is dedicated to some of the important practical aspects of conducting research relevant to Health EDRM, beginning with some of the steps that will help someone become a successful researcher (Chapter 6.1). Chapter 6.2 covers the identification of existing literature that might help in becoming a researcher or designing a new study. Chapters 6.3 and 6.4 outline key things to consider when preparing an application for funding and obtaining ethical approval for a study, while Chapter 6.5 highlights specific issues encountered in relation to doing research in the field. Chapter 6.6 provides guidance on writing up and publishing the report of the study. Finally, Chapter 6.7 concludes the book with some more examples of the types of research that have been done in Health EDRM.

1.1.4 Key messages

Evidence is vital to well-informed decision making in Health EDRM. The research that provides this evidence must be high quality and fit for purpose. This book aims to provide guidance for researchers, would-be researchers, policy-makers and practitioners in order to:

- improve the quality of research in Health EDRM
- improve the quality of the policy, practice and guidance that is supported by evidence from such research
- increase research capacity among researchers and the research community, including new researchers, experienced researchers and teachers of research, and
- strengthen collaboration and engagement between the research community and policy-makers, practitioners and stakeholders for improved Health EDRM.

1.2 Background: Health EDRM and research

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1.2.1 Introduction

Over recent decades, a number of risk drivers – including unplanned urbanization, unmitigated climate change, weak health systems and conflicts – have resulted in increased risks of emergencies and disasters *(1)*. The impacts of emergencies and disasters on human health have also become more severe, in part due to the role played by increasing exposure and vulnerability, such as poverty, people living in risk-prone areas, and changes in the social dynamics and age profiles of communities. The toll taken by emergencies and disasters on people's health is profound, often persisting well after the headlines fade. Between 2008 and 2017, disasters caused by natural hazards affected an average of nearly 200 million people a year, caused nearly 70 000 deaths annually and led to economic losses of more than US$160 billion annually *(2)*. Many tens of millions more are affected by conflict *(3)*. Some emergencies and disasters are large, and become national, regional or even global crises – these range from cyclones and drought, to conflicts and major disease outbreaks. However, more localized emergencies – such as traffic crashes, landslides and fires – can also be devastating in their collective costs to human lives, livelihood and health.

Too often, health emergencies and disasters set back a country's development, sometimes for decades, jeopardizing universal health coverage (UHC) along with the country's other development agendas. They shatter the aspirations of children and adults, destroying the communities they live in or call home. Health emergencies and disasters can overwhelm health systems and decimate the economies that fund them. The various actors in health and other sectors who are engaged in trying to prevent hazardous events and their health effects and then stopping them from becoming emergencies or disasters – by preparing for their occurrence,

responding to and recovering from them, must be able to access and use research to inform their decision making, and where uncertainties remain, they must be able to resolve these uncertainties by facilitating new research.

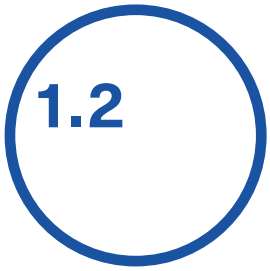
In 2015, the Third UN World Conference on Disaster Risk Reduction established the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework), a global agreement that introduced a framework for action to enhance the resilience of communities, and of health and social systems. The Sendai Framework, which includes more than 30 references to health issues specifically, includes health in its goal of "the substantial reduction of disaster risk and losses in lives, livelihoods and health " *(4–5)*. It also emphasizes the importance of improving the scientific evidence base in order to advance health emergency and disaster risk management (Health EDRM). Reducing the health risks and consequences of emergencies and disasters is one of the most pressing priorities, and is central to achieving the "triple billion" goals of WHO's 13th General Programme of Work, in which WHO aims to ensure that by 2023, one billion more people benefit from UHC, one billion more people have better protection from health emergencies, and one billion more people enjoy better health and well-being *(6)*.

1.2.2 WHO Health EDRM Framework

The WHO Health EDRM Framework, published in August 2019, is a substantial response to this challenge of managing the health risks of emergencies and disasters across the world *(7)*. It emphasizes the critical importance of prevention, preparedness and readiness, together with response and recovery, to save lives and protect health. It also emphasizes the need to work together, because Health EDRM is never the work of one sector or agency alone. It shows how the entire health system and the whole-of-society can and must be fundamental in all these efforts. The Health EDRM Framework also details the clear need for communities to be in the driving seat. Although emergencies affect everyone, those whose situations and circumstances render them the most vulnerable are disproportionately affected (see Chapters 2.5 and 3.2). The needs and rights of the poorest, as well as of women, children, people with disabilities, older persons, migrants, refugees and displaced persons, and people with chronic diseases and other underlying health conditions, must therefore be at the centre of the efforts made.

Reducing the health risks and consequences of emergencies is vital to local, national and global health security and to building the resilience of communities, countries and health systems. Sound risk management is essential in order to safeguard the development and implementation of the SDGs, including the pathway to UHC, the Sendai Framework, the International Health Regulations (IHR) (2005), the Paris Agreement on Climate Change and other related global, regional and national frameworks.

The Health EDRM Framework does not replace these other frameworks, but rather serves as a bridge across them, striving for stronger coherence between them. The Health EDRM Framework builds on past achievements, good practices and the trends evident in health and multi-sectoral



emergency and disaster risk management practices worldwide; it brings together local, national and international work on humanitarian action, epidemic preparedness and response, disaster management and health systems strengthening into a common and inclusive approach.

Many countries have strengthened their capacities to reduce the health risks and consequences of emergencies and disasters by implementing multi-hazard disaster risk management, the IHR (2005) and health systems strengthening. Nonetheless, many communities remain highly vulnerable to a wide range of hazards. Fragmented approaches to the management of risks associated with different types of hazards – including an over-emphasis on reacting to events, instead of preventing them and preparing properly in order to be ready for response – as well as gaps in coordination both within health systems, and between health and other sectors, have hindered the ability of communities and countries to achieve optimal development outcomes, including for public health. The Health EDRM Framework is intended to help resolve such issues by providing a common language and a comprehensive approach that can be adapted and applied by all the actors – in health and other sectors – working to reduce the health risks and consequences of emergencies and disasters.

The Health EDRM Framework also focuses on improving health outcomes and well-being for communities at risk in different contexts, including in fragile settings, and low- and high-resource settings. It places emphasis on assessment, communication and risk reduction across the continuum of prevention, preparedness, readiness, response and recovery. This will help build the resilience of communities, countries and health systems.

Health EDRM is derived from the disciplines of risk management, emergency management, epidemic preparedness and response, as well as health systems strengthening, and draws on the expertise and field experience of many of those who contributed to the development of the Framework. It is fully consistent with and helps to align policies and actions for health security, disaster risk reduction, humanitarian action, climate change and sustainable development. Effective implementation of Health EDRM is therefore critical to achieving UHC in all country contexts.

Health EDRM aims to transform the policy, practice and culture with respect to the management of emergencies and disasters; the change in approach it brings is summarized in Table 1.2.1.

Table 1.2.1 Summary of change in approach through Health EDRM *(7)*

From		To
Event-based	→	**Risk-based**
Reactive	→	**Proactive**
Single-hazard	→	**All-hazard**
Hazard-focus	→	**Vulnerability and capacity focus**
Single agency	→	**Whole-of-society**
Separate responsibility	→	**Shared responsibility of health systems**
Response-focus	→	**Risk management**
Planning for communities	→	**Planning with communities**

1.2.3 The Health ERDM Framework: Vision and Expected Outcome

The vision of Health EDRM is the "highest possible standard of health and well-being for all people who are at risk of emergencies, and stronger community and country resilience, health security, universal health coverage and sustainable development" *(7)*.

The expected outcome of Health EDRM is that "countries and communities have stronger capacities and systems across health and other sectors resulting in the reduction of the health risks and consequences associated with all types of emergencies and disasters" *(7)*.

Health EDRM is founded on the following set of core principles and approaches that guide policy and practice *(7)*:

- risk-based approach
- comprehensive emergency management (across prevention, preparedness, readiness, response and recovery)
- all-hazards approach
- inclusive, people- and community-centered approach
- multi-sectoral and multidisciplinary collaboration
- whole-of-health system-based and
- ethical considerations

Health EDRM comprises a set of functions and components that are drawn from multi-sectoral emergency and disaster management, capacities for implementing the IHR (2005), health system building blocks and good practices from regions, countries and communities *(7)*. The Health EDRM Framework focuses mainly on the health sector, noting the need for collaboration with many other sectors that make substantial contributions to reducing health risks and consequences.

1.2

Health EDRM functions are organized under the following components *(7)*:

Policies, strategies and legislation: Defines the structures, roles and responsibilities of governments and other actors for Health EDRM; includes strategies for strengthening Health EDRM capacities.

Planning and coordination: Emphasizes effective coordination mechanisms for planning and operations for Health EDRM.

Human resources: Includes planning for staffing, education and training across the spectrum of Health EDRM capacities at all levels, and the occupational health and safety of personnel.

Financial resources: Supports implementation of Health EDRM activities, capacity development and contingency funding for emergency response and recovery.

Information and knowledge management: Includes risk assessment, surveillance, early warning, information management, technical guidance and research. This recognizes the need for these capacities to be strengthened to support risk/needs assessments, disease surveillance and other early warning systems, and public communications with the aim of ensuring that "the right information gets to the right people (including communities, practitioners and decision makers) at the right time" and the role of research in supporting the evolution of evidence, knowledge and practice and the development of new interventions and innovative risk management measures.

Risk communications: Recognizes that communicating effectively is critical for health and other sectors, government authorities, the media, and the general public.

Health infrastructure and logistics: Focuses on safe, sustainable, secure and prepared health facilities, critical infrastructure (such as water and power), and logistics and supply systems to support Health EDRM.

Health and related services: Recognizes the wide range of health-care services and related measures for Health EDRM.

Community capacities for Health EDRM: Focuses on strengthening local health workforce capacities and inclusive community-centered planning and action.

Monitoring and evaluation: Includes processes to monitor progress towards meeting Health EDRM objectives, including monitoring risks and capacities, and evaluating the implementation of strategies, related programmes and activities.

The Health EDRM Framework recognizes that information and knowledge management capacities are crucial for effective Health EDRM. This includes the ability to support risk assessments and other forms of needs assessments (Chapters 2.2 and 3.1), disease surveillance and other early warning systems (Chapter 2.4), and public communications (Chapter 4.11). It also seeks to ensure that the collection, analysis and dissemination of information is harmonized across relevant sectors. This requires good quality research, with evidence-based technical guidance to build capacity through training programmes and health systems improvements.

1.2.4 The WHO Thematic Platform for Health EDRM Research Network

In 2018, WHO established the WHO Thematic Platform for Health EDRM Research Network (Health EDRM RN) in order to promote global collaboration among academics *(6–7)*, government officials and other stakeholders so as to generate better scientific evidence to inform policy and practice for managing health risks associated with emergencies and disaster. In 2017, leaders of this emerging research network published review papers on the Sendai Framework implementation and recommendations on Health EDRM research *(8–9)*. These highlighted the critical importance of conducting research before, during and after emergencies and disasters, and not only in the acute phase. Some key themes emerged from the research network's deliberations, including:

- the need for a holistic approach to Health EDRM to ensure that physical, mental and psychosocial health and well-being are addressed;
- identifying populations at risk with specific health needs;
- standardization of needs assessments, standardization of evaluation methodologies and reporting systems for countries, communities and individual cases;
- multidisciplinary and multi-sectoral approaches; and
- a review of research for informing better policy development and implementation.

There was also recognition of the need to reflect the variety of hazards that relate to Health EDRM (Table 1.2.2).

Table 1.2.2 Truncated WHO Classification of Hazards *(7)*

Groups	Sub-groups	Examples of main types
Natural	Geophysical	Earthquake, geophysical-triggered mass movement, tsunami, volcanic activity
	Hydrological	Flood, wave action, hydrometeorological-triggered mass movement
	Meteorological	Storms, cyclones, extreme temperature
	Climatological	Drought, wildfire
	Biological	Air-, water-, and vector-borne diseases, animal and plant diseases, food-borne outbreaks, antimicrobial resistant microorganisms
	Extraterrestrial	Meteorite impact, space weather
Human-induced	Technological	Industrial hazard, structural collapse, fire, air pollution, infrastructure disruption, cybersecurity, hazardous materials (including radiological), food contamination
	Societal	Armed conflict, civil unrest, financial crisis, terrorism, chemical, biological, radiological, nuclear, and explosive weapons
Environmental	Environmental degradation	Erosion, deforestation, salinization, sea level rise, desertification, wetland loss/degradation, glacier retreat/ melting

1.2

To accelerate research in Health EDRM, WHO organized a meeting to identify key research gaps and questions, bringing together leading experts from WHO, the World Association for Disaster and Emergency Medicine (WADEM) and Japan International Cooperation Agency (JICA), and delegates to the Asia Pacific Conference on Disaster Medicine (APCDM). The meeting was organized by WHO Kobe Centre for Health Development as one of the programmes during the Asia Pacific Conference on Disaster Medicine, on 17 October 2018, in Kobe, Japan *(10)*. One of the outcomes of that meeting was recognition of the need to produce guidance on research methods for those who need to use this research, and those who might be responsible for commissioning or conducting research in the future *(11)*.

1.2.5 WHO and research

Research and innovation are vital to WHO as a knowledge-based, normative and standard-setting organization. WHO hosts special research programmes, coordinates multi-country research, and supports research capacity development. It also benefits from over 800 WHO collaborating centres, which are institutions designated by the Director-General to carry out activities in support of WHO's international programme of work. Critical research functions have already been addressed and integrated into relevant strategic priorities: for example, research and development in support of access to and prequalification of medicines for UHC, and coordinating research for emergencies including the development of diagnostics, vaccines and therapeutics for epidemic-prone diseases. Research also forms a foundation for strategic shifts – in conjunction with diplomacy and advocacy, with normative guidance and agreements being based on the best science and evidence. WHO draws upon a wide range of disciplines, from the social sciences to implementation research, and uses its comparative advantage in respect of identifying needs and translating knowledge in order to facilitate research best conducted in research institutions.

WHO also helps to develop and scale up innovative solutions. Innovation can accelerate attainment of the SDGs and the goals in WHO's 13th General Programme of Work. WHO uses various approaches to achieve this: science and technology, and social, business or financial innovation. WHO's most effective role is as a facilitator, addressing barriers to innovation and acting as a "champion of champions" for innovation. WHO also works with partners to identify and coordinate the research, development and innovation needed to better detect, prevent and respond to new and emerging diseases and other hazards that endanger health.

1.2.6 The role of research in Health EDRM

People working in Health EDRM must face many topics about which there is uncertainty. In considering these, it is important to note that the UN General Assembly adopted the definition of disaster risk as "the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" *(12)*.

Uncertainties may arise from limited knowledge, understanding, access to or application of evidence, or the lack of evidence to support decision making and action. This may include uncertainty as to how common problems are, how to reduce the risks of those problems occurring and how to alleviate them if and when they do occur – questions that can be answered through the types of research described in other chapters. Evidence, supported by good quality research, is vital to helping resolve these uncertainties. Without evidence to support their decision making, decision makers run the risk that their actions will do more harm than good.

In some cases, the necessary research may have already been done and is brought together in systematic reviews and guidelines (Chapter 2.7), which can be used to inform decision making and action. Such guidelines must be prepared using rigorous systematic methods and the methods for producing high quality guidelines are now clearly described in, for example, the WHO Handbook for Guideline Development *(13)*. In some cases, practitioners and policymakers in Health EDRM will be able to rely directly on those guidelines, with current examples including the WHO Guideline on Communicating risk in public health emergencies *(14)* and WHO Housing and health guidelines *(15)*. Such guidelines should be underpinned by systematic reviews of existing research evidence (Chapter 2.6) and those producing the guidelines might draw on the output of international organizations dedicated to the production and maintenance of these reviews, such as Cochrane, the Campbell Collaboration and the Joanna Briggs Institute, or organizations, such as Evidence Aid, that collate systematic reviews to produce collections on specific topics, such as malnutrition *(16)* (Chapter 3.7).

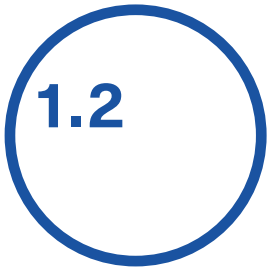
In some areas of Health EDRM, research has already had a substantial impact on decision making, influencing the implementation of effective interventions or the avoidance of ineffective ones, thus improving the health and well-being of individuals and populations. For instance, research brought together in systematic reviews has identified:

- the benefits of vaccination to prevent common diseases *(17)*;
- strategies to improve water quality *(18)*;
- drugs to ease pain *(19)* ways to treat wounds *(20)*; and
- the potential harms of interventions such as brief debriefing to prevent post-traumatic stress disorder (PTSD) *(21)*.

Additional examples are featured as case studies in the chapters that follow.

However, in many cases, decision makers will be faced with an absence of existing systematic reviews or a lack of relevant studies of sufficient quality *(22)*. In these cases, they may need to work with researchers, and collaborators interested in doing research, to design and conduct their own studies *(23).* This book provides guidance on this process by outlining:

- research management processes that will lead to effective and efficient research studies;
- the value of a systematic approach to designing, conducting, reporting and using research;



- how to ensure that research is reliable, robust and fit for purpose, and meets the priority needs of those who will use it; and
- how to implement a research plan and translate its findings in routine, day-to-day practice, policy and programme direction setting.

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1.3 Historical developments in Health EDRM policy and research: the case study of Japan

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1.3.1 Learning objectives

To understand the importance of research evidence for Health EDRM policy and practice, considering Japan as a case study, in order to be able to:

1. Review historical examples of disaster impact and response relevant to health.
2. Discuss how changes in health risks and resilience affect disaster impacts, and how disasters affect health risks.
3. Explain improvements in the methods used to assess and minimize health impacts of disasters.

1.3.2 Introduction

Disaster risk, which is defined as "the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" *(1)*. This definition of risk can apply to all types of hazardous events, including emergencies and disasters. These events are the outcome of the conditions of risk, that is the interrelationship between hazard, exposure, vulnerability and capacity, that are present in a community. This relationship can be expressed as follows:

$$Risk \propto function\ (hazard, exposure, vulnerability, capacity)$$

Disaster risk management relates to efforts to either reduce the hazards, exposure and vulnerability, increase the capacities, or do both.

As a disaster-prone country, Japan has developed a disaster risk reduction (DRR) policy and programme to manage the risks of the large-scale disasters it has experienced through its history, which include earthquakes, tsunamis, typhoons, floods and volcanic eruptions. Although the occurrence of a natural hazard largely depends on geographical and climate conditions, the impact of an event depends not just on the event's magnitude, but also on vulnerabilities and socioeconomic conditions such as poverty and social development *(2)*. Poor infrastructure and limited disaster risk management lead to higher numbers of deaths, injuries and illnesses in the affected population *(3–6)*.The amounts of missing and out-of-date data that reflect the social development and stability of each community should be considered when calculating the overall risk *(2, 7–8)*.

After the onset of a disaster, communities need to put an enormous effort into response, recovery, rehabilitation and reconstruction, as well as into reducing risks and anticipating or preparing for the next hazard event. These cyclical events can spiral into higher levels of risk and worse situations in future unless the aim of "Building Back Better" is achieved, but will worsen if this fails. Research and investment in Health EDRM provide an important means of identifying and managing the risk through these spiral cycles of disasters, and so are identified as priorities in the Sendai Framework *(9)*.

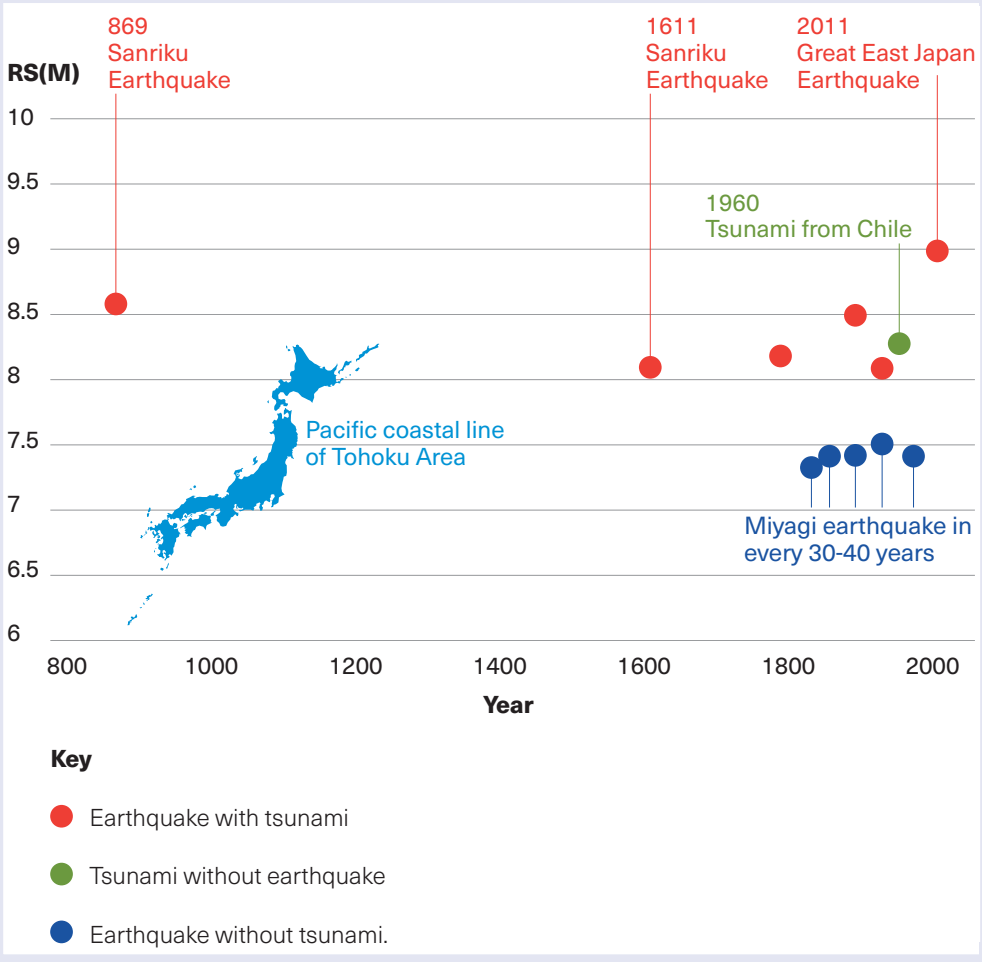
This chapter shows how the environment for conducting Health EDRM research has improved in Japan as a result of historical events *(10)* (see Case Study 1.3.1), and with the transformation and expansion of the country's disaster medical system (see Case Studies 1.3.2 to 1.3.7). These experiences are also relevant to policy and programme development in other countries.

1.3

Case Study 1.3.1
Using the history of disasters to understand disaster risk

Japan has a long history of preserving documents: the oldest historical record of a tsunami is from the 869 Sanriku Earthquake at Japan Trench, with an estimated magnitude of 8.6 *(11)*. The affected area, Tohoku in the northeast of Japan, has since been affected by several more earthquakes and tsunamis, including the 1611 Sanriku Earthquake, and has experienced magnitude 7 earthquakes every 30 to 40 years. In addition, the 1960 Valdivia Earthquake in the Republic of Chile led to a tsunami that killed 142 people and affected nearly 150 000 more in Japan (Figure 1.3.1). These level 2 tsunamis occur every 400 to 800 years, and evacuation has usually been the only way to survive *(12)*. More recently, the region has improved its risk management of earthquakes and tsunamis, by building earthquake-proof housing and longer and taller sea walls, and by drawing on community tradition to educate people to evacuate after strong shaking. Although the 2011 Great East Japan Earthquake resulted in more than 20 000 deaths and displaced 480 000 people, the level of vulnerability reduction and capacity building was not in vain. For instance, seismic-proof buildings that did not collapse and high seawalls, such as that in Taro Town, Iwate Prefecture *(13)*, along with early warning systems and the tradition of self-evacuation behaviour *(14)* all helped to reduce the number of victims.

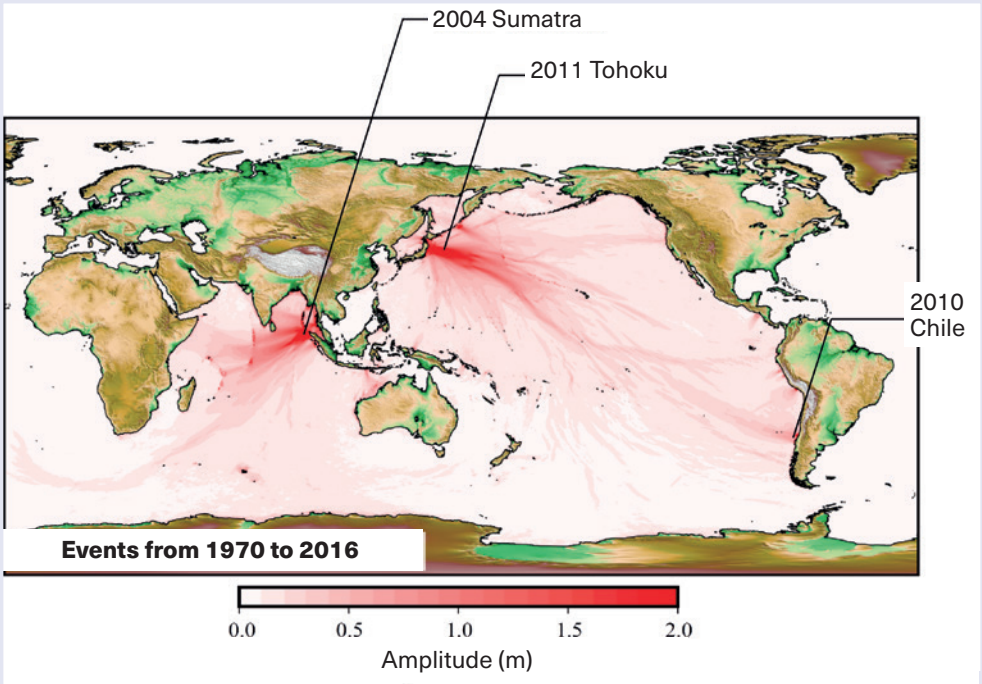
Figure 1.3.1 History of earthquakes and tsunami in the pacific coastal line of Tohoku area, Japan



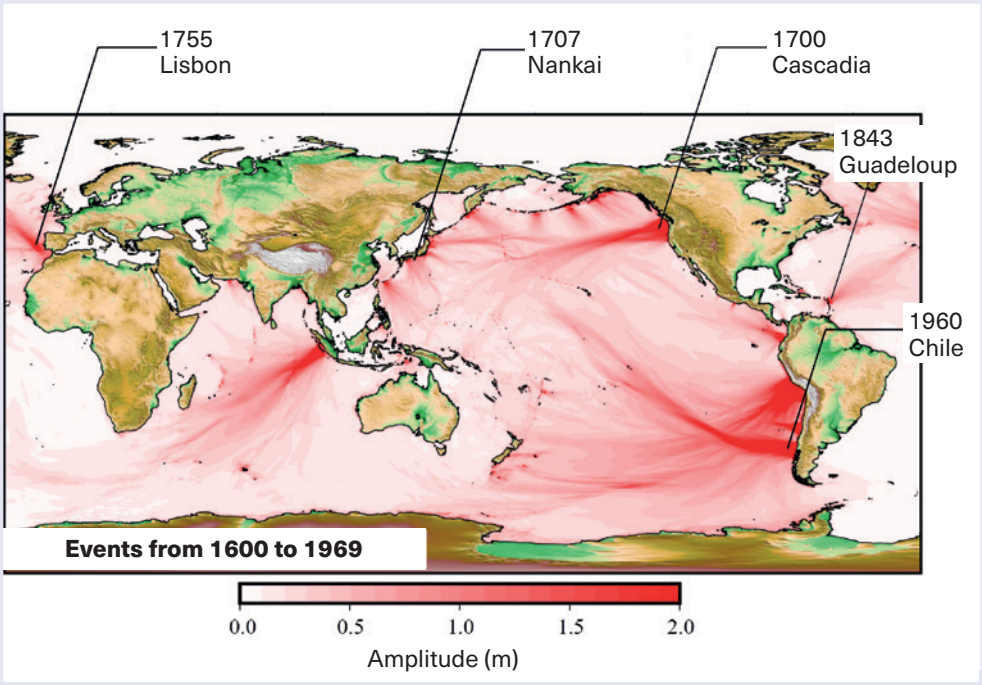
Although tsunamis occurred only in the western Pacific and Indian Ocean from 1970 to 2016, (Figure 1.3.2-A), in the 370 years from 1600 to 1969, major tsunamis had occurred in all areas of the world (Figure 1.3.2-B). This shows the importance of assessing and understanding hazards via historical events, and not relying solely on recent experiences.

Figure 1.3.2 Simulated maximum tsunami amplitude (adapted from *(15)*)

A: 1970 to 2016 (47 years)



B: 1600 to 1969 (370 years)



1.3

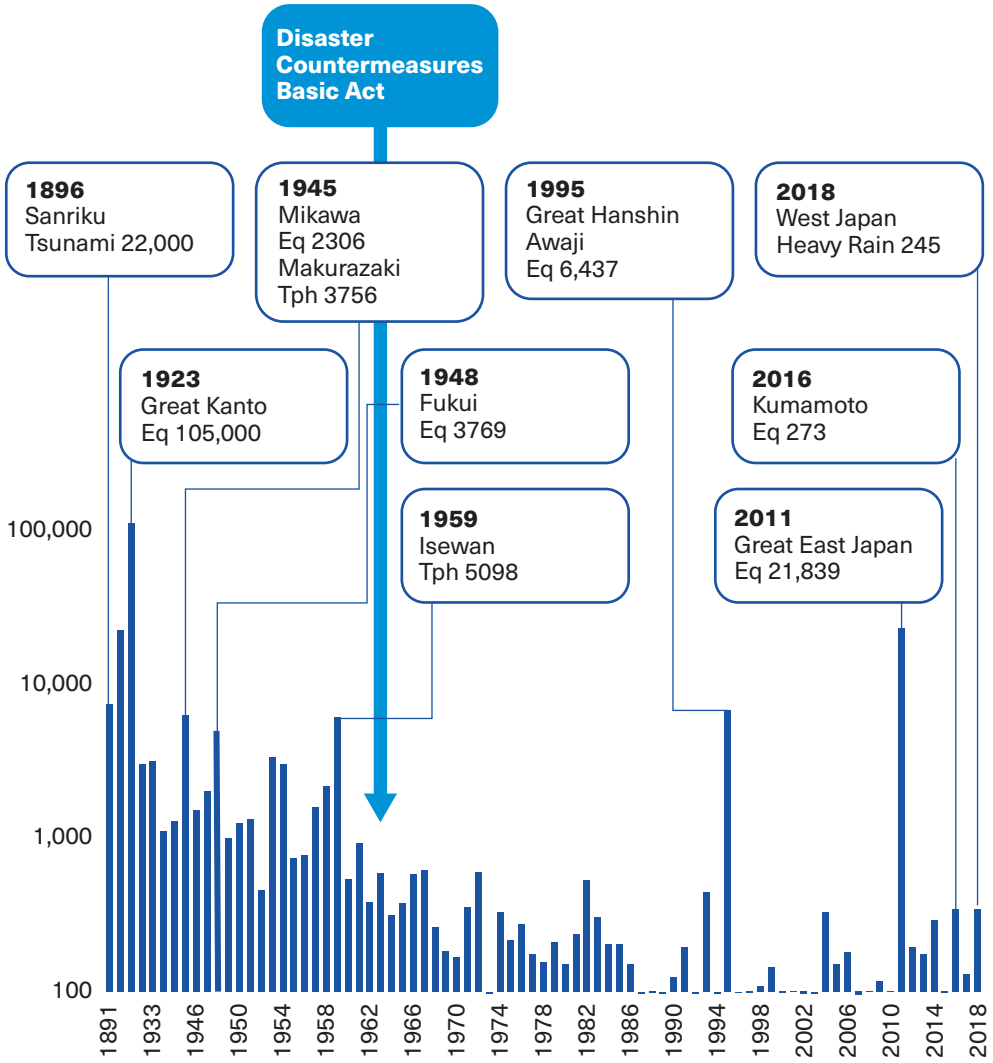
1.3.3 Large-scale disasters prompt policy changes to address health needs

On 1 September 1923, the Great Kanto Earthquake struck the Tokyo metropolitan area and more than 100 000 people were trapped in collapsed buildings or killed by fire. As a consequence, the building code first enacted in 1920 was modified in 1924 to triple the mechanical safety factor. After World War II, Japan experienced several earthquakes and typhoons that killed thousands of people (Figure 1.3.3), leading the Government of Japan to establish the Disaster Countermeasures Basic Act in 1961 (Act No. 223 of 15 November 1961; revised June 1997) and to develop comprehensive and systematic disaster risk management as a national priority *(16)*. Under the Disaster Countermeasures Basic Act, the Government of Japan prepares an annual report, the White Paper, which provides an overview of disasters in Japan, various statistical data and disaster management measures taken by the Government *(17)*.

The building code was revised again several times during the twentieth century, to include regulations to increase lateral seismic coefficient, strengthen reinforced concrete, and set allowable unit stress and horizontal load bearing capacity using evidence from surveillance and research on damaged buildings in earthquakes. After many buildings collapsed in the 1995 Great Hanshin Awaji Earthquake, the current version of the building code was enacted in 2000, requiring buildings to be able to endure at least one violent shake.

The building standard for nuclear reactors was established in 1981 and further modified in 2006. This requires nuclear reactors to be fixed to firm rock bed and countermeasures for possible tsunami inundation. After the 1979 Three Mile Island nuclear power plant incident in the United States of America (USA), the Japan Nuclear Safety Committee established the Disaster Measure around Nuclear Power Plant (Nuclear Emergency Response Guideline) in 1980. Then, after the 1999 Tokaimura critical nuclear incident, that guideline was revised and renamed “Disaster Measure around Nuclear Facility” in 2000. The Nuclear Regulation Authority enforced the current Nuclear Emergency Response Guideline in 2013, after the 2011 Great East Japan Earthquake and Fukushima nuclear power plant incident *(18)*.

Figure 1.3.3 Number of deaths in natural disasters in Japan



Key: Eq: earthquake, Tph: Typhoon.
The number of deaths in the 1995, 2011 and 2016 earthquakes include disaster-related deaths. Adapted from White Paper of Disaster Management *(19)*.

On 17 January 1995, the Great Hanshin Awaji Earthquake (magnitude 7.3) struck the densely populated Kobe City and surrounding area. It caused 6437 deaths and injured nearly 44 000 people, and led to the concept of "preventable disaster death", which is defined as "death occurring during a disaster that would have been preventable under normal conditions of regional health systems" *(20)*. Analyses of the deaths found that 83.3% resulted from crush injuries due to the collapse of buildings and 12.8% were from burns *(22)*. This highlighted the main medical needs in the acute phase (within three days after the onset of the disaster), which were for the treatment of trauma, such as crush syndrome, and severe burns *(22–23)*. However, meeting these needs was especially difficult because 97.8% of the 180 hospitals and 84.0% of the 1809 clinics were damaged *(23)* (see Case Studies 1.3.2 to 1.3.4).

1.3

Case Study 1.3.2
Development of disaster nursing support system

The widespread damage to medical facilities caused by the 1995 Great Hanshin Awaji Earthquake meant that many hospitals and clinics were unable to function. Nurses were one of the main frontline health workers to provide medical support to survivors, but they were also greatly affected by the earthquake themselves. In order to provide the necessary surge capacity, the Japan Nursing Association (JNA) called on volunteer support nurses from across Japan and sent hundreds of nurses to the affected area. The Japan Nursing Association collaborated with Hyogo Nursing Association and the College of Nursing Art and Science Hyogo to coordinate the matching and allocation of volunteer nurses, based on the health needs of local communities. Volunteer nurses were sent to hospitals, elderly care homes and evacuation shelters to serve vulnerable populations, to screen for health problems among evacuees and to improve hygiene in the evacuation shelters.

Following this experience, the Japan Nursing Association established the volunteer nurses dispatching system for the response to disasters. Local nursing associations provide training to nurses willing to support this system and, once they qualify, register them as a Disaster Support Nurse. This system has worked well in several large-scale disasters, including the 2004 Niigata Chuetsu Earthquake, when 400 nurses were dispatched and the 2011 Great East Japan Earthquake, when 3770 nurses were dispatched *(24)*.

To support this initiative by the Japan Nursing Association, Japanese academia has developed disaster nursing capacity building. A national survey in 2005 found that approximately one in nine Nursing Schools in Japan had an independent subject of disaster nursing and 46% included disaster nursing as a part of other subjects *(25–26)*. Globally, the International Council of Nurses (ICN) and WHO have developed the International Council of Nurses Framework of Disaster Nursing Competencies *(27)*, which is being used to educate and train nursing students and professionals around the world *(28)*.

Case study 1.3.3
Development of an acute mental health support system

Since 1995, the Government of Japan has organized annual workshops for disaster mental health, including treatment for Post-Traumatic Stress Disorder (PTSD), which have been attended by 12 000 mental health professionals. Each local prefectural government appointed the participants to contact when there is a need for mental trauma care in an emergency situation. The Government also tasked the National Center for Neurology and Psychiatry with developing a national guideline for community mental health treatment in disasters. This states that most psychological symptoms after a disaster are natural, common and transient reactions; that psychological debriefing was not proven to be effective for preventing PTSD, and that Psychological First Aid (PFA) was the most recommended psychosocial counter measure immediately after a disaster. The guideline was distributed to every local government in

Japan as a basic national principle for the management of post-disaster mental health and has been translated into Thai and Indonesian.

In Japan, under the Disaster Relief Act, it is the governor of an affected local government who is responsible for requesting assistance and rescue from central and other local governments. Since 1995, this has included the dispatch of mental health care teams, composed of psychiatrists, nurses, psychologists, social workers and clerks, who usually rotate over one or two weeks. In the 2011 Great East Japan Earthquake, 57 teams including 3419 members were sent to disaster areas, and worked in close collaboration with the local prefectural and municipal mental health and welfare centres *(29–30)*.

Case Study 1.3.4
Development of a long-term mental health support system

As well as establishing a system for acute-phase mental health response after disasters, Japan has also developed a long-term mental health support system for survivors of large-scale disasters (*31–32)*. In response to the need for mental health support among the survivors of the 1995 Great Hanshin Awaji Earthquake, a traumatic stress care centre was established five months after the earthquake and the Disaster-Affected People Assistance Programme was implemented. This provided nearly 21 000 mental health consultations including more than 17 000 outreach visits and nearly 5000 group activities for survivors during its first five years. In 2004, the centre was reorganized as the Hyogo Institute of Traumatic Stress, becoming the first institute in Japan specializing in PTSD treatment, research and training *(33)*.

Building on the work of this centre, mental health care centres for long-term psychosocial support were also established following the 2004 Niigata Chuetsu Earthquake, the 2011 Great East Japan Earthquake and the 2016 Kumamoto Earthquake. The mental health care centre for the 2004 Niigata Chuetsu Earthquake provided more than 9000 consultations for more than 16 000 survivors in ten years. Three mental health care centres were established after the 2011 Great East Japan Earthquake; in Iwate, Miyagi and Fukushima. In collaboration with local municipalities and local academia, each centre has provided specialized care and support based on local needs, including outreach support, in-house consultation, mental health support for healthcare providers, advocacy for local communities and capacity building. These initiatives also enabled long-term follow up of people at risk of mental health disease, providing important data for research, such as that discussed in Chapters 2.1 and 5.1.

1.3

1.3.4 The National Disaster Medical System

The experiences of the Great Hanshin Awaji Earthquake described in Case Studies 1.3.2 to 1.3.4 prompted Japan to initiate its National Disaster Medical System. This comprises four components to enhance surge capacity for health response during and after disasters, which are shown in Table 1.3.1.

Table 1.3.1 Components of the Japanese National Disaster Medical System

Disaster base hospital	As of May 2019, 743 tertiary hospitals (with multiple hospitals in each of the 47 prefectures in Japan) are designated as disaster base hospitals, with the following requirements: _ Seismic-proof structure _ Emergency supply of power, water, medical gas _ Emergency department, intensive care unit and heliport. _ Business continuity plan (added in April 2019) Disaster base hospitals provide a centre of disaster response in the designated area and host a Disaster Medical Assistance Team (DMAT), composed of its employees, to support affected hospitals. Outside of disasters, disaster base hospitals provide education in disaster medicine to health professionals. The recently added requirement for a business continuity plan aims to strengthen emergency power, water and medical supply based on experience in recent disasters that caused disruption of basic service. All disaster base hospitals had implemented a business continuity plan by August 2019 *(34)*.
Disaster Medical Assistance Team (DMAT)	DMATs are teams of specially trained medical professionals comprising up to five members, including medical doctors, nurses and logisticians, who are able to work together using a single car. As of April 2017, there are more than 1500 teams registered across all prefectures in Japan. In principle, a DMAT would arrive at the affected area within 24 to 48 hours, under the command and control of DMAT headquarters. DMATs assist affected hospitals, health and welfare facilities, municipal headquarters and manage Staging Care Units (SCU) for wide area transportation, including hospital evacuation. DMAT members update their knowledge and skills through periodic training *(35)* and their education programme was revised after the 2011 Great East Japan Earthquake to focus more on communication, coordination and hospital support, including hospital evacuation *(36)*. The initial concept of DMAT was developed in the USA, and the Japanese version of DMAT and Emergency Medical Information System (EMIS) have been implemented in many medical facilities *(37)*.
Staging Care Unit (SCU) and wide area transportation	To reduce the number of preventable disaster deaths, Staging Care Units (SCU) are used to select patients who will be transported to non-affected areas. SCUs are often based at an airport close to the affected area and support coordination between medical responders and transportation agencies. The role of SCU with limited resources can be flexible according to the situation *(36–38)*.
Emergency Medical Information System (EMIS)	EMIS is used to share real-time information among fieldworkers, headquarters and central government. It collects, frequently updates and shares information about the function of disaster base hospitals and other hospitals in the affected area, the status of evacuation centres, field hospitals, DMATs, and road and airport conditions for transportation. The updated headquarters activity plan and record are also shared through EMIS *(37–38)*. EMIS was updated after the 2011 Great East Japan Earthquake to incorporate a geographical information system (GIS) (see Chapter 4.8) in order to allocate the hospitals, clinics, welfare centres and DMATs in real time on a single map to improve efficient data sharing and decision making.

The Japanese National Disaster Medical System improved the health response to disasters and was successfully implemented in several large-scale disasters after its establishment. However, the Great East Japan Earthquake on 11 March 2011 (magnitude 9.0) that affected a wide area of northeast Japan, causing many tsunamis over 10 meters high and leading to 22 252 deaths and 6233 injured people, identified further health needs, especially in relation to the care of vulnerable populations.

As of October 2011, of 380 medical facilities in the three most affected coastal prefectures (Iwate, Miyagi, Fukushima), 191 had totally or partially lost their ability to have in-patients and 205 facilities were completely or partially unable to accept out-patients. Ten facilities were completely destroyed and 290 facilities were partially destroyed *(21)*. The large size of the affected area, the wide variety of population needs and the range of assistance available made clear the need for disaster medical coordinators *(39)*. For instance, disruption to haemodialysis as a result of loss of electricity and water was an emergent threat to life, and so the network of medical doctors related to haemodialysis collaborated successfully with DMAT to organize the large-scale evacuation of 80 haemodialysis patients from the Kesennuma area of Miyagi Prefecture to Hokkaido and 581 patients from the Fukushima Prefecture (154 to Niigata, 382 to Tokyo and 45 to Chiba), providing temporary dialysis before transfer if necessary *(40)*. This led to the inclusion of haemodialysis liaison as an additional component of the National Disaster Medical System.

In the acute phase after the earthquake, particular challenges included providing support for damaged psychiatric hospitals and ensuring safety, food and medicine for hundreds of their hospitalized patients. Although some mental health professional teams voluntarily supported the affected areas, effective support was difficult to implement because of the lack of clear reporting lines or collaboration agreements *(41)*. In response to the need for mental health support for affected people and damaged facilities, the Disaster Psychiatric Assistance Team (DPAT) was established in 2013 *(42–43)*.

Government facilities and the public health workforce were also severely damaged in the 2011 Great East Japan Earthquake. A total of more than 140 000 person days were provided by external local municipality officials to support the affected areas, but the damage to facilities and the loss of officials meant that the host municipalities lost much of their management and coordination capability and could not effectively allocate or utilize the limited resources *(44)*. Therefore, to address the surge needs for public health and logistical management, Disaster Health Emergency Assistance Teams (DHEAT) were developed.

In addition, further health needs, including evacuation support and follow-up rehabilitation for disabled people and the need for special consideration and follow up for maternal and child health were also highlighted in the management of evacuations. These and other follow-up activities resulted in the development of the Japan Disaster Rehabilitation Assistance Team (JRAT) and Mother and Child Health Liaison.

Another of the significant gaps during the 2011 Great East Japan Earthquake was the lack of any standard medical record form for emergency medical teams. Teams from different organizations used

different forms, making it difficult for them to share clinical information. This failure in continuity of care led to the creation of the Joint Committee for Disaster Medical Record of Japan, which proposed a standard disaster medical record form *(45)*. A special feature of this standard recording format is its inclusion of a daily medical report function called J-SPEED (see Table 1.3.2 and Case Study 1.3.5).

The earthquake also highlighted the concept of "disaster-related death" *(46)*. According to the Government of Japan's Reconstruction Agency, as of 21 August 2012 some 1950 people who had initially survived the earthquake and tsunami were confirmed dead due to disaster-induced fatigue, psychological trauma or the aggravation of existing chronic diseases. This concept was further highlighted in the 14 April 2016 Kumamoto Earthquake (magnitude 6.5) where nearly 80% of deaths (218 out of 273, as of 12 April 2019) fell into this category *(46)*. As a consequence, the SPHERE standard *(47)* is increasingly applied to the environmental improvement of evacuation shelters and to the lives of affected people to try to reduce these deaths that are not directly caused by the disaster.

Along with the developments in health response to disasters in Japan described above, there have also been important innovations to improve preparedness for better health response in the acute phase (Case Study 1.3.5) and research to increase health resilience in affected areas (Case Studies 1.3.6 and 1.3.7).

Table 1.3.2 Additional components of the Japanese National Disaster Medical System introduced after the 2011 Great East Japan Earthquake

Disaster medical coordinators	Disaster medical coordinators are officially appointed by prefectures and coordinate the activities of external and internal medical assistance teams to maximize their impact on the medical and public health needs of affected populations through close communication with local stakeholders. Following an initial initiative in Hyogo Prefecture after the 1995 Great Hanshin Awaji Earthquake, by 2011 only four prefectures had designated a disaster medical coordinator but, by 2015, 43 out of 47 prefectures (91%) had designated or were planning to designate such a coordinator *(39)*.
Disaster Psychiatry Assistance Team	Disaster Psychiatry Assistance Teams (DPAT) assist psychiatric hospitals and support surge mental health needs in affected areas after disasters by assessing the local psychiatric needs and collaborating with DMAT and other assistance teams and local psychiatric facilities to provide high quality psychiatric medicine *(43)*. With the support of the DPAT Secretariat, DPAT members update their knowledge and skills through periodic training *(44)*.
Disaster Health Emergency Assistance Team	Disaster Health Emergency Assistance Teams (DHEAT) assist the management function of the public health sector in affected local municipalities, through information collection, integration, analysis and sharing with fieldworkers. Local municipalities (prefectures, special assigned cities and political areas) are recommended to organize Disaster Health Emergencies Assistance Teams with public health professionals *(48-50)*. The operation plan has been developed since 2014 and has been available on the Ministry of Health, Labour and Welfare website since March 2018. Sixteen local municipalities dispatched Disaster Health Emergencies Assistance Teams to the areas affected by the 2018 West Japan Heavy Rain *(44).*
Japan Disaster Rehabilitation Assistance Team	Japan Disaster Rehabilitation Assistance Teams (JRAT) assist, in particular, older people and people with disability from the very early phase of evacuation. JRATs promote conversation with evacuated people, set up slopes and handrails in the evacuation centre or in temporary houses, and provide care and supervision. JRATs also provide temporary support devices and aids to promote rehabilitation of affected people.
Mother and Child Health Liaison	Paediatricians and obstetricians join the disaster medical headquarters team to coordinate mother and child health issues, including perinatal care and mental and physical support of children.
Haemodialysis Liaison	Physicians network to identify people who need haemodialysis in the affected area and coordinate their transportation to areas outside the affected region. This can include the provision of transitional temporary haemodialysis before patients are sent to more distant hospitals *(40)*.
Standard disaster medical record /J-SPEED	The disaster medical record has been standardized and all emergency medical teams use it regardless of their organization. This makes it easier to transfer clinical information among medical providers for continuity of patient care. One special feature of this standardization is a daily medical report function called J-SPEED (see Case Study 1.3.5).

Case Study 1.3.5
Development of health data management systems

Timely and effective data collection during and after a disaster is key for better health response (see Chapter 4.4) and is a large challenge for national Emergency Medical Teams (EMTs) such as DMAT *(51)*. Having experienced these problems after the 2011 Great East Japan Earthquake, a joint committee was established and started a project to develop a standardized format for medical data collection to support effective information collection, sharing and analysis for the following response. This format was developed with reference to the Surveillance in Post Extreme Emergency and Disaster (SPEED) system, developed by WHO and the Ministry of Health of the Philippines *(52)* (see Chapter 2.2).

The newly developed format, referred to as the Japanese version of SPEED (J-SPEED) includes health conditions such as certain chronic diseases, which are more common in Japan *(53)*. It was successfully used by all national EMTs during recent disasters in Japan, including gathering medical data from 8089 consultations during the 2016 Kumamoto Earthquake, 3620 consultations during the 2018 West Japan Heavy Rains and 591 consultations during the 2018 Hokkaido earthquake. It enabled rapid assessment of the health needs of affected people and significantly contributed to the identification of people who required referrals to specialist teams, acute mental health support (who were referred to DPAT), and other specific health responses *(54)*.

This progress has taken place alongside the development of the WHO Emergency Medical Team (EMT) Minimum Data Set (MDS), a standardized medical data collection and reporting system adopted in 2017.

Case Study 1.3.6
Cohort studies to evaluate longitudinal effects of a disaster on affected communities

Many cohort studies have been designed and conducted to evaluate longitudinal effects of the 2011 Great East Japan Earthquake on the affected communities. These studies were established as a collaborative effort between local governments and academic institutes in the affected regions to better understand the health condition of residents. Care and follow-up activities were undertaken to improve the health condition of the affected communities based on the outcome of the surveys.

For example, the Fukushima Health Management Survey is conducted by the Fukushima Prefectural Government and the Fukushima Medical University to alleviate residents' concerns over radiation and facilitate appropriate health care of residents in the Fukushima Prefecture. The surveys assess longitudinal health conditions of people who lived in the Prefecture between 11 March and 1 July 2011 *(55-56)*.

As another example, the Center for Community Health was established in Tohoku University to assess the longitudinal effect of the earthquake on affected communities in Ishinomaki city, Shichigahama town and Sendai City *(57)*. The Shichigahama Health Promotion Project was designed and conducted as a collaboration between Shichigahama town and Tohoku

University. The project team conducted annual surveys and follow-up of all residents whose houses suffered major damage *(58)*.

Knowledge accumulated from these activities can be useful not only for improving the health of residents affected by this specific disaster, but also for reducing exposure and vulnerability, disaster preparedness, response to, and recovery from future disasters. Similarly, using the same or a similar format for the collection of health information for people affected by future disasters will support research consistency and should facilitate ethical approval (see also Chapters 3.4 and 6.4).

Case Study 1.3.7
Long-term follow up using registers and biological data

Tohoku University is one of Japan's leading national universities and is located in the area affected by the 2011 Great East Japan Earthquake. It initiated the Tohoku Medical Megabank Project in order to restore community medical services in the areas heavily damaged by this earthquake and tsunami disaster, and to establish an advanced medical system to meet the global trend towards large-scale medical information technology. The project is executed in corporation with Iwate Medical University and funded by the national Government of Japan.

The earthquake caused catastrophic damage not only to health facilities but also to the health workforce in the Tohoku District. While the reconstruction of health facilities was implemented relatively successfully with support for infrastructure reconstruction, there was a notable decline in the number of medical professionals in Tohoku. This became alarmingly severe in more recent years and recruiting health professionals to work in the re-constructed medical facilities became critical. This urgent need led to a unique project to develop a centre of future-oriented medical services in Tohoku and to make this a driver for attracting medical practitioners.

Through the Tohoku Medical Megabank Project, an integrated biobank was established of biospecimen and information from cohort studies focused on the effect of the disaster on health *(59)*. There are two initial cohort programmes in the Tohoku Medical Megabank Project: (i) the Birth and Three-Generation Cohort Study and (ii) the Community-Based Cohort Study. Both are predominantly targeting the earthquake-affected areas and consist of multiple components including genomic studies. Along with assessment of the effects of the disaster, participants in these studies can contribute to other independent biomedical research to address knowledge gaps relating to differences between those with and without the same illness who lead the same lifestyle, and differences between individuals who are responsive or non-responsive to various forms of exposure. Several reports from the project have already clarified the influence of the disaster on vulnerable populations *(60)*. This project has enabled the long-term follow up of biomedical aspects of disaster-affected people, as well as promoting large-scale research more generally, which will use the voluntary contributions of the study participants to address other areas of uncertainty.

1.3

In Japan, the national Government's disaster management policies are decided by the Central Disaster Management Council, which is chaired by the Prime Minister and includes all Cabinet members. During and after a large-scale disaster, the Cabinet Office is engaged in the collection and dissemination of accurate information, reporting to the Prime Minister, establishment of the emergency activities system (including the Government's Disaster Management Headquarters), and the overall wide-area coordination of disaster response measures. DRR has been carried out using the concept of "Building Back Better" through consultation with scientific experts to help with prediction of hazards, assessment and reduction of exposure and vulnerability, and building of response capacity *(17)*.

Improvements to the National Disaster Medical System is a key part of DRR. Research into Health EDRM is promoted by a grant-in-aid from the Japanese Society for Promotion of Science, Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Health, Labour and Welfare of Japan, while the budget for implementing countermeasures and response comes from the Cabinet Office. Awareness of these mechanisms for research promotion and implementation among researchers is also promoted in order that science and technology can be used to enhance DRR.

1.3.5 Conclusions

The long history of large-scale disasters in Japan and the substantial events of recent decades have provided the country with many opportunities to learn from the past to improve Health EDRM for the future. This has made use of evidence from research of many different types, and has led to the implementation of the National Disaster Medical System. This has continued to be refined as new evidence has accumulated, helping to ensure that disaster risk management, including prevention, preparedness, response and recovery, make an important contribution to the health of the nation, and encouraging partnerships between policy makers, practitioners and researchers to lead to further improvements in the future.

1.3.6 Key messages

- **Health EDRM requires the continual enhancement of policies and programmes using both historical evidence and up-to-date, reliable, scientific evidence from research. This requires high-quality research, which needs capacity building in research methods and timely, accurate and appropriately collected data.**
- **This chapter featured Japan as an example of applying the principle of Building Back Better through its spiral cycles of disasters. The development of health systems and the health workforce over time in response to the health needs identified in emergencies and disasters has improved data collection, assisted the management of survivors and produced a better environment for research and subsequent policy making.**
- **This chapter illustrates how policy development and the enhancement of health systems have built on evidence from before, during and after emergencies and disasters in Japan, and provides a practical example for other countries.**

1.3.7 Further reading

Hazards and health:

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International framework:

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Disaster Medical Needs and Responses in Japan

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