6.1 Health EDRM research in the context of COVID-19

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6.1.1 Learning objectives

1. To understand the impacts of COVID-19 and other concurrent emergencies for health emergency and disaster risk management (Health EDRM), and key challenges and lessons for Health EDRM research in the context of COVID-19.
2. To signpost researchers to other chapters in this book, to help them to plan, conduct and communicate Health EDRM research in the context of COVID-19 and concurrent risks from all hazards, including epidemics and future pandemics.
3. To share case studies of Health EDRM research in the context of COVID-19.

6.1.2 Introduction

The coronavirus disease (COVID-19) pandemic has taken a drastic human toll, and the economic and social impacts of the pandemic continue to reverberate globally *(1-2)*. The pandemic has been described as the greatest crisis of our time and, as of 4:12pm CEST 30 August 2022, the World Health Organization (WHO) dashboard for cases showed that 599 071 265 confirmed cases of COVID-19 including 6 467 023 deaths had been reported to WHO (Figure 6.1.1) *(3)*. In addition, as of 23 August 2022, a total of 12 449 443 718 vaccine doses had been administered.

Figure 6.1.1 WHO Coronavirus (COVID-19) Dashboard as of 30 August 2022, see https://covid19.who.int

The timeline of the initial WHO response to COVID-19 is summarised in Figure 6.1.2, and the following are key points from the first couple of months:

31 December 2019: WHO's Country Office in the People's Republic of China picked up a media statement by the Wuhan Municipal Health Commission that referred to a cluster of cases of viral pneumonia and immediately informed the WHO Regional Office for Western Pacific and WHO headquarters when the incident management system was established.

5 January 2020: WHO issued the first global press release on this outbreak.

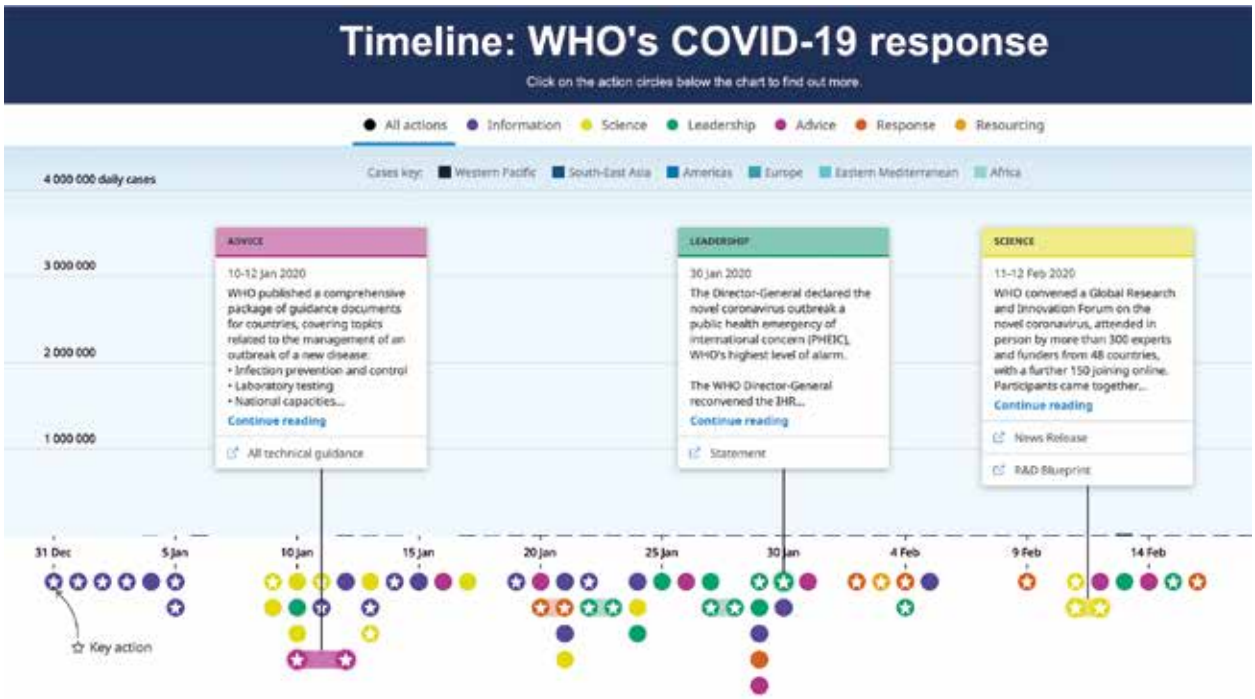
9 January 2020: WHO reported that the Chinese authority had determined that the outbreak was caused by a novel coronavirus.

30 January 2020: WHO declared this outbreak to be a Public Health Emergency of International Concern.

11 February 2020: WHO announced the official name of the virus as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the disease it causes as coronavirus disease 19 (COVID-19).

11 March 2020: as COVID-19 cases were confirmed in 123 countries *(4)* and territories across all six regions of WHO, an Emergency Committee meeting was convened and WHO characterized COVID-19 as a pandemic *(5-6)* and called on countries to scale up their emergency response mechanisms and to take a whole-of-government and whole-of-society approach.

Figure 6.1.2 WHO's COVID-19 response in first six weeks (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline)



The impact and management of COVID-19 in many countries exposed and exacerbated inequalities, and unmasked the inadequate level of preparedness in health systems and in other sectors. The implementation of public health and social measures to control the spread of the virus faced challenges across the world due to the lack of awareness of people, uncoordinated actions of different sectors and unprepared health facilities at large. Although the impact of the pandemic varies from country to country, it will most likely increase poverty and inequalities at a global scale, making achievement of the United Nation's Sustainable Development Goals (UN SDGs) even more urgent *(7)*. As of mid-2021, approximately 115 to 125 million people had been pushed into extreme poverty from the socioeconomic impact of the virus *(8)*.

A UN framework for the immediate socio-economic response to COVID-19 *(7)* identified the following essential work streams which are supported by the UN development system:

1. Ensuring that essential health services are still available and protecting health systems;
2. Helping people cope with adversity, through social protection and basic services;
3. Protecting jobs, supporting small and medium-sized enterprises, and informal sector workers through economic response and recovery programmes;
4. Guiding the necessary surge in fiscal and financial stimulus to make macroeconomic policies work for the most vulnerable and strengthening multilateral and regional responses; and
5. Promoting social cohesion and investing in community-led resilience and response systems.

During the COVID-19 pandemic countries are also facing the burden of concurrent emergencies from many hazards causing public health challenges to the communities and countries, including:

- Infectious diseases such as Dengue in the Western Pacific Region (2021) *(9)*; Ebola in North Kivu Province, Democratic Republic of Congo (2021) *(10)*; measles outbreaks in India, Nigeria, Yemen, United Republic of Tanzania and other countries (2020-2021) *(11)*; polio in Yemen *(12)*; TB globally *(13)* and the mortality of HIV doubled in England *(14)*;
- Natural hazards such as floods, excess cold, earthquakes in Croatia and the Republic of Türkiye, cyclones affecting Mozambique and Bangladesh, floods in Indonesia, hurricanes in Dominican Republic and Haiti;
- Chemical emergencies such as the explosion in Beirut, Lebanon on 4 August 2020 *(15)*;
- Ongoing conflicts and protracted emergencies, including famine and impacts of climate change;
- Societal unrest, violence and unplanned mass gatherings.

An overview of key approaches to the management of COVID-19 risks has identified the need for a wide range of responses from different sectors with a whole-of-society approach led by the government. These include whole-of-government *(16)* engagement including management of patient surges in the community, hospitals and other health facilities; risk management measures at different points of entry to reduce global and community transmission; public health and social measures at all levels; development and deployment of vaccines, diagnostics, pharmaceuticals and medical supplies; and humanitarian response to the pandemic and community-centered action plans. A special program to tackle the infodemic of misinformation about COVID-19 has also been launched by WHO and its partners to address false or misleading information in digital and physical environments with the aim to develop and deliver sustainable tools that health authorities at all levels and communities can use to prevent and overcome the harmful impacts of misinformation (Case Study 6.1.1).

6.1

Case Study 6.1.1 Infodemic management: WHO's special program to address false or misleading information in digital and physical environments during the pandemic

An infodemic occurs when too much information without any evidence to support it causes confusion, leads to risk-taking behaviour that might harm health and causes mistrust in health authorities, thereby undermining public health and other responses. Infodemic management requires the systematic use of risk- and evidence-based analyses and approaches to reduce impacts on health behaviours during health emergencies. Such management includes:

- Listening to community concerns and questions;
- Promoting understanding of risk and health expert advice;
- Building resilience to misinformation; and
- Engaging and empowering communities to take positive action.

Through partnerships, WHO is bolstering digital capabilities and leveraging social inoculation principles to foster improved digital and health literacy, build resilience to misinformation, and deliver innovative ways to reach communities with reliable health information *(17)*. These innovations include:

- Developing a public health research agenda that provides guidance for where to invest in research to better understand, measure and respond to infodemics;
- Establishing the EARS (Early Artificial Intelligence-supported Response with Social listening) tool to help health authorities quickly identify rising narratives and "information voids" that interfere with people getting the information they need to make good health choices *(18)*;
- Preparing a weekly aggregate of publicly available social and news media, web analytics and online search data to identify and understand online infodemic-related conversation patterns;
- Conducting visual network analyses to better understand the ecosystems where misinformation is able to thrive;
- Establishing a repository of more than 200 active?COVID-19 fact-checking groups that verify COVID-19 related claims in more than 40 languages *(19)*;
- Refining an Artificial Intelligence-based infodemic observatory to assess the current status of misinformation and disinformation diffusion in countries and globally levels;
- Convening conferences for the global community to discuss and chart ways forward on infodemic management *(20-21)*.

The COVID-19 pandemic has also identified a range of research challenges and key lessons. These not only include how to define COVID-19 mortality but also many other areas, including assessing the indirect effects of COVID-19 on healthcare delivery and use, and physical and mental health

outcomes *(22)*. For example, although WHO provided a Technical Note on the medical certification, and coding and reporting of mortality associated with COVID-19 in June 2020 *(23)*, the reporting of COVID-19 deaths by UN member states has remained complex because even though they report these to WHO and to the Sendai Framework Monitor *(24)*, they do so using their nationally agreed definitions.

In addition to highlighting the importance of a global system of all-hazards health emergency and disaster risk management including prevention, preparedness, response and recovery, the COVID-19 pandemic accelerated collaboration for the innovation and learning needed to develop response strategies in record time *(25)*. The Research and Development Blueprint for Action to Prevent Epidemics *(26)*, which was developed by WHO after the West-Africa Ebola experience, had already integrated a research agenda in the outbreak management of the WHO Health Emergencies Program. As part of the global response to COVID-19, this Blueprint was further activated to expedite research for the development of diagnostics, vaccines, therapeutics and public health and social measures for COVID-19, and guided the development of the Coordinated Global Research Roadmap for the 2019 novel coronavirus *(27)*. Overall, the COVID-19 pandemic saw the emergence of an ecosystem with enhanced collaboration between basic, translational and implementation research, that facilitated the development of research agenda for COVID-19 and for emergency preparedness, as well as grants to fund COVID-19 related research linked to Health EDRM research by the WHO Centre for Health Development. The pandemic has also accelerated existing global collaborations such as GLOPID-R (Global Research Collaboration for Infectious Diseases Preparedness) which, alongside WHO, worked to identify research priorities needed to respond to the pandemic and supported relevant projects for rapid funding *(28)*. For example, the Solidarity trial, an international clinical trial traversing over 30 countries, was launched by WHO and partners to evaluate potential therapeutics for the treatment of COVID-19 *(29)*. Following this, Solidarity II, another collaboration led by WHO, facilitated a collaborative environment for public health agencies and academia to answer pertinent questions related to the COVID-19 pandemic *(30)*. Initiatives such as these focussed the research agenda on providing the evidence for specific operational support to countries and territories, but many areas of uncertainty remain. These include the best mechanisms to take a whole of society approach in pandemic response, the epidemiology of multiple waves of infectious hazards such as COVID-19, and many other questions about managing pandemics which require further research. The continuing gaps in knowledge on COVID-19 are reflected in a report that provides a summary of the many key initiatives, achievements and lessons from COVID-19. *(31)*

6.1.3 Research in the context of COVID-19

As the SARS-CoV-2 virus and information about COVID-19 disease spread around the world in early 2020, there was a rapid rush to conduct research into the virus and the illness. This research grew considerably over the ensuing months, with large numbers of people and organisations involved in the planning, funding, conducting and reporting of relevant studies. The speed with which research studies were completed and the growth in the

related literature in the time since the virus emerged and the COVID-19 pandemic was declared have probably been faster and larger than for any other single disease outbreak in history. For example, the medical literature database, PubMed, contained more than 140 000 articles about COVID-19 by mid-June 2021 and the landmark figure of 100 000 articles published and indexed in a single 12-month period was reached on 1 February 2021. Even with these vast numbers, it is worth noting that PubMed contains only a subset of the scientific literature (Chapter 7.2), and the total literature produced on COVID-19 is likely to be much larger. The research that has been reported in this literature uses many of the designs and processes discussed in this book among other health research techniques, such as the genetic sequencing of the virus in order to develop vaccines and laboratory or computer-based methods to identify potential therapeutics.

The following section of this chapter describes how some of the principles and guidance outlined in this book can be used for planning, conducting and reporting new research into the health consequences and management of COVID-19 risk, as well as its socio-economic effects which, in turn, can lead to other emergencies. It also reflects the integration of all types of hazards and emergencies including disease outbreaks, epidemics and pandemics in health EDRM. Careful consideration of these principles is important for ensuring that the research carried out addresses important areas of uncertainty and/or evidence gaps and will not waste resources by duplication or irrelevance. Avoiding waste in research is important if the research will not become the equivalence of boxes of useless aid supplies that are 'ineffective' after any large-scale disasters and humanitarian emergencies, because they arrived too late or were not appropriate. The research needs to be relevant and needed, carefully planned with defined objectives and conducted and clearly reported. It needs to cover all aspects of the prevention, preparedness, response to and recovery from the COVID-19 pandemic, including policy, and will include observational and experimental studies, and those that use qualitative or quantitative data, or both. Most importantly, research projects need to answer the questions being asked by the governments and communities they hope to serve.

Choosing the research question and the appropriate study design

Using the appropriate research design should be at the heart of research relevant to the prevention, preparedness, readiness, response and recovery phases of the COVID-19 pandemic and its consequences. This includes studies into transmission, diagnosis and treatment and impact of COVID-19 on health and non-health sectors. Choosing an appropriate study depends on the area of uncertainty that needs to be better understood through the new research and the research question to address this (Chapter 3.5). This requires clarity on the type of evidence that will be needed from the research and how it might be used in policy and practice. For example, the issue may relate to how often patients with COVID-19 will require critical care, why patients with certain co-morbidities are more likely to become infected with SARS-Cov-2 or to develop severe COVID-19 disease, how to prevent, diagnose or treat COVID-19, and the outcomes (both qualitative and quantitative) for patients with COVID-19 and how these might be changed by the use of specific interventions in communities and as well in health facilities. The research might seek to explain what has already happened or to find ways to improve health and

other outcomes in the future, and is likely to require consideration of the impact of different waves of the pandemic in different settings, including the response of the public, healthcare practitioners and others to these waves. Regardless of the type of research or the questions it seeks to answer, it needs to be conducted in an ethical manner (Chapters 3.4 and 7.4) and clearly communicated (Chapters 4.11 and 7.6).

A first step in improving understanding of COVID-19 should be to investigate the underlying epidemiology. This will include the incidence of COVID-19 and its mortality, its impact on health and the determinants of health for individuals, governments and societies. It should also take into consideration the multiple peaks (pandemic waves) of the disease and people's reaction to, and acceptance of, different public health and social measures. This requires research that investigates specific impacts (Chapters 2.1 and 2.2) of the disease and the broader consequences of the pandemic and the associated measures to control it. This will require good quality data (Chapter 4.4) and might draw on routine data that are being collected by health systems (Chapter 2.4). However, it is important to acknowledge the shortcomings in data quality, particularly in the early stage of a pandemic. Such research should include assessments for various subgroups of the population, particularly those in high-risk groups (Chapter 2.5), such as those with co-morbidities, age-related risk factors, poor access to health services and/or marginalised groups.

Some of the resources available for examining the incidence of COVID-19 at a regional or global level include those from the Johns Hopkins Coronavirus Resource Center (https://coronavirus.jhu.edu/data), the European Centre for Disease Prevention and Control (https://www.ecdc.europa.eu/en/cases-2019-ncov-eueea) and the WHO Coronavirus (COVID-19) dashboard (https://covid19.who.int/) (Figure 6.1.1). Research at a more local level might be needed to identify the effects on specific patients and populations, including under-privileged populations, refugees (Chapter 5.3) and indigenous people (Chapter 5.4).

Other important areas for COVID-19-related research will usually include the identification of effective interventions for the prevention, diagnosis and treatment of the disease including COVID-19 risk management in health facilities at different levels particularly in the hospitals, and the measures and actions that might be taken at a policy or programme level. An important focus needs to be on documenting the various aspects of the COVID-19 pandemic that can inform the response to future pandemics. These studies need to be underpinned by careful consideration of the research question to investigate (Chapter 3.5). They should include detailed consideration of the assets available (Chapter 3.1), the development of appropriate interventions (Chapter 3.3) and the use of scoping reviews to help justify the new study (Chapter 3.6). Section 4 of this book contains several chapters that are relevant to designing research into the effects of interventions, which could also be applied in the context of the COVID-19 pandemic and its associated measures. These include evaluations of interventions directed at COVID-19 itself, and at the impact on other areas of health. There will be a need for randomised trials, both at the individual (Chapter 4.1) and cluster levels (Chapter 4.3); careful choice of outcomes (Chapter 3.5), including the use of core outcome sets *(32- 33)*; the use of appropriate statistical techniques (Chapters 4.2 and 4.5),

including for modelling (Chapter 4.6) and economic analyses (Chapter 4.7); and the use of logic models in planning the intervention and its delivery (Chapter 4.10). Qualitative (Chapter 4.12) and mixed methods research (Chapter 4.13) will also be vital to obtaining a full understanding of the effects of the pandemic and interventions that might help to overcome it. Whatever methods are used in the research conducted, given the global nature of the pandemic and its varied impacts in countries, it will be important to consider the means by which multidisciplinary international collaborations can be quickly assembled for planning and conducting the research (see Case Study 6.1.2).

Case Study 6.1.2 Establishing an international and multidisciplinary research team to investigate risk information and negative psychological and behavioural consequences during the COVID-19 pandemic

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As the COVID-19 pandemic rapidly spread around the world, propagation of fear, confusion and mistrust among populations was noted. Communication strategies and media discourse quickly became significant and, as early as February 2020, an international and multidisciplinary project was put in place to contribute to a better understanding of risk information about the COVID-19 outbreak. This was urgently needed to mitigate the negative psychological and behavioural consequences already observed and expected to grow over time *(34)*. The project allowed comparative analyses across eight parts of the world (Belgium, Canada, the United Kingdom, Hong Kong Special Administrative Region, China, New Zealand, Philippines, Switzerland and the United States).

Multinational coordination was facilitated at each step of the project by the WHO Thematic Platform for Health EDRM Research Network (TPRN) (Chapter 1.2). This network promotes global collaboration among academia, government officials and other stakeholders to produce rich scientific evidence to better inform policy and practice in the management of health risks during emergencies and disasters *(35)*. The TPRN allowed a solid team of investigators and collaborators to be built in a timely manner, bringing together a broad range of content and method expertise. This enabled the integration of different perspectives and methodologies in the identification of tailored interventions to counter the spread of health-related misinformation.

This collaboration was particularly sound and productive in the first objective of the project, which aimed to examine how the population of the eight different parts of the world with different governance modes and sociocultural contexts understood and reacted to the COVID-19 outbreak. Using an online questionnaire, the evolution of psychosocial impacts on adults as the pandemic progressed was studied. Many individual and country-level factors were also explored in order to understand their contribution to the evolving psychological response. The online survey was conducted in May/June and November 2020, with a sample of 17 833 adults at the age between 18 and 100. Probable generalized anxiety disorder (GAD) and major depression episode (MDE) were assessed and found to be much higher than in the pre-pandemic era, rising from May/June to November 2020, and positively associated with both pandemic (such as self-isolation/quarantine) and infodemic (such as false beliefs) related risk factors *(36-38).*

6.1

Identifying existing research into COVID-19

Many thousands of research studies relating to COVID-19 have been conducted or are underway. In planning new research, it is important to identify these studies (Chapter 7.2) to avoid unnecessary duplication or waste and to identify important gaps. Several projects have been initiated since early 2020 to track the large number of studies related to COVID-19. These include resources that are attempting to map the global literature on COVID-19, such as that from the WHO with nearly 290 000 records (https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov) by mid-June 2021 and the Living overview of evidence (L·OVE) Platform which contained details for more than 185 000 articles by the same time (https://app.iloveevidence.com/loves/5e6fdb9669c00e4ac072701d). There are also repositories focused on research studies, such as the Cochrane COVID-19 Study Register (https://covid-19.cochrane.org) which contained 66 000 studies by mid-June 2021 and the GLOPID-R and UKCDR Research Tracker, which provides an overview of research projects mapped against the priorities identified in the WHO Coordinated Global Research Roadmap *(39)* and had reported on more than 10 000 studies by the end of April 2021. These had been funded by 201 funders and were taking place across 142 countries with a total investment of more than US$ 4.7 billion.

Systematic reviews and COVID-19

Throughout the process of planning, designing, conducting and reporting new research studies, the use of systematic reviews to identify, appraise and synthesize existing relevant research studies is important for ensuring that the new research is justified and for placing it in context (Chapter 2.6). This is especially important for COVID-19 where a vast number of systematic reviews have been undertaken or are underway. There are freely available registers of completed systematic reviews related to COVID-19, including the COVID-END inventory of best evidence syntheses (https://www.mcmasterforum.org/networks/covid-end).By late April 2020, more than 500 reviews had been registered on the prospective register of systematic reviews, PROSPERO *(40)*. Fourteen months later, there were 4400 reviews in this register (https://www.crd.york.ac.uk/prospero). Similarly, in mid-June 2021, PubMed contained 2700 records indexed as systematic reviews, having reached 1000 at the start of October 2020 and 2000 by the start of March 2021. This vast number of systematic reviews and the challenges faced by decision makers trying to access them led Evidence Aid (Chapter 3.7) to create a special collection of summaries of systematic reviews relevant to the COVID-19 pandemic and its effects (Case Study 6.1.3). There are also important initiatives to bring those involved in evidence synthesis together, including the Evidence Collaborative on COVID-19 Network (ECC-19), coordinated by WHO (Case Study 6.1.3).

Case Study 6.1.3 Evidence syntheses and COVID-19

The Evidence Collaborative on COVID-19 Network (ECC-19) is a consortium of experts and organizations who meet every one or two months to discuss progress and initiatives around evidence retrieval to manage the risks of COVID-19 pandemic. They focus on support for evidence-based policies, interventions and initiatives.

ECC-19 is coordinated by the Department of Quality Assurance of Norms and Standards within the Science Division of WHO. It is a self-organizing network for information sharing and collaboration around evidence retrieval efforts to combat COVID-19. ECC-19 Partners include organizations and individual experts, as well as WHO staff from offices around the globe, all of whom are working in the area of evidence generation and retrieval related to COVID-19 and SARS-CoV-2. The Network includes organisations such as Cochrane, COVID-END and Evidence Aid, and provides links to many resources relevant to research and evidence for COVID-19 (https://sites.google.com/view/ecc19/resources).

Evidence Aid (Chapter 3.7) seeks to improve access to evidence from systematic reviews to people working in disasters and other emergencies. Since March 2020, it has been building a collection of summaries of systematic reviews relevant to COVID-19 (https://evidenceaid.org/evidence/coronavirus-covid-19). If a systematic review investigates the effects of an intervention, the summary includes brief background information for the topic and the review, and then details of what works, what doesn't work and what's uncertain. Where the systematic review is of another topic (e.g. prevalence or impacts), the summary includes brief background about the topic and the review and the review's findings. If there is more than one review of the same topic, a combined summary is prepared and each summary, whether for one or multiple reviews, contains the citation for each review and links to the full text. As of mid-June 2021, the Evidence Aid collection included 500 summaries, covering 800 systematic reviews.

Prioritizing new research

People planning new research for COVID-19 should consult the repositories of existing research to ensure that their research will address an area of ongoing uncertainty and not simply be "more of the same", which might be wasteful. Careful considerations should be given to prioritise the new research (Chapter 2.7) and whether it will tackle priority areas (see Case Study 6.1.4) and be able to contribute useful evidence for decision makers, beyond what is already available. For example, the interest in the possible effects of chloroquine and hydroxychloroquine led to many studies starting in 2020 *(41)*. In September 2020, when the searching was done for the Cochrane Review that concluded that there was moderate? to high?certainty evidence that hydroxychloroquine has no clinical benefit in treating COVID-19 in hospitalized patients and probably increases adverse events, 122 ongoing trials were registered for the use of chloroquine or hydroxychloroquine for treatment or prevention of COVID-19. The Cochrane authors included a summary of the 22 ongoing treatment trials and 15 ongoing prevention trials that were reported to be recruiting actively, or that had completed recruitment but were yet to

publish, which had a target recruitment of 500 or more participants *(42).* Similarly, care needs to be taken that systematic reviews do not unnecessarily duplicate the same research. As an example, a cross-sectional study of systematic reviews of studies of the imaging findings for children with COVID-19 found 25 systematic reviews up to 1 September 2020, with a total of only 17 primary studies included in these reviews. The authors concluded "this study presents a particular case in which, in less than 6 months, the literature was flooded with more systematic reviews than primary studies trying to answer a very specific clinical question" *(43).*

Case Study 6.1.4 WHO Global Priorities for COVID-19 Research

The WHO is maintaining a roadmap for COVID-19 research, which encompasses basic research through to late-stage development, licensing and early use of products. This provides a collaborative framework to underpin strategic goals and research priority areas so as to accelerate the development of diagnostics, therapeutics and vaccines to prevent and control severe emerging diseases due to priority pathogens. A coordinated global research roadmap for COVID-19 was released in March 2020 *(27)* and achievements from the first year were reported in April 2021 *(44)*.

The early work on this involved a meeting in Geneva, Switzerland on 11-12 February 2020, which was organized by WHO and the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R). This helped set the global research agenda for COVID-19, including priorities and governance frameworks for global coordination and implementation. The forum brought together a group of key experts, partners and stakeholders and the resulting roadmap included an analysis of current capacities and ongoing efforts in affected countries and globally. It also included a review of the steps that the community should take to accelerate critical research. The participants included members of the scientific community, researchers from the public health agencies in WHO member states, regulatory experts, bioethicists with expertise in research in emergencies and major funders of research related to the COVID-19, including editors and authors associated with this Guidance.

The two main aims of the roadmap are:

- Establishing a clear case definition, then ensuring that those displaying agreed symptoms of COVID-19 are promptly diagnosed and receive optimal care, while integrating innovation fully within each research thematic area; and
- Supporting research priorities in a way that leads to the development of global research platforms pre-prepared for the next epidemic and thereby allowing for accelerated research and development for diagnostics, therapeutics and vaccines and timely access to those shown to be effective.

Priorities for social science research include providing evidence to inform policy and practices to strengthen public health response, sharing of localised adaptations that work and the role of communities in response and mitigation, attention to the uneven impact of COVID-19 on different social groups, and methods, infrastructure and research capacity. This

COVID-19 social science research agenda aims to:

- generate high-quality social science evidence for achieving the goals of national strategic public health response plans;
- develop and employ strong methodologies, and theoretical frameworks to tackle current epidemic challenges; and
- understand un-intended consequences of epidemic-control decisions.

WHO and GloPID-R organised a further virtual meeting of the Global Research and Innovation Forum on COVID-19 on 1-2 July 2020. More than 1200 key experts, partners and stakeholders took part and a very wide range of topics were discussed. A further virtual COVID-19 Global Research and Innovation Forum took place on 13-14 May 2021 to inform the development of a revised COVID-19 Global Research and Innovation Roadmap. Topics discussed include research priorities on disease transmission and control measures, equitable access to COVID-19 interventions, accelerating research and development for vaccines, research into SARS-COV-2 variants, evaluating therapeutics to reduce the short- and long-term effects of COVID-19, clinical management of COVID-19, virus natural history and transmission, animal human interface, availability of diagnostic tests, community engagement and global accountability, and the management of information.

When making choices about future research, it is also important to consider the balance of research that has already been done or is underway in different broad areas, which may indicate gaps that need to be filled. This is illustrated by Table 6.1.1, which is based on data from the L·OVE Platform on 18 June 2021, when the platform contained a total of 176 804 primary studies and 6277 systematic reviews, with 107 722 and 6235 (respectively) of these tagged as prevention or treatment, diagnostic, aetiology, epidemiology or prognosis. This shows that nearly half of the categorised primary studies looked at the prevention or treatment of COVID-19, compared to 39% of the systematic reviews; while 29% of the systematic reviews had focused on epidemiology compared to only 21% of the primary studies.

Table 6.1.1 Categories of COVID-19 research, from the L·OVE Platform on 18 June 2021

Topic	Primary studies (n=107 722)	Systematic reviews (n=6325)
Prevention or treatment	53 156 (49%)	2458 (39%)
Diagnostic	4195 (4%)	251 (4%)
Aetiology	5193 (5%)	395 (6%)
Epidemiology	22 537 (21%)	1830 (29%)
Prognosis	22 641 (21%)	1301 (21%)

6.1

The next section of this chapter will discuss how the methods and principles discussed in this book might be applied to the conduct of Health EDRM research in the context of COVID-19 and pandemic diseases more generally.

6.1.4 Determining the scope of Health EDRM research in the context of COVID-19

In 2018, responding to the need for a more systematic approach to strengthen the scientific evidence base for Health EDRM, WHO established a global research network: WHO Thematic Platform for Health EDRM Research Network (Health EDRM RN) *(45)*. By May 2021, more than 200 global experts from all WHO Regions were involved in this network, contributing to global research collaboration and knowledge synthesis on Health EDRM, including the WHO Health EDRM Knowledge Hub *(46)*. Expert meetings convened by the Health EDRM RN have recommended several key research areas. For example, the 2018 Kobe Expert Meeting on Health EDRM proposed five key research areas *(35)*:

- Health data management;
- Mental health and psychosocial support;
- Addressing the needs of subpopulations;
- Health workforce development; and
- Research methods and ethics.

Three additional research areas were proposed by the 2019 Core Group Meeting of Health EDRM *(47)*:

- Translational research;
- Complex health risk conceptualization; and
- Cross disciplinary research agenda.

Subsequent to this, priority research areas proposed by the 2020 Annual Conference of Japanese Association for Disaster Medicine *(48)* included:

- Mental health including dementia and other cognitive disabilities;
- Business continuity planning;
- Malnutrition – both overnutrition and undernutrition;
- Welfare and nursing care; and
- Security and safety of response teams and volunteers and local responders.

Building from these priorities and the additional implications of the COVID-19 pandemic for Health EDRM research, WHO conducted an online survey on priority Health EDRM research areas in April and May 2020. The 22 experts from the Health EDRM RN who responded identified consensus key research areas (based on agreement from more than 50% of the respondents). The area that was judged to be important by the highest number of respondents (82%) was the synthesis of evidence to develop strategies and recommendations on preparedness and response for concurrent emergencies from other hazards in the context of COVID-19.

This was followed by recovery of health systems (64%), risk literacy and community acceptance of risk assessment, and the adherence to non-pharmaceutical public health interventions (59%) and health workforce development in the context of COVID-19 (55%). These experts also noted the importance of particular research methods, including case study analysis (62%), structured expert consultation such as Delphi (52%), systematic review (43%) and rapid scoping review (33%). The survey also gathered opinions on the suggested channels for the dissemination of research results. The most popular was peer-reviewed journals (77%), followed by policy/research briefs (68%), and oral/poster presentations at academic conferences (36%).

Given the results of the survey and reflecting the engagement of whole-of-society and country and community resilience, WHO called for the following topics:

1. Research that increases the likelihood of implementing an all-hazards Health EDRM approach, including prevention, preparedness and readiness, for the risks related to emergencies that may occur during pandemics.
2. Research that strengthens governance mechanisms and enables a whole-of-society approach to manage the risks related to the COVID-19 pandemic and other health emergencies.
3. Research to strengthen community resilience before, during and after the COVID-19 pandemic.
4. Research on building back better from the pandemic and related damage on population health.

In the 2020 Core Group Meeting of the Health EDRM RN, in addition to the specific research topics, the following were highlighted *(49)*:

- Ensuring the evidence and research is of benefit to countries to develop and implement risk management actions in prevention, as well as preparedness, response and recovery to emergency and disaster situations;
- Quality evidence curation, collation and communication to guide timely policy actions;
- Dissemination efforts including e-learning activities and reaching out to alumni; and
- Cross regional collaboration and continued dialogue with policy makers and practitioners.

Adaptations to new and ongoing research on Health EDRM in the context of COVID-19

Just as the COVID-19 pandemic has transformed many aspects of health research, it has also impacted the operational procedures and conduct of research in Health EDRM. There have also been challenges as research staff were re-deployed from research they were working on to COVID-19 studies. Among the impacts on ongoing non-COVID-19 Health EDRM research were those arising from the need for physical distancing and avoiding physical contact. This has led to changes in how people work in the field (Chapter 7.5) and to an increase in desk-top research projects such as systematic reviews and case study analysis, which rely on the analysis and synthesis of existing research or data.

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Pandemic restrictions have led to much greater use of online methods in research projects. For example, many studies had to change the methods used for training, stakeholder interviews or focus groups or collection of health outcome data from face-to-face to online *(50).* This will have had a particular impact on qualitative studies (Chapter 4.12) that had hoped to use data collection via focus groups with, for example, older people or those with health conditions that make them particularly susceptible to COVID-19 (see Case Study 6.1.5). Switching this data gathering from face-to-face to online requires additional efforts for study participants and the research team, especially in low- and middle-income countries. It may also introduce challenges for maintaining engagement of study participants and the need for reliable internet infrastructure. On the other hand, if this internet infrastructure is in place and reliable, it can lead to more inclusive research by facilitating research participation at a distance.

Case Study 6.1.5 Strategic risk assessment in Bangladesh

An example of the impact of COVID-19 on qualitative research is the strategic risk assessment in Bangladesh to develop a country infectious hazards emergency risk profile. The researchers used the WHO Strategic Toolkit for Assessing Risks (STAR), which supports a qualitative, discussion-based approach with multiple key stakeholders to assess the risks from all hazards and was implemented in over 60 countries globally in person. Considering the COVID-19 related public health and social measures, the STAR methodology was considerably adapted for use online. The virtual workshop was conducted for five days in May 2021 where the participants and the facilitators were connected from more than six different time zones across the world. The plenary and the group discussions were all conducted online. The virtual workshop was attended by more than 70 high-level experts from diverse sectors including WHO experts from country, regional office and headquarters and representatives from the World Bank and the International Center for Diarrhoeal Disease Research of Bangladesh, and was led by the Institute of Epidemiology Disease Control and Research of the Ministry of Health, Bangladesh.

Thirty-three infectious hazards were listed by the national experts, out of which nine were prioritized as high-risk based on the analysis of exposure, coping capacity and vulnerabilities.

The COVID-19 pandemic also affected the collection of data for quantitative research, such as the WHO Emergency Medical Team data collection (Chapter 4.4). For example, since 2017, WHO has implemented the standardized medical data collection form, WHO Emergency Medical Team Minimum Data Set (WHO EMT MDS), in various events related to natural hazards that EMTs supported, including Cyclone Idai in Mozambique in 2018. The WHO EMT unit is revising the MDS to capture data relevant to COVID-19 and within the restrictions caused by the COVID-19 pandemic and its associated measures. This effort to improve data collection measures can also be used for routine data collection outside the context of disasters, for example, to gather data that might inform the delivery of remote medical care in sparsely populated areas.

Challenges have also arisen because of how the pandemic and its associated measures have transformed societies. For example, the severe health impacts and economic disruption have created challenges for researchers examining the economic or health-economic impacts of health emergencies and disasters (Chapter 4.7). This is because pandemic-related disruptions create key issues for Health EDRM research. For example, first, it may be unclear if a person's economic welfare was impacted by the pandemic, or the concurrent emergency or disaster, or some combination of the two. Second, the person's recovery from the impacts of the emergency or disaster may be impeded due to community-level and societal and other sectoral disruptions arising from the pandemic, which would not have been present in other circumstances and might include mass unemployment in some economic sectors.

Communicating research about Health EDRM during COVID-19

As discussed in Chapter 4.11, researchers need to consider how they will disseminate their findings. For some time, the main means of doing so in the health domain was via peer-reviewed journals and the indexing of these articles in bibliographic databases such as PubMed (Chapters 7.2 and 7.6). However, during the COVID-19 pandemic, there has been increasing necessity to communicate the findings of research more quickly and widely and to expedite the transfer of knowledge into effective policy and practice. This has also prompted acceleration of the synthesis of knowledge via, for example, systematic reviews (Chapter 2.6) and into relevant policies and practices, which was highlighted in the aforementioned WHO survey of the Health EDRM RN. It has also led to a tremendous growth in the number of research studies that are published first as preprints, which are not peer reviewed *(51),* that may contain useful information for all relevant stakeholders including decision makers, implementers and risk communicators, and may be an important option for researchers to report their findings in the future (Chapter 7.6).

6.1.5 Conclusions

The COVID-19 pandemic has exposed stark global-, national- and community- level inequities, fragilities and unsustainable practices that pre-date this pandemic and have intensified its impact *(52).* This pandemic has highlighted many uncertainties about how best to manage the risks of a pandemic and its consequences. These impacts have gone beyond health, with substantial effects on education, economies and other aspects of society; but all of them will require high quality research studies of the range of types discussed in this book to generate reliable and robust evidence. As research and other evaluations of COVID-19 continue to identify and describe the lessons from COVID-19, it will be essential that policy-makers, practitioners, researchers and all stakeholders apply and translate those lessons into stronger capacities for managing the risks of future pandemics and other types of emergencies. The pandemic struck countries at different times in different waves and research will also be key to understanding how these waves happened, how countries and communities managed them, the systems and capacities required to put in place to reduce vulnerabilities and inequities, improve prevention and to better prepare the communities and countries and what to expect in the future. The research that will help to resolve these uncertainties will need

to involve coordination, collaboration and prioritisation, and mechanisms to ensure that the findings are made available in a clear and accessible manner for relevant evidence-informed policy and practice for health emergency and disaster risk management.

6.1.6 Key messages

- **The COVID-19 pandemic has been unprecedented in many ways.**
- **In the first 16 months of the pandemic, tens of thousands of research studies, and thousands of systematic reviews were initiated, leading to an overwhelming volume of research and a vast amount of evidence for decision makers and practitioners to navigate through during the management of the COVID-19 pandemic.**
- **There has also been a considerable impact on how research into aspects of Health EDRM is designed, conducted, reported and used in managing other similar types of emergencies and disasters, including concurrent ones during the pandemic.**
- **Future research in Health EDRM needs to learn from the lessons identified during the COVID-19 pandemic to ensure that research is prioritized appropriately, coordinated well and reported clearly if it is to provide the evidence needed by decision makers managing the risks, including planning for and responding to ongoing and future emergencies and disasters, including disease outbreaks, epidemics and pandemics.**
- **Greater engagement in Health EDRM research will be key to provide evidence from health and non-health sectors that can inform all relevant policy and practice for managing current and future risks from all emergencies and disasters that communities and countries are exposed to.**

Further reading

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