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Epidemics and pandemics risk governance: a case of post-COVID-19 in the United Kingdom

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List of abbreviations

CCA Civil Contingencies Act
CCC Civil Contingencies Committee
CMO Chief Medical officer
COBR Cabinet Office Briefing Room
DH Department of Health
DRG Disaster Risk Governance
IRGC International Risk Governance Council
IRGF International Risk Governance Framework
LG Local Authorities
NHP National Hazard Partnership
NHS National Health Service
NRA National Risk Assessment
NSC National Security Council
PHE Public Health England
PM Prime Minister
PPE Personal Protective Equipment
SAGE Scientific Advisory Group for Emergencies
UK United Kingdom
WHO World Health Organization

1. Introduction

Epidemics and pandemics have crippled societies and economies for centuries (Fu & Zhu, 2020; Leach et al., 2020, p. 105233). However, the 21st century marked several epidemics and pandemics across the world: for example, COVID-2 SARS in 2003 (Leach et al., 2020, p. 105233), Ebola in 2013, Zika virus in 2018/19 (Georgalakis, 2020), and the novel coronavirus at the end of 2019, which is known as COVID-19. The novel disease emerged in Wuhan, China, as the epicenter of the pandemic (Amaratunga et al., 2020; Dayrit & Mendoza, 2020; Djalante et al., 2020; Fu & Zhu, 2020).

COVID-19 has significantly impacted all sectors in countries around the world (Amaratunga et al., 2020). When the World Health Organization (WHO) announced COVID-19 as a global pandemic, the virus had spread among 172 countries (Shaw et al., 2020). Since then, the virus has killed more than 1.9 million people and infected more than 89 million people across 216 countries as of January 12, 2021 (WHO, 2021). Even though an estimation of the true economic impact is difficult, many predicted that it would be the worst economic downturn in global history. A study by IMF estimated that the world's economy would contract by 3% in 2020, and that it would rise again to 5.8% later in 2021 with the suppression of the virus (Kashyap & Raghuvanshi, 2020). Besides, COVID-19 has made significant health and socio-economic impacts worldwide (Collins et al., 2020; Laufs & Waseem, 2020; Shaw et al., 2020).

The COVID-19 pandemic has had a devastating impact on the United Kingdom's health, economic, social, and environmental sectors (Scally et al., 2020). At the end of the first wave (end of June 2020), the highest number of deaths in Europe was reported by the United Kingdom, with more than 43,000 deaths (Ahmad, 2020; Sibony, 2020); this was followed by the second wave with more than 30,000 deaths (ONS, 2021). The pandemic has crippled the country, with the sharpest economic contraction since the Great Depression in the 1930s. The expected fall in the economic growth in the United Kingdom has been projected to be 10% during 2020 (Ahmad, 2020).

Due to the unpredictable nature of epidemic and pandemic outbreaks and their devastating impacts, strengthening pandemic preparedness has become an important strategy and an urgent need, according to policymakers (Ansell et al., 2020; Dayrit & Mendoza, 2020; Djalante et al., 2020; Welby-Everard et al., 2020). Unfortunately, even though the possibility of a pandemic outbreak emerging within this century was predicted as a White Swan event (Dunford & Qi, 2020), most governments were ill-prepared to face such disruptive and wicked problems (Ansell et al., 2020; Connolly, 2015).

Thus, several spontaneous measures have been introduced by many governments and hence shown mixed results (Collins et al., 2020; Shaw et al., 2020). For example, several East Asian countries introduced immediate risk reduction and response measures while others acted leisurely (Amaratunga et al., 2020; Shaw et al., 2020). Furthermore, South Korea adopted a rapid and systematic test and tracing system while Sweden followed a voluntary mechanism. Nevertheless, both cases delivered positive results. On the other hand, late measures taken by several European countries led to devastating impacts on their health systems, people, and economies (Ahmad, 2020). Such evidence indicates issues within national pandemic risk governance systems worldwide (Ahmad, 2020; Collins et al., 2020; Djalante et al., 2020; Fu & Zhu, 2020; Scally et al., 2020; Shaw et al., 2020) and emphasizes the

importance of strengthening pandemic risk governance systems (Amaratunga et al., 2020; Aven & Renn, 2018; Connolly, 2015; Georgalakis, 2020). This is because risk governance plays a significant role in dealing with unknown risks that involve trade-offs (Amaratunga et al., 2019; Aven & Renn, 2018; Collins et al., 2020; Renn, 2015; Renn et al., 2011). Therefore, this study intends to explore the disaster risk governance (DRG) mechanism and identify any strengths and weaknesses within the pandemic risk governance mechanism during the COVID-19 pandemic in the context of the United Kingdom.

The rest of the chapter will be organized as follows; Section 2 presents the methods adopted in the study, followed by Section 3 introducing DRG concepts relevant to the study. Section 4 presents the DRG mechanism adopted in the United Kingdom, identifying the strengths and weaknesses within the UK pandemic risk governance system compared to other countries. Finally, Section 5 concludes the study by providing critical insights about the present DRG system in the United Kingdom, and providing suggestions to policymakers to overcome the identified challenges.

2. Methods

In achieving the study's objectives, a systematic literature review was conducted. The systematic literature review explores the United Kingdom's epidemic and pandemic risk governance system following a methodical approach. The systematic literature review helps identify key concepts related to the study scope systematically (Ferrari, 2015; Laufs & Waseem, 2020). The outcome of the systematic literature review provides insights to policymakers in drawing recommendations based on the identified strengths and weaknesses in DRG while addressing issues raised by the pandemic (Laufs & Waseem, 2020).

At the beginning of this systematic literature review, a literature review protocol was developed. It comprised research objectives, search engines, search strings, inclusion and exclusion criteria, and how it was maintained. Accordingly, three electronic databases were used: Science Direct, Emerald, and Google Scholar.

A search string was used to search through Science Direct and Emerald databases: "(Covid-19 OR pandemic) AND (disaster risk governance OR risk governance) AND (United Kingdom OR UK)". Accordingly, Science Direct resulted in 1087 documents while Emerald resulted in 381 papers. The inclusion criteria were: the papers were written between 2010 and 2020; research articles; representing the papers from the social science discipline. The exclusion criteria included: papers outside this period; papers not written in English; commentaries; book reviews; and newspaper articles. After applying the inclusion and exclusion criteria, 222 articles were found from Science Direct, while 141 papers were found from the Emerald database. The third search engine, Google Scholar, was searched using the search string, "Covid-19," "Risk Governance," "UK," and limiting results to research papers published in 2020 only, from which 211 papers were found.

After screening the abstracts and removing the duplications, 98 full papers were found from the three databases as eligible. From further reading of the abstracts and skimming through the full papers, 46 papers were finally included for this systematic analysis. In addition to the selected papers, some gray literature was further identified from the UK Government websites and reliable international reports to cover policy background relevant for the study.

3. Key concepts

3.1 Epidemics

The term epidemics came from a Greek word meaning a disease prevalent among people within a country. Similarly, the Cambridge Dictionary defines an epidemic as the appearance of a particular disease among a large number of people at the same time ([Control & Prevention, 2012](#)).

3.2 Pandemic

Similarly, the term pandemic also came from the Greek word pan meaning all, and demos meaning people. The dictionary also defines a pandemic as a disease existing in almost all areas or almost all of a group of people, animals, or plants. The WHO defines a pandemic as the worldwide spread of a new disease. According to the WHO, an influenza pandemic occurs when a new influenza virus emerges and spreads worldwide. Most pandemics begin with an animal influenza virus, for which people do not have immunity ([WHO, 2020](#)). Pandemics have more severe health impacts than epidemics. For example, the previous pandemics, especially those that emerged in 1918, 1957, and 1968, evidenced an unprecedented number of fatalities with huge socioeconomic consequences ([Connolly, 2015](#)). Pandemics have been identified as ongoing risks, potentially occurring in any given year ([Jones et al., 2018](#)).

Managing or responding to pandemics requires effective risk reduction and response measures supported by a strong DRG system ([Ansell et al., 2020](#); [Connolly, 2015](#); [Djalante et al., 2020](#); [UNISDR, 2015](#)). Thus, the next section presents an introduction to DRG, identifying its elements and priorities.

3.3 Disaster risk governance

Risk governance refers to both the institutional structure and the policy process that guides and restrains the collective activities of a group, society, or international community, to regulate, reduce, or control risk problems. In this process, experts, stakeholders, and public involvement are recommended as a key feature in the stage of communication and deliberation ([Amaratunga et al., 2019](#); [Aven & Renn, 2018](#); [Renn, 2015](#); [Renn et al., 2011](#)).

Risk governance has become an important instrument for pandemics since there is no confirmed medicine for new pandemics ([Georgalakis, 2020](#); [Shaw et al., 2020](#)). In addition, several researchers have demonstrated the impact of pandemics due to weak DRG ([Ansell et al., 2020](#); [Connolly, 2015](#); [Smith-Walter & Sharif, 2017](#)). Specifically, for COVID-19, some medicines were at the trial stage, and no medicine had been approved when this chapter was written. Therefore, social measures had been replaced and introduced as legislative forms and voluntary measures.

Pandemic control strategies require strong governance, the use of technologies, strong community participation, and solidarity to reduce the risk and the effects of pandemics ([Shaw et al., 2020](#)). In addition, through governance, scientific inputs could be incorporated for better preparedness and response measures ([Georgalakis, 2020](#)). Risk governance

is similarly important since pandemics are transboundary by nature and need multistakeholder engagement at different levels of government in controlling the pandemic crisis (Connolly, 2015).

Furthermore, DRG is important for COVID-19 in deciding how to communicate and characterize risks and handle the risk effectively (Fu & Zhu, 2020). During a pandemic, both experts and politicians struggle to handle uncertainties caused by the pandemic and thus how to decide the correct way to handle the situation (Atkinson et al., 2020). Politicians receive advice from the subject specialist for decisions on effective preparedness, response, and recovery measures. Thus, as a key element of DRG, multistakeholder participation becomes important when dealing with pandemics (Amaratunga et al., 2020; Aven & Boudier, 2020; Renn, 2015). Some scientists consider governance as an outcome of a battle between risk and regulation, where risk is universal to all life, while regulations help to lower perceptions of risk or to control or reduce fear (Cagnin et al., 2011). This is a valid claim during pandemics since they cause an unpredictable level of risk and regulations are used to lower or control the risk.

3.4 Elements of disaster risk governance

The International Risk Governance Council (IRGC) introduced the International Risk Governance Framework (IRGF), comprised of five key elements: preassessment, appraisal, characterization and evaluation, management, and cross-cutting aspects (IRGC, 2019; Renn, 2015). Preassessment refers to risk framing, early warning, and preparing for risk handling with relevant stakeholders. The appraisal element involves deciding whether a risk should be taken and, if necessary, identifying and selecting suitable options for preventing, mitigating, adapting, or sharing risk based on a knowledge base. Characterization and evaluation refer to comparing the outcome of risk appraisal with specific criteria, determining the significance and acceptance of the risk, and preparing decisions. The management element refers to designing and implementing the strategies required to avoid, reduce, transfer, or retain the risks. Finally, the cross-cutting element comprises communication, stakeholder engagement, and the context (Renn, 2015; Renn et al., 2011). In line with the elements presented in the IRGF, several researchers emphasized the crucial role of open, transparent, and inclusive communication and engagement of multistakeholders in assessing and managing risks within the relevant societal context as the key elements of DRG (Collins et al., 2020; Fu & Zhu, 2020).

3.5 Strategies for disaster risk governance

Three strategies were presented for dealing with DRG. The strategies are risk-informed, cautionary/precautionary, and discursive (Aven & Renn, 2018). Risk-informed decision refers to treatment, avoidance, reduction, transfer, and retention of risks based on risk assessments. Cautionary strategies involve choosing risk management options, including close monitoring, containing, and developing new knowledge and substances to control the pandemic. Finally, the discursive strategies involve building confidence and trustworthiness through clear facts and reducing uncertainties with the participation of affected communities and ensuring accountability (Amaratunga et al., 2019). According to Aven and Renn (2018), effective risk strategies use all three aspects.

4. Pandemic risk governance in the United Kingdom

4.1 Legal and policy background

Risk governance mechanisms are shaped by institutional structures and policy processes guiding stakeholders to regulate, reduce, or control risks (Renn et al., 2011). Accordingly, this section presents a brief overview of the legislative and policy background in the UK pandemic DRG system. The Civil Contingencies Act (CCA) (CCA, 2004), DHUK Influenza Pandemic Preparedness Strategy, Pandemic Influenza Response Plan 2014, Pandemic Influenza Strategic Framework 2014, Health and Social Care Influenza Pandemic Preparedness and Response (2012), and the latest Coronavirus Act (2020) are the key legislative and policy measures governing the UK pandemic risk governance.

The CCA governs the overall disaster management structure in the United Kingdom. The Act provides a coherent framework for emergency planning and response at the local and national levels and defines the tasks to be performed and the cooperation mechanism. In addition, the Act identifies regional and local level civil protection planning in a disaster situation (CCA, 2004). The CCA is supplemented by another document, Emergency Preparedness Guidance. The document provides a generic framework for civil protection in the United Kingdom (Cabinet Office, 2012). However, there are no special provisions on dealing with epidemics, pandemics, or biological hazards in the Emergency Preparedness Guidance.

In addition, the DHUK Influenza Pandemic Preparedness Strategy (2011) sets the UK-wide strategic approach to planning for, and responding to, the demands of an influenza pandemic. It was developed based on the 2007 National Framework for responding to the influenza pandemic with the lessons learned during the Swine flu outbreak (2009) and the latest scientific evidence (Connolly, 2015; Department of Health, 2011). Moreover, Public Health England (PHE) issued the Pandemic Influenza Response Plan 2014 to identify the specific roles and responsibilities of PHE during a pandemic emergency, since the influenza pandemic had been identified as a top national risk for public health in the United Kingdom. For an effective response, activation and coordination of PHE's national emergency response arrangements are implemented by the Department of Health (DH) in England (Public Health England, 2014a).

In addition, the Pandemic Influenza Strategic Framework (2014) sets out the roles and responsibilities of PHE and various centers and divisions within PHE at each of the five phases of the pandemic. The framework complements the Pandemic Influenza Response Plan and allows the United Kingdom to respond rapidly and flexibly to emerging epidemics or pandemics through decisions and governance approaches under different possible scenarios (Chambers et al., 2012; Public Health England, 2014b). Accordingly, the PHE advice is evidence based or based on best practice in the absence of evidence, and the advice is based on ethical principles, established practice, and systems as far as possible and is coordinated at local and national levels (Public Health England, 2014b).

Health and Social Care Influenza Pandemic Preparedness and Response (2012) is another legal document that governs the UK pandemic preparedness strategy. The document defines operational aspects of pandemic response within the United Kingdom's health and social care sectors. It highlights the areas where public, independent, and voluntary sector health and social care organizations should work together toward an integrated operational

arrangement for planning and response during an influenza pandemic. The report further outlines the structures and roles of the National Health Service (NHS) and public health organizations in England during the transition period. Accordingly, multiagency plans are recommended to be in place in local health economies with regular testing and exercises (DH/HIP/PIP, 2012).

The newest legislative evidence is the Coronavirus Act (2020). The Act came into operation on March 25, 2020. In the beginning, the Act was set to be valid for 2 years and to be renewed, if necessary, depending on the medical advice. The Act entrusts powers to the government to slow down the spread of the virus, reduce the resourcing and administrative burden on public bodies, and limit the impact of potential staffing shortages on delivering public services. The Act also delegates discretionary powers to the government to control the daily operations in the country. For example, the government can limit or suspend public gatherings, control or suspend public transport, order businesses such as shops and restaurants to temporarily close, and detain individuals suspected to be infected by COVID-19. Other provisions made by the Act allow the government to intervene or relax regulations, suspend operation of ports and airports, temporarily close educational institutions and childcare premises, enroll medical students and retired health-care workers in the health services, relax regulations to ease the burden on health-care services, and assume control of death management in particular local areas (GOV.UK, 2020b).

After presenting the legislative and policy background relevant to the UK pandemic risk governance, the following section provides the literature synthesis of the UK risk governance during the COVID-19 pandemic in terms of the key elements set in the IRGF.

4.2 Elements of pandemic risk governance in the United Kingdom

The UK DRG structure is largely a political one, following a right-leaning approach with liberal economic policies, and having socially conservative while individualizing policy directions without much emphasis on cultural norms. Thus, a strong emphasis was given to public health and epidemiological experts over other aspects. However, for better risk governance, politics, culture, and health expertise are similarly required (Brown, 2020). In line with pandemic risk governance in the United Kingdom, all elements are examined in the next section and compared with other countries to evaluate and identify any weaknesses/challenges within the UK COVID-19 DRG system.

4.2.1 *Preassessment*

The first early warning signs of a future pandemic threat in the United Kingdom emerged due to excessive winter flu-related deaths and the Ebola outbreak in 2014/2015 (Connolly, 2015). Besides, the National Risk Assessment (NRA), conducted by the Government Chief Scientific Advisor (GCSA) and other departmental chief scientific officers, revealed in the recently updated National Risk Register the risk of a medium-high likelihood of an influenza pandemic in the next 5 years as a high impact risk category incident (Nice, 2020; Welby-Everard et al., 2020).

In terms of COVID-19, the Chinese government announced the virus as an epidemic in early January, assessing the risk of the virus (Fu & Zhu, 2020). Accordingly, the WHO issued

early warnings on the COVID-19 outbreak at the beginning of January 2020 (Brown, 2020; Shaw et al., 2020). In addition, the PHE experts issued early warnings on the possible level of the pandemic impact in the United Kingdom, which led to the activation of the Scientific Advisory Group for Emergencies (SAGE) on January 22, 2020 (Atkinson et al., 2020). Furthermore, another team of experts from Imperial College London issued early warnings of the new diseases highlighting their possible impact (Watkins, 2020).

Some criticized the UK approach of not taking initial preparatory steps while most East Asian countries prepared for the pandemic. They highlighted that the United Kingdom played out the early warnings issued by many sources at the pandemic's beginning (Watkins, 2020). Some others argued that the WHO's warnings influenced the government to speed up responses (Atkinson et al., 2020). Instead, the government followed the containment phase (Scally et al., 2020) while many scientists put pressure on the necessity of issuing early warning signs and acting upon it. However, no actions were taken until the first lockdown was announced on March 23, 2020 (Hunter, 2020). Instead, the UK government downgraded the risk from level 4 (highest) to 3 (Scally et al., 2020). A complete opposite action was taken by the South Korean Government, raising the alert level from Blue (Level 1) to Yellow (Level 2) (Shaw et al., 2020).

4.2.2 Appraisal

As part of the UK COVID-19 pandemic risk assessments, the R-value (reproduction number) was calculated. The number indicates the level of transmissibility and the degree of contact between people (Jackson, 2019 as cited in Collins et al., 2020). The London Imperial College assessed the pandemic risk without any policy intervention scenario and estimated that more than 7 billion people would be affected, and more than 40 million lives would be lost across the world (Walker et al., 2020 as cited in Collins et al., 2020). The Cabinet Office Briefing Room (COBR) activated the SAGE to provide scientific and technical advice to manage the pandemic situation in the United Kingdom.

The United Kingdom, as the first country to establish scientific advice to policymaking through the SAGE, is impressive. Many other countries followed this approach, for example, New Zealand, Malaysia, and Canada (Vallejo & Ong, 2020). The SAGE was chaired by the GCSA and was responsible for responding to questions raised by the COBR (Vallejo & Ong, 2020), chaired by the Secretary of State for Health and Social Care (Atkinson et al., 2020). Identification of risk through surveillance systems had happened during past pandemic outbreaks (Bell et al., 2012). A similar scientific advisory committee was found in South Korea. From the beginning, the South Korean Government set up a decision-making process centered around the quarantine countermeasure headquarters operated by the KCDC (Shaw et al., 2020).

Furthermore, the National Hazard Partnership (NHP) conducts and assesses future risks for the United Kingdom. The partnership coordinates institutions that provide advice on natural hazards for the governments and resilient communities in the United Kingdom. It also provides authoritative and consistent information, research, and analysis on natural hazards for effective policymaking toward risk reduction and prevention (MET, 2020). Also, the NHP overviews and assesses natural hazards and potential natural hazards daily and assesses the health implications that can affect the country for 5 days on average (Hemingway & Gunanwan, 2018).

However, several have criticized the SAGE for not correctly assessing the risk and for not advising the government to take measures to prevent, manage, or mitigate the risk during the outbreak. For example, the GCSA believed that herd immunity would solve the pandemic, assuming that the level of the risk would be like influenza (Scally et al., 2020). However, the decision delayed the full response measures and left behind adequate preparedness time and measures. Atkinson et al. (2020) highlighted another mistake, indicating that the government had underplayed the risk assessments done by the scientists, and the Prime Minister (PM) was shaking people's hands as an indication of downplaying the risk assessed by the scientists.

4.2.3 Appraisal characterization and evaluation

Some scientists predicted that a vaccine would not be available for at least 18 months after the lockdown was announced (Ahmad, 2020). Moreover, an effective response against a novel infectious disease like COVID-19 requires highly specialized knowledge and expertise. Thus it is essential to develop and implement a holistic response plan by an expert group (Shaw et al., 2020).

As part of pandemic risk evaluation in the United Kingdom, SAGE engaged with scientific expertise (Shaw et al., 2020). Nevertheless, Exercise Cygnus evaluated the UK pandemic influenza preparedness strategy and highlighted the inadequacy of existing influenza preparedness in the United Kingdom (Atkinson et al., 2020). In addition, many statistical models predicted the possibility of reducing the spread of the disease by following some lockdown measures (Hunter, 2020). However, the government followed a slow and long-term plan for COVID-19, assuming a long-term time frame for risk and policy interventions. Accordingly, the herd immunity approach was selected as the long-term approach to control the virus in the country (Brown, 2020).

This long-term approach left behind valuable time for taking other actions and underestimated the importance of the test and tracing system in the United Kingdom (Brown, 2020). In addition, the UK risk evaluation made a mistake by underestimating the number of deaths caused by the pandemic, and similarly overlooked the estimated number of deaths predicted by the experts from Imperial College London (Collins et al., 2020). Later, the SAGE advised closing schools and universities and nonessential shops and public gatherings; however, schools and universities were kept open (Hunter, 2020). Another wrong evaluation was the impact of voluntary or enforced self-protection measures to be practiced in the United Kingdom. For example, voluntary measures have been successfully applied in Sweden, allowing and trusting community self-protection mechanisms (Collins et al., 2020).

In contrast, many countries evaluated their risk of COVID-19 and suggested many strategies to be implemented during the pandemic management. In particular, several East Asian countries evaluated the level of risk with the support of scientific committees and decided the best options for preventing the spread of the virus early (Shaw et al., 2020).

4.2.4 Management

Countries have introduced many measures to control the spread of the virus, such as external border control, school closures, restriction on nonessential business, social distancing, wearing personal protective equipments (PPEs), social practices, and emergency declarations. Among such measures, most countries have adopted lockdown measures as the nonpharmaceutical primary strategy (Fu & Zhu, 2020).

Targeting community resilience is a core element of UK emergency planning (Stephenson et al., 2014). Emergency plans are significant for unfamiliar and complex events, including pandemics, since they can produce very high levels of impact (Eriksson & McConnell, 2011). Accordingly, the government followed the measures stated in the National Framework during the Swine flu outbreak in 2009. For example, stockpiling antiviral vaccines during the previous outbreak (Connolly, 2015). Antiviral medication, as a pharmaceutical measure, and several containment measures, such as school and border closures, travel restrictions, contact tracing, and postponement of mass gatherings, were introduced during the Swine flu pandemic. However, some criticized the effort and huge spending due to minimum results generated during the previous pandemic outbreak (Watkins, 2020).

At the beginning of the present pandemic, the government adopted the “herd immunity” approach (Collins et al., 2020; Scally et al., 2020). However, with the sharp rise in deaths, the government changed this approach to a countrywide lockdown (Ahmad, 2020; Scally et al., 2020), reporting the world’s longest and most restrictive lockdown measures which provided some additional time to the health sector managing the excessive number of patients (Kashyap & Raghuvanshi, 2020). In addition to health measures, the government introduced a huge financial package to secure the economy. With the size of the financial package, some estimate that the economic repercussions may not be as severe as in previous pandemics (Kashyap & Raghuvanshi, 2020). Furthermore, the UK government took leadership in conducting novel viral pathogen research, which helped the scientists gather patients’ data rapidly, facilitating and accelerating diagnostics and developing vaccines (Atkinson et al., 2020).

Nevertheless, there has been criticism of some of the response measures introduced by the UK government. For example, they downgraded the risk from Level 4 to Level 3. Many scientists believed that this decision was to manage the shortage of PPE (Scally et al., 2020). The government decided not to ban mass gatherings (Hunter, 2020) and decided to discharge elderly patients to care homes without testing, which were considered wrong actions. Such measures have escalated the spread of the virus and started a second epidemic through community infection (Scally et al., 2020). Despite the need to take immediate response during a pandemic outbreak, the measures introduced were late compared to other European countries, for example, the announcement of the first national lockdown was delayed (Ahmad, 2020; Atkinson et al., 2020; Scally et al., 2020). When the WHO issued early warning signals on the necessity of taking immediate short-term action to control the virus on March 15, 2020, the UK government took a long-term approach. This decision led to downgrading the importance of testing in the country (Brown, 2020). Most of the measures were introduced without reinforcement measures (Hunter, 2020).

COVID-19 is more infectious than other influenza pandemics. Thus, working according to contingency plans made for epidemic influenza was inadequate for handling the present pandemic outbreak (Atkinson et al., 2020). Another example where the UK pandemic strategy went wrong was inadequate resources available at the beginning of the pandemic, for example, an inadequate number of hospital beds, ventilators, and PPE (Hunter, 2020; Scally et al., 2020). Thus, the Health Secretary invited UK suppliers to produce any number of ventilators, guaranteeing purchase (Hunter, 2020). Accordingly, the government placed an order with Dyson to produce 10,000 ventilators (Kashyap & Raghuvanshi, 2020). These examples demonstrate weak preparedness measures for handling the pandemic in the United Kingdom.

Preparedness measures through contingency planning are highly important to maintain reputations (Eriksson & McConnell, 2011). For example, when other countries introduced the digital contact tracing system, the United Kingdom was reluctant to introduce it due to civil rights concerns. In contrast, many East Asian countries took immediate response measures in managing the pandemic. For example, South Korea successfully introduced the digital contact tracing system (Ryan, 2020; Shaw et al., 2020). Similar results were found from Taiwan who introduced many early response measures; thus they were able to open the economy within a short period. As a result, on December 31, 2019, Taiwan announced medical advice to self-quarantine, wear masks, and continuously check temperatures. Further, an early warning was given to people who travel from Wuhan, and a clear warning was given on legal actions on spreading the fake news (Shaw et al., 2020).

4.2.5 Communication

Open and transparent communication is key for effective risk governance (Aven & Renn, 2018; Fu & Zhu, 2020), and it is considered a cross-cutting element in the IRGF (IRGC, 2019). Rapid communication also benefits to inform communities about the severity of the crisis (Fu & Zhu, 2020; Vallejo & Ong, 2020). Hence, communication to health and social care staff and the public should be timely, accurate, and reconcile the pressure for simple messages (Atkinson et al., 2020). Engagement of the public and communicating public health messages during pandemics are important. Thus, public health providers consider campaigns on public health communications as a shared responsibility and as part of public health governance connecting with its people as collective agents (Stephenson et al., 2014). Thus, surveillance in risk identification and communication was identified at the center of governance during the Swine Flu outbreak (Bell et al., 2012).

During the COVID-19 outbreak, the main communication strategy of the UK government was the COBR meeting and the daily press release. At the daily press release, the Prime Minister was supported by the GCSA and Chief Medical officer (CMO). This daily press release with the government chief advisors was planned to improve transparency and trust among the public (Atkinson et al., 2020). The meetings provided useful information and measures to be taken after consultation with the scientific experts. This daily briefing started at the beginning of the pandemic outbreak in the United Kingdom and continued until the end of July. Clear messages and figures were given to the public during the daily briefings.

The Government used slogans during the pandemic period as an effective communication strategy. Three distinctive slogans were introduced: Stay alert—control the virus—save lives; stay home—protect the NHS—save lives; and hands—face—space. In addition, the scientific advisors believe that behavioral and social sciences can inform and promote appropriate behavior changes (GOV.UK, 2020c). Hence, the government followed a traffic light system for the COVID-19 outbreak to communicate the risk level. This method is similar to the UK's Terrorism Threat Levels (Fearnley & Dixon, 2020).

Nevertheless, several researchers highlighted many issues within the UK risk communication system during the COVID-19 pandemic. For example, the evaluation report by Exercise Cygnus on the UK pandemic influenza preparedness, which found inadequacy of the pandemic influenza preparedness, was not officially released, leading to transparency issues (Atkinson et al., 2020). Besides, some political figureheads gave the wrong indication to the public. According to Atkinson et al. (2020), the Prime Minister was shaking hands, ignoring the risks indicated by the scientists and giving a wrong signal to people. After 20 days, the

Prime Minister again announced a countrywide lockdown. A similar indication was given by the Chinese president when visiting the Wuhan epicenter to signal that the virus has been controlled (Shaw et al., 2020). In addition, messages and advice were frequently changed by the PM during the daily briefing, and the messages were vague and unclear (Atkinson et al., 2020; Hunter, 2020). As a result, most health sector workers were confused with the stream of information they received daily. In addition, there was no clear communication of changes to PPE policies to health-care workers (Atkinson et al., 2020).

4.2.6 Multistakeholder participation in pandemic risk governance

Multistakeholder participation is another cross-cutting element of DRG (IRGC, 2019; Renn, 2015). Accordingly, multistakeholder participation was adopted in many instances within the pandemic risk governance system. It is important to decide whether the public is considered only a recipient of public health advice or whether they are considered as members of society who will respond to the pandemic situation (Stephenson et al., 2014).

Several stakeholders are identified within the UK pandemic preparedness system. The Central Government participates in cross-government planning and coordination, developing and maintaining contingency preparedness (health and social care response), liaising with international health organizations, providing information and specialist advice to ministers, other government departments, and responding organizations during a pandemic outbreak. Similarly, Local Authorities (LAs) could be identified as a stakeholder within the preparedness system. They act as Category I responders and develop and publish plans for the council to ensure the continuation of essential services. The LAs are further engaged in all the response activities during a pandemic outbreak, for example, by supporting the NHS, provisioning care for the vulnerable in the community, carrying on local communications for the public, delivering PPE to front line staff, and liaising with voluntary organizations (Lambeth & Southwark Public Health, 2016). In addition, LAs are responsible for planning for any excess deaths caused by pandemics, and for preparing plans to cope with an increase in burials and cremations during a pandemic with the support of the local service providers (Department of Health, 2011).

In addition, the NHS and PHE provide a health-care system in England and work with the Department of Health and Social Care. During epidemics and pandemics, the NHS works with the four Devolved Administrations. The NHS also deals with the WHO to liaise and provide information and advice to other government departments (Department of Health, 2011). In the event of an epidemic or pandemic, PHE plays a vital role in preparing pandemic preparedness and response measures. Among these activities, surveillance, microbiology, statistics and modeling, the provision of expert clinical and infection control advice communications, managing the national stockpiles of countermeasures, developing and validating new diagnostic tests, undertaking research, and procuring pandemic specific vaccines are the main responsibilities undertaken by PHE (Public Health England, 2014a). Similarly, the CMO for the UK Government engages as a key stakeholder, providing advisory services and the GCSA. The CMO has made a strong case for appointing more social science experts in policymaking (Atkinson et al., 2020).

However, some have criticized stakeholder representation within the COVID-19 pandemic risk governance structure in the United Kingdom. The Civil Contingencies Committee (CCC) is the cabinet committee established to deal with emergencies caused by natural disasters or terrorist activities known as COBR. The Civil Contingencies Secretariat supports CCC or

COBR through advisory services ([Department of Health, 2011](#)). For example, the COBR meeting was initiated in late January 2020, and the meeting was limited to GCSA, CMO, SAGE, and the Cabinet and the Prime Minister's office. There was criticism of the PM for not attending the first five COBR meetings during this pandemic. However, at later stages, ministers from Scotland, Wales, and Northern Ireland also participated in the meeting ([Haddon, 2020](#)).

Stakeholder participation also demonstrates some leadership styles. A leader's personality affects the decision to consider scientific advisory ([Eriksson & McConnell, 2011](#)). The British crisis management history scholars highlighted several examples from history. For example, [Eriksson and McConnell \(2011\)](#) identified knee jerk reactions from some former British ministers during crises. Similarly, during this pandemic outbreak, the PM had some issues working with the National Security Council (NSC). The NSC takes decisions on matters relating to national security and is generally chaired by the Prime Minister ([GOV.UK, 2020a](#)). According to [Parker \(2020\)](#), the NSC has played a significant role in the UK's intelligence and security matters over the decades. However, the present PM has canceled the NSC meetings after disagreements with his executive colleagues regarding the scope of the major defense and national security review planned for 2020, without recognizing their contribution ([Parker, 2020](#)).

4.3 Lessons learnt from the pandemic DRG in the United Kingdom

Based on the systematic literature review presented above, key lessons learnt from the UK COVID-19 pandemic experience are presented below, assuming that these lessons will nurture future epidemic and pandemic risk governance in the United Kingdom and other countries.

1. **Risk assessment issues:** Risk assessment issues led to panic-based decisions such as accelerating the production of ventilators, purchase of the wrong PPE, building the Nightingale hospitals and purchasing hospital beds without adequate numbers of trained staff, and downgrading the risk level at the beginning, ignoring early warnings.
2. **Transparency issues:** Selection of scientific experts to the SAGE without representation of public health experts, which led to setting up an 'Independent SAGE' and unpublished meeting minutes in the SAGE.
3. **Lack of political support:** A lack of political support to NSC; absence of the PM at the first five SAGE meetings.
4. **Delay in decision-making:** Delays in announcing border control measures, a delay in introducing test and trace systems, a delay in buying PPE, and a delay in announcing lockdown measures.
5. **Lack of multidisciplinary and multistakeholder approach:** At the beginning of the SAGE four CMOs were not invited; issues in selection to the SAGE, the establishment of Independent SAGE, and minimal representation of public health experts.
6. **Wrong strategy and beliefs:** Ignorance of scientific estimation of the pandemic risk, following a long-term herd immunity approach; misevaluation of self-protecting measures, releasing elderly patients to care homes without testing, working on epidemic preparedness strategy, and not implementing digital test and tracing methods.
7. **Communication-related issues:** Wrong messages were given by political figureheads; vague messages, frequent changes of messages, and delays in issuing early warnings.

5. Conclusions

The importance of DRG is evident across many disciplines where competing decisions are made. DRG has become extremely important during epidemic and pandemic outbreaks to prevent any adverse consequences resulting from wrong or ineffective government decisions. The United Kingdom has been hit hard by the COVID-19 pandemic compared to other countries in the region. Accordingly, the government has introduced several measures to address the challenges posed by the pandemic.

At the time this study was conducted, mixed results had emerged out of government decisions. Hence, this study was conducted to explore the pandemic risk governance system in the United Kingdom and evaluate its effectiveness against the IRGF elements. Even though the study was conducted at the early stage of the pandemic, such early evaluations can facilitate policymakers and practitioners to recognize the areas where innovative risk governance mechanisms should be introduced or strengthened.

Based on the systematic literature review conducted, several strengths were identified within the UK pandemic risk governance strategy. However, in addition to the identified strengths, major issues were identified within the pandemic risk governance system. Due to such issues identified within the pandemic risk governance mechanism in the United Kingdom, thousands of lives were lost as a short-term impact, and loss of livelihoods, as well as antisocial acts and behaviors resulted as long-term impacts. Hence, there is an urgent need to strengthen the pandemic risk governance mechanism for any future pandemic or crisis. Accordingly, several recommendations were drawn, based on the literature review, to address the above-stated challenges.

One of the key recommendations identified from the review is to promote and strengthen multistakeholder participation. According to [Ansell et al. \(2020\)](#) and [Atkinson et al. \(2020\)](#), robust governance strategies are required, specifically during pandemics or crises. They emphasized the role of the public sector as a key stakeholder. Similarly, coordination between the scientific community and policymakers for effective risk governance was also recommended by several researchers. For example, [Djalante et al. \(2020\)](#) and [Collins et al. \(2020\)](#) highlight the necessity of strengthening science–policy interactions and the importance of implementing decisions without ignoring or delaying. Coordination among national and international agencies is also recommended to enable data sharing and collaboration, as recommended by [Dayrit and Mendoza \(2020\)](#).

Another key recommendation was strengthening effective risk assessment and timely actions. One of the issues faced by countries, specifically the United Kingdom, was ignorance of early risk assessments. Hence, [Collins et al. \(2020\)](#) emphasized the importance of reviewing national and international risk assessments thoroughly and strengthening emergency preparedness measures. According to [Djalante et al. \(2020\)](#), effective risk assessments play a key role in effective disaster risk reduction. They further emphasize the involvement of many health science experts in assessing and understanding future risks of pandemics.

In addition to correct risk assessment, an appraisal is vital when dealing with emergencies, especially when dealing with unknown pandemic outbreaks. For example, [Parker \(2020\)](#) highlighted how important the UK's NSC is for gathering intelligence on any future threats

to the United Kingdom. He recommends using the NSC, rather than limiting their role, and introducing necessary legislative measures to support the services for which the NSC was initially established. Adding to the same recommendation, [Djalante et al. \(2020\)](#) recommended that existing early warning systems could be used for any health-related emergencies in the future. [Collins et al. \(2020\)](#) also suggest to utilize advanced technologies to strengthen the future pandemic risk governance. For example, the use of technology for an effective test and trace system was recommended.

Several researchers have recommended timely actions as another key factor when dealing with a pandemic. According to [Collins et al. \(2020\)](#), timely actions and strengthening disaster preparedness measures are equally important. For example, one of the major issues faced by the UK Government was inadequate PPE, hospital beds, and trained staff in the NHS. Thus, they propose strengthening the emergency preparedness measures with adequate resources ([Collins et al., 2020](#)). Hence, the government should invest more in health-care systems toward building resilience for future pandemics and other emergencies. [Dayrit and Mendoza \(2020\)](#) recommended government leadership in designing more inclusive social protection and health-care systems, to avoid any member of the society being left behind. They further recommend designing such recovery plans at the early stages. [Djalante et al. \(2020\)](#) and [Dayrit and Mendoza \(2020\)](#) also recommended identifying the most vulnerable groups in the community, women, and disabled, and including them in designing recovery packages.

In controlling the spread of a pandemic, communication plays a major role. Nevertheless, there were several issues identified within national and global communication strategies during the COVID-19 pandemic. Hence, strengthening communication and information sharing were suggested specifically when dealing with future health emergencies. For example, [Djalante et al. \(2020\)](#) recommended sharing key information and messages with communities during a future pandemic outbreak, such as sharing experiences of preventive and treatment systems, information on new vaccines and preventive medicine, means to protect the community from spreading the line of infection, and also basic awareness on sanitation. [Collins et al. \(2020\)](#) also recommended establishing national and international risk information centers and making them responsible for communicating warnings as soon as a risk is identified. Furthermore, attention could be paid to allocating adequate resources to such centers and introducing decentralized communication systems.

[Fearnley and Dixon \(2020\)](#) further recommended incorporating a last-mile approach, applicable in other disaster early warning systems (EWS), for pandemic EWS at the community level. They further recommended the introduction of translation and multiway communication when designing and issuing alerts, to understand what information is credible and relevant. Similarly, the use of common communication protocols was also suggested. [Fu and Zhu \(2020\)](#) also recommend to ensure transparency and proactive communication which is essential for early detection and containment of pandemics.

Even though it is too early for a complete evaluation, this initial analysis provides imperative inputs to the government for addressing the issues identified within the pandemic risk governance in the United Kingdom. Nonetheless, further research is required to capture further risk governance aspects in detail.

Acknowledgement

This project is funded by the UK Research and Innovation through the UK Government's Global Challenges Research Fund (GCRF) and the Newton Fund [grant number EP/V026038/1]. UK Research and Innovation accept no liability, financial or otherwise, for expenditure or liability arising from the research funded by the grant, except as set out in the Terms and Conditions or otherwise agreed in writing.

References

- Ahmad, E. (2020). Multilevel responses to risks, shocks and pandemics: Lessons from the evolving Chinese governance model. *Journal of Chinese Governance*, 1–29.
- Amaratunga, D., Fernando, N., Haigh, R., & Jayasinghe, N. (2020). The COVID-19 outbreak in Sri Lanka: a synoptic analysis focusing on trends, impacts, risks and science-policy interaction processes. *Progress in Disaster Science*, 8, 100133.
- Amaratunga, D., Haigh, R., & Hettige, S. (2019). *Accountability in the context of disaster risk governance*.
- Ansell, C., Sørensen, E., & Torfing, J. (2020). The COVID-19 pandemic as a game changer for public administration and leadership? The need for robust governance responses to turbulent problems. *Public Management Review*, 1–12.
- Atkinson, P., Gobat, N., Lant, S., Mablesen, H., Pilbeam, C., Solomon, T., Tonkin-Crine, S., & Sheard, S. (2020). Understanding the policy dynamics of COVID-19 in the UK: early findings from interviews with policy makers and health care professionals. *Social Science & Medicine*, 266, 113423.
- Aven, T., & Boudier, F. (2020). The COVID-19 pandemic: how can risk science help? *Journal of Risk Research*, 1–6.
- Aven, T., & Renn, O. (2018). Improving government policy on risk: eight key principles. *Reliability Engineering & System Safety*, 176, 230–241.
- Bell, M., Warren, A., & Budd, L. (2012). Scales of governance: the role of surveillance in facilitating new diplomacy during the 2009–2010 H1N1 pandemic. *Health & Place*, 18(6), 1404–1411.
- Brown, P. (2020). *Studying COVID-19 in light of critical approaches to risk and uncertainty: research pathways, conceptual tools, and some magic from mary Douglas*. Taylor & Francis.
- Cabinet Office. (2012). *Chapter 1 Introduction revision to emergency preparedness*. England Cabinet Office.
- Cagnin, C., Loveridge, D., & Saritas, O. (2011). FTA and equity: new approaches to governance. *Futures*, 43(3), 279–291.
- Civil Contingencies Act 2004. (2004).
- Chambers, J., Barker, K., & Rouse, A. (2012). Reflections on the UK's approach to the 2009 swine flu pandemic: conflicts between national government and the local management of the public health response. *Health & Place*, 18(4), 737–745.
- Collins, A., Florin, M.-V., & Renn, O. (2020). COVID-19 risk governance: drivers, responses and lessons to be learned. *Journal of Risk Research*, 1–10.
- Connolly, J. (2015). The “wicked problems” of governing UK health security disaster prevention: The case of pandemic influenza. *Disaster Prevention and Management*, 24(3), 369–382. <https://doi.org/10.1108/DPM-09-2014-0196>.
- Control, C.f. D., & Prevention. (2012). *Principles of epidemiology in public health practice. An Introduction to applied epidemiology and biostatistics* (3rd ed.). Atlanta: US Department of Health and Human Services.
- Dayrit, M., & Mendoza, R. U. (2020). *Social cohesion vs COVID-19*. Available at: SSRN 3555152.
- Department of Health. (2011). *UK influenza pandemic preparedness strategy 2011*. Department of Health.
- DH/HIP/PIP. (2012). *Health and social care influenza pandemic preparedness and response*. Department of Health. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/213696/dh_133656.pdf.
- Djalante, R., Shaw, R., & DeWit, A. (2020). Building resilience against biological hazards and pandemics: COVID-19 and its implications for the Sendai framework. *Progress in Disaster Science*, 6, 100080. <https://doi.org/10.1016/j.pdisas.2020.100080>
- Dunford, M., & Qi, B. (2020). Global reset: COVID-19, systemic rivalry and the global order. *Research in Globalization*, 2, 100021.

- Eriksson, K., & McConnell, A. (2011). Contingency planning for crisis management: recipe for success or political fantasy? *Policy and Society*, 30(2), 89–99.
- Fearnley, C. J., & Dixon, D. (2020). Early warning systems for pandemics: lessons learned from natural hazards. *International Journal of Disaster Risk Reduction*, 49, 101674.
- Ferrari, R. (2015). Writing narrative style literature reviews. *Medical Writing*, 24(4), 230–235.
- Fu, K.-w., & Zhu, Y. (2020). Did the world overlook the media's early warning of COVID-19? *Journal of Risk Research*, 1–5.
- Georgalakis, J. (2020). A disconnected policy network: The UK's response to the Sierra Leone Ebola epidemic. *Social Science & Medicine*, 250, 112851.
- GOV.UK. (2020a). *The government UK*. Retrieved 20 July 2020 from <https://www.gov.uk/government>.
- GOV.UK. (2020b). *Guidance coronavirus act 2020: status table*. Department of Health and Social Care. Retrieved 14 08 2020 from <https://www.gov.uk/government/publications/coronavirus-act-2020-status/coronavirus-act-2020-status-table>.
- GOV.UK. (2020c). *PM Statement on coronavirus: 12 March 2020*. GOV.UK. Retrieved 26 05 2020 from <https://www.gov.uk/government/speeches/pm-statement-on-coronavirus-12-march-2020>.
- Haddon, C. (2020). *UK government coronavirus decision making: key phases*. Institute for Government. Retrieved 20 08 2020 from <https://www.instituteforgovernment.org.uk/explainers/uk-government-coronavirus-decision-making-phases>.
- Hemingway, R., & Gunawan, O. (2018). The natural hazards partnership: a public-sector collaboration across the UK for natural hazard disaster risk reduction. *International Journal of Disaster Risk Reduction*, 27, 499–511.
- Hunter, D. J. (2020). Covid-19 and the stiff upper lip—the pandemic response in the United Kingdom. *New England Journal of Medicine*, 382(16), e31.
- IRGC. (2019). *International risk governance framework*. Retrieved from <https://irgc.org/risk-governance/irgc-risk-governance-framework/>.
- Jones, N., O'Brien, M., & Ryan, T. (2018). Representation of future generations in United Kingdom policy-making. *Futures*, 102, 153–163.
- Kashyap, A., & Raghuvanshi, J. (2020). A preliminary study on exploring the critical success factors for developing COVID-19 preventive strategy with an economy centric approach. *Management Research: The Journal of the Iberoamerican Academy of Management*, 18(4), 357–377. <https://doi.org/10.1108/MRJIAM-06-2020-1046>.
- Lambeth, & Southwark Public Health. (2016). *Pandemic flu coordination plan Lambeth & Southwark*.
- Laufs, J., & Waseem, Z. (2020). Policing in pandemics: a systematic review and best practices for police response to COVID-19. *International Journal of Disaster Risk Reduction*, 101812.
- Leach, M., MacGregor, H., Scoones, I., & Wilkinson, A. (2020). Post-pandemic transformations: how and why COVID-19 requires us to rethink development. *World Development*.
- MET. (2020). *Natural hazards partnership*. Met Office. Retrieved 15 08 2020 from <https://www.metoffice.gov.uk/services/government/environmental-hazard-resilience/natural-hazards-partnership>.
- Nice, A. (2020). *Expert advice to government on pandemics*. Retrieved 29 06 2020 from <https://www.instituteforgovernment.org.uk/explainers/expert-advice-government-pandemics>.
- ONS. (2021). *Latest data and analysis on coronavirus (COVID-19) in the UK and its effect on the economy and society*. Office for National Statistics. Retrieved 28 05 2020 from <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases>.
- Parker, C. G. (2020). The UK national security council and misuse of intelligence by policy makers: reducing the risk? *Intelligence and National Security*, 1–17.
- Public Health England. (2014a). *Pandemic influenza response Plan2014*. P. H. England.
- Public Health England. (2014b). *Pandemic influenza strategic framework-2014*. London: Public Health England. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/344696/PI_Strategic_Framework_13_Aug.pdf.
- Renn, O. (2015). Stakeholder and public involvement in risk governance. *International Journal of Disaster Risk Science*, 6(1), 8–20.
- Renn, O., Klinke, A., & Van Asselt, M. (2011). Coping with complexity, uncertainty and ambiguity in risk governance: A synthesis. *Ambio*, 40(2), 231–246.
- Ryan, M. (2020). In defence of digital contact-tracing: human rights, South Korea and Covid-19. *International Journal of Pervasive Computing and Communications*, 16(4), 383–407. <https://doi.org/10.1108/IJPC-07-2020-0081>

- Scally, G., Jacobson, B., & Abbasi, K. (2020). The UK's public health response to covid-19. *British Medical Journal Publishing Group*, 369. <https://doi.org/10.1136/bmj.m1932>.
- Shaw, R., Kim, Y.-k., & Hua, J. (2020). Governance, technology and citizen behavior in pandemic: lessons from COVID-19 in East Asia. *Progress in Disaster Science*, 100090.
- Sibony, A.-L. (2020). The UK COVID-19 response: A behavioural irony? *European Journal of Risk Regulation*, 1–8.
- Smith-Walter, A., & Sharif, F. S. (2017). Is government (un) dead?: What apocalyptic fiction tells us about our view of public administration. *International Journal of Organization Theory and Behavior*, 17(3), 336–366. <https://doi.org/10.1108/IJOTB-17-03-2014-B004>.
- Stephenson, N., Davis, M., Flowers, P., MacGregor, C., & Waller, E. (2014). Mobilising “vulnerability” in the public health response to pandemic influenza. *Social Science & Medicine*, 102, 10–17.
- UNISDR. (2015). *Sendai framework for disaster risk reduction 2015–2030*. Retrieved from http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf.
- Vallejo, B. M., Jr., & Ong, R. A. C. (2020). Policy responses and government science advice for the COVID 19 pandemic in the Philippines: January to April 2020. *Progress in Disaster Science*, 7, 100115.
- Watkins, J. (2020). Preventing a covid-19 pandemic. *British Medical Journal Publishing Group*, 368. <https://doi.org/10.1136/bmj.m810>.
- Welby-Everard, P., Quantick, O., & Green, A. (2020). Emergency preparedness, resilience and response to a biological outbreak. *BMJ Military Health*, 166(1), 37–41.
- WHO. (2020). *Emergencies preparedness, response*. World Health Organization. Retrieved 12 August 2020 from https://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/.
- WHO. (2021). *Coronavirus disease (COVID-19) pandemic*. World Health Organization. Retrieved 12 01 2021 from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>.