



Handling false information in emergency management: A cross-national comparative study of European practices

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ABSTRACT

During emergencies, exposure to false information can increase individual vulnerability. More research is needed on how emergency management institutions understand the effects of false information and what are the various approaches to handling it. Our document analysis and 95 expert interviews in eight European countries – Germany, Italy, Belgium, Sweden, Hungary, Norway, Finland, and Estonia – show that approaches vary considerably: some have instituted central management of identifying and tackling false information while others prioritise the spreading of accurate information. A review of national practices and an analysis of recent crisis cases show that both approaches may be necessary. The diffusion of false information is strongly affected by the lack of timely and verifiable information from governments. We also find that in several countries, the emergence of false information is often associated with malicious foreign influence activities. Our study contributes to a better understanding of how the effects of false information are mitigated by the emergency management systems in Europe.

1. Introduction

Communication is a fundamental tool in emergency management. The purpose of communication in emergency management is raising awareness about risks and urging protective behaviour prior to and during hazardous events [1]. The truthfulness of sent and received messages becomes essential during emergencies, while a persons' well-being and decisions are dependent on the quality of information they receive.

With a broader surge of social media use, the spread of unverified and often false information has proliferated [2–8]. The ability of individuals to distinguish between false and correct information is supported by clear and easily understandable official messages [9]. In the context of crises and disasters, false or misleading claims, malicious disinformation, rumours, or pranks may put individuals at increased risk and/or hamper the normal operation of emergency management

institutions [10,11].

For the normal operation of emergency management, regular and accurate communication is essential [12,13]. It is therefore necessary to study the effects of false information on the capacity of individuals and institutions to cope with emergencies [5,9,14,15]. The specific mechanisms that are used in emergency management systems to prevent or mitigate harmful effects of false information need more scholarly attention to enable appropriate mitigation measures in emergency management [16–19]. There are some studies that look at strategies of handling false information [20–22], but there are few, if any, cross-national comparative overviews of these practices.

In this article, we explore how emergency management institutions understand the effects of false information and what approaches are used to manage false information during actual crises. By analysing official documents and 95 expert interviews in eight European countries (Germany, Italy, Belgium, Sweden, Hungary, Norway, Finland, and

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Estonia), we offer a systematic, comparative understanding of the practices of institutional handling of false information in the emergency management systems in Europe. We address three research questions:

- 1) How do different national institutions concerned with emergency management conceptualise false information?
- 2) How have emergency management institutions mitigated the risks posed by false information?
- 3) How has false information been handled by emergency managers in actual crises?

We first review existing literature on the principles and practices of handling false information by emergency management institutions. We then describe our data and method in more detail and present the results of our analysis. We conclude by discussing the main lessons drawn from our case studies.

2. Understanding vulnerability to false information and tools for its mitigation by emergency managers

When emergencies occur, all first responders, crisis communicators and local authorities have to cooperate in sharing information with the aim of reducing people's vulnerability and increasing resilience [12]. Therefore, emergency management systems and their communication networks (e.g. supporting government agencies, local institutions) should update and inspect their capabilities to tackle information-related problems regularly [23].

Inaccurate institutional communication during emergencies brings about several communication-related vulnerabilities. These include instances where people either believe and act upon false information, neglect truthful information because of distrust towards institutions [24], or cannot receive relevant information because of their circumstances [10]. Individuals' trust in information sources can be evaluated by studying their assumption of risks [25,26] and this trust may change over time due to the changing cost and quality of the information source [25].

Information behaviour researchers have argued that our need for information during uncertain situations is impelled by a desire to make confident decisions concerning subsequent actions [27]. Emergency situations are occasions when people are likely to engage in information seeking to reduce uncertainty and dissonance [28,29]. Hence, when false information happens to be the only information available, the subsequent actions during emergency situations can easily lead to sub-optimal outcomes.

Quarantelli [30] foresaw the problematic aspects of the diffusion of inappropriate or incorrect disaster-related claims and ideas already before the social-media era. Contemporary technology has changed the ways of communicating and socialising, whereas the speed, scale and anonymity of messages are unprecedented. In addition to traditional official channels, people increasingly use social media during crises to determine their future actions [31]. This increases their likelihood of running into inaccurate or incomplete information that does not coincide with the official communication of emergency management institutions in their countries. To counteract these tendencies, over a 100 independent fact-checking groups and organisations have emerged around the world during the last decade [4] and international organisations such as the Europol [32]; the International Organisation for Migration [33], the World Health Organisation [34] and the United Nations [35] have launched awareness campaigns to combat harmful information.

To better understand the causes and effects of the increasing spread of unchecked information – a global information pollution or “information disorder” – Wardle & Derakshan [36] have suggested differentiating between three dimensions of informational harm and falseness: *misinformation*, when false information is shared, but no harm is meant; *disinformation*, when false information is knowingly shared to cause

harm; and *malinformation*, when genuine information is shared to cause harm (e.g. leaks of private information). This framework has been adopted also by other scholars [15,37–39]. From their taxonomy, “disinformation” denotes activities conducted by malicious powers to influence the perceptions, behaviour and decisions of target groups to the benefit of those powers [40,41].

Previous studies on information disorder during emergencies have mainly focused on public social media usage [19,42–47]. Because of the rapidity of information flow in social media and the lack of possibilities to verify information in emergency situations, social media becomes a perfect platform for false information [4,48–50]. Unequal capacities to deal with false information has been attributed to the countries' varying abilities to accommodate to the new reality of social media [42].

Research on citizens' social media use during emergencies shows that disorganised and chaotic information flows hamper the work of emergency managers [43]. However, social media may also help to engage the public in the debunking of false information during emergencies [46] and may have a positive effect on collaborative problem-solving [42,48].

One key determinant of individuals' resilience to false information is information literacy (or media literacy), which involves the “careful retrieval and selection of information available / ... / in all aspects of personal decision-making” ([51], 215). Commonly, media literacy is understood as “a process or set of skills based on critical thinking” ([52], 3). That, paired with the proven benefit of online collaborative problem-solving, sets a positive example of the possibility to tackle false information by individuals. A person's skills in handling false information may be also enhanced by using tools such as browser plugins [53–55] and educational games [56].

A growing body of research deals with vulnerabilities related to false information, including harm to health [15,57] as well as harm occurring during humanitarian crises, natural disasters, manmade crises, health-care crises and complex emergencies [38]. However, the mechanisms of becoming vulnerable due to false information, including how false information hampers the functioning of institutions tasked with managing emergencies and securing well-being, remain under-explored [10].

Communication researchers show that people who use fewer news sources and lack skills of using the internet are most vulnerable to false information [58]. The situational and intersectional nature of communication-related vulnerabilities, including access to verified information and the ability to distinguish between false and correct information, has been highlighted, too [10,59]. For example, a lack of official information about the emergency undermines one's ability to respond to disaster scenarios [60].

Only a few studies have explored the extent and nature of institutional strategies for handling false information. Some researchers have recommended emergency managers fill the role of “sense-givers” who 1) provide instant and accurate information, 2) take a position on circulating rumours and, if necessary 3) debunk misinformation [61]. A well-regulated use of social media helps to avoid chaotic communication and to support the work of emergency managers [43]. Veil et al. [14] recommend that institutions use social media also for daily communication, to strengthen the relationship of trust with the public that could be employed also at the time of emergency.

Furthermore, the clear labelling of official messages contributes to tackling the spread of unofficial and unverified information [9]. Brynielsson et al. [62] highlighted data acquisition and data analysis as important aspects in social media screening for increasing situational awareness by the emergency management institutions.

Much of the research on the topic of false information has focused on the growing mechanisms of false information during public crises or fast-paced events [17,39,63] and on the possibilities of mapping it online [6,16,39,48,64] or of debunking and correcting it [20].

In the context of emergency management, researchers have shown that decentralised management and resource allocation helps to avoid high consequence failures that centrally managed systems are more

prone to [65]. The benefits of decentralisation have thus been supported by others [66]. However, there are no comparative studies yet looking at de/centralisation of tackling false information in different emergency management systems.

By exploring the official definitions and current practices of handling false information during emergencies, we seek to contribute to the empirical study of institutional experience with false information and shed new light on how false information makes individuals more susceptible to contemporary hazards.

3. Data and method

To answer the research questions stated in the introduction, we examined various institutional emergency management approaches to dealing with false information in Europe, along with an array of crises that have ravaged different European communities: the earthquake in L'Aquila, Italy (April 2009); the terrorist attack on government building in Oslo and at the island of Utøya, Norway (July 22, 2011); a snowstorm in Hungary (March 2013); a flood disaster in Germany (June 2013); a sharp rise in asylum seekers in Sweden (2015); the terrorist attack on Brussels airport and metro (March 22, 2016); drinking water contamination in Nousiainen, Finland (January 2017); and, critical infrastructure failures due to a storm in Southern Estonia (October 2019). The cases were chosen to best illuminate the hypothetical crisis communication challenges experienced in Europe, and include crises triggered both by natural as well as man-made hazards. They also help to illustrate how false information has been handled by emergency managers in practice.

We collected and analysed empirical material including publicly accessible legal acts, policy documents, official guidelines, and press reports. We searched for documents concerning emergency management and scrutinised them for themes concerning the institutional practices of handling false information. To complement this material, country study team members carried out 95 semi-structured expert interviews (approximately 60 min each) with emergency managers in selected European countries between September 2019 and February 2020 (see Appendix).

Interviewees were identified based on their specialisation and experiences in crisis management and mitigating vulnerabilities in crisis, including risk and crisis communication. The semi-structured questions for the informants followed the analytical themes of how different crisis management institutions conceptualise false information, what are the actions taken by these institutions to mitigate the risks posed by false information, and experiences of handling false information in past major crises.

Similar cross-national thematic analysis has been used in the past when comparing the crisis management systems in European countries [67,68]. When different languages and systems are involved in a cross-national study, it is advised to collect and organise data in the local language and only later compile country reports in a common language [69].

Our research team members, who also carried out the interviews, shared the task of undertaking preliminary analyses of interviews and documents, with those in languages other than English being read and summarised into case studies by native speakers. For each country analysis there were two deliverables: an answer sheet with brief answers to thematic questions about emergency management systems in Europe; and, a longer more detailed country study narrative. We then used qualitative thematic content analysis [70] on the country reports to identify major commonalities and differences in the ways in which false information is defined and treated in different political/administrative systems.

4. Results

Our findings from the eight countries fall under three thematic

sections: (1) conceptualisations of false information; (2) approaches to handling false information; and, (3) recent experiences with false information and its effect on vulnerability. The comparison between the analysed countries' emergency management systems in terms of conceptualisations and activities in handling false information is summarised in Table 1.

4.1. Conceptualisations of false information

While none of the studied institutions have officially defined false information, in most countries (Germany, Italy, Sweden, Finland, Norway and Estonia) the related terms are either mentioned in some documents or conventionally used by emergency managers.

The fact that official definitions existed in none of the studied countries could signify that crisis communication experts' knowledge and existing official guidance related to the subject has been sufficient. This claim is supported by the fact that much of the discourse in our data on the topic of false information derives from guideline documents for officials [71–77,88,104] and is backed with interviews (Interview at German National Emergency Organisation (BBK), December 2019; Interview at Italian government office, January 2020).

Terminology seems to revolve around two sub-terms of false information: misinformation and disinformation. The term "misinformation" is prevalent in the discourse [73,74,76,78–80]. However, it is often used in both meanings (Interview at German National Emergency Organisation, December 2019; [73]). "Inaccurate" or "unintentional" are repeatedly mentioned properties of misinformation in Sweden and Estonia (e.g. [73]).

False information spread is often blamed on the lack of information (Interview at German National Emergency Organisation, December 2019), but also on the lack of trust in public institutions (Interview at Italian government office, January 2020). Notably, the emergency managers interviewed in Italy use the term "bad information" to refer to any false information phenomena (Interview at Italian government office, January 2020). Overall, the understanding of false information is rather biased towards the malcontent part of it, e.g. disinformation (Interview at German National Emergency Organisation, December 2019 [41,81,104]).

Distinctions of disinformation types emerge according to the effect it has. For example, disinformation is seen as (1) deliberate false information exploited for political purposes or (2) hindering or damaging emergency operations (Interview at German National Emergency Organisation, December 2019). The Norwegian Directorate for Civil Protection (DSB) conceptualises the same idea by laying down disinformation's main purposes: "To divert attention from a theme, cover the truth or try to influence the actors to act in a particular way" (Interview at DSB, January 2020).

Foreign influence activities have been highlighted as one of the primary manifestations of disinformation in Sweden [41,81,104], Norway (Interview at DSB, January 2020), Finland [71,82], and Estonia [75,83]. The Finnish document of planning municipalities' crisis communication goes a step further and attributes the spread of disinformation to the techniques of modern warfare [71]. Similarly, the Norwegian DSB describes disinformation as "misleading information and arguments to influence the public debate or decision making; or undermine democratic processes" (Interview at DSB, January 2020).

4.2. Approaches to handling false information

We found that responding to misinformation is organised relatively loosely in Germany, Italy, Hungary, Norway, Finland, and Estonia and more strictly in Belgium and Sweden. It appears that countries with decentralised emergency management (Germany, Norway, Finland, Estonia) also have a decentralised system for responding to misinformation. Formal guidelines or regulations for dealing with challenges of misinformation in the context of emergency management exist in

Table 1
Approaches to false information in emergency management in eight European countries.

	GER	ITA	BEL	SWE	HUN	NOR	FIN	EST
Conceptualisations of false information								
No official definitions of false information in policy documents	X	X	X	X	X	X	X	X
Concept of false information is generally understood	X	X		X		X	X	X
Approaches to handling false information								
Responding to misinformation organised loosely	X	X			X	X	X	X
Responding to misinformation organised more strictly			X	X				
Semi-official groups included in responding	X	X					X	X
Formal guidelines/regulations for misinformation				X		X	X	X
Campaigns about misinformation dangers		X	X	X		X	X	X
Emphasis on media literacy		X					X	
Level of institutionalisation								
Centralised crisis management system		X	X	X	X			
Decentralised crisis management system	X					X	X	X
False information associated with malicious foreign activities				X		X	X	X

Sweden, Norway, Estonia and Finland.

4.2.1. The level of organisation in tackling false information

Italy, Belgium, and Sweden have specific agencies either dedicated to, or with clear responsibility for, countering misinformation. Somewhat more decentralised (i.e., using the help of benevolent groups, NGOs, citizen initiatives, on-call volunteers etc.) information response systems can be found in Germany, Italy (in addition to specific agencies), Hungary, and Norway.

In Italy, the agency responsible for tackling misinformation depends on the scope of the case. In case of an emergency, the local mayor tackles false information with the tools available; but if the emergency is managed centrally, the Department of Civil Protection prioritises social media as the channel to respond to false information (Interview at Department of Civil Protection, December 2019). In Italy, a simple form for reporting 'fake news' has been instituted so that the Postal Police will be able to intervene directly [84].

In Belgium, crisis management teams respond to misinformation. Municipal or provincial authorities appoint a crisis management official who develops a crisis communication plan that serves as a guideline for informing the population in an emergency situation [85]. On the federal and provincial levels, there are officials specifically trained in crisis communication and dealing with social media (Interview at University of Liege, January 2020).

In Sweden, the guidelines for responding to misinformation are presented in the Swedish Civil Contingencies Agency's (MSB) 'regulatory letter' [86] which includes tasks for enhancing relevant actors' preparedness by provision of research funding, education and collaboration with the media regarding information influencing. The agency also has a central responsibility to coordinate action against misinformation campaigns targeting Sweden. This includes monitoring and analysis to understand identified problems, actively communicating correct information, and distributing messages to counter misunderstandings and false information [77].

In Hungary, the National Directorate General for Disaster Management located within the Ministry of Interior publishes official announcements and monitors social media (Interview at Hungarian Civil Protection Agency, December 2019; Interview at Budapest Waterworks, November 2019).

In Norway, responding to misinformation is generally organised by the department of communication of the institution that is affected. The guidelines for responding to misinformation are included in the crisis communication guidance for public and private agencies by the DSB [87].

4.2.2. Emphasis on spreading truthful information

When examining Finland and Estonia we find an emphasis on spreading truthful information rather than directly tackling misinformation via specific agencies (Interview at Estonian Information System Authority, November 2019; [109]). In these decentralised systems, each emergency management institution and vital service provider (e.g., water and electricity companies) is responsible for their own communication.

The government of Finland has published a general handbook for communication experts titled *Countering Information Influence Activities* [109] that offers help on how to tackle information operations and false information. The book stresses that "media, open sources and observing opinions and analysing them becomes more important in abnormal situations and emergencies. Systematic observation and analysing aims to prevent rumours and disinformation from spreading ..." ([109], 21). According to a Finnish official, "rescue services don't take part in debates" but "social media is followed and when needed, a correction is posted as a reply to a message" (Interview at Finland Regional Emergency Services, January 2020).

In Estonia, official plans for solving different scenario emergencies also include countering misinformation as a task for communication teams [76]. The *Handbook on Crisis Communication* states that a crisis communication group should inform the group leader about false information and speculation. If false information triggers unwanted behaviour among the population, every effort should be made to counter it [73]. In terms of preparation, the *Estonian Guide for Coping with Information Attacks* [83] explains how to prepare for malicious information attacks, how to recognise such activity, and how to react when information attacks occur in crisis situations.

4.2.3. Semi-official management mechanisms

Semi-official groups participate in countering false information in Germany, Italy, Finland, and Estonia. In Finland, there is an agency called Faktabaari, an impartial journalistic service using social media for collecting and distributing factual information. Faktabaari is managed by a voluntary staff of professional journalists, researchers and EU experts with the help of broader network of topical experts and information and media literacy specialists. The *Finland Security Strategy for Society* highlights the role of good journalism in tackling disinformation and improving citizens' media literacy promotes safe control of media environment and helps defend against disinformation" ([88], 23).

Norway has a somewhat similar approach. Faktisk.no AS is a non-profit organisation and independent editorial board for fact-checking of the public debate in Norway. The purpose of Faktisk.no is to contribute to an open, inclusive and fact-based public conversation. Faktisk.no is owned and financed by some of the largest media

companies in Norway (Faktisk.no, 2020). Several of these companies receive public funding. In addition, Faktisk.no gets funding through grants from non-profit organisations and foundations [89].

Germany has implemented a hybrid solution. In Germany, decentralised crisis management and communication teams, called “Virtual Operations Support Teams”, monitor and respond to crises (including misinformation) in social media. These teams are available as a support for every emergency on the German territory, including searching for new information, validating information, and supporting communication [90].

Italy has online communities that do fact-checking and unmask hoaxes [91,92] and in Estonia, there is a volunteer organisation called Propastop, (a part of the Estonian Defence League) which operates to counter misinformation campaigns [93].

4.2.4. Campaigns to enhance awareness of false information

Italy, Belgium, Sweden, Norway, Finland, and Estonia have carried out campaigns for informing the public about the dangers of false information. Existing campaigns have either been addressed to the youth (e.g., Italy, Finland, Norway) or just to unspecified “public” (e.g., Italy, Belgium, Sweden, Finland, Norway, Estonia). However, only a few of them have focused on false information in emergency situations (e.g., Italy, Estonia). While all campaigns provide suggestions for general media literacy, the Finnish and Italian approaches take a step beyond. By addressing different age groups and maintaining a Media Literacy School (in Finland), the campaigns are aggressively ongoing.

In Italy, the Postal Police and the regional committees for communications, have been carrying out information and prevention activities in schools for years to address the risks and dangers associated with the use of the Internet, e.g. hate speech, stalking, violations of privacy, but also phishing [94].

In Belgium, the website Info-risques.be has a page dedicated to “responsible communication”, which, amongst other things, asks the public not to share rumours or any other information from unidentified sources [95] and in Sweden, the Swedish Civil Contingencies Agency (MSB) provides advice to the public on their websites on how to evaluate sources of information [96].

Finland emphasises the high level of education, which stimulates information literacy [75]. The campaign “Skills in the digital era” run by Ministry of Education and Culture and Finnish National Agency for Education seeks to strengthen adults’ digital skills. The National Audio-visual Institute (KAVI) promotes media education, children’s media skills and the development of safe media environment for children [97].

In Norway, critical thinking and source criticism have been reinforced in the new curricula to be implemented in autumn 2020 (Interview at Norwegian Directorate for Civil Protection, January 2020). One of the most important tasks of the Norwegian Media Authority is to increase critical media literacy of the population, e.g., through a campaign “Stop. Think. Check” (Interview at Norwegian Directorate for Civil Protection, January 2020).

In Estonia, the Code of Conduct for Crisis Situations [80] tells the citizens to “watch trustworthy information channels for official crisis communication and follow the code of conduct”. Also, the Estonian Information System Authority’s programme “IT-vaatlik” teaches how to reveal frauds on the web. The Government Office organises ‘digital competence days’ multiple times a year (Interview at Estonian Government Office, November 2019; Interview at City of Tartu, November 2019).

In Germany, there are no campaigns on misinformation threats in crisis situations, but there exists a federal guideline from the Ministry of Interior about crisis and risk communication [98], which informs institutions of the Federal Ministry’s demand of being perceived as the leading source of information. Likewise, Hungarian institutions tasked with crisis management have put an emphasis on crisis communication rather than on preparedness campaigns.

4.3. Experiences with false information

We explored particular country-specific crisis cases to find out how false information has interfered with crisis management. The content of false information, its dissemination mechanisms, the institutional reactions and means of harm in each of these cases are summarised in Table 2.

The case studies of the flood in Germany and the snowstorm in Hungary did not reveal any evidence that people were hurt due to misinformation. Regarding the terrorist attacks in Belgium, late and misdirected communication by the authorities had a harmful effect: it may have led to fatalities during the attacks in the underground [99]. Interestingly, official institutions reacted to false information, in some way, in almost all crisis cases. Only in the case of Elbe floods in Germany did officials not make any coordinated efforts to prevent the spread of misinformation.

We found that the diffusion of false information was commonly caused by the inability of the authorities to gather and share verified information widely and in time. For example, the July 22, 2011 terrorist attack in Norway illuminates the dangers of the absence of timely official social media statement [100]. The dissemination of incorrect information about how far the police had progressed towards the location persisted until the arrest of the culprit.

The studied cases indicate that the vastness of the operations that need to be coordinated to restore normal services may halt the normal information circulation and give room for the spread of rumours and false information. This was the case in the interrupted services of social assistance in Sweden [101], interruption of vital services due to storm in Estonia [102], and drinking water contamination in Finland [103]. The crisis coordination of service restoring efforts overweighed the efforts put into restoring and maintaining communication in crisis situation.

The analysed cases indicated that false information also spread due to the institutionalised, habitual information behaviour by officials, which was not reflexive to the situation at hand. For example, in the interruption of vital services in Estonia, an automated message was sent to clients. The message contained an underestimation of the time it took to restore the electricity connection. In the Finnish drinking water contamination case, official identification of and information about the source of contamination was delayed.

Unverified risk assessments and projections (e.g., underestimating threats) may later cause harm due to growing distrust in official sources. For example, in the Italian earthquake case, inaccurate information came from an amateur scientist who predicted an imminent earthquake based on fluctuations in radon gas detected by four homemade radiometers. Coincidentally, the forecast preceded the real earthquake for a few weeks, and this raised many doubts that the L’Aquila 2009 earthquake could have been predicted in advance. Additionally, the consequent court cases with the experts of the government created alarmism and reduced trust in institutions. This case shows that false information creates anger amongst the population, which believes it is being misled by official institutions.

The duration and foreknowledge of the hazardous event also played a significant effect in the spread of false information. German and Hungarian natural disaster incidents were different from the Italian. In the former cases, the existing forecasts and predictability about the event left less room for the emergence of false information and this might have led to less casualties. In the Italian case, the false alarms interfered with official information prior to the devastating earthquake.

5. Discussion

The management of false information varies considerably among countries, ranging from institutionalised, centralised management of false information to decentralised guidelines, and from active promotion of official narratives to a hands-off approach emphasising individual responsibility.

Table 2
Handling of false information caused vulnerabilities in particular country cases.

	What was the false information about?	How did it spread?	What was the institutional reaction?	Who were hurt as a consequence of false information?
Earthquake in L'Aquila, Italy, in April 2009	Prediction of imminent earthquake based on fluctuations in radon gas detected by four homemade radometers	Mass media and internet highlighted the information	A denunciation for "false alarm" was issued, and an injunction forbade the person from publicising his data on the Internet.	People who evacuated unnecessarily from home and citizens who no longer trust institutions
Red sludge disaster in Hungary in 2010	Non-toxicity of the red sludge	Company manager	Delayed governmental reaction	People who washed themselves in good faith
Terrorist attack against government complex in Oslo, Norway in 2011	Messages about it being more than one bomb explosion; and that Islamist terrorists were behind the attacks	The damage in Oslo city were so massive that people believed that it had been caused by several bombs Social media	Publication of actual number of bombs The police made the offender's identity public	Incidents where "Muslim-looking" people were threatened with violence
Terrorist attack at the island of Utøya, Norway in 2011	The arrival time of the police	Facebook and Twitter	Delayed police reaction	Unsuspecting youth who came out of hiding
Flood disaster in Germany in June 2013	Misinformation resulting in misallocation of helpers	Facebook and Twitter	No coordinated institutional response	No particular socio-demographic group
Increase in asylum seekers in 2015 in Sweden	Asylum seekers' confusion about their status (cause: no translation)	Word of mouth	Institutional attempts to change the narrative	Unaccompanied minors registered unknowingly
Drinking water contamination in Nousiainen, Finland in 2018	Official doubts about the credibility of the contamination of water	Facebook group	Delayed municipal reaction	Water drinkers
Critical infrastructure failures in Southern Estonia in 2018	Automatic message: power returning soon	Automatic message	No reaction	Local people who did not start preparing for a long-term power cut

The fact that official definitions for false information existed in none of the studied countries may signify that crisis communication experts possess sufficient knowledge and existing official guidance related to the subject. This claim is supported by the fact that much of the discourse in our data on the topic of false information derives from guideline documents for officials [13,71,73–77,80,104] and is backed with interviews (Interview at German National Emergency Organisation, December 2019; Interview at Italian government office, January 2020).

Official response to false information is organised relatively loosely in Germany, Italy, Hungary, Finland, Norway, and Estonia; and more strictly in Belgium and Sweden. Formal guidelines or regulations for dealing with challenges of false information in the context of emergency management exist in Sweden, Finland, Norway, and Estonia.

Depending on the structure of the crisis and risk communication systems (centralised or decentralised), identification and response to false information are organised differently. Countries with decentralised emergency management (Germany, Finland, Norway and Estonia) also have a decentralised system for responding to false information. Some countries (Italy, Belgium and Sweden) have specific agencies, or sections of agencies, dedicated to countering false information. Others (Finland and Estonia) put an emphasis on spreading truthful information rather than directly tackling false information.

In some countries, specialised communication support teams have been instituted to improve media monitoring and tackling false information on social media. Not bound to any particular crisis management institution, the teams can be called to action in any crisis case regardless of its location in a country. Semi-official groups for refuting false information exist also in Germany, Italy, Finland and Estonia. The German solution is a sort of a hybrid: a decentralised management with the opportunity to call to aid specialised central teams for crisis communication.

Our study indicated that the dissemination of false information is (in Sweden, Finland, Norway and Estonia) often associated with malicious foreign influence activities. The varying recognition of information influencing between different countries is problematic since it may hamper effective and coordinated communication response to harmful false information [105].

In our case studies, the diffusion of falsehoods was mainly caused by the lack of timely and officially confirmed information. Furthermore,

the existing forecasts and foreknowledge about the event left less room for the appearance and spreading of false information and this might have led to less casualties. Such scientific projections can be available in case of slowly evolving natural hazards like flood or snowstorm, but are more difficult to map in case of malicious acts like terrorist attacks, and almost impossible to predict in case of accidents or sudden natural hazards (e.g., earthquakes). In all country cases, various forms of false information led people to underestimate risks, thus making them more vulnerable to the hazards they were exposed to.

While previous literature has highlighted the importance of public trust in emergency management institutions [24], the issue of trust did not arise frequently in our studies, with the exception of Italy. This could be explained by the fact that, among the studied countries, Italy has the lowest rate of general trust towards public institutions [106]. As an important vulnerability mechanism, distrust towards official sources may hamper disaster management. Building and maintaining mutual trust between institutions and the public may discourage people from relying on unreliable sources, thereby possibly mitigating communication-related vulnerability in the context of emergencies.

As for other approaches to mitigating vulnerability to false information in emergencies, our case studies indicated that detecting problematic issues in media helps to mitigate the spread of possible false information. Nevertheless, not all countries have instituted monitoring mechanisms. This can be attributed to the varying levels of adopting social media tools altogether [42]. The case studies here demonstrated that social media is the primary channel for disseminating false information (see Table 2).

Another way of mitigating vulnerability to false information in crises is to provide media literacy training and organise public awareness campaigns (e.g., the Finnish example). This seems to be a reasonable strategy, since vulnerability to false information is higher among people who use fewer news sources and lack skills of using the internet [58].

A solution to mitigate the false information effect in social media could be the further development of social media platforms so that they would not expose users to narrow, targeted information, but would rather increase the users' exposure to a variety of topics and politically diverse information [107]. Zhu and others [63] also arrived at this conclusion from their comprehensive studies modelling the growing pathways of false information. They showed that when the susceptibility

rate of false information is low, the success of diffusion falls considerably. This supports the media education prevention technique in tackling false information. The approach has been also highlighted in the OECD report on combating misinformation [4].

Admittedly, the method of cross-national comparative qualitative analysis used here has limitations. The diversity of particular national settings, including the culture-specific connotations of the terms regarding crisis communication and false information, poses a challenge for interpreting the data. In our case, the risk of misrepresenting the country-specific data was lowered because our research team members had deep and native knowledge of the national and local socio-cultural contexts. Additionally, while our access to relevant interviewees and documents differed between countries, the country studies represent the information best available from public documents and key informants. For researchers who are planning to carry out similar large scale cross-national analyses, we highly recommend using a detailed research protocol to improve the consistency of data collection from different countries.

Drawing from the results of our research, future risk and crisis researchers could cross-analyse the relations of European risk cultures and false information management systems (e.g. [108]). The question whether pan-European campaigns complement or contradict the diversity of national level responses outlined in this article also remains to be explored in more detail. The diffusion of false information in relation to official institutional communication during emergencies needs more studying, as it might give researchers insight into the underlying alleviating effect of accurate institutional communication.

6. Conclusion

Our study suggests that in European emergency management systems: (a) false information is not officially defined in policy documents; (b) formal guidelines for tackling false information exist in only some countries, and there are no uniform practices of tackling false information in the context of crises; (c) decentralised crisis management systems use decentralised responses to false information and vice versa; (d) the diffusion of false information about crises is mainly seen as a result of the lack of up-to-date and officially confirmed public information; and, (e) building and keeping the relationship of trust between institutions and the public mitigates people's vulnerability to false information, because it can prevent people from relying on untrustworthy sources.

Understanding how emergency managers handle false information will help future decision-makers at multiple governance levels to alleviate the detrimental impact of false information in emergency management. Based on the lessons learned here, officials could usefully engage in information literacy campaigns, generally, in local communities, while targeting their specific efforts in two ways: by countering false information directly and by enhancing their own ability to provide trustworthy and timely information.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Interviews

Germany

National Emergency Organisation. (12/2019). Group interview

Italy

Italian government office. (1/2020)

Department of Civil Protection. (12/2019)

Belgium

University of Liege. (1/2020). Personal interview

Hungary

Hungarian Civil Protection Agency. (12/2019). Personal interview

Budapest Waterworks. (11/2019). Personal interview

Finland

Regional Emergency Services. (1/2020). Personal interview

Norway

The Norwegian Directorate for Civil Protection. (1/2020). Personal interview

Estonia

Estonian Information System Authority. (11/2019). Personal Interview

City of Tartu. (11/2019). Personal Interview

Estonian Government Office. (11/2019). Personal Interview

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