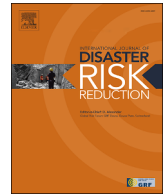Contents lists available at ScienceDirect

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Effectiveness of audience segmentation in instructional risk communication: A systematic literature review

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ABSTRACT

Instructional risk communication, with messages usually delivered in forms of general education campaigns, is not always effective. One of the reasons is that very often messages are not tailored for specific needs and demands of recipients. Audience segmentation can prove to be useful.

This paper presents a systematic literature review of peer-reviewed articles related to the effectiveness of application of audience segmentation to disaster education. The objective of this review is to highlight the effectiveness of audience segmentation as a concept within instructional risk communication and to provide specific instructions to managers that would benefit from applying this concept.

We identified 1493 papers published before April 2023 using systematic and hand-searching and we identified 15 articles for in-depth review that matched our inclusion criteria.

We extracted data on segments investigated, factors analysed, effectiveness analysis and related theoretical frameworks.

The results of this systematic literature review confirm the importance of tailoring contents of instructional risk communication to the needs of heterogeneous audiences through target messages. In the presentation of the findings of this systematic literature review, several important themes emerged, such as the importance of community engagement, the main characteristics of the segments, the necessity to involve vulnerable groups and the role of social media.

This review shows that audience segmentation can prove effective not only in health and climate communication, but also in crisis communication. Most of the results taken from the selected articles underline the need for crisis managers and practitioners to further explore the use of audience segmentation.

1. Introduction

Instructional risk communication aims to familiarize audiences with self-protective actions to take in case of risks to avoid negative consequences [1]. Despite being employed frequently in national campaigns, exercises and in emergency simulations, people are often not well prepared for disasters, and this often raise doubts about the effectiveness of instructional risk communication as a tool [2]. Previous analysis of the nature of existing instructional risk communication programs has found that such programs are often based on: a) conventional wisdom and personal experience of experts rather than on evidence and scientific research [3,4]; b) myths and unconventional beliefs such as panic [5]; c) individual rather than social instructions that do not reflect actual people's behaviour [6,7]; and d) generic programs that are not targeted to the specific characteristics of different groups of people [8]. These may explain

why people not always take self-protective action after receiving instructional messages, that is very common for example in case of evacuation orders [9–12].

Recently, the role of targeted communication towards such audience segments has been discussed as a potential resource for increasing the effectiveness of instructional risk communication [13]. As well stated in the literature, in fact, instructional risk communication is addressed towards an audience (and audience segments) that present different characteristics and features [14]. On the contrary, generic instructional risk communication programs that target general audience, fail to understand, and hit the differences in risk perception and acceptance; therefore, instructional risk communication programs and strategies failing to consider such differences risk being less effective [15].

Recent literature and research on instructional risk communication has tried to apply theoretical frameworks focused on the importance of different audiences, such as the audience segmentation. The concept of audience segmentation originates in the field of marketing and refers to the idea that customers can be segmented into similar homogenous groups with similar needs and demands [16,17]. The logic is similar when applied to instructional risk and crisis communication: general population receiving crisis or risk messages can be divided in similar homogeneous groups, each with its specific needs and demands which must be addressed to produce an effective and efficient communication [18].

Audience segmentation is often indirectly discussed in the general crisis communication literature, where several studies have frequently highlighted the importance of demographic factors such as age, sex, and ethnicity in relation to the acceptance of instructive messages [14,19,20]. The concept has also drawn attention in other disciplines, particularly in relation to public health and climate change communication. However, research and knowledge of best practices focusing on audience segmentation applied to instructional crisis and risk communication is limited [21].

In the specific context of instructional crisis communication, audience segmentation is addressed both implicitly and explicitly, with studies focusing on, for example, the influence of demographic factors on acceptance of instructional messages [22], and the idea of using different learning styles based on audience segmentation to produce tailored instructional messages [23]. Understanding the ways in which different segment of people receive and respond to instructional messages is increasingly viewed as an important indicator to analyse how the public behave during a crisis and disaster event [24,25]. Yet, while audience segments needs and characteristics are often view as important, there is a lack of knowledge on how audience segmentation may be incorporated into the instructional crisis communication literature to increase acceptance and therefore effectiveness.

The application of audience segmentation to crisis and risk communication is present in some fields such as in health and food sectors [26]. Audience segmentation in food crises, for example, allows the food companies to engage with specific groups of customers, understanding their needs and their demands to avoid crisis and risks especially concerning the supply chain disruptions. Audience segmentation is also used to improve the content messages about potential food crisis, because targeting diverse audiences means better understanding and consequently avoid, drivers and fears about food-related crises [27]. Similarly, research in the public health context, has stressed the that the importance of health communication able to target specific vulnerable and at-risk populations [28].

Thus, it is clear that instructional risk communication may benefit from audience segmentation and results in a significant improvement in communication strategy. As well known, ethnicity and culture especially have a pivotal role (and often represent an issue) on how instructions are perceived by the audience as well as on the effectiveness in tackling needs of the targeted group [29]. Alongside this, audience segmentation could help to highlight the need to provide instructions in different languages to allow targeted audiences to understanding of specific and crucial messages [30,31].

Finally, the application of audience segmentation could also help disaster managers to better focus on differences in gender; cultural values, in fact, are related to the roles of women across different societies, and targeted instructions and information could improve women participation during disaster and crises [32]; p. 2365).

This paper presents a systematic literature review that aims at discussing key concepts and find gaps in research related to the effectiveness of application of audience segmentation to risk and crisis communication. The objective of this review is to summarise the existing strategies that increase the effectiveness of audience segmentation applied to instructional risk communication and to provide insights to managers that would benefit from applying this concept.

2. Materials and methods

For this review, we applied a methodology based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [33] to identify and select documents that can be considered for a full-text review.

A systematic literature review was conducted using three main search engines; a) Web of Science; b) PubMed; and c) PsychINFO. The following search terms were included: disaster* OR crisis OR crises AND segment* OR target* AND communicate*. Dorks

The selection process aimed to identify articles with relevant research on the application and the testing of effectiveness of audience segmentation in the context of disaster and/or risk communication. As mentioned in the introduction, the application of audience segmentation in instructional communication has been investigated in various disciplines. Only studies written in English were Language included. Studies related to such disciplines (e.g., climate change, public health) other than the context of disaster and/or risk communication were excluded. Studies discussing the importance of using audience segmentation without testing its effectiveness were also excluded. Published and unpublished, scientific literature, peer-reviewed online academic journals and books, conference papers, theses and dissertations were excluded. Studies meeting all criteria were included regardless of the study design, the size of the sample, the factors analysed, and the analysis conducted. Choose a citation tool

Search results were imported into Zotero and duplicate entries from the same study identified and removed. Titles and abstracts of all papers retrieved were screened and any disagreements were discussed between the reviewers and the main author. Then full text

from selected articles were assessed for inclusion and a backward and forward review was performed to find respectively a) references cited in each article and b) articles that cite an original article or work after it had been published. After the backward search two papers were found but not included. Forward search did not result in further papers to be added. All data from included studies were extracted independently to create a standardised excel spreadsheet.

All the reviewers worked independently under the supervision of the PI in order to assess the risk of bias in terms of selection bias, performance bias or confounding, detection bias and reporting bias.

For the included articles, we extracted descriptive data such as year of publication, type of disaster, and country. We used a deductive approach to identify segments/groups investigated, data sources, study design, number of participants, conceptual framework used and the measurement bias. Finally, we extracted limitations and future research.

3. Results

A total of 1493 studies were found (Web of Science: 867; PubMed: 371; PsychInfo: 255); 309 duplicates were removed before the screening. 1184 records meeting the criteria were identified. The title and abstract screening resulted in 149 records selected (1035 excluded) and then assessed for eligibility. At the end of the process, we identified 15 articles for in-depth review. The PRISMA flow diagram in Fig. 1 provides an overview of the study selection process.

All articles included consist of peer-reviewed papers. The list of the articles and the related characteristics are presented in Tables 1 and 2.

This systematic literature review resulted in a selection of papers that present different topics, experiments and theories related to audience segmentation and crisis and disaster communication. A special focus was dedicated to papers discussing the effectiveness of audience segmentation.

Of the 15 included works, 12 (80%) clearly provide evidence and demonstrated experimentally the effectiveness of audience segmentation in crisis communication; only three theoretically discussed the effectiveness. 8 articles (53%) present experiment that were conducted specifically in US, 3 (20%) in multiple countries, 1 in the Netherlands, 1 in Mozambique and 2 without a specific country. The selected papers have the following five main objectives: a) describing how audience segmentation has been used to define the characteristics and behaviors of different segments [2,21,35]; R. A. [43]; b) examining learning style preferences and the related effect on receivers' perceived efficacy [23]; c) understanding stakeholders 'engagement [37,40,46]; d) investigating the role of social media [38,39,42,44]; and e) providing information about specific vulnerable groups [41,45], such as tourists [36].

The results of this review have been grouped in the following main themes.

3.1. Theoretical frameworks

Research has shown that several theoretical frameworks can be considered when applying audience segmentation to instructional risk communication. Such theories come from three main different domains, namely a) behavioral studies, b) communication ecology, and c) targeting approaches. Frisby and colleagues (2013) for example, pointed out that when specific learning preferences are targeted, the effectiveness of instructional messages during times of crisis may improve. Furthermore, the segmentation model [47] and behavioral targeting are often present; behavioral targeting, for example, is very often used by online advertisers to increase the effectiveness of advertisement campaigns by using users' choices and preferences to predict users' future behaviours [38].

3.2. Effectiveness of audience segmentation

The results of this systematic literature review confirm the importance of tailoring contents of instructional risk communication to the needs of heterogeneous audiences through target messages. [34] found that educational campaigns can benefit from the applica-
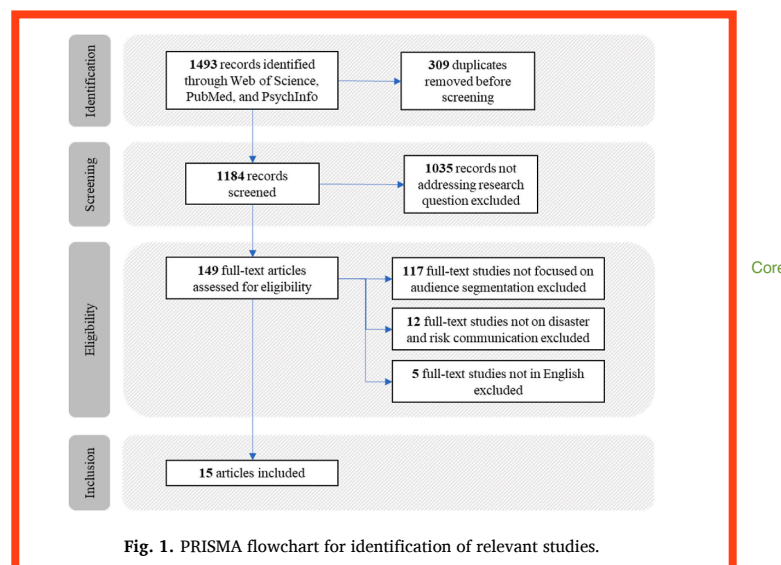

Fig. 1. PRISMA flowchart for identification of relevant studies.

Table 1
Overview of the studies selected in the study in terms of segments and factors analysed.

	Citation	Type of Event	Segment investigated	Factors analysed	Effectiveness
1	[34]	Earthquake	Campaign registrants	Gender, ethnicity, age, income, behaviour	Y
2	[35]	Terrorism	Consumers attitude	Consumer attitudes and values (fear and concerns)	Y
3	[23]	Food contamination	Students	Learning styles and preferences	N
4	[36]	No specific event	Tourists	Tourists, behaviour linked to various crisis scenarios	Y
5	[21]	Airplane crash	Classified according to ethnicity, gender, education	Ethnicity, education, age	Y
6	[37]	No specific event	Humanitarian organizations and stakeholders	Abstract audience, followers, other NGOs, news organizations, volunteers, donors' companies, public agencies, and citizen-based groups	Y
7	[38]	No specific event	No specific segment	N/A	N/A
8	[39]	Hurricane Harvey	Stakeholders and Emergency Management Organizations	Stakeholder groups including citizens, peer government agencies, and media during crisis	Y
9	[40]	Fire accidents	No specific segment	N/A	N/A
10	[41]	Water contamination	Consumers	N/A	N/A
11	[42]	Hurricane Sandy	Twitter users	Evolution of communication patterns and user concerns during Hurricane Sandy	Y
12	[43]	Famine	Female farmers	Local social life and groups - main focus on legumes and seeds	Y
13	[44]	COVID-19	Public health agencies for online communication	Agencies' engagement with communication partners (organizations and social groups)	Y
14	[45]	Natural disasters	Family groups	Demographic variables – gender, ethnicity, age, educational level, and income	Y
15	[46]	Food safety	College students	Issue involvement, predisposition toward the corporations	Y

Table 2
Overview of the studies selected in the study in terms of methodology and theoretical framework.

	Citation	Country	Data source	Study design	Type of message	Theoretical framework
1	[34]	US	Online survey	Quantitative	Great ShakeOut campaign	Abramson (2005), Bandura (1997), Murphy et al. (2009)
2	[35]	US	Survey	Quantitative	N/A	[35]; Stinson et al., 2006, 2007 a, b; Reynolds and Seeger (2005); Kinsey et al., 2008
3	[23]	US	Survey	Quantitative	Videos	[1], (Bandura, 1982),
4	[36]	AU, UK, US, CA	Survey	Quantitative	N/A	Roselius (1971), Beirman (2003a), Dolnicar, Laesser, & Matus, 2009
5	[21]	US	Online survey	Quantitative	Asiana Airlines' first press release on the crash	Communicative Action in Problem Solving (CAPS) [21]
6	[37]	JP, US, UK, PH, SG, CH, AU, DE	Online survey (Facebook and Twitter)	Quantitative	Responses to users' inquiries, posts on social media,	Saxton & Gup (2012, 2014), Schultz et al. (2012), Kent & Taylor (2018), Kent & Taylor (1998)
7	[38]	No specific country	Existing literature	Theoretical	N/A	
8	[39]	US	Tweets analysis	Quantitative	Tweets from US government	Freeman (1984), Mitchell et al. (1997), Yang & Taylor (2018)
9	[40]	NL	Existing literature	Theoretical	N/A	Chen, Sharman, Rao, and Upadhyaya (2008)
10	[41]	No specific country	Existing literature	Qualitative	N/A	Witte et al., 2001, Seeger 2006, [28]
11	[42]	US	Tweets analysis	Quantitative	Tweets during storm-phase	Not mentioned
12	[43]	MZ	Interviews, survey	Quantitative	N/A	LCA (Lanza, Collins, Lemmon, & Schafer, 2007)
13	[44]	IT, US, SE	Tweets and press releases analysis	Qualitative	Tweets and press releases from health agencies	Martin et al. (2016)
14	[45]	US	Survey	Quantitative	N/A	Godshalk (1994)
15	[46]	US	Survey	Quantitative	Facebook posts	SCCT Coombs (2007); Rowley (1997) amd [47]

tion of audience segmentation that targets the needs of different audience. In particular, audience segmentation has been proved effective in: a) improving community participation; b) engaging specific active groups and community leaders; c) prioritizing diverse stakeholder groups especially in the case of resource constraints; d) targeting and supporting vulnerable groups such as tourists; e) taking advantage of existing personal and familiar bonds; and f) adapting messages to situational variability that consider the evolution of the crisis and the related evolution of the messages. Also, audience segmentation has been proved useful to identify barriers and avoid those segments that can impede the diffusion of the messages.

3.3. Community participation

One of the main themes that emerged from this review is the use of targeted communication to increase community participation. The best communication for one community is not necessarily the most effective for another, and understanding the needs of a community is just as important as understanding the information to be communicated, if not more so [41]. [34] recognized the value of preparedness programs that offer these more involved, interpersonal activities, such as community meetings, as there are segments of

the population who want to participate and who benefit from their involvement. Likewise, Jones and colleagues (2010) pointed out the value of targeting community participation during experimental preparedness campaigns for Avian Influenzas. Their study found that simulated preparedness campaigns which used paper cut outs of individuals representing community members allowed focus group members to more effectively reduce anxieties and build trust in the messages received from authorities as part of the campaign [48]. Audience segmentation used to target specific segments of people such as community leaders [2], active persons [21], and resilient to crisis [36] can improve the effectiveness of preparedness.

Also, friends and family members can play an important role in crisis and disaster as an informal source of information [45]. This is in line with several studies highlighting the importance of relationships with familiar persons in disasters [49,50]. As highlighted by Ref. [45] individuals with strong social networks (e.g., families, neighbours) are not only more effective in collecting information, but also better in adapting and responding to disasters and emergencies situations.

3.4. Community leaders' engagement

The concept of community participations directly connected with the engagement of leaders and active persons. Targeting these individuals for additional participation and leadership opportunities may also improve preparedness among the entire population [2]. Leaders in particular play a pivotal role in risk communication. This underlines the importance of using audience segmentation not only to create tailored messages but also to engage different publics; the engagement of very active clusters or leaders of a community for example, can improve the involvement of the rest of the contacts within their social network [2] and facilitate the transmission of crisis information [21].

Audience segmentation can help to find crisis-resistant persons. Hajibaba and colleagues (2015) studied tourists, and in particular those who were adapted to risks instead of avoiding it. Finding such persons and targeting them may reduce the vulnerability of tourism businesses and destinations, thereby offering a pro-active rather than re-active approach to disaster management in tourism [36].

These results tell us that emergency managers and public health practitioners need to exploit the lessons of audience segmentation further by providing the most engaged persons with opportunities and resources to contribute to local community resilience building [2].

3.5. Stakeholders engagement

Stakeholder engagement through stakeholder targeting and message framing can also prove to be effective. Stakeholder targeting refers to all the communication strategies that aim at engaging with specific groups of stakeholders framing and raising the salience of specific issues [37]. Organizations can target specific stakeholders generally aiming to establish relationships with key stakeholders through "meaning making" and fostering empathetic reactions [51]. This is particularly important in cases of organizational crises, since organizational crises have potentially strong implications for a broad range of stakeholders [51]. When applied to crises involving the general public, audience segmentation can provide a more detailed analysis of public support for mitigation and risk reduction measures, as well as generating reflections on the cost-effectiveness of targeting specific segments [52]. As described above, communities and community leaders represent two potential stakeholder groups which can be targeted by instructional risk communication.

3.6. Prioritization

Public segmentation is essential for organizations to ensure that limited resources and budgets are efficiently allocated to establish relationships with prioritized publics [39]. Stakeholder theory also helps to identify which group of stakeholders outweighs another, as the importance of each stakeholder group differs. When developing an effective communication campaign, the first major step of public segmentation is to identify and prioritize the audience to be targeted (R. A [43].

3.7. Targeting vulnerable groups

Often linked most closely to studies focusing on demographic groups, audience segmentation can help identify the extent to which socially disadvantaged groups engage in self-protective behaviour. For example, [21] noted that statistically significant differences in engagement with crisis communications existed between different age groups and different income groups during an experimental study. Similarly, [34] noted that previous studies found that socially disadvantaged groups including ethnic minorities, low-income households and persons with chronic illnesses were less likely to have elaborated family communication plans in preparedness for potential earthquakes. It is important to understand and familiarize with the needs of vulnerable groups before a disaster or a crisis to identify barriers and develop effective messages [41]. The study by Tagliacozzo and colleagues (2021) shows that during the COVID-19 pandemic agencies provided examples of tailored information to some social groups but not all the vulnerable groups were considered equally (e.g., pregnant women, people with disabilities, immigrants, and homeless populations) [44]; when such groups are excluded and a specific communication absent, negative consequences may be expected.

3.8. Segments characteristics

All authors confirm the necessity to understand and describe the public to create an effective communication strategy. Theories and studies about audience segmentation can support crisis managers to create messages and instructional communication that target concerns, needs, and perspectives of the key publics, as well as selecting the best communication channel to share such information [21]. In the process of segmentation publics and segments needs to be defined according to concerns [38], personal characteristics (e.g., age, socioeconomic status, educational level) [41], interests [39], involvement [21,46], needs [38,44], prior crisis experience [21], communicative activeness [21], perception and relative behaviour [38], and expectations [39,41]. Targeted communication

needs to carefully take in consideration the characteristics of the audience as well as barriers to effective communication [41]. The needs assessment is internationally recognized as one of the most important characteristics and it is one of the five step process for communicating with the public during crisis situations presented by the World Health Organization [28].

3.9. The role of social media

A very common theme in most of the articles selected was the role of social media. Social media platforms can help disseminate targeted information during a crisis. However, it is pivotal to efficiently utilize the massive flow of information coming from these communication sources [42].

Social media platforms such as Twitter can be useful for effective information dissemination during crises, as evidenced by Sadri and colleagues (2018). Such a platform can be used to engage stakeholders, answering to public questions, retweeting messages to facilitate a quicker information sharing, and using hashtags to connect online discussion and threads [39]. On the other side, the real-time analysis of information shared online by users, could be used by disaster manager to monitor, and analyse the evolution of concerns/sentiment over time allowing the prioritize of the response and a better resource allocation [42]. The keywords mostly used by the users, could also been used to create new hashtags at different phases (e.g., warning, response) to help people to receive updated information via social media [42].

3.10. PRE-EVENT preparedness

The development of communication strategies and the creation of targeted messages towards the public need to be prepared in advance; the collaboration with focus groups and the test of different messages, different approaches, and different strategies with different groups before a disaster or a crisis can help disaster managers to be better prepared to respond to a disaster when necessary [41].

3.11. Message redundancy

Studies have shown that message redundancy, sharing the same message through different sources, increases the possibility that the information is absorbed and acted upon in crisis contexts [44,53]. The concept of message tailoring has grown increasingly popular among scholars, since it is considered as among the most targeted an accurate means of reaching all relevant audiences [34]. This has resulted in the conceptualisation of what could be termed "hyper targeting" build upon the vast amount of personal data stored on social media platforms [38]. However, this approach ultimately presents a dilemma between the potential reach of instructional crisis communication and its ability to remain relevant and practical to implement. There are innumerable ways of segmenting audiences, and as such, some scholars have suggested that the most effective way to address all is to use a universal approach [23]. Hence, the IDEA model became a fundamental example, due to the crucial aspect of "internalization" [1]. This way, communication strategies tend to value and prioritize individuals' perspectives on a potentially unfolding crisis, eventually providing more useful and personalized information.

Finally, audience segmentation and targeting should be applied not only in communication, but also in preparedness drills and exercise including more interactive in-person and virtual activities to target different segments of the population and enhance overall community resilience [34].

4. Discussion

The use of audience segmentation represents an innovative topic of discussion in the field of instructional crisis communication and understanding how different audiences react to different messages is pivotal to develop a more effective crisis communication in practice. As shown by this systematic literature review, despite different studies and application of audience segmentation in crisis communication exist, there is still a lot to be investigated and, above all, tested; this field of study requires extra attention, especially regarding future research strategies, and a sufficient theoretical base related to better understanding of best-practices can only be created through extensive research.

As a starting point, this systematic literature review provides not only a comprehensive overview of the existing literature especially concerning the effectiveness of such method, but also a list of the main concepts and widely acknowledged key elements that should be considered when creating and designing effective communication messages targeting segments within public audiences. Considering current globalization trends, for example, the importance of considering local contexts and community has proven essential. One of the big concerns is that the application of audience segmentation may not fully fit the characteristics of unexpected crises characterized by urgency and short time to react [54]. Nevertheless, as largely shown by this review and by other studies on health and climate change communication, risk communication may in fact largely benefit from audience segmentation practices due to its prevention-oriented nature.

As a results of this review, it is also clear that communication in disaster need to move from a generic approach to a more focused one that consider risk perception, vulnerability, needs, and social perspective [55]. For example, the use of advanced data analysis tools such as target-audience profiling can facilitate a more personalized and targeted communication [38]; however, most of the paper were not able to translate the research on advanced technologies in something simple and more accessible that can be used to implement this practice. Our suggestion is to explore the combination of communication techniques that facilitate sensitive and personalized emergency communication with communication that have been already tested; the IDEA model [1], for example, of a simple framework used for designing effective instructional communication messages that address not only elements of information explana-

tion but also elements of internalization; such internalization focuses on perceived value and relevance of the distributed information via "proximity, personal impact, and timeliness" (p. 140).

Finally, further connection with related studies about disaster risk perception and vulnerability in social media communication should be explored [56]; for example, discuss individual and social aspects that influence people's personal capacity to prepare for and respond to disasters.

5. Conclusion

Despite audience segmentation being widely recognized as a very useful tool to create effective communication efforts, the application of audience segmentation for the creation of instructional risk communication programs remains scarce. As the results of this literature review show, in fact, only a few studies report the testing and application of audience segmentation in risk communication.

This review shows that audience segmentation can prove effective not only in health and climate communication, but also in crisis communication. In the presentation of the findings of this systematic literature review, several important themes emerged, such as the importance of community engagement, the role of the leader, the necessity to involve vulnerable groups and the role of social media.

Most of the results taken from the selected articles underline the need for crisis managers and practitioners to further exploit the use of audience segmentation. This type of investigation can be done by applying different theoretical frameworks and methodologies with a special attention to the use of social media. One common recommendation to managers is to use audience segmentation before the creation of educational campaign and instructional programs to know the different audiences who will receive the message considering characteristics, needs, concerns, and participation.

The results suggest the need for future research combining instructional theories, frameworks, and message tailoring to help crisis management, instructional campaign design and finally self-protection efficacy.

Future research is needed to better explore and identify pivotal aspects when selecting audience segments and adjusting communication strategies. Furthermore, research will allow to confirm what core aspects are fundamental in order to apply audience segmentation in instructional communication strategies.

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.

Data availability

Data will be made available on request.

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