



How do women face the emergency following a disaster? A PRISMA 2020 systematic review

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Received: 5 April 2022 / Accepted: 3 October 2022 / Published online: 15 November 2022
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Abstract

The aim of the study is to conduct a systematic analysis of scientific articles from a social sciences perspective that focus on the role of women as active subjects during an emergency, particularly in terms of evacuation actions in the aftermath of disasters of natural origin. The methodology used in the present literature review was designed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. The databases used were Web of Science and SCOPUS. This systematic review comprises the 25 articles which met our selection criteria out of the 63,852 studies initially found in the search. Although the progressive incorporation of a gender perspective can be seen in the academic study of disasters within the field of social sciences, the scientific production, especially with reference to the emergency phase, remains scant. The current literature reveals the importance of taking into account the knowledge women have, as well as how they behave following a disaster of natural origin. The results of the analysis carried out demonstrate that in making visible how gender roles operate during the early response period in an emergency, especially in relation to the role played by women as active subjects, the traditional notion of rescue is extended. On the basis of this analysis, recommendations are made which can facilitate an approach to disaster risk management that guarantees gender equality in an emergency.

Keywords Gender · Disasters · PRISMA review · Emergency · Rescue

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1 Introduction

Disasters of natural origin impact the populations where they occur in ways that go far beyond physical damage and/or damage to infrastructures: they disrupt the social order and human relations. However, a look at the literature on disasters reveals the preponderance of studies that are technical rather than social in nature (Enarson 1998). Even today, much research considers that events such as earthquakes, volcanic eruptions, floods, hurricanes and pandemics affect all members of the population equally and does not approach such phenomena and their impact from a gender perspective. In the 1980s, pioneering studies, such as those of Rivers (1982) and Dufka (1988), highlighted the fact that poverty affects women to a greater extent than men, making it more difficult for them to recover after a catastrophic event.

That said, it was not until the following decade that research began to incorporate a gender perspective in the analysis of disasters (Anderson 1994; Enarson and Morrow 1998; Fothergill 1998). Since then, substantial advances have been made that point to the greater vulnerability of women, which is reflected in their higher levels of mortality in certain disasters and the worse effect on their health (Oxfam International 2005; Akerkar 2007; Bradshaw and Fordham 2013). The data also indicate that following a disaster, there is an increase in violence against women (Fisher 2010; Seager 2014), as well as a widening of economic inequality (Wiest et al. 1995; Bradshaw and Fordham 2013; Llorente-Marrón et al. 2020a) and a rise in women's social vulnerability (Llorente-Marrón et al. 2020b). Specifically, research suggests that in dealing with these situations, pre-existing gender inequalities are evident in all dimensions and phases.

The most recent works focus on not only the impact of the disaster on gender relations, but also on the active role that women can play in such a context, thus widening the scope of the study from women's vulnerability to considering the capacities they deploy in confronting an emergency situation (Paton and Johnston 2017; Yumarni and Amaratunga 2018). In addition, intersectional analyses have been carried out which have revealed the relationship between gender and other variables (McKinzie 2017). Other works have demonstrated the differential experience and specific needs of men and women in a disaster context depending on their age (Brolles et al. 2017; Baytiyeh 2019; Kawachi et al. 2020) or whether they have any functional diversity (Phibbs et al. 2014). There are also studies which show how gender intersects with ethnicity, particularly in populations where there is greater ethnic/racial diversity (Gaillard et al. 2015; Gotham and Cheek 2017). Other recent areas of interest in the literature are masculinities (Enarson and Pease 2016; Olivius 2016) and sexual diversity (Gaillard et al. 2017; Rushton et al. 2019), which has led to the adoption of wider and more inclusive notions of gender than the gender binary used until recently in this field.

The immediate aftermath of a disaster is a particularly suitable scenario in which to observe the behaviour of the population since there are a huge range of immediate decisions that need to be taken in order to prioritise actions, coordinate efforts, help in the search for people, keep them alive or reduce their suffering and take care of survivors, among many other issues. Many of these tasks are not unfamiliar to women as they form part of the reproductive work that they undertake on a daily basis. However, the scientific production has principally focussed on the protagonist role of men during the rescue of people (Tyler and Fairbrother 2013; Enarson and Pease 2016; Rushton et al. 2021a, b). Male actions, both those relating to the family and the wider community as well as those undertaken under the auspices of organisations involved in the emergency, which are often

highly masculinised—such as the military, civil protection services and firefighters—are extremely visible. In the social imaginary, men figure as the principal protagonists in rescue actions, something which is reinforced by the treatment they receive in the media (Cox et al. 2008; Quigley and Quigley 2013; Zarqa 2014). It is for this reason that the current article aims to systematically analyse the scientific literature which focuses on the active role played by women during an emergency. Since such studies are still quite scarce, the present article seeks to make visible women's contributions in this phase, in contrast to the predominant focus of the literature on women's vulnerability in such situations. Demonstrating women's capacity for agency is not only important in scientific terms as it also has serious practical implications. Based on our findings, we also propose directions for future research efforts and recommendations which can be incorporated in disaster risk management policies with the aim of improving their impact in terms of gender.

2 Methods

2.1 Information sources and inclusion criteria

The methodology employed for the literature review in the present work was designed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) protocol. This methodology, first published in 2009 and modified and extended in 2020, was created in order to carry out systematic reviews of the scientific literature in various fields of knowledge. The PRISMA methodology proposes a protocol to be followed in the search, selection and analysis of the existing scientific literature and a checklist to validate the process. This procedure allows the review of the literature to be conducted in a manner that is methodical, transparent, and exhaustive.

The databases selected for this paper were Web of Science (WoS) and SCOPUS. The criteria for including articles in the analysis were based on our proposed aim. As such, we considered those from the field of the social sciences which analysed the role of women as active subjects during an emergency and, specifically, in undertaking rescue and evacuation actions following a disaster of natural origin.

2.2 Search strategy and selection process

The terms employed in both databases for the literature search were ("Disaster*" OR "Natural disaster*" OR "Hazard*" OR "Natural hazard*" OR "Catastrophe*" OR "Natural calamit*" OR "Fatalit*") AND ("Rescue*" OR "Evacuation procedure*" OR "response" OR "Salvage" OR "early response" OR "emergency") AND ("Gender" OR "Women" OR "Female" OR "feminine" OR "sex").

The search was first carried out in the WoS database, limiting it to the "Web of Science Core Collection", which yielded an initial 7,553 documents. The initial automatic filtering of the results was conducted by excluding the terms: ("nutrient*" OR "addiction*" OR "consumption" OR "disorder*" OR "patient*" OR "DNA" OR "rat*" OR "refugee*" OR "mice" OR "menstrual" OR "sexual" OR "protein" OR "model" OR "covid" OR "antibiotic*" OR "stress" OR "pregnan*" OR "postpartum" OR "perinatal" OR "sport*" OR "war*" OR "political conflict*" OR "protest*" OR "terrorism"), because of their high incidence in the results but their low relevance and relationship with the study's aim. In this way, the sample was reduced to 502 documents, of which 461 scientific articles were

automatically selected, thereby excluding book chapters and reviews, among others. Next, the search was circumscribed to the 24 knowledge areas in this database that refer to the social sciences in the widest sense, including socioenvironmental and gender studies, as well as those which were multidisciplinary in nature. The articles were grouped as follows: Environmental Sciences (37), Environmental Studies (30); Social Sciences Interdisciplinary (22); Geography (11); Social Work (11); Multidisciplinary Sciences (10); Sociology (10); Public Administration (7); Multidisciplinary Psychology (7); Psychology (6); Social Issues (6); Women Studies (5); Development Studies (5); Anthropology (4); Communication (4); Family Studies (4); Psychology Social (4); Regional Urban Planning (4), Education Educational Research (3); Psychology Applied (3); Psychology Developmental (3); Behavioural Sciences (1); Religion (1); Urban Studies (1). Due to their simultaneous presence in more than one area of knowledge, 33 articles were excluded and the final selection was therefore 166 articles.

In the SCOPUS database, the search was limited to the principal collection, which produced an initial selection of 56,299 documents. For the automatic filtering step, the same exclusion terms were used as for WoS, which reduced the sample to 3,338 documents. From these, 2,753 scientific articles were automatically selected, thus excluding, as in WoS, any document that was not a scientific article. Next, the search was circumscribed to six areas of knowledge: Social Sciences (457) Environmental Sciences (337); Psychology (127); Multidisciplinary (45); Decision Sciences (6); Undefined (3), and this reduced the articles selected to 870, after which 105 were excluded because they appeared in more than one knowledge area.

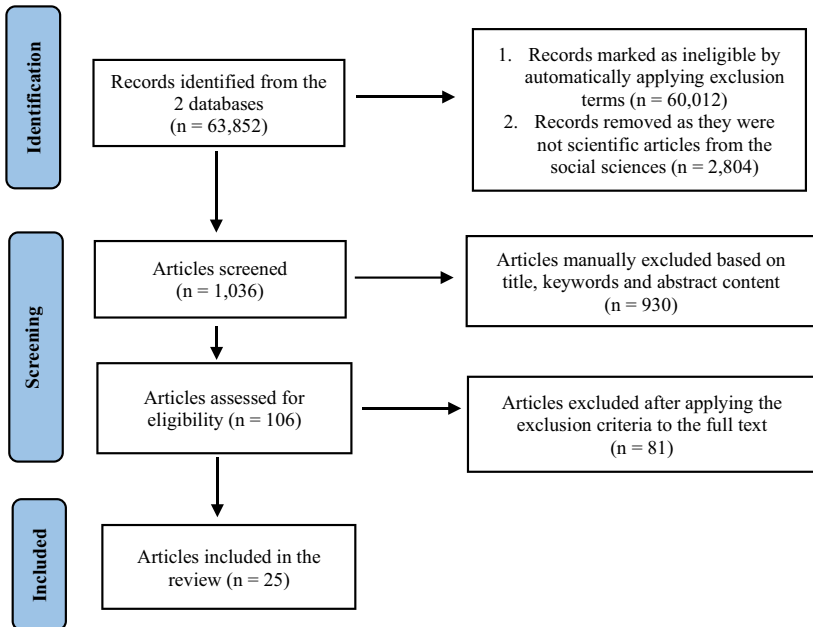
It is important to highlight that knowledge areas are not organised in the same way in WoS and in SCOPUS. In WoS, the subdivisions by knowledge field are more specific than in SCOPUS, which is why 24 areas were included (as itemised above) which deal with scientific production in the social sciences in a wide sense. In SCOPUS, on the other hand, these fields of knowledge were concentrated in just six areas.

2.3 Screening

The title, abstract and keywords of 1,036 articles, 166 from WoS and 870 from SCOPUS, were examined and we excluded those which (a) did not incorporate a gender perspective; (b) were focussed exclusively on women's vulnerability and not on their active role; (c) only addressed the role of men in rescue actions; (d) were not focussed on populations affected by a disaster of natural origin; (e) analysed natural origin disasters which developed over time rather than being 'sudden'; (f) studied the reconstruction phase in the medium and long term; (g) had a geo-technical focus only; (h) investigated armed conflicts; (i) investigated pandemics and epidemics; and (j) were not based on empirical research.

These exclusion criteria allowed only those articles referring to the active role of women in the emergency phase of a disaster of natural origin to be selected, in line with the aims of the current study. This reduced the number of articles from WoS from 166 to 37, and those from SCOPUS from 870 to 69.

The resulting 106 articles were then reviewed in-depth one by one, providing a final selection of 7 articles from WoS, 13 from SCOPUS and 5 which appeared in both databases. The final number of articles that were included in the systematic review was thus 25, the duplicated articles only being counted once and attributed to the WoS database. The number of articles rejected in each stage of the exclusion process explained above is shown in Fig. 1.



Source: Produced by the authors from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* (2021)

Fig. 1 Identification of studies via databases and registers. Source: Produced by the authors from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* (2021)

2.4 Data extraction

The articles in this literature review were organised into categories using a data extraction template. Firstly, the methodology used in each article was systematised, including its aims, the methodological approach and data collection techniques used, along with information about the study sample if it was specified (Table 1). Secondly, general information was extracted about the findings of each article, as well as their main contributions and any limitations (Table 2). The data were tabulated and narratively synthesised (PRISMA Results Report).

2.5 Study risk of bias assessment and quality assessment

In order to minimise potential bias, the full process of designing the present study, as well as the search and selection of articles for analysis, was undertaken collectively, systematically and exhaustively. In terms of the design, the four authors, all experts in gender and disasters, together established the aim of the analysis and the parameters for the search for articles. In addition, a work protocol was set up that consisted in replicating the search at two different times. Firstly, one of the researchers made an initial selection, both automatic and manual, on their own. The results were discussed among all the researchers, and two months later, they were all involved in repeating the search to validate the process. The

results of the second search were the same as those of the first, with the exception of one article that had not appeared before because it had only recently been published in WoS, but it was included due to its relevance. Furthermore, the research team was able to access the complete text of all the published works selected, which facilitates in-depth analysis and substantially reduces the bias that may have resulted if this had not been the case.

The two databases used for the PRISMA review, WoS and SCOPUS, bring together the scientific production with the greatest impact on the planet as a whole. However, we are aware that the knowledge collated in these databases is not neutral. On the one hand, most of the works published in these databases are in the form of articles and, to a lesser extent, books and other types of publications that are more common in the social sciences and the humanities. On the other, they are mainly written in English, which results in the overrepresentation of realities as perceived by the English-speaking world. Finally, gender issues are not dominant in scientific journals, nor in social sciences ones, and even less so in those related with disasters.

In relation to quality assessment, the systematic analysis of the results has enabled themes to be identified that are common to a number of articles, thereby providing a general panorama of the role of women in the emergency phase following a disaster of natural origin. In addition, several of the studies make recommendations that include promoting the contribution of women and mitigating gender inequalities, as well as those arising from the intersection of gender and other forms of inequality. These recommendations lead to improved disaster risk management in the area under review. In summary, it is considered that the articles analysed meet the quality criteria for addressing the aim of the article.

3 Results

In this section, we provide the principal results of the systematic review of the selected articles. These results show the methodological perspectives used to study the active role of women during an emergency resulting from a disaster of natural origin, specifically during evacuation and rescue. They also show the themes that have been studied, along with the main results obtained and conclusions reached.

3.1 The use of methods

The articles selected for analysis were heterogenous in terms of the methodologies they employed (see Table 1). While there is no clear predominant approach, there are more works of a quantitative character (Bateman and Edwards 2002; Soetanto et al. 2017; Cvetković et al. 2018; Rohli et al. 2018; Augustine et al. 2019; Oliveira et al. 2020; Wei et al. 2020; Jayasekara et al. 2021; Khan et al. 2021; Lachlan et al. 2021) compared with those taking a qualitative approach (Cupples 2007; Hamilton and Halvorson 2007; Dhungel and Ojha 2012; Tyler and Fairbrother 2018; Hou and Wu 2020; Walker et al. 2020; De Silva 2021; Dema Moreno et al. 2022) or those employing a mixed methodology (Bradshaw 2001; Alam and Collins 2010; Silver and Andrey 2014; Whittaker et al. 2016; Reyes and Lu 2017; Kang et al. 2021; Oktari et al. 2021).

With respect to the data collection techniques used by the articles taking a quantitative approach, the first point of note is that half of them have a sufficiently large probabilistic sample to make them statistically representative of the population as a whole (Bateman and Edwards 2002; Cvetković et al. 2018; Augustine et al. 2019; Wei et al. 2020; Khan et al.

Table 1 Methodological characteristics of the articles examined. (Source: Produced by the authors on the basis of data from the systematic review)

Study design	Authors (year)	Study aim	Type of disaster/year	Area/Country	Techniques	Population selected and sample size
Quantitative	Bateman and Edwards (2002)	Investigating disaster response, specifically how women and men evacuate their homes as hurricanes approach	Hurricane Bonnie (1998)	United States (North Carolina)	Secondary sources (analysis based on data from previous survey)	1,029 household respondents (62% women and 38% men; 83% white population and 17% non-white)
	Soetanto et al. (2017)	Exploring perceptions of SR (social responsibility) and demographic factors in relation to flooding for householders and local businesses	Various floods (No specific date)	United Kingdom (Birmingham, South East London)	Survey (on-site, non-probability sampling)	414 respondents (58% men, 42% women)
	Cvetković et al. (2018)	Investigating the risk perceptions and preparedness of women and men regarding catastrophic events	Various hazards (2014)	Serbia (Kraljevo, Šabac, Novi Sad, Secanj Obrenovac, Priboj, Kragujevac, Bašta, Smederevska Bajina Palanka, Užice, Smederevo, Loznica, Rekovac, Kruševac, Paracin, Batocina, Lapovo, Svilajnac, Sremska Mitrovica)	Survey (on-site)	2,500 respondents (50.2% women, 49.8% men)
	Rohi et al. (2018)	Evaluating the responses exhibited by college students and their feelings when threatened by the presence of hurricanes	Hurricane Isaac (2012)	United States (Louisiana State University, Baton Rouge)	Survey (on-site, non-probability sampling)	107 respondents (55% women, 45% men)
	Augustine et al. (2019)	Analysing the level of disaster preparedness and response among households' members	N/A	Afghanistan (30 villages in three Badakhshan districts: Yawan, Kohistan, and Raghistan)	Survey (on-site)	314 respondents (158 men, 156 women)

Table 1 (continued)

Study design	Authors (year)	Study aim	Type of disaster/year	Area/Country	Techniques	Population selected and sample size
	Oliveira et al. (2020)	Obtaining exploratory data and analysing trends in relevant factors shaping an individual's hazard response	Wildfires (2016–2017)	Portugal (Algeriz and Pedrogao Grande)	Survey (on-site and online, non-probability sampling)	282 respondents; mainly women
	Wei et al. (2020)	Evaluating the cognition and response of middle/high school students to earthquakes and providing suggestions on education strategies for disaster prevention and reduction	N/A	China (Ya'an city, Sichuan Basin)	Survey (on-site)	1,164 respondents (39.3% men; 56% women; 4.7% missing)
	Jayasekara et al. (2021)	Analysing the gaps in existing EW (early warnings) and EP (early preparedness) related to tsunami and other coastal hazards	Various tsunamis (No specific date)	Sri Lanka	Survey (online, non-probability sampling)	408 respondents (352 fully completed); not disaggregated by sex
	Khan et al. (2021)	Exploring gender-based emergency preparedness at the high school level in a multi-hazard environment	Various earthquakes (No specific date)	Pakistan (Gilgit city)	Survey (on-site)	486 respondents, 248 men, 238 women
	Lachlan et al. (2021)	Examining cognition and ruminative coping tendencies as potential mechanisms driving the observed sex differences in information seeking	Hurricane Dorian (2019)	United States (Florida, North Carolina, South Carolina, and Georgia)	Survey (Not specified whether it was online, face-to-face or by telephone; non-probability sampling)	1,152 respondents; not disaggregated by sex

Table 1 (continued)

Study design	Authors (year)	Study aim	Type of disaster/year	Area/Country	Techniques	Population selected and sample size
Qualitative	Cupples (2007)	Examining women's roles and relations to consider how participants' involvement in the disaster process impacts on their subjectivities and their gender identities	Hurricane Mitch (1998)	Nicaragua (urban communities of El Mirador, El Tambor and Barrio Richardson and in the rural communities of Apantillo Siates and El Hatillo)	In-depth semi-structured interviews	12 participants (only women)
	Hamilton and Halvorson (2007)	Making recommendations for the significant challenges and concerns facing women earthquake survivors	Earthquake (2005)	Pakistan (Kashmir)	N/A	N/A
	Dhungel and Ojha (2012)	Analysing the activities of Women's Empowerment Centres (WEC) developed as part of Disaster Risk Reduction and Humanitarian programme (DRR-HP)	Various floods (No specific date)	Nepal (southern areas)	Review of partners' reports, focus groups	37 reviews and focus groups (all of them women)
	Tyler and Fairbrother (2018)	Examining gender differences in the preference of early evacuation in a wildfire context	"Black Saturday" fires (2009)	Australia (New South Wales, Victoria, and Western Australia)	Interviews	107 interviews with 116 participants (54 women, 62 men, some of them in pairs)
	Hou and Wu (2020)	Studying women's leadership at different stages of their lifespans after an earthquake situation	Earthquake (2008)	China (Wenchuan County, Mao County, City of Dujiangyan, City of Shifang, city of Mianzhu, and Beichuan County)	Focus groups, walk-along interviews	18 focus groups (119 women); 72 walk-along interviews (72 women)
	Walker et al. (2020)	Proposing intersectionality as a framework approach in analysing wildfires	Wildfires (2017)	Canada (La Ronge tri-community, Saskatchewan)	Semi-structured interviews	34 semi-structured interviews (13 men, 21 women)

Table 1 (continued)

Study design	Authors (year)	Study aim	Type of disaster/year	Area/Country	Techniques	Population selected and sample size
	De Silva (2021)	Evaluating TEW (tsunami early warning) programme and developing digital gender equity strategies in TEW systems	Various tsunamis (No specific date)	Sri Lanka (Galle, Batticaloa, and Hambantota)	Semi-structured interviews	38 interviews; not disaggregated by sex
	Dema Moreno et al. (2022)	Analysing the gender roles of men and women in the phase of rescuing people	Earthquake (2011)	Spain (Lorca, Murcia)	Focus groups	2 focus group (15 women) and 2 focus groups (13 men)
Mixed Methods	Bradshaw (2001)	Focussing on women's participation in emergency, individual household responses and their leadership in reconstruction projects	Hurricane Mitch (1998)	Nicaragua	Census, semi-structured interviews, focus groups	N/A
	Alam and Collins (2010)	Exploring the context of vulnerability and local coping strategies in relation to cyclone response experiences	Cyclones (1970, 1985, 1991, 1997, 1998 and 2007)	Bangladesh (Coastal areas of Chakoria, Kutubdia Island, Sandwip, Bay of Bengal, Urir Char)	Life experiences, participant observations, semi-structured and open-ended interviews, surveys (on-site, non-probability sampling), focus groups	1 man life experience, 120 household heads interviewed (108 men, 12 women), 8 focus groups (6 of men, 2 of women)
	Silver and Andrey (2014)	Understanding the factors that influence individuals' behaviours, focussing on previous disaster experience and demographics	Tornado (2011)	Canada (Godertich, Ontario)	Semi-structured interviews, surveys (online and on-site, non-probability sampling)	35 semi-structured interviews and 304 survey respondents; not disaggregated by sex
	Whittaker et al. (2016)	Examining the gendered dimensions of risk awareness, preparedness and response among households affected by bushfires	"Black Saturday" fires (2009)	Australia (Victoria)	Semi-structured interviews, survey (online, non-probability sampling)	600 in-depth interviews; 1,314 household survey respondents; not disaggregated by sex

Table 1 (continued)

Study design	Authors (year)	Study aim	Type of disaster/year	Area/Country	Techniques	Population selected and sample size
	Reyes and Lu (2017)	Studying the Philippines disaster management system, to investigate the role of institutions in the vulnerability of women to local disasters	Various floods (No specific date)	Philippines (Metro Manila, City of Malabon, Barangay Catmon)	Interviews, survey (on-site)	6 interviews and 68 survey respondents (all of them women)
	Kang et al. (2021)	Examining post-disaster response activities of females in earthquake situation	Earthquake (2017)	South Korea (Pohang, “Pohang Mom Cafe” online community)	Focus group interview, individual in-depth interviews and semantic network analysis	1 focus group interview (5 members); 4 individual in-depth interviews; 1,326 posts used for network analysis
	Oktari et al. (2021)	Examining the integration of the gender perspective in a disaster-resilient village programme	Various hazards (No specific date)	Indonesia (Aceh Besar District, Aceh Province)	Observation, interviews, survey (on-site)	179 participants (95 women and 84 men)

2021). The other half do not meet the criteria to be considered representative, as they use non-probability sampling (Soetanto et al. 2017; Rohli et al. 2018; Jayasekara et al. 2021; Lachlan et al. 2021; Oliveira et al. 2020). Furthermore, two of the studies do not provide methodological information about the composition of the sample in terms of sex/gender, despite them analysing these variables in the results (Jayasekara et al. 2021; Lachlan et al. 2021).

In addition, all the questionnaires used to collect information were completed on-site, except for one which was online (Jayasekara et al. 2021), one that could be completed either online or on-site (Oliveira et al. 2020), one by phone (Bateman and Edwards 2002) and one where the data collection method was not specified (Lachlan et al. 2021).

The studies using a qualitative methodology, for their part, obtained information principally through the use of in-depth interviews or focus groups (Cupples 2007; Dhungel and Ojha 2012; Tyler and Fairbrother 2018; Hou and Wu 2020; Walker et al. 2020; De Silva 2021; Oktari et al. 2021; Dema Moreno et al. 2022). Two of the articles analysed, however, used techniques which are not commonly applied: Dhungel and Ojha (2012) review the information contained in reports from Women's Empowerment Centres in Nepal; and Hamilton and Halvorson (2007) collected testimonies, without specifying the technique employed, of women who lived through the earthquake in Pakistan in 2005. These qualitative works, although they are not in themselves generalisable, provide localised information that is useful to find out about women's experiences in an emergency, particularly during the evacuation and rescue of people.

The mixed methods articles analysed usually combined interviews and questionnaires to gather information (Alam and Collins 2010; Silver and Andrey 2014; Whittaker et al. 2016; Reyes and Lu 2017; Oktari et al. 2021). However, only two of them involved a representative sample of the population analysed (Whittaker et al. 2016; Oktari et al. 2021). In addition to combining interviews and questionnaires, some of the articles employ a third technique: in the case of Oktari et al. (2021), this was observation, while the work by Kang et al. (2021) used network analysis. Bradshaw (2001) also used three techniques, namely the combination of census data with focus groups and interviews, this study also having the peculiarity of taking as its starting point a previous study which was extended to analyse the active role played by women during hurricane Mitch in 1998. The article which used the largest number of data collection techniques was that of Alam and Collins (2010) who, in addition to a questionnaire, interviews and observation, also use the personal lived experience of the first of the authors in the various cyclones that have hit Bangladesh in recent decades.

Those studies analysed which combined qualitative and quantitative approaches did not follow a single pattern. Some prioritised quantitative techniques and used qualitative techniques as a complement to contextualise, guide and/or provide more depth to the numerical data (Whittaker et al. 2016; Reyes and Lu 2017; Oktari et al. 2021). Other articles, in contrast, foreground qualitative techniques and use quantitative data to confirm or validate the results obtained (Bradshaw 2001; Alam and Collins 2010; Silver and Andrey 2014). Only the article by Kang et al. (2021) gives equal weight to the two methodological perspectives and provides an interrelated analysis of the qualitative and quantitative data.

Finally, the low representativeness of the quantitative studies, together with the lack of generalisability of those that are qualitative ones, problems also identified in the mixed method studies, makes it difficult to draw general conclusions about differences in the lived experiences of socioenvironmental disasters and their impact on men and women. Furthermore, the fact that the majority of publications about women's active role in emergency contexts focus on regions such as Asia, North America and Australia, limits our knowledge

on this issue with respect to other contexts, such as Latin America and Africa, making the comparison of territories at the global scale more complicated.

3.2 Thematic areas

The systematic review carried out has enabled us to observe that the research behind the articles analysed addresses different aims and gives rise to results that differ in line with the methodological approach used (see Table 2).

Two of the aspects studied quantitatively are men's and women's perception of risk and gender differences in access to information about disasters. Some articles demonstrate that women have a heightened perception of subjective risk compared to men (Bateman and Edwards 2002; Cvetković et al. 2018), who appeared to be more confident about managing an emergency situation. This also affects the way men and women approach and make the decision to evacuate their homes when a disaster occurs. Other studies reveal that women do not access the information necessary for decision-making in an emergency to the same extent as men (Augustine et al. 2019; Oliveira et al. 2020). Authors such as Cvetković et al. (2018) indicate that this, at least in part, occurs because the channels through which men and women get information are different. Women reported receiving information mainly through their family network and technological sources, using digital media to search for information about the disaster more often than men (Lachlan et al. 2021). Men, for their part, complement this information with that gained from their neighbours, friends, and coworkers. As a result, women are less well-informed due to having fewer opportunities to maintain a high level of social networking in the community.

Some of the studies also indicate that gender is not the only dimension that determines access to information and preparation for a disaster, with previous experience, the social class, age and ethnicity and/or religion of those affected also playing a part, thus highlighting the intersectional character of the factors involved (Bateman and Edwards 2002; Soetanto et al. 2017; Rohli et al. 2018; Khan et al. 2020; Jayasekara et al. 2021; Wei et al. 2020). This intersectionality, particularly the relationship between gender and age, is identified in the works by Khan et al. (2020) and Wei et al. (2020) in terms of male and female students' access to information about the evacuation procedures for their educational facility. Specifically, girls were found to have less knowledge and information about evacuation than boys.

The articles based on qualitative methods basically deal with three themes: decision-making within the home with respect to evacuation, the active role played by women during the emergency and women's participation in disaster risk reduction programmes and their training in this respect. In terms of the first of these themes, some articles show that, sometimes, family consensus is not possible because of differences in the criteria for evacuation that each person in the couple holds, related to the fact that women prefer to evacuate early, while men are more likely to remain in the danger zone for longer (Tyler and Fairbrother 2018; Walker et al. 2020). This pattern has been observed in cases of wildfires in Australia, where women and children are the first to leave their homes while men stay in the home, either to protect it from the disaster or to rescue belongings necessary for survival (Tyler and Fairbrother 2018). However, there are also occasions where women are more reticent to abandon the home, because they consider that they are more protected there or because they are the ones responsible for gathering together the essential goods necessary for dealing with the immediate aftermath of the disaster (Dema Moreno et al. 2022).

Table 2 Main contributions of the articles examined. (*Source*: Produced by the authors on the basis of data from the systematic review)

Study design	Authors (year)	Main results	Main conclusions	Limitations
Quantitative	Bateman and Edwards (2002)	Females were more likely than males to evacuate from their homes because of Hurricane Bonnie. Bivariate and multivariate results support the argument that sex differences in evacuation were not caused by inherent or 'natural' differences between the sexes. Rather, women are more likely to evacuate than men because of socially constructed gender differences with respect to other factors that influence the intention and capacity to evacuate.	Women are more likely to evacuate because of hurricanes due to underlying gender differences in care-giving roles, evacuation preparation, their greater exposure to certain objective risks, and their more acute perception of subjective risk.	There is not a clear differentiation between the decision to evacuate and the structural restrictions that limit a person's capacity to do so.
	Soetanto et al. (2017)	The model used to measure social responsibility (SR) indicates that experience of flooding is the most important variable, behind age of respondent and ethnicity, impacting on the perception of SR when a disaster occurs. Gender does not seem to be a significant variable and does not increase the explanatory power of the model proposed.	Experience, age and ethnicity should be taken into account when attempting to understand motivating factors for engagement with policies and agendas.	The finding of this research is limited by its non-probabilistic sampling of the respondents and unequal sample representation, especially in terms of ethnic groups and age. In addition, responses from flooded communities may not necessarily be from individuals whose homes or businesses were flooded.
	Cvetković et al. (2018)	The most important predictor of individual preparedness is gender. Men reported providing more assistance to catastrophic victims, as well as economic support for their families. Women have more proactive attitudes about effective assistance at reception centres compared to men.	Although there were some variables that indicated no, or only slightly, significant differences between men and women, larger magnitude and significant differences appeared in relation to men's perceptions of being more prepared and being more active or willing to be involved in or lead community-level activities. Women generally reported being less confident and also more concerned about household and family-level care.	No limitations are indicated.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Rohlf et al. (2018)	A direct relationship was found between hurricane knowledge and preparedness, and preparation anxiety was significantly and inversely related to preparedness.	The positive association between knowledge and experience of hurricanes and preparedness shows that experience is the most important variable when a disaster has to be confronted. Knowledge and experience are negatively correlated with preparation anxiety.	The results of this study are limited to students at a single university.
	Augustine et al. (2019)	Female heads of households who were engaged in agriculture or related employment and had low monthly income, low disaster-preparedness knowledge, and with prior disaster experience were more likely to take low preparedness measures for future disasters.	The findings reveal that less economic security, lower knowledge of emergency plans, being a female head of household, and having prior disaster experience tended to predict lower levels of preparedness among individuals. Disaster-preparedness interventions targeted at improving knowledge of hazards and emergency plans, as well as enhancing the livelihood and income security of affected households, could minimise the negative impact of disasters.	The study does not clearly show how the main sociodemographic variables studied affect the way in which people deal with the emergency situation that they face.
	Oliveira et al. (2020)	Depending on their age, gender, educational level and professional activity, people had different perceptions and made different choices. This should be further investigated, and the findings integrated in communication and training actions so as to increase their efficiency.	Although sociodemographic characteristics influence a population's knowledge of fire risk, a general problem is identified in all social strata: the disconnection between policies and citizens' needs. To overcome this, it is recommended that decision makers should design efficient measures adjusted to the needs of each specific group in the population.	Since the sample analysed is not representative of the whole of the country, the questionnaire should be extended to other areas and the results compared.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Wei et al. (2020)	Significant differences in earthquake disaster knowledge and response capability among different sociodemographic groups were found. Differences in earthquake knowledge and dealing with emotions are statistically significant between male and female students. Differences in prevention skills between male and female students are not significant.	Even having the same educational background, female students might be more vulnerable to disasters and their impacts than male students. More attention should be paid to female students in terms of training, information and access to information in schools.	The work does not clearly show the ways in which the catastrophe preparedness of the population is put into practice at the point when a catastrophe actually occurs.
	Jayasekara et al. (2021)	The low use of social media for communicating disaster-related information depends mainly on people's age. Gender does not appear to be a significant factor.	Numerous communication problems in catastrophe situations are identified which affect both the community itself and its relations with the authorities. On the basis of these 'gaps', more than 40 recommendations are made and the need to create an easily accessible online platform in order to improve communication during a disaster.	No information is provided about the gender composition of the sample and as such it is not possible to know to what extent the results are representative.
	Khan et al. (2021)	The analysis revealed a clear difference in emergency preparedness and its components in that the boy students seemed relatively better prepared for emergencies than the girl students.	Emergency preparedness is needed in schools to protect the lives of students. This will not only save lives but will also empower the overall ability of communities to deal with natural hazards. The gender differences were particularly significant in terms of crisis communication, and the support and assistance component of emergency preparedness. The study indicates that information campaigns should be run in schools to improve emergency preparedness.	The robustness indicators and index need to be tested in other schools for validation purposes. In addition, more research is needed to study gender differences in the contexts of urban and rural schools; public and private schools; and also consider gender differences between teachers, students, and principals.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Lachlan et al. (2021)	Differences between men and women were detected in information seeking and rumination tendency. However, at low levels of need for cognition and high levels of rumination, men and women were almost identical with respect to level of information seeking. Information seeking did not differ significantly across those who had or had not physically lost their home.	Women reported higher levels of information seeking, consistent with recent research in crisis and risk communication. Women, regardless of level of rumination tendencies, appear to exhibit high levels of information seeking behaviour. Men with high levels of rumination tendencies are far more similar to women at all levels of rumination in comparison with men with low or middle levels of rumination.	No information is provided about the gender composition of the sample, and as such it is not possible to know to what extent the results are representative.
Qualitative	Cupples (2007)	It is not possible to say that women will behave or respond to a disaster in a particular way. Even women with similar background characteristics will not react to the same event in the same manner.	Disasters provide a favourable context for the renegotiation of gender roles and produce personal and social transformations.	The qualitative results are not generalisable.
	Hamilton and Halvorson (2007)	Women played a critical role in spontaneous and organised relief efforts, digging out survivors, feeding those in need and building and maintaining temporary shelters.	Women became a fundamental force in the struggle for survival, and as first responders caring for the injured and the dying. The highly patriarchal social structure and purdah made it extremely difficult for women to evacuate mountain villages and to access aid materials, health care and compensation for their losses.	The qualitative results are not generalisable.
	Dhunge and Ojha (2012)	Women in the communities where WEC (Women Empowerment Centres) are active perform multiple roles with respect to disaster risk management at the household and the community level.	WEC are effective in building resilient communities as they ensure better disaster preparedness at the household and the community level. This type of project facilitates the empowerment of the most vulnerable groups, particularly, women.	The qualitative results are not generalisable.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Tyler and Fairbrother (2018)	Gendered expectations, particularly regarding dominant constructions of masculinity, could inhibit open discussion and negotiation between members of a heterosexual couple about the best course of action to take during a bushfire. There are competing expectations for men and women (the latter being more likely to feel comfortable about leaving earlier, or responsible for the evacuation of others, especially children), which could make reaching agreement difficult.	The social construction of gender needs to be better understood as a factor that influence what course of action may appeal to residents and how they determine, or attempt to determine, an agreed course of action within a household.	The qualitative results are not generalisable.
	Hou and Wu (2020)	Women's local leadership capacity had grown beyond the traditional care-giving role and more importantly, had extended to the decision-making process, contributing to the advancement of resiliency at individual, family and community levels.	Women's capacity for managing and negotiating, shown in their leadership after the catastrophe, directly advances resilience at the individual, family and community level. Their leadership capacity also demonstrates the powerful contributions to disaster risk reduction that women can make in the post-disaster period.	The qualitative results are not generalisable.
	Walker et al. (2020)	Gendered norms influence residents' responses to fire. Elders, pregnant women and those with existing health concerns were among the first to leave their homes, following the voluntary evacuation announcements.	Location, race, ethnicity, gender and age intersected in complex ways, resulting in diverse experiences of impacts and losses, such as physical health and safety, mental and emotional well-being, sense of place, and self-determination and influence	The qualitative results are not generalisable.
	De Silva (2021)	TEW (tsunami early warning) practices and strategies are affected by women's and men's socially assigned roles and responsibilities.	The study indicates the need to develop strategies and practices that are gender sensitive and to allow women to participate in TEW systems.	The qualitative results are not generalisable.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Dema Moreno et al. (2022)	At the time of a catastrophe, men and women undertake a series of immediate actions that are in line with traditional gender roles.	Women's rescue actions are not as visible as men's, which act as the hegemonic model. Women's interventions are not limited to physical rescue but also include verbal suggestions and recommendations linked to their traditional caring roles.	The qualitative results are not generalisable.
Mixed Methods	Bradshaw (2001)	Men and women worked together to evacuate people but, women's actions were not made visible or were not valued as they are related to care and securing basic needs. When women undertake masculinised work, their labours acquire value and visibility, although they are usually considered to consist in 'helping' men in their activities.	The majority of men recognised women's work during the emergency, although principally when this work was outside traditional activities performed by women.	The study combined census data with interviews and focus groups from previous research. No information was provided about sample size.
	Alam and Collins (2010)	Most affected householders only left their homes when they saw water coming close. The decision to save belongings and to leave home in most cases rested with the male head of the household. Due to conservative religious beliefs, many of the male heads of households preferred not to move to cyclone shelters, thinking that the female members of the household might break their purdah.	The findings highlight three underlying vulnerabilities to cyclone disasters: hazard risk perceptions; pre-cyclone decisions whether to go to cyclone shelters; and inadequate land management policies in the coastal areas of the country.	The qualitative results are not generalisable.
	Silver and Andrey (2014)	In most cases, protective action is not statistically associated with individual sociodemographic variables. However, females are more likely than males to take protective actions.	Previous recent experience of a disaster influences the protective actions taken by the population. Gender itself is a factor that affects the decision-making involved in carrying out these protective actions.	No information is provided about the gender composition of the sample, and as such it is not possible to know to what extent the results are representative.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Whittaker et al. (2016)	Differences in women's and men's perceptions of risk were identified and they affected their responses when a disaster occurred. Women more often wanted to leave their homes than men.	Bushfires are gendered experiences in that they are influenced by the roles played by men and women in society. Knowledge of how men and women behave in bushfire scenarios allows community safety initiatives to be designed that are tailored to the particular needs of women and men.	No information is provided about the gender composition of the sample, and as such it is not possible to know to what extent the results are representative.
	Reyes and Lu (2017)	More than two-thirds of the population consider the assistance of the government to be necessary during disasters, and they also perceive that the government is readily accessible. In terms of disaster preparation, more than nine out of ten respondents expressed familiarity with national policies concerning disasters and they also understand that the local government is prepared for such situations.	The study underscored the importance of gender mainstreaming in disaster management due to the increased vulnerability of women in such contexts, as well as the fact that it is women who take on the brunt of caring for the household during and after disasters. The study also showed the short-term responses of institutions to disasters, particularly local government, in terms of the provision of training for emergency responses and aid.	The confidence level of the survey is low (90% for the sample selected).
	Kang et al. (2021)	Mothers faced a series of transformation processes in post-disaster, from fear and helplessness to a sense of duty to protect their children. They also deploy active collective responses.	The active role of women in disaster situations is comprehensive, and their notion of responsibility gives them strength to confront the situation. Digital activities and communication facilitate their collective action and the protection of their families from the emergency and from future risks. All of this increases women's capacity to influence community politics.	This study focuses on the active role of mothers and cannot be extrapolated to other women. Due to its qualitative nature, its results are not generalisable.

Table 2 (continued)

Study design	Authors (year)	Main results	Main conclusions	Limitations
	Oktari et al. (2021)	<p>Only a small number of women have planned, for themselves and for their family, some form of earthquake and tsunami preparedness. Most of the female respondents are still in the low and medium levels of preparedness. More than 80% of women preferred to be saved by their relatives.</p>	<p>The analysis carried out confirms the importance of integrating gender as a cross-disciplinary element in village disaster resilience programmes. The study also suggests taking affirmative actions in order to create a better sense of equality that would boost women’s negotiating power and enable their voices to be heard.</p>	<p>The results refer to a specific programme.</p>

In both these cases, however, the research points to the main reason behind these decisions being women's traditional care role, especially when they have responsibility for children or people with dependency needs (Tyler and Fairbrother 2018). Women are more likely to make decisions that better protect those in their care, even putting the safety of their charges before their own lives. Along these lines, Cupples (2007) suggests that, on occasion, women are disproportionately exposed to risk, remaining in the home or the location they find themselves in when the disaster hits for longer than necessary, or returning to the danger zone to rescue others.

This latter issue is linked to the second of the themes identified in the qualitative studies, namely the active role played by women in all phases of the emergency, including rescue, which calls into question the central role traditionally ascribed to men in this respect (Hamilton and Halvorson 2007; Hou and Wu 2020; Dema Moreno et al. 2022). Finally, but closely related to the previous point, the research indicates that despite women's participation in the emergency phase, they are not usually involved in the development of early warning systems. In this sense, researchers such as De Silva (2021) point out that women's participation in such programmes would guarantee greater efficiency and avoid discrimination against them. One example is the disaster risk reduction programme analysed by Dhungel and Ojha (2012), which promotes women's participation in all the phases of an emergency. Women are put in charge of identifying vulnerable people in their communities, participating in the construction of bioengineered embankments to protect their crops and preventative actions which ensure the community is better prepared to deal with disasters. During an emergency itself, women lead the evacuation and rescue of people that have been identified as vulnerable, and they actively participate in the reconstruction afterwards.

In terms of studies employing a mixed methodology, their results are similar to those already mentioned above. On the one hand, they identify differences in the criteria employed by men and by women when dealing with the decision to evacuate (Alam and Collins 2010; Silver and Andrey 2014; Whittaker et al. 2016). To this end, some studies indicate that women, particularly in traditional families, wait at home until the arrival of their husbands, who, in their role as head of the family, have the final say with respect to initiating the evacuation process and when it happens (Alam and Collins 2010). Other research demonstrates how couples negotiate, either in person or by phone, to reach an agreement about evacuating (Kang et al. 2021).

Similarities were also observed with respect to women's active participation in the emergency (Bradshaw 2001; Kang et al. 2021) and the need to promote women's access to information and training, with the aim of them thus acquiring the information necessary for dealing with disaster situations (Reyes and Lu 2017; Oktari et al. 2021). Deserving of special mention among such studies is that of Kang et al. (2021) into the post-disaster response actions of women, especially mothers, following the Pohang earthquake (2017), where they used an existing online community of women as a tool to facilitate their own active participation. The combination of qualitative and quantitative methods, that is interviews and network analysis, also made it possible for these researchers to observe that the Internet, beyond enabling the exchange of information, offered the women emotional support and a space within which to articulate their demands to institutions. As such, they used it not only to organise the rescue of people with dependencies, particularly children, but also to call for compensation from the government and promote reconstruction which would avoid future environmental risks, thereby facilitating their empowerment.

4 Discussion

This work provides a systematic analysis of the social sciences literature which deals with the active role undertaken by women in the emergency phase following a disaster of natural origin, particularly with respect to the evacuation and rescue of people. Scientific production with respect to this field of research is not abundant, indeed, the two databases that collate the majority of specialist publications, WoS and SCOPUS, only contain 25 articles dealing with this issue.

The studies analysed here highlight the significant actions developed by women in the period immediately after the disaster strikes, including taking on an active role in the rescue of individuals, as well as their willingness to prepare and train to better enable them to make informed decisions about evacuating themselves, their families and neighbours (Bradshaw 2001; Cupples 2007; Dhungel and Ojha 2012; Hou and Wu 2020; Kang et al. 2021). In addition, it can be seen that the behaviour of women during evacuation is conditioned by their traditional care role (Bateman and Edwards 2002; Alam and Collins 2010; Silver and Andrey 2014; Tyler and Fairbrother 2018). This scientific evidence challenges the stereotyped opinion spread through the media that, during a disaster, women are passive subjects who need to be rescued by men (Enarson 1998; Dema Moreno et al. 2022). The findings, on the contrary, point to the need to widen the concept of rescue in order to incorporate the ways in which women deal with this phase of a disaster, and make their contributions visible. As well as taking into consideration the fact that women rescue those who are in their care, principally children and people with dependency needs, it should be recognised that they also protect and care for them during the emergency, actions which are just as necessary to save lives. In a similar vein, focussing our analysis specifically on women's actions enables their communitarian dimension to be identified. As some of the articles analysed reveal, there are numerous examples of women confronting the disaster in a collective manner, particularly through informal groups linked to the care networks they belong to, either in their physical neighbourhood or community or in the virtual space created by new technologies.

However, beyond this issue, the studies analysed show that risk perception is determined not only by exposure to the destructive phenomenon, but also by the social and cultural context that the disaster produces. Power systems, gender among them, influence the way that a population experiences a disaster and also how it responds to it and manages the risks involved. Gender differences, related to women's lack of power and social participation in addition to their limited control over the management of the emergency, may be intensified in a catastrophe context. The articles analysed provide scientific evidence of the unequal access of men and women to information and knowledge, as well as the reduced family and sociopolitical influence that women have compared to men. Both these issues contribute to women's subordinate role in decision-making when dealing with a disaster (Augustine et al. 2019; Oliveira et al. 2020; De Silva 2021; Oktari et al. 2021). The result of these differences is that these phenomena impact women disproportionately, affecting their safety and limiting their survival chances. To reverse this situation, it is essential that, in disaster risk management, and particularly in the emergency phase, pre-existing inequalities are taken into account. The principal recommendations that come from the texts analysed to guarantee gender inequality in an emergency consist in making visible women's capacity for agency, ensuring their access to knowledge and information, enabling women's autonomy in decision-making and facilitating their participation in early warning systems.

Along similar lines, another pertinent issue raised by this systematic review is the importance of continuing to provide more depth to gender analysis by taking an intersectional approach. In this sense, the works analysed here do not constitute any great advance in terms of considering the diversity of women's experiences during an emergency from a perspective whereby gender combines with systems of oppression such as poverty, ethnicity, age, sexual diversity, rural living and disability, among others. The analysis conducted has also allowed us to identify a gap in the literature in terms of the role played by men and women in the rescue of material goods in a disaster context. The goods rescued by men and by women, and how they go about this, has not been examined in a systematic way. This is important in order to know what men's and women's material priorities are in such situations, the extent of the risk they take in such rescues and, particularly, whether under the exceptional circumstances of a disaster men and women simply reproduce gender roles or if alterations to these roles are produced (Cocina Díaz et al. 2022).

Finally, this article identifies two types of limitation that refer both to the literature analysed and the process of selecting it. Despite the fact that in recent years there has been a progressive increase in the scientific production on gender and disasters, the great majority of articles published focus specifically on a catastrophic event and are limited to a specific territory, especially English-speaking and Asian settings, therefore, their results are not generalisable to other contexts. At the same time, although some studies have adopted a mixed perspective, combining quantitative and qualitative techniques to address the issue in a more comprehensive way, in practice, there is little integration of methodologies, which has an impact on the results obtained.

Authors contribution RP-G screened all the articles retrieved, firstly removing duplicates and then screening titles and abstracts to identify studies that clearly did not meet the inclusion criteria. SDM, RGA and VCD repeated the process to validate it. The selected articles were tabulated, analysed and discussed in the article by RP-G, SDM, RGA and VCD. The four authors contributed equally to the writing of this article, and the final approval was made by SDM.

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature and this work was supported financially by the Spanish Research Agency through the GENDER (Gender, Disasters and Risk) Project, FEM 2017-86852-P.

Declarations

Conflict of interest The authors declare that no competing interests exist.

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