
Household Preparedness for Natural Disasters: A Review of Literature

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Abstract

Numerous literature reviews have been carried out in the area of household preparedness activities for natural disasters. The present study aims to summarize the latest findings of natural disaster preparedness levels and aims to address the following research questions: What evidence is there for natural disaster preparedness levels? What are the demographic characteristics and potential variables that influence natural disaster preparedness? What has been reported in major bibliographic databases? The first step involved a systematic search to identify relevant studies published between 1995 and 2019 in the following electronic databases EBSCOhost, Scopus, ScienceDirect, and Web of Science. Nineteen studies met the inclusion criteria and were included in the final review. By analysing the available literature, it has been observed that in the area of preparedness activities for natural disasters most households do not have a rapid development plan for preparation. Although little research has been done on the preparedness of the older population, it will be necessary to analyse which communication methods would be used in case of a natural disaster, as well as look into the benefits of their use for networking and rapid communication of information before and during the natural disaster.

Introduction

According to Fritz disaster is “an event concentrated in time and space, in which a society or one of its subdivisions undergoes physical harm and disruption, such that all or some essential functions of the society or subdivision are impaired” (1). The initiator of disaster research in the context of sociology was Samuel Henry Prince, who in 1920 wrote the first doctoral dissertation on the topic of disaster, which was Canada’s worst catastrophe, the 1917 Halifax explosion. Systematic and extensive social science work on disasters started in the very early 1950s (2). Droughts affect societies more powerfully than many other natural disasters when the event is coupled with a lack of financial means, emergency management failure, and a lack of administrative power to enforce existing laws (3). A severe heat wave began in Europe in June 2003 and continued through July until mid-August, raising the summer temperatures by 20 to 30% in comparison with the seasonal average in Celsius degrees over a large portion of the continent, extending from northern Spain to the Czech Republic and from Germany to Italy (4). Most of the victims were over 65 years of age and many of them died from dehydration, hypothermia, or cardiovascular system failure (5).

In total, the number of weather- and climate-related disasters has more than doubled over the past forty years, accounting for 6.392 events in the 20-year period between 1996 and 2015, up from 3.017 in the period between 1976 and 1995 (6). Zakour points out that from January 2001 to December 2010 there were 38.400 disasters (6). Of the deaths from disasters in this decade, 62.5% occurred in Asia, 23.1% occurred in the Americas, 12.9% occurred in Europe, and 1.3% in Africa (7). Over 700 thousand people have lost their lives, over 1.4 million have been injured, and approximately 23 million have been made homeless as a result of disasters (8). According to CRED in Europe, in the period between 2000 and 2017, of 891 natural disasters, 34 were earthquakes (average magnitude 5.7) affecting 13 different countries, mainly Italy and Greece (9). This has resulted in 701 deaths, 257.303 affected people (including 95.189 homeless and 3.103 injured), and almost US\$ 29 billion in economic damages. In 2016, EM-DAT preliminary data indicated that 301 country-level

disasters occurred, affecting 102 countries. This has resulted in a total of 7.628 deaths, 411 million affected people, and US\$ 97 billion of economic damages (9). Compared to 2017, the number of persons aged 60 or above is expected to more than double by 2050 and more than triple by 2100, rising from 962 million in 2017 to 2.1 billion in 2050 and 3.1 billion in 2100 (10). Globally, the number of persons aged 80 or over is projected to increase from 137 million in 2017 to 425 million in 2050, and further to 909 million in 2100 (10). As the global population of humans increases, the number of deaths by natural disasters is expected to rise (11). As our population demographics change and the number of people with disabling conditions increases, it becomes increasingly important to develop appropriate disaster plans (12). One vulnerability can also be understood in terms of functionality related to communication, medical care, independence maintenance, supervision, and transportation (13). There are systematic variations in the social impacts people are likely to experience even controlling for hazard exposure and structural vulnerability (14). Older adults are more vulnerable not because of their age, but because of the nature of their disabilities and how those disabilities limit their capacity to develop and carry out a plan (12). The elderly are more likely to be injured in a disaster because of their frail bodies (15). Without appropriate preparation, vulnerable individuals may not be able to evacuate as instructed, reach points of distribution for medical countermeasures, understand written or verbal communications during an emergency, or find suitable housing if their residence is destroyed during a disaster (16). The concept of risk can have drastically different connotations for different groups, depending upon the context in which it is used (17). Risk accumulation, dynamic changes in vulnerabilities, and different phases of crises and disaster situations constitute a complex environment for identifying and assessing risks and vulnerabilities, risk reduction measures, and adaptation strategies (13). Dynamic changes of vulnerability and hazard phenomena also mean that risk is non-static; it changes over time and these changes have to be considered when applying specific assessments, as well as when developing corrective (current risk) or prospective (future risk) interventions (18). According to Ranke, *preparedness* can be defined as organizational activities that ensure that the systems, procedures, and resources required to confront a natural disaster are available in order to provide timely assis-

tance to those affected, using existing mechanisms wherever possible (e.g. training, awareness raising, establishment of disaster plans, evacuation plans, purchase and maintenance of necessary supplies, early warning mechanisms, and increasing general knowledge about preparedness) (5). Preparedness activities protect lives and property when threats cannot be controlled or when only partial protection can be achieved (19). It results from a process in which a community examines its susceptibility to the full range of environmental hazards (vulnerability analysis), identifies available human and material resources for coping with these threats (capability assessment), and defines the organisational structures by which a coordinated response is to be made (plan development) (20). Structured and pre-planned preparedness and a healthy response to a disaster help save lives (21). Most commonly, this cycle is divided into four periods of hazard mitigation, disaster preparedness, emergency response, and disaster recovery (22). Without mechanisms to ensure accountability and without specific requirements, appropriate preparedness is unlikely to be accomplished (16). Older people should be involved in the processes of preparedness planning for disasters. They can play an important role by volunteering because they can have specific skills that are rarely used in disaster preparedness and response assistance.

Aim

The aim of this study was to gain a better understanding of the existing literature and to provide a synthesis of studies relevant to the topic. This study aims to address the following questions:

RQ 1: What evidence is there of natural disaster preparedness?

RQ 2: What are the demographic characteristics and potential variables that influence natural disaster preparedness?

RQ 3: What has been reported in major bibliographic databases?

Methods

The author systematically reviewed the literature using PRISMA (Preferred reporting items for systematic reviews and meta-analyses) guidelines (23). The first step involved a systematic search to identify relevant studies performed in the following electronic databases: articles in English published between 1995 and 2019 in bibliographic databases EBSCOhost, Web of Science, Scopus, and ScienceDirect. The last search was conducted on 25 January 2019. The reviewed articles were obtained by searching using the following keywords: natural disaster, preparedness, and hazard. We then used these areas to develop a list of keywords and searched for each of these terms in conjunction with the keyword "preparedness".

We limited our search to titles, abstracts, and keywords of the articles to avoid false positive results of full-text search. The whole process of reviewing included searching for literature, sorting and prioritizing the retrieved literature, and creating a flow chart of the article selection process. The present study was conducted following the recommendations of Liberati et al. and Aveyard (23,24). From a growing list of on-line databases, we selected EBSCOhost, Web of Science, Scopus and ScienceDirect (25,26,27).

Inclusion and Exclusion Criteria

The search was focused on studies on household preparedness for natural disasters and the pre-disaster preparedness of the public, while excluding those studies that fit the exclusion criteria (see Figure 1).

Characteristics of the included studies

Sixteen studies that fulfilled the inclusion criteria were considered for the review (Figure 2). The data extraction phase elaborated the process of sorting the data of selected studies that deal with preparedness for natural disasters. Data retrieval for selected studies was performed using Microsoft Excel.

Figure 1. **Inclusion and Exclusion Criteria defined for screening**

Inclusion Criteria	Exclusion Criteria
IC1: Studies that explore pre-disaster preparedness	EC1: Articles that did not focus on pre-disaster preparedness
IC2: Peer-reviewed	EC2: The study is only published as an abstract
IC3: Full papers	EC3: The study is not written in English
IC4: Empirical research	EC4: Pre-1995
IC5: All articles published by January 2019	EC5: The paper is repeated
IC6: Explained research methods	EC6: Unpublished research
IC7: Clearly described outcomes	

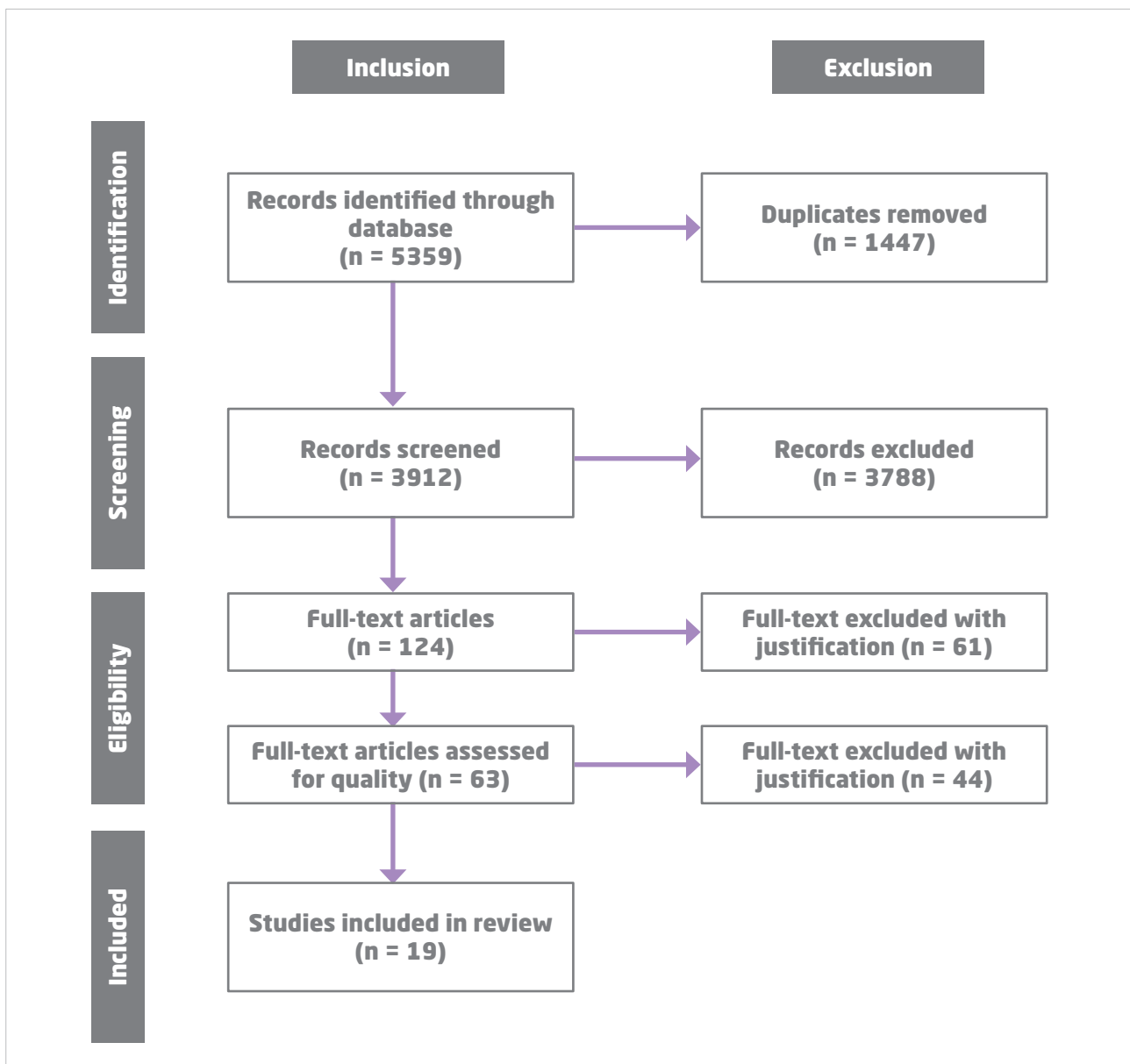


Figure 2. **PRISMA flow chart of the article selection process. The chart shows the entire search and selection process (23)**

Results

In our search, we identified 3,912 potentially relevant articles. Database search produced 484 journal articles. Duplicates were removed and 124 citations were screened. Nineteen studies met the inclusion criteria and were included in the final review. The results of the reviewed studies were categorized and presented in two main parts: (1) review of disaster preparedness and (2) review of disaster preparedness of the older population. The year of publication of the journal articles ranged from 2009 to 2018. Most of the papers which were included were published between 2014 and 2017.

Additionally, four of the studies were published between 2009 and 2013, and one article was published in 2018.

The author, year, country, study period, main focus, research questions, variables, and summary findings were extracted to describe the characteristics of the study. A summary of the reviewed study characteristics is provided in table 1. The majority of the 19 studies were conducted in the United States (n=6), while others were conducted in New Zealand (n=4), and other countries.

Ashenefe et al. reported that household flood preparedness was found to be at 24.4% (38). Kin et al. found that only 29% of households answered “yes” to all three emergency-preparedness items (44). Wakui et al. reported that 26% of the caregivers reported being

Table 1. Studies included in the research synthesis of population preparedness for natural disasters

Authors	Research question	Study objectives/goal	Main focus	Summary findings
Uscher-Pines et al. (28)	Unknown	“To compare the preparedness behaviours of households with and without special-needs members” (28).	Households with a member with special medical needs	“Households with a special-needs member had greater odds of having arranged a place to meet (OR_2.2; 95% CI_1.26, 3.88); located a shelter (OR_1.8; 95% CI_1.05, 3.24); or packed a bag (OR_1.8; 95% CI_1.02, 3.21). No significant differences were identified with respect to awareness of evacuation routes, purchasing of food and water, or creation of an emergency plan to guide evacuation decision-making” (28).
Becker et al. (29)	Explores the influence of experiences on earthquake preparedness.	“To improve knowledge about the roles that different types of experience can play in the earthquake preparedness process and the interactions that occur as part of that process” (29).	Direct and indirect disaster experience	“This study concludes that experience has seven different types of influence on the preparedness process, including prompting thinking and talking; raising awareness and knowledge; helping individuals understand the consequences of a disaster; developing beliefs; developing preparedness; influencing emotions and feelings; and promoting community interaction regarding disaster issues” (29).
Al-rousan et al. (30)	How prepared are older US adults for natural disasters?	“To determine natural disaster preparedness levels among older US adults and assess factors that may adversely affect health and safety during such incidents” (30).	Older adults	“The preparedness score indicated that increasing age, physical disability, and lower levels of education and income were independently and significantly associated with worse overall preparedness” (30).

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Morrison, Oladunjouye (31)	CEO effectiveness in overseeing natural disaster preparedness in organizations in the manufacturing sector.	"The perceptions of those in mid-management positions in terms of the effectiveness of the CEO in overseeing organizational preparedness in regard to natural disasters will not vary by region of the country, size of the organization, length of employment, and education level" (31).	CEO effectiveness in overseeing natural disaster preparedness in organizations	"The perceptions of those in mid-management positions in terms of the effectiveness of the CEO in overseeing organizational preparedness in regard to natural disasters will not vary by length of employment, education level, and size of the organization is rejected" (31).
Gowan et al. (32)	Assessed health-promoting attributes that build resiliency, conceptualized as health-protective attitudes and behaviours.	To determine how QoL and well-being affect household evacuation preparedness.	Application of QoL scales to pre-event preparedness	"Spiritual well-being was the only QoL variable that significantly and uniquely explained variance in preparedness" (32).
Ronoh et al. (33)	Unknown	To contribute to the role of children with disabilities, in theory, research and practice.	Children with disabilities	"The findings indicate a considerable variation in how children with disabilities access available resources and perceive, face and cope with natural hazards" (33).
Okamoto et al. (34)	Unknown	"The study aimed to examine the lessons and learned older people faced as a result of their displacement, and to assess the impact of the disaster on their wellbeing and the forms of support available to them." (34).	Older adults	"It is revealed that older people relied on their experiences, such as the tsunami stories they heard or drills in which they participated. It is clear that this experience also helped other family members" (34).
Sadiq, Graham (35)	What are the determinants of preparedness for natural disasters at the organizational level?	"The goal here is not to review all the risk perception studies at the individual and household levels, but to show that there is a preponderance of studies at these levels in comparison to the organizational level" (35).	Organizational level preparedness	"This study demonstrated that organization size (facility level) is a consistent predictor of preparedness at the organizational level" (35).
Mehiriz, Gosselin (36)	1. How are municipalities prepared for weather-related disasters? 2. How do they respond to weather warnings?	"The accountability of local decisionmakers to their citizens motivate them to develop a disaster management plan that matches the needs of the population" (36).	Emergency management coordinators	"This study shows that most Quebec municipalities are sufficiently prepared for weather hazards and undertake measures to protect the population when informed of imminent extreme weather events" (36).

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Authors	Research question	Study objectives/goal	Main focus	Summary findings
Meena et al. (37)	Unknown	"To understand dairy farmers' perception and preparedness for flood disaster, perceived losses due to disaster, and their adaptation measures" (37).	Farmers' awareness of floods	"This study concludes that poor communication, weak institutional support system, and household-based adjustment exacerbate the impacts of flooding in rural communities and that there needs to be a comprehensive national flood disaster action plan with special emphasis on agriculture and animal husbandry" (37).
Asheneffe et al. (38)	Unknown	To assess household flood preparedness and associated factors in the flood-prone community of the district of Dembia, northwest Ethiopia.	Flood preparedness and associated factors	"This study shows that household flood preparedness was found to be 24.4%. Household flood preparedness was significantly associated with the older age group, attending primary level education, having a higher monthly income, receiving household level warning messages, having knowledge on preparedness, prior exposure to a flood, and length of flood >6 days" (38).
Wakui et al. (39)	Unknown	"To examine the preparedness of family caregivers of older adults with long-term care needs and to identify the characteristics of older adults and their caregivers that are associated with poor preparedness and greater concern about disasters" (39).	Older adults with long-term care	"The majority (75%) of the caregivers had no concrete plans for evacuation in an emergency, and those caring for persons with dementia were 36% less likely to have any plan. Caregivers with poor health or limited financial resources or who were responsible for older persons with mobility difficulties reported higher levels of anxiety about their disaster preparedness" (39).
Kerstholt et al. (40)	How people's perceptions of the quality of their social relationships influence their interpretation of risk and what they might do to manage it.	"To examine to what extent these different variables could predict flood preparedness of 629 Dutch citizens resident in the Hague (an area below sea level)" (40).	People's beliefs about the probability of a future event.	"This study suggests an indirect pathway was mediated by people's assessment of the probability of a future event. This supports the notion that preparatory behaviour is influenced by both a cognitive and an effective route" (40).
Becker et al. (41)	What influence do individual beliefs have on people's interpretation and meaning-making of earthquake hazards and preparedness information?	"To identify the diverse hazard- and preparedness-related beliefs people hold and to articulate how these are influenced by public education to encourage preparedness" (41).	Individual beliefs	"It is suggested that several salient beliefs found previously to influence the preparedness process were confirmed by this study, including beliefs related to earthquakes being an inevitable and imminent threat, self-efficacy, outcome expectancy, personal responsibility, responsibility for others, and beliefs related to denial, fatalism, normalization bias, and optimistic bias" (41).

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Hoffmann, Muttarak (42)	Unknown	"To explore the role of education, disaster experience and a set of potential mediating factors in explaining a person's tendency to undertake preparedness measures" (42).	Education and disaster experience	Experience of loss and damage caused by previous disasters increases disaster preparedness.
Kim, Zakour (43)	What is the level of disaster preparedness among older adults?	To understand the extent to which older adults are prepared for disasters and to investigate the factors associated with their levels of preparedness.	Older adults	"Individuals who have higher levels of social support and more connections to community organizations are more likely to be prepared for disaster-related emergency situations. 29% of households answered "yes" to all three emergency-preparedness items" (43).
Kin Lam et al. (44)	Unknown	To assess the state of community disaster preparedness of Hong Kong residents and to identify factors associated with adequate preparedness behaviours.	Urban disaster preparedness	"Community resilience-building programs should tailor information provision to different age groups with a focus on the family caregivers of elderly residents. There is a need for promoting first-aid training and disaster education in the community" (44).
Domianni et al. (45)	Unknown	Unknown	Power outage preparedness	"Of all the respondents (n=887), 58% were prepared and 46% expressed concern about health. Respondents with electric-dependent household members (9% of all respondents) tended to have higher preparedness (70 vs. 56% of respondents without electric-dependent household members)" (45).
Shapira et al. (46)	Unknown	To evaluate the anticipated behaviour patterns of residents in a high seismic risk area in Israel in the face of a strong earthquake.	Anticipated behavioural response patterns to an earthquake	"The results demonstrate that residents with low socioeconomic status are more vulnerable. Several personal and socioeconomic characteristics are associated with the residents' expected behaviour. Levels of earthquake preparedness and dwelling type are significant predictors of choice of the recommended behavioural strategy" (46).

“somewhat to well prepared” (39). Hoffman and Mutarak reported that disaster preparedness is higher in the Philippine sample: 76% reported undertaking disaster preparedness actions as compared to only 32% in Thailand (42). Individuals who are well-connected with their friends or neighbours can, along with community organizations, build their capacity for effective preparation for disasters (43). Becker et al. found that the more direct an experience was, the more likely people were to relate to the experience, have raised awareness and knowledge, engage in thought and discussion, understand the consequences of disasters, think about their experience in the context of future disasters, form or cement relevant beliefs, have relevant emotions and feelings, and have a motivation to prepare (41). Kim and Zakour reported that race and community participation were significantly associated with the dichotomized emergency-preparedness variable, suggesting that African Americans were well-prepared and had emergency-disaster plans when compared to older adults of other races or ethnicities (43). Shapira et al. found that higher preparedness was significantly associated with higher education levels, higher income, greater experience with previous emergencies, and lower levels of earthquake risk perception (46). Another approach by Al-rousan et al. showed that demographic variables, gender, race/ethnicity, marital status, and living alone were not associated with score levels, but scores were significantly lower (i.e. less prepared) with increasing age and decreasing levels of education and annual income (30). Ashenefe et al. found that the age group of ≥ 46 years (adjusted odds ratio [AOR]=2.62; 95% CI: 1.12, 6.00), monthly household income > 893 Ethiopian Birr (AOR=6.72; 95% CI: 2.27, 19.88), primary level education (AOR=22.08; 95% CI: 8.16, 59.74), a household disaster warning system (AOR=5.41; 95% CI: 2.38, 12.32) and knowledge of flood prevention (AOR=2.52; 95% CI: 1.43, 5.57) were positively associated with household flood preparedness (38). Dominianni et al. also found that preparedness was lower among Hispanic respondents (45%, $p=0.03$), those with household income less than US\$ 30,000 (45%, $p = 0.05$), and those who live in multi-family buildings (51%, $p=0.02$) (45). Gowan et al. showed that the strongest significant contribution to predicting possession of a prepared disaster kit was spiritual well-being (standardized regression coefficient $\beta=0.112$; $p=0.01$) (32). Hoffman and Mutarak found that education positively influences undertaking actions of preparedness (42). Hoffman and Mutarak reported that both education and disaster experience

can trigger learning processes that lead to increased preparedness levels (42). Becker et al. found that experience has seven different types of influence on the preparedness process, including prompting thinking and talking; raising awareness and knowledge; helping individuals understand the consequences of a disaster; developing beliefs; developing preparedness; influencing emotions and feelings; and promoting community interaction regarding disaster issues (41). Kerstholt et al. reported that preparatory behaviour is influenced in both cognitive and effective ways (40). The studies included in this review were very heterogeneous in aim and outcome measures. Firstly, some authors suggest that the age of the head of the family, education, monthly income, a household warning system, knowledge on preparedness and prior exposure were significantly associated with household preparedness (32,38,41,42,44-46). Some studies, such as the one by Mehriiz and Gosselin show that participants are sufficiently prepared for weather hazards and undertake measures to protect the population when informed of imminent extreme weather events (36). The characteristics of warning messages are also important in determining people’s protective responses (14). Ashenefe et al. found that there was a strong association between prior exposure and household flood preparedness (38). Respondents who lost power during Superstorm Sandy were not more likely to perceive their households as prepared or actually be prepared (45). Gowan et al. reported that for those with prior disaster experience, however, social network support was anecdotally reported as the most helpful resource for coping with disasters by a margin of 50% over mental and emotional support combined; only one person identified physical health as the most helpful factor (32). A lack of experience led people to predominantly believe that they were unlikely to be affected by future events, or that they would fare well if a disaster were to occur (29). Ashenefe et al. found that individuals who were aged ≥ 46 years were nearly three times more likely to have household preparedness when compared with those aged 18-28 years (AOR=2.62; 95% confidence interval [CI]: 1.12, 6.00). Neuhauser et al. found little information about the readability of emergency preparedness materials for vulnerable populations (47). Efforts to encourage older adults, particularly vulnerable adults, to play an active role in disaster planning may have more success through a strategy that emphasizes not the dangers of failing to prepare but the benefits of being proactive (12).

Discussion

The present study aimed to summarize the latest findings on natural disaster preparedness levels. Becker et al., Hoffmann & Muttarak and Tierney et al. generally concluded that an understanding of household preparedness for disasters must be based on an understanding of how the public perceives and acts on risk information. The challenge today is in knowing how to protect vulnerable older adults from the catastrophic effects of hurricanes, floods, ice storms, heat waves, or wildfires, and the area is yet to be extensively studied (12). Public disaster preparedness education campaigns are complex endeavours, regardless of their size or scope (17).

As a secondary objective, this review also collected other variables related to the age of the population, but expected results related to the needs of older adults were not obtained. The studies included in this review focused on the motivational factors for preparedness. There is little evidence of the impact of motivational factors on preparedness.

Implications for practice and policy

There are several implications for preparedness planning for disasters as a result of this review. Firstly, this review can contribute to the identification and evaluation of ways of increasing community support for household preparedness. Secondly, the benefits and impacts of this literature review demonstrate the level of preparation for natural disasters among the older population. Thirdly, the results presented in this study can improve our understanding of the public pre-disaster preparedness behaviour.

Questions for future research

A great deal of progress has been made in the research of the relevance of experience and motivation for undertaking preparedness actions. Solutions which are capable of being adapted to the understanding of how and why experience contributes to preparedness are yet to be developed. Furthermore, one important area of future research is the examination and assessment of significant opportunities for a deeper understanding of motivation that leads to a change in behaviour in order to take preventive

measures. However, there is great potential for developing the understanding of how and why experience contributes to preparedness activities for natural disasters.

Limitations of the review

The limitations were the following: the author included only published data, which is why there is a possibility of overestimation; inclusion of only peer-reviewed articles; English-language journals, which may have restricted the findings.

Conclusion

By analysing the literature review it has been observed that in the area of preparedness activities for natural disasters most of the households do not have a rapid preparation plan for disasters. Although little research has been done on the preparedness of the older population, it will be necessary to analyse which communication methods would be used in case of a natural disaster, as well as the benefits of their use for networking and the rapid communication of information before and during the natural disaster. On the basis of this analysis, it seems reasonable to conclude that it is necessary to investigate what motivates older people to improve personal preparedness for natural disasters.

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PRIPREMA KUĆANSTAVA ZA ELEMENTARNE NEPOGODE: PREGLED LITERATURE

Sažetak

U području pripreme kućanstava za elementarne nepogode provedeno je mnogo istraživanja. Cilj ove studije bio je pregledati i sažeti najnovija saznanja o razinama pripremljenosti za elementarne nepogode. Cilj je ovog istraživanja pronaći odgovore na sljedeća istraživačka pitanja: Koji su dokazi o razinama pripremljenosti za elementarne nepogode? Koje su demografske karakteristike i potencijalne varijable koje utječu na pripremljenost na elementarne nepogode? Prvi je korak uključivao sustavno pretraživanje kako bi se identificirale relevantne studije objavljene između 1995. i 2019. u sljedećim elektroničkim bazama podataka: EBSCOhost, Scopus, ScienceDirect i Web of Science. U ovom je istraživanju devetnaest studija ispunilo kriterije uključivanja te je uključeno u završni pregled. Analizom pregleda literature uočeno je da u području pripremljenosti kućanstava za elementarne nepogode većina kućanstava nema plan za pripremu. Iako je proveden malen broj istraživanja o pripremljenosti starije populacije, bit će potrebno analizirati koje će se komunikacijske metode rabiti u slučajevima elementarnih nepogoda te koja će biti korist njihove uporabe za umrežavanje i brzu komunikaciju prije i tijekom elementarne nepogode.

Cljučne riječi: elementarne nepogode, nesreće, pripremljenost, starije osobe
