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Earthquake preparedness among religious minority groups: The case of the Jewish ultra-orthodox society in Israel

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Abstract. To work effectively, emergency management systems that address the threat of an earthquake must consider the needs of minority groups. Studies have been conducted regarding earthquake preparedness among marginalized social-cultural groups and on ways to improve it. However, very few studies have examined this in the context of religious minority groups, even though religious frameworks can have an impact on emergency preparedness. This study examined the effects of religious beliefs and customs on earthquake preparedness among the Jewish ultra-orthodox community in Israel, a significant religious minority with unique social, cultural, and economic characteristics. Findings obtained using mixed methods that included a survey and in-depth interviews demonstrated that the majority of the community had a low level of hazard knowledge and a high level of disbelief that a devastating earthquake would occur in their area in the near future. This is despite a long-documented history of earthquakes that devastated the Levant. Low exposure to media, insularity of educational institutions, and suspicious attitudes toward state authorities were shown to hinder preparedness, whilst strong social capital improves it. Religious beliefs affected preparedness both positively and negatively. Practical recommendations for policymakers to improve preparedness in religiously diverse societies include receiving support from religious leaders and adapting technologies and information to be religiously appropriate. The findings establish that religion is a significant factor that influences all stages of disaster response and consequently, must be taken into consideration when attempting to upgrade preparedness.

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1 Introduction

Earthquakes often occur with little to no warning and have the potential to cause enormous amounts of destruction and death. Many countries have developed emergency management systems to address this threat. These systems must consider the needs of minority groups in order for the systems to work effectively for the society as a whole. Some research has been done regarding earthquake preparedness among marginalized social-cultural groups, as well as on ways to improve it. However, only very few studies focus on religious minority groups, despite the fact that in some cases, religious characteristics clearly have an impact on emergency preparedness.

The goal of our research is to examine the effect of religious beliefs on earthquake preparedness in order to recommend ways for improving risk mitigation in religious minority communities. In order to achieve this goal, we studied the Jewish ultra-orthodox community in Israel, a significant religious minority in Israeli society that has unique social, cultural, and economic characteristics.

The research questions include the following: What is the level of preparedness in the Jewish ultra-orthodox community? Which characteristics have a positive effect on preparedness and which characteristics have a negative effect? How can the level of preparedness and conduct during an emergency be improved? We argue that this case study adds a unique point of view to the study of earthquake preparedness, which can help upgrade preparedness in other societies worldwide.

2 Literature Review

2.1 Earthquake preparedness among marginalized minority groups and religious communities

Marginalized social and cultural groups are more vulnerable to natural disasters than majority groups. Vulnerability is the measure of a system's susceptibility to harm or loss from exposure to stress (Adger, 2006). When referring to a community system, vulnerability includes the social, economic and political factors that influence a community's capacity to anticipate disaster and cope with its outcomes (Gil-Rivas and Kilmer, 2016). In a research conducted by Maldonado et al. (2016), it was found that minority groups, such as Hispanic immigrants in the United States, show a low level of self-protection and preparedness, a low level of hazard knowledge and a high level of risk perception, all of which reflect a high degree of vulnerability. It is generally accepted that racial and ethnic minorities, as well as the poor, are hit harder during crises and that disasters are disproportionately debilitating for disadvantaged social groups (Handmer et al., 2007; Maldonado et al., 2016; Spence et al., 2007).

Marginalized social and cultural groups have specific features which may be the cause of this vulnerability. For instance, marginalized groups have a harder time accessing education and information and therefore are at greater risk before and after a disaster (Kellman, 2011). Plapp and Werner (2006) give another example of how religious and cultural beliefs impact vulnerability: According to some religious traditions, natural disasters are seen as a divine punishment that cannot be prevented, and consequently none of the preparations called for by the civil authorities is necessary. Another example of this can be found in a research done by Ya'ar et al. (2015) who found that people who were not exposed to media reports on the subject of earthquakes were more vulnerable. One of the

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groups they studied is the Jewish ultra-orthodox community in Israel, a marginalized group who is unexposed to the mainstream media for religious and cultural reasons.

The preparedness gap between majority and minority groups is reflected in both the disaster preparation phase, the emergency phase and the restoration phase. Regarding **the preparation phase**, the existing literature supports the general observation that non-minority populations are better prepared for disasters than others. For example, in the context of Hurricane Katrina in the United States, Spence et al. (2007) found evidence of differences across race in crisis preparedness. A study on disaster preparedness in Martinique, a French island in the West Indies with a high seismic hazard, found that though an earthquake awareness campaign succeeded, there was still a gap between the increased awareness and the actual level of preparedness. This gap can be explained at least in part by social, cultural and religious factors, such as the dominant fatalism embedded in religious and magical beliefs (Audru et al., 2013; cf Azim and Islam, 2016 in the context of Jeddah, Saudi Arabia).

A person or a community's decision regarding whether or not to prepare for an upcoming disaster is influenced by four factors: risk perception, information, emotional and psychological factors and demographic, social and cultural statuses (Ya'ar et al., 2015; cf Pescaroli and Magni, 2015). These factors influenced the decisions of the Jewish ultra-orthodox women studied by Ya'ar et al. (2015). The women were interested in raising their level of earthquake preparedness. They were aware of the risk and felt that it is their religious obligation to take action. On the other hand, however, some of the ultra-orthodox population in their city remained apathetic to preparedness efforts since a religious leader promised that no harm would befall them even if an earthquake were to occur.

A growing international body of evidence has established that correct behavior during **the emergency phase** can save many lives and reduce property damage. Lucini (2014) provides evidence for this statement through her research on two Italian earthquakes. Her findings show that a community that knows how to cope during the disaster can reduce the disaster's impact. Minority groups show a lower level of action in the emergency phase. For example, they are less likely to evacuate their homes during a hurricane. Moreover, racial and ethnic minorities are less likely to accept risk warning messages without confirming them first, especially if these messages were sent out by the government, which may be the subject of mistrust by these minorities (Spence et al., 2007). This statement can be troubling when adherence to these messages is an issue of health and safety. In order to improve the emergency phase, it is crucial that the state support and coordinate the emergency response on the local level, since the local response is most vital in this stage of a disaster (Alexander, 2010). A community with strong social networks and social capital can manage better during the emergency phase. Under such conditions, community members take action after an earthquake to help each other, even before emergency forces arrive (Aldrich, 2011).

Resilience refers to the ability of communities and individuals to cope relatively well during and after crisis. In **the restoration phase**, resilience includes the ability to rebuild, recover, secure livelihoods and return to normalcy quickly (Handmer et al., 2007). A community's resilience depends on its wealth, income security, access to services, housing quality, general wellbeing and formal and informal skills (Handmer et al., 2007). Aldrich (2011; 2012) maintains that the resilience of a community primarily depends on its social capital, or in other words on the resources embedded in its social networks. He shows that social capital is the strongest predictor of population recovery after catastrophe. A community with strong social networks can provide informal insurance and housing or

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promote collective actions like guarding to prevent looting, all of which advances restoration. According to Kotani and Honda (2019), in order to make recovery more effective and to prevent the social amplification of risk, scientific information regarding recovery should be delivered to the public via the government or non-governmental officials, rather than by relatives or neighbors.

The literature proposes several vital points to upgrade a population's preparedness for a disaster. According to Smawfield (2013), preventative training activities and information campaigns in the education system are some of the most common and effective strategies in disaster risk mitigation. He states that natural disaster preparedness can be learned through extra-curricular activities, supplementary readings and hidden curricula (see also Lucini, 2014). Gil Rivas and Kilmer (2016), recommend several strategies specifically geared toward upgrading community preparedness. First, they stress the import of partnering with trusted community leaders and using their local knowledge. Second, it is consequential to focus on enhancing already existing local resources like community organizations. Third, it is vital to empower affected communities to take control of their own recovery. Similarly, Audru et al. (2013) illuminate the need to increase the engagement of local communities and individuals in raising their level of preparedness. Based on their findings in Martinique, they recommend anchoring campaign efforts in local culture and religion, using the local language as well as developing educational techniques tailored to the needs of specific groups and promoting participatory educational experiences. In the context of Saudi Arabia and Muslim societies, Azim and Islam (2016) propose to include certain interpretations of the Quranic sources to support risk mitigation strategies. Lastly, decentralizing disaster risk reduction policies and measures, and increasing the role of local government in decision-making, is also effective in improving preparedness (Grady et al., 2016).

Since socio-cultural aspects affect different stages of a disaster, it is critical that research on prevention and intervention efforts be grounded in an understanding of the unique characteristics of the groups they are working with. These include the community's view of itself, its strengths, its goals and the difficulties that it faces. Appleby-Arnold et al. (2018) conclude that a disaster management that seeks to take culture into consideration should identify and use cultural factors, such as shared values, traditions, worldviews and local everyday experiences to improve disaster preparedness and response. Such culturally-informed disaster management should identify and address not only the vulnerabilities but also the strengths of specific socio-cultural groups.

In recent years, studies have examined the influence of religion on disaster preparedness and response. These studies have shown that religion can have both a positive and a negative effect on disaster management. On the one hand, religious beliefs and practices may serve as a vital source of spiritual support in urgent times, which bonds people together and helps them cope with the disaster successfully (Gianisa and Le De, 2018; Sun et al., 2018). On the other hand, fatalistic beliefs, which are common in many religious societies, may lead to a passive attitude regarding the need for disaster preparation and to passivity during the emergency (Baytiyeh and Naja, 2014; Sun et al., 2018). Hence, scholars emphasize the importance of considering religious factors and beliefs when attempting to improve disaster preparedness. For example, in cultures where fatalistic attitudes prevail, critical thinking should be emphasized in the educational frameworks (Baytiyeh and Naja, 2014; Yari et al., 2019). Moreover, authorities that work on risk reduction should collaborate with the primary religiously-affiliated community organizations, which often have a strong effect on all areas of life in a religious society (Baytiyeh, 2017; Gianisa and Le De, 2018).

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As the above literature review indicates, minority groups' responses to natural disasters have been studied to some extent and, currently, there is a growing body of literature that focuses on disaster management in religious societies. Yet, to date, very few studies have researched disaster preparedness among religious groups that also constitute a marginalized minority. It seems that this intersection of religious observance and disadvantaged minority status may create distinct characteristics and needs in terms of disaster risk reduction, needs which thus far have not been sufficiently addressed. Furthermore, to the best of our knowledge, the preparedness of the Jewish ultra-orthodox society in Israel to natural disasters has not been the focus of any systematic study. Thus, the present study makes a significant contribution to the existing pool of knowledge regarding the influence that minority groups' religious observance has on their preparedness for a natural disaster event.

2.2 The Jewish Ultra-Orthodox Sector

In 2017, Israel's ultra-orthodox population reached one million people, comprising 12% of the population in Israel. Ultra-orthodox Jews adhere to a strict interpretation of Jewish religious law. Religious precepts regulate all aspects of their daily life. Their life values, educational frameworks and culture distinguish them from all other groups in Israeli society. The ultra-orthodox Jews strive to create a "scholarly society" where men are totally immersed in studying Jewish religious law. Some other values and norms of Jewish ultra-orthodox society include a family-centered lifestyle, insular communal life, conservatism, extensive social control of members' behavior, special dietary laws, gender segregation, strict dress codes, and respect for the leadership of prominent rabbis in all areas of life. Jewish ultra-orthodox society is characterized by high population growth, poverty, very limited participation in the army draft and a separate education system where the focus is religious study, with a minimal presence of secular subjects. Though many tend to view the ultra-orthodox population as homogeneous, it is in fact composed of several different communities belonging to different factions that diverge in worldview, lifestyle, custom, religious leadership, as well as in their economic and political institutions (Caplan, 2007; Caplan and Stadler, 2012; Gal, 2015; Malach et al., 2016; Vardi et al., 2019).

Recently there has been a rise in ultra-orthodox participation in the general Israeli economy, society and civic affairs. This change indicates that a large number of ultra-orthodox individuals believe that the society should move away from being a "scholarly society" where men are discouraged from joining the workforce. However, this is not the view of the entire ultra-orthodox population (Caplan and Stadler, 2012; Vardi et al., 2019).

With regard to earthquake preparedness, most members of the Jewish ultra-orthodox society in Israel live in high-density neighborhoods and towns and in buildings that do not meet the standards for earthquakes. As most earthquake fatalities result from collapse of buildings (e.g., Coburn et al., 1992), the ultra-orthodox population is exposed to a considerable earthquake hazard.

In conclusion, as marginalized social-cultural group, the Jewish ultra-orthodox population is more vulnerable to disasters. Our research proposes to improve this population's preparedness and resilience by examining the community's characteristics which are relevant to these matters.

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2.3 Earthquake Hazard in Jerusalem

We focus attention on Jerusalem where most of our interviews have been conducted. Throughout Israel, the active Dead Sea fault system (DSFS) that separates the Arabian plate from the Sinai-Levant Block (Fig. 1) (e.g., Quennell, 1956; Freund et al., 1968; Garfunkel, 1981) exposes nearby settlements to earthquake hazard. Since 1900 a number of medium-to-strong earthquakes have caused numerous casualties and extensive structural damage along the DSFS. On 11 February 2004, a small, magnitude 5.1, earthquake occurred on the DSFS northeast of the Dead Sea (Fig. 1). It caused light damage and panic in Jerusalem, 32 km to the west (Hofstetter et al., 2008). The magnitude 6.2 earthquake of 1927, centered north of the Dead Sea (e.g., Shapira et al., 1993; Hough and Avni, 2011), killed several hundred people, injured a thousand or more, and destroyed numerous buildings. Since 1927, the population has grown significantly, and with it the number of buildings. Clearly, such an earthquake hitting today would lead to far greater damage. In fact, in 1995 a strong magnitude 7.2 earthquake occurred on the DSFS but much farther south in the Gulf of Aqaba. This earthquake was accompanied by more than 10 reportedly felt aftershocks and led to damage to buildings in the towns of Aqaba (Al-Tarazi, 2000) and Eilat (Hofstetter et al., 2003; Shamir et al., 2003; Baer et al., 2008). This latest strong earthquake on the same DSFS is a potent reminder that a nearby earthquake would have devastating effects.

Over the last millennia, the Jerusalem's population and buildings repeatedly suffered from earthquakes on the DSFS (Fig. 1). Table 1 lists historic earthquakes that damaged Jerusalem since Roman times. The locations and intensities of earlier catastrophes, depicted in the Bible or by Josephus Flavius are less certain (Ambraseys, 2009). The source of most of these events were likely in the Jordan Valley - Dead Sea sector of the fault system (Fig. 1) (Agnon, 2014; Lefevre et al., 2018).

3 Methods

In this research, we used a mixed method approach that combines quantitative and qualitative methods. This approach allowed us to consider different aspects of the research field from multiple perspectives (Creswell and Plano Clark, 2011). Specifically, this study used convergent parallel mixed methods (Creswell, 2014). The quantitative aspect of the study integrated closed- ended questions within a survey that is analyzed using statistical tools. The qualitative aspect included a few open-ended questions in a survey, as well as in-depth interviews with key stakeholders. The qualitative data was analyzed using qualitative content analysis and Grounded Theory, including an iterative search for repeating concepts and ideas (Corbin and Strauss, 2014).

3.1 Survey

We conducted a special-purpose social survey comprising both open-ended and closed-ended questions, which was distributed throughout the general Jewish ultra-orthodox pubic. The questionnaire was based on a reliable and validated questionnaire created by Ya'ar et al. (2015), who studied the Israeli public's attitudes toward earthquake

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preparedness by asking respondents to indicate the perceived level of earthquake risk, as well as their self-assessed level of preparedness. We edited, processed and adapted the questionnaire to the ultra-orthodox sector, which we distributed to people through in-person interviews. We then created a shortened version of the questionnaire to spread via an online form. The questionnaires received 228 responses: 140 through in-person interviews and 88 via the online form. The answers to the closed-ended questions were analyzed using statistical methods with SPSS (Statistical Package for the Social Sciences). The data collected using the open-ended questions was thematically analyzed both deductively and inductively according to key categories and themes.

The research questionnaire included the following topics: Socio-demographic features (age, civil status, area of living, socio-economic status, community affiliation); involvement in earthquake preparedness activities; religion and preparedness; preparation of the respondent's home for an earthquake; subjective views on earthquake preparedness; coping capacities; and exposure to information regarding earthquake preparedness.

3.2 In-Depth Interviews

The research team conducted 30 in-depth, semi-structured interviews with 16 relevant national-level policy and decision makers, nine paramedics and other rescue personnel, and five religious leaders and key figures in the ultra-orthodox community. The semi-structured interviews allowed us the flexibility and interactivity of qualitative research, while at the same time facilitating a greater degree of standardization than more open "field" interviews (Kelly, 2010).

The interviews were recorded, fully transcribed and thematically analyzed both deductively and inductively according to key categories and themes. The interviews allowed us not only to gain new insights and produce data from additional perspectives, but also to openly discuss the existing and proposed policy mechanisms and recommendations with key actors in a dialogic and interactive process.

4 Results

4.1 Findings from the Questionnaires

4.1.1 Demographic Features

The average age of the respondents was 28 (SD=10.22), with ages ranging from 18 to 77.
59% were married and 50% were parents. 82% lived in Jerusalem and its surrounding cities.

4.1.2 Earthquake Preparedness

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When asked about the likelihood of a disastrous earthquake occurring in Israel in the next five years, 54% believed that the chances are nonexistent or at least very low. The percentage of disbelief rose to 64% when respondents were asked about the likelihood of an earthquake occurring in close proximity to their living area.

To the statement "I do what it takes to prepare for an earthquake, even if it costs money or takes time", 75% responded negatively or said that they prepare minimally. Similarly, 81% responded negatively to the statement "I am actively seeking information regarding preparations for a possible earthquake".

Another example of respondents' low level of preparedness was the high rate of respondents who indicated that they did not know the earthquake safety guidelines and that they do not have the equipment available for emergencies. One of the open-ended questions asked respondents what they would do if they felt that an earthquake was taking place. Many of the respondents, including those who replied that they did not know the rules of conduct, did know the basic guideline of exiting to an open area. Most of the respondents said they were not aware of the guideline of disconnecting electric and gas switches following an earthquake.

60% of the respondents believed that they did not have the knowledge and tools necessary to deal with an earthquake.

50% of the respondents believe that their home did not meet the requirements of the law passed in Israel in 1995 that set a new standard regarding earthquake safety.

Of the respondents who are parents to small children, only 15% of parents said they spoke to their children about the rules of earthquake emergency. Less than 4% of parents practiced these rules with their children.

4.1.3 Effect of Religion on Preparedness

Regarding religious views on earthquake preparedness, the respondents were asked if they believe that there is a Jewish religious obligation to prepare for disasters such as earthquakes. About two thirds (68%) answered positively, with some quoting specific commandments that prove their point, 7% stated that a Jewish leader or scholar must rule on the matter and the remaining 12% answered that they believe that there is no such obligation.

The respondents were asked whether they think that the fact that emergency preparedness guidelines are issued by the national (secular) authorities has a negative effect on their community's preparedness level. One out of five (20%) answered positively, saying that the source of the instructions has a negative effect. Another 20% believe that the source of the instructions has a positive effect on preparedness since it makes people take the guidelines more seriously. Others believe that there is no existing connection between the source of the instructions and the preparedness level.

4.1.4 Exposure to Earthquake Preparedness Publications

About half (46%) of the study participants answered that they have been exposed to publications regarding earthquake safety measures in various media such as newspapers, websites, radio and direct mail. Additional sources

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of exposure include hospitals, government offices and schools. 72% out of those exposed to these publications claim that they have not properly prepared for an earthquake.

4.1.5 Ways to Upgrade Preparedness

We asked the respondents about what could convince them or help them to prepare for an earthquake. 25% of the respondents answered that if they were to learn of a high probability of an earthquake occurring in their area, then this would convince them to prepare. Other factors they mentioned include having a higher level of awareness, training, advertisements on the subject, the authority of a religious leader and other state authorities. When asked specifically if an instruction from a religious leader or a ruling according to Jewish law would convince them to prepare for earthquakes, 68% of the respondents said "yes".

The four main ways that respondents identified as effective in raising awareness in the ultra-orthodox sector include: instruction from a religious leader, disseminating information in ways that are adapted to the ultra-orthodox community, community preparedness efforts and youth education.

4.2 Qualitative Findings

The findings from the in-depth interviews regarding the level of earthquake preparedness in ultra-orthodox society can be divided into three main themes: the characteristics of the ultra-orthodox society that may have a negative effect during the preparation and emergency phases; the characteristics of the ultra-orthodox society that may have a positive effect during the preparation and emergency phases; strategies for improving the preparation and emergency phases.

4.2.1 Characteristics That May Have a Negative Effect

Ultra-orthodox society has several characteristics that may have an adverse effect on their level of preparedness for an earthquake and may make functioning during emergencies difficult. The characteristics we will discuss in this sector include: certain aspects of the ultra-orthodox worldview and guiding philosophy, technological disparities, the insularity of educational institutions, attitudes toward state authorities, and low socio-economic status.

Worldview and Guiding Philosophy. In ultra-orthodox society, various religious laws and viewpoints relate to emergency preparedness. We identified two basic, ostensibly contradictory perspectives rooted in Jewish tradition that lead to divergent approaches to emergency preparedness. One perspective can contribute to a religious preference not to prepare for earthquakes, while the other perspective can lead to appropriate preparations. The view that leads many ultra-orthodox individuals to refrain from preparing for disasters is the deeply-held belief that everything that happens is God's will, and that preparation for a disaster cannot change God's decree. Likewise, some believe that the best way to prepare is through prayer, repentance and studying sacred texts. Lastly, some consider preparedness efforts to be implying a lack of trust in God, and they therefore refrain from such activities.

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Some of these philosophies may make it difficult for the people to efficiently prepare for earthquakes. This point is brought out through the words of Shmuel, one of the leaders of an ultra-orthodox emergency rescue organization: "During an emergency we approached members of one ultra-orthodox community asking for help. They immediately offered to pray, when in fact we were looking for help in rescue operations and evacuating the injured. There is totally a risk factor that needs to be emphasized… part of the ultra-orthodox community believes that ultra-orthodox faith and prayer would do more to protect than anything else".

Technological Disparities. Most interviewees spoke of a prevailing lack of awareness regarding earthquake risk and proper preparation. This may adversely affect functioning during emergencies and may make it difficult for rescue forces to operate. One main cause for this low awareness is the fact that the ultra-orthodox public is less exposed to technology for religious reasons. Most people do not own a television at home, and many do not have access to the internet or the radio. This fact impedes the preparation and emergency stages of disaster preparedness, since ultra-orthodox people are not exposed to information that is disseminated online. This challenge is outlined by Gershon, an officer at the Israel Defense Force's Home Front Command, which coordinates the government's response in emergency situations, especially regarding the protection of civilians: "Today, despite having the most advanced technology available, it is not accessible to the ultra-orthodox sector in large parts of it... This communication with the ultra-orthodox sector is limited, some of them still use old forms of media such as street posters and leaflets".

It should be noted that many respondents are of the opinion that it not only the ultra-orthodox that lack awareness, but rather Israeli society as a whole which is not sufficiently aware of the implications of an earthquake, and which is therefore not properly prepared.

Insularity of Educational Institutions. An effective way to raise the level of preparedness of a population is by conducting trainings in its educational institutions. In Israel, the military-affiliated "Home Front Command" invests heavily in providing emergency training to children and youth through schools and other educational institutions. However, a large segment of ultra-orthodox society is characterized by insularity and detachment from the secular world. Institutions in the ultra-orthodox sector do not allow the government or military to enter educational institutions to deliver trainings, even on crucial issues such as emergency preparedness. This is a decisive factor that leaves the ultra-orthodox population less prepared for earthquakes. Though the Home Front Command has adapted its curriculum to the norms of ultra-orthodox society, most ultra-orthodox schools still do not allow military personnel to conduct trainings, and therefore the majority of the students do not receive training.

Attitude Toward State Authorities. Opinions among the interviewees differed on the fact that earthquake preparedness guidelines come from the state and military authorities. Some of them insisted that members of the ultra-orthodox population would not accept directives that come from the army or the state, while others believed that the ultra-orthodox society respectfully accepts these instructions.

Low Socioeconomic Status. The low socioeconomic status that characterizes ultra-orthodox society hampers earthquake preparedness for two reasons. The first reason is that people immersed in daily survival spend less time thinking about preparing for future emergencies. The second reason is that people with limited means will find it

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difficult to buy and maintain essential emergency equipment.

4.2.2 Characteristics Which May Create a Positive Effect

Ultra-orthodox society features characteristics that may improve its level of preparedness and help its functioning in times of emergency. The characteristics we will discuss in this section include certain aspects of the ultra-orthodox worldview, as well as strong social capital.

Worldview and Guiding Philosophy. As mentioned earlier, there are two Jewish perspectives that result in opposite approaches to emergency preparedness. In the previous section, we explained a prominent view that has a negative effect on preparedness. Another set of Jewish laws, however, may actually have a positive effect. A large number of interviewees spoke of the fact that the ultra-orthodox society is very strict about the religious precept to keep away from danger, and that the subject of preparedness would be acceptable if it were presented in such terms. In addition, there is an ultra-orthodox view stating that efforts must be made to protect oneself from threats, and that one may not rely on miracles for this purpose. A senior rabbi that we interviewed said, for example, that learning about this issue can be considered Torah study (Jewish religious study) and therefore as legitimate: "Caution is in itself a learning that I would consider to be Torah study." The research participants proposed to emphasize and leverage this religious point of view.

Strong Social Capital. The ultra-orthodox community has a high level of social solidarity and sustains many community organizations that provide medical and financial aid. The interviews reflect a general agreement that one strength of the ultra-orthodox society from a disaster preparedness point of view is the ultra-orthodox community's high level of social involvement, both in the community dimension and the organizational dimension. A number of respondents noted that in the first few days after a potential earthquake, they expect most of the aid to come from within the community itself and not from the authorities. For this reason, a cohesive and engaged community, such as the ultra-orthodox community, has a higher chance of reducing harm in the emergency phase and thriving in the recovery phase. David, a senior official in an NGO specializing in rescue and recovery, described how a large, connected community can improvise and manage during a disaster: "From the perspective of manpower, we have more organized, living manpower than any other place. There are between 70,000 and 13,000 yeshiva [an orthodox Jewish seminary] students and young men, there is a clear hierarchy, they can mobilize recruitment, they know how to organize huge events, so they will also know how to translate that to improvisation and emergency assistance."

4.2.3 Strategies for Improving the Preparation and Emergency Phases

In this section, we will focus on those methods discussed by the interviewees that can help improve the ultra-orthodox population's earthquake preparedness and its functioning during the emergency. The main ways in which to improve these stages include: providing information; soliciting support from religious leaders or community figures; school training; family activities; advertising; adapting the state's training to the ultra-orthodox public; empowering ultra-orthodox organizations in leading preparedness efforts; and adapting technologies.

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Providing Information. Many interviewees agree that it is essential to invest in explaining to and showing the public "what is an earthquake" Various ways were suggested to publicize the information, including children books, community leaders, workshops for parents, conferences and existing community organizations. A number of respondents said that this process should emphasize the importance of moving to an open area during an earthquake.

Soliciting Support. Ultra-orthodox society places great value on obeying religious authorities. Oftentimes interviewees believed that efforts to disseminate earthquake preparedness guidelines to the public must be supported by the ultra-orthodox religious authorities. Apart from receiving their support on the general issue of earthquake preparedness training, interviewees identified other critical matters that they can help with. For example, Gershon from the Home Front Command said that there is an existing technology that can send a text message to "call only" phones (audio devices without texting options) and issue alerts about an earthquake in progress. Many ultra-orthodox Jews do not allow the use of text messaging for religious reasons, and use "call only" phones. Therefore, implementing this technology would require the support of religious leaders.

There were differences of opinion among the interviewees regarding which authority figures should be approached. Some said that support must come from accepted and esteemed rabbis, while others believed that it is enough to receive support from community leaders, directors of major educational institutions or public activists.

School Trainings. Respondents frequently said that an effective way to improve the preparedness of the ultra-orthodox population is through lectures, activities, and seminars in educational institutions. They surmised that children and adolescents who undergo these sessions could raise the awareness of their entire family. Mendy, a safety officer in an ultra-orthodox city, explained the importance of school training: "We invest a lot in instruction and preparation ahead of time. We do it through the schools because it is very difficult for us to concentrate the population, to sit them down and to give them lectures and sermons. We think that the ones we trained twenty years ago are already parents today… We invest in lectures and study days and instructions and all that we can in order to give them the information".

Family Activities. Ultra-orthodox society is very family-centered, therefore family ties can be a means of raising awareness regarding earthquake preparedness. It is reasonable to assume that parents who undergo training will pass on the information to their children. Shmuel, one of the leaders of an ultra-orthodox emergency rescue organization, recommends conducting large events for ultra-orthodox parents and children that will include activities such as earthquake training, demonstration of rescue techniques, emergency kits, publishing vital emergency preparedness documents, and holding lectures for parents and ultra-orthodox public figures.

Advertising. Another effective way to raise awareness is to publicize the issue using media that is appropriate for the ultra-orthodox population. These include publishing the guidelines in ultra-orthodox newspapers and using street ads and neighborhood leaflets that are distributed for free to every household. Also, the guidelines should be published in ultra-orthodox news websites and radio channels.

Adapting the State's Trainings. A large part of the ultra-orthodox population is unwilling to accept directives issued by the state and the military authorities. For this reason, the interviewees recommend removing any national and governmental symbols from earthquake preparedness literature. Moreover, respondents repeatedly recommended that the soldiers who deliver earthquake preparedness trainings in schools should not wear uniforms.

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Ya'ir, a safety officer at the ultra-orthodox education system, explains the significance of the way the instructors introduce themselves: "The way he introduces himself to the ultra-orthodox education system is crucial. He should introduce himself as a representative that has come to help and not as a representative of the Home Front Command… He must say that it is a religious obligation to prepare."

Empowering Organizations in Leading Efforts. Several respondents noted that one of the ways to improve the population's preparedness for an earthquake is by transferring the entire issue from the Home Front Command to a civilian body which is seen as legitimate by ultra-orthodox society. For instance, the government can establish community-based trainings in ultra-orthodox schools, with the trainers being ultra-orthodox educators rather than soldiers, so that the trainings would be considered more legitimate and acceptable.

Adapting Technologies. Many respondents believed that preparedness for the emergency stage can be improved using various technologies that are adapted to ultra-orthodox population's culture. One idea that is being promoted is the distribution of radios that have only one channel, which would only be used during emergencies to receive guidance from the authorities. Although many ultra-orthodox authorities do not allow the use of radio, there is hope that such a device would be accepted since it only has access to one emergency channel.

5 Discussion and Conclusions

Past research has much to say regarding how emergency preparedness among marginalized communities can be improved, including both conduct during emergencies as well as recovery efforts following disasters. Many of our findings support this literature. For example, similar to the Hispanic immigrants in the United States (Maldonado et al., 2016), the Jewish ultra-orthodox community reflects a lower level of self-protection and preparedness, and a lower level of knowledge regarding potential risk. One of the central reasons for this is minimal exposure to mainstream media, a critical factor that the literature notes can jeopardize both the preparation and emergency phases (Kellman, 2011; Ya'ar et al., 2015). Similarly, we found that an effective way to raise community preparedness is through the educational system (Yari et al., 2019; Baytiyeh, 2017; Smawfield, 2013; Lucini, 2014). The existing literature points out that minority groups show a lower level of action during the emergency phase (Lucini, 2014). Furthermore, racial and ethnic minorities are less likely to accept risk warning messages without confirming them first, especially if these messages are sent out by government authorities, which minority groups may not trust (Spence et al., 2007). Our findings support these statements.

Furthermore, conclusions have been drawn from past literature regarding hazard mitigation among religious communities. With regard to the preparation and emergency phases, religious groups that hold fatalistic attitudes show low levels of hazard awareness and poor conduct during the disaster (Sun et al., 2019; Yari et al., 2019; Sun et al., 2018; Baytiyeh and Naja, 2014). This too stands in agreement with our findings.

Aldrich (2011; 2012) claimed that social capital or social networks are the strongest predictor of a population's recovery after a catastrophe. Our findings show that the ultra-orthodox community has very strong social capital. Therefore, in line with Gil Rivas and Kilmer (2016), we recommend bolstering the existing local resources and community organizations in the ultra-orthodox society. Religion is a factor which has been proven to promote

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disaster recovery. Religion provides spiritual support and enhances communal bonds, on both the emotional and the practical level, functions which are crucial when external resources are limited (Sun et al., 2019; Sun et al., 2018; Gianisa and Le De, 2018). In line with the above statements, many of our interviewees predicted a relatively successful recovery in the ultra-orthodox sector following an earthquake.

Although some research has addressed the response of minority groups to a natural disaster, few have focused on disadvantaged sociocultural groups that are also religious minorities. Given that the ultra-orthodox constitute a religious minority in Israel, the state authorities' representation of these communities is minimal. Most disaster risk reduction guidelines are strategized and formulated by secular officials and, therefore, they may not be religiously appropriate. This greatly increases the ultra-orthodox communities' vulnerability. Our findings establish that religion is a significant factor that influences all stages of disaster response and therefore it must be taken into consideration when attempting to improve preparedness. Our research points to some of the features of a religious minority group which may affect its preparedness, whether positively or negatively, and suggests avenues for improving its level of preparedness. While previous studies have examined the impact of religion on the level of preparedness in general, our findings add significant knowledge regarding the influence that religion has on preparing for a natural disaster among minority groups, especially when the officials and policymakers are part of the secular majority.

Our research questions included three main themes: the actual state of earthquake preparedness in the ultra-orthodox sector, characteristics that may hinder or promote preparedness, and ways of improving preparedness. The findings from the first two questions are summarized in a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis that identifies where the community is prepared and where it lacks preparedness. Furthermore, it identifies both those community characteristics which hinder preparedness, as well as characteristics that can increase preparedness (Table 2).

Our research also sought to find out how to effectively upgrade preparedness in the Jewish ultra-orthodox sector. We found that adjustments in many areas must be made to improve this sector's preparedness. For example, before approaching the community, it is imperative to receive support from community leaders. Emergency preparedness representatives must be accepted by the community, their dress code must be appropriate, and the instructions they give must be adapted according to the community's needs. Advertisements on the subject must align with the community's religious beliefs. Furthermore, we recommend taking advantage of the already existing and accepted organizations of the community for improving preparedness and spreading the guidelines. Technologies should be adapted in ways that will be accepted by the community.

One crucial strategy for minimizing the harms caused by earthquakes in the ultra-orthodox community is by structurally retrofitting buildings in the community so they will be able to withstand earthquakes. Half of our survey respondents indicated that they do not live in buildings that meet the legal safety standards. Despite this, none of our respondents recommended retrofitting. Our interviews with relevant stakeholders further confirmed that very few ultra-orthodox people are interested in retrofitting. The reasons for this include a lack of awareness regarding the potential impact of earthquakes, the significance of building conditions in reducing harm, and the government's willingness to support retrofitting, as well as the intangibility of the danger and the low socio-economic status of

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ultra-orthodox society. Government offices should therefore proactively raise the ultra-orthodox society's awareness regarding the importance of retrofitting and make the information about the financial support that is available to citizens who want to retrofit their houses more accessible to ultra-orthodox people.

One can draw conclusions from our findings that may help upgrade the preparedness and resilience of any minority group, and especially religious minority groups, to natural disasters. We recommend that every government create an organization that can study the different cultures and religions in their respective countries, and to recommend specific adaptations to upgrade the preparedness of minority groups. Furthermore, we reaffirm the importance of local authorities giving non-governmental organizations official responsibilities in the area of earthquake preparedness, since these organizations are accepted by the community. In addition, community leaders should be asked to give their support before approaching the community they lead.

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Data availability

The data is unavailable for review as we promised complete confidentiality and anonymity to the research participants, in line with the ethical principles of social science research.

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Author contribution

ZO and AA designed and led the study, developed the methodology and contributed to data interpretation. TE conducted interviews and analyzed the qualitative data. SG created the questionnaire and performed the statistical analysis. OB contributed to the questionnaire and to data collection. MW initiated the study and conducted interviews. All authors contributed to article preparation.

Competing interests

The authors declare that they have no conflict of interest.

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Year CE	Estimated magnitude	Jerusalem intensity [a]	Comments
363	6-6.5	VIII	Likely on the Carmel branch
418/419	6-6.5	≥VI	Jordan Valley
634/635	~6	~VII	Northern Wadi Araba
659/660	~6	VI-VII [b]	Jordan Valley
746 to 757	6.5-7.5	VIII-IX	Multiple rupture along rift
(1016)	?	VII	Local event, dubious
1033	7-7.5	VII-VIII	Damage to the holy sites
(1068)	n/a	n/a	Scant historic evidence
1105	n/a	V	Panic, no damage
1113	n/a	V	Panic, no damage
1117	n/a	V-VII	"*buildings were shaken to ruins*"†
1293	6.5-7	No reports	J'lem between VIII (Ramla) and IX (Karak)
1458	6.5-7	~VII	Holy Sepulchre destroyed; a minaret collapsed
1504	n/a	V	Three shocks, no damage
1546	6-6.5	VIII	"*Damage to all tall houses"; "fell… Al Aqsa*"*
1557	n/a	VII	Several buildings collapsed
1644	n/a	VII	Houses collapsed; preceded by a foreshock 1643
1753	n/a	III-VI	Felt in Jerusalem
1817	n/a	VI-VII	Two churches seriously damaged
1834	6-6.5	VI-VII	Several churches damaged, few collapsed
1844/1845	n/a	IV-V	Two shocks felt, apparently a preshock 1843 too

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1857	n/a	III-IV	A slight shock felt
1859	n/a	IV-VI	A strong earthquake felt
1863-1873	n/a	III-V	Four to five shocks felt
1874	n/a	IV-VI	A strong earthquake felt
1877	n/a	III-V	Two earthquakes felt (15 February; 14 March)
1879	n/a	III-V	A shock felt
1885-1889	n/a	III-IV	Two slight shocks felt
1893	n/a	III-V	An earthquake felt

[a] The seismic intensity signifies the local level of damage estimated from reports.

795 IX: Partial collapse, shifting over foundations

VIII: destruction of more than half of the buildings in a local settlement

VII: broken minarets and chimneys

VI: plaster may fall

V: objects overturn

800 IV: felt by many

III: felt by few

[b] Calculated by Langgut et al. (2016).

† Ambrasyes (2009, p. 291) provides this quote from "*Historia Hierosolymitana of about 1122*".

805 * Ambrasyes (2009), p. 445.

Table 1: Listing of historic earthquakes that damaged Jerusalem since Roman times.

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Actual State of Preparedness	Strengths	Weaknesses
	The majority know the basic earthquake emergency guidelines that are practiced in Israel. Almost half (46%) of the respondents were exposed to advertisements on the subject.	The majority do not believe that a devastating earthquake will occur in their area in the near future. The majority have not made the necessary preparations. Many are unfamiliar with the emergency response guidelines. The majority have not stocked on equipment and supplies necessary for emergencies. Half of the homes are not built according to the legal standard. Very few discussed the subject with their children. Of those exposed to advertisements on the subject, very few took action.
Opportunities and Threats for Improving Preparedness	Opportunities	Threats
	The majority believe that there is a religious obligation to prepare for a potential disaster. The community has a strong social capital which can be an advantage in the preparation, emergency and restoration phases.	Religious belief that disasters are God's will. Belief that the appropriate means of preparation is through prayer and not through action. Low exposure to information and the media. Difficulty in using educational institutions as a tool. Suspicion towards instructions brought by state authorities. Low socio-economic status.

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Table 2: SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis summarizing the state of earthquake preparedness in the ultra-orthodox sector and characteristics that may hinder or promote it.

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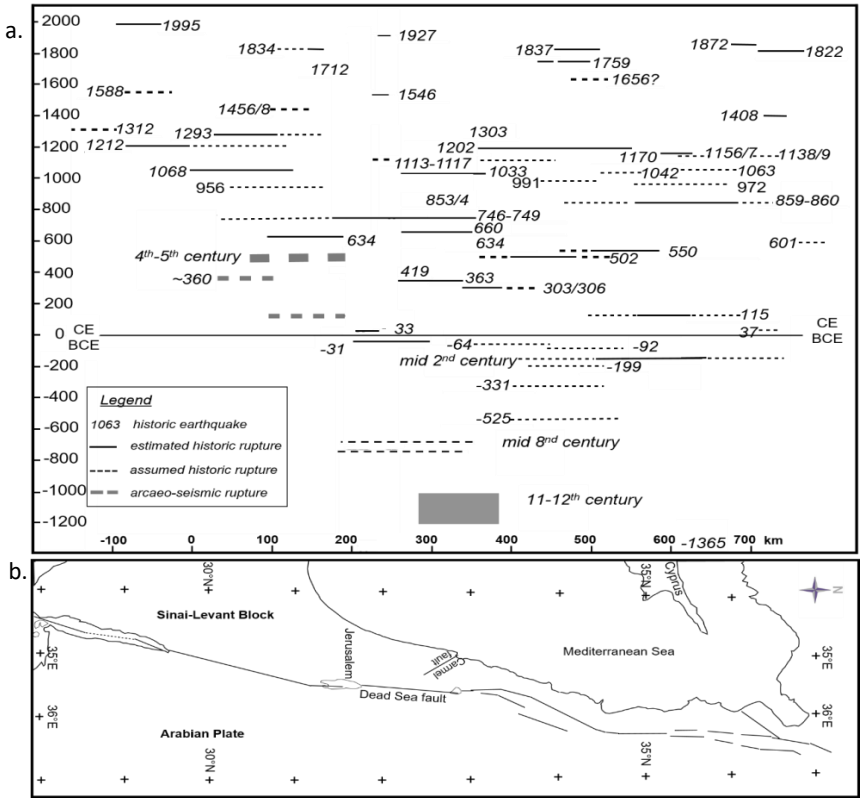

820 **Figure 1: (a) Estimated spatial extent of ruptures from historic periods along the DSFS. (b) Map showing archeo-seism sites indicated in (a) projected on the main segments of the DSFS, after Agnon (2014).**