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Original research article

Embodied competences in preparedness for blackouts: Mixed methods insights from rural and urban Norwegian households

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ABSTRACT

As part of governmental risk management policies, households are advised to be aware of local preparedness plans, make a family emergency plan and kit, and stock supplies to increase their level of preparedness. But the sole focus on this 'formal preparedness competence' fails to consider the 'embodied preparedness competence' that comes into play during a blackout. Drawing on 25 in-depth interviews in Norwegian households and a representative web survey ($N = 1,005$), this article considers how an embodied competence shape household preparedness for extensive electricity and ICT infrastructure breakdowns. Informed by social practice theory, we define embodied competences as practical knowledge of how to act, and demonstrate the importance of three constituents: (i) previous experience with blackouts or having lived with restricted access to electricity or ICT; (ii) local geographical knowledge of climate and weather conditions and the built environment; and, (iii) mobilising social networks. The analysis shows that the formal preparedness competence was low, while the three constituents of the embodied competence were found to be significant preparedness resources. However, these varied between and within households, and most notably rural households had more experience with blackouts, more extensive social networks and were more engaged in their geographical surroundings than urban households. Our analysis provides important insights for policy in demonstrating that households should be recognized as resourceful through their everyday practices rather than by the level of implementation of formal preparedness resources.

1. Introduction

In modern society, everyday life is increasingly sustained by complex systems of infrastructures stretched across large geographical areas. Electricity powers a range of technologies in our homes that give us heat and cold, light, enables us to use our TVs, computers, mobile phones, and connects us to the internet. These interconnected infrastructures exist at the backdrop of our lives and we seldom reflect on them, even though they are imperative for modern society to function [1–3]. According to the IPCC [4], the frequency of extensive infrastructure breakdowns will increase in the future as a result of more extreme weather conditions caused by climate change. In 2018, IPCC [5] warned about the consequences of a rising temperature, which included a higher occurrence of storms, floods and fires that can damage critical infrastructure. Moreover, an increasingly complex and interwoven infrastructure system is more vulnerable to long-term breakdowns [6–8].

In most OECD-countries, citizens are now expected to be part of the preparedness for such breakdowns, echoed in the growing popularity of concepts such as 'societal resilience' and 'community resilience' in global, national, and local risk management policies [9–11]. Within this discourse, preparedness 'provides a way of understanding and intervening in an uncertain, potentially catastrophic future [12]. According to the Federal Emergency Management Agency (FEMA), this intervention consists of 'a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action to ensure effective coordination during incident response' [13]. In Norway, a 'total defence' concept aims to include citizens in such strategies, and in 2018 all households received the brochure 'You are part of Norway's emergency preparedness' [14]. Despite the increased use of a discourse that positions citizens as active participants to increase societal resilience, little is known about what social, cultural, and material resources they have and can mobilise during blackouts. This is particularly the case for the Nordic countries, as most existing studies examine

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coping strategies in developing countries, and high-risk areas [15–17].

There has generally been a lack of in-depth studies of individual and household preparedness, most likely as a result of how the concept has been conceptualised and operationalised in empirical studies. Literature reviews have indicated that there is no uniform definition of household preparedness (eg. [18,19–21]), and according to Kirschenbaum [22] and Staupé-Delgado and Kruke [23], preparedness lacks a theoretically informed conceptualisation. Currently, preparedness is used interchangeably with other phrases such as readiness, contingency management and planning. The concept of preparedness has a political origin and is used to organise the plans and exercises set in place to manage potentially catastrophic events that cannot be predicted [12]. It gives policy a way to be ready for the unknown by building a framework of readiness. Many empirical studies of preparedness use a definition produced in policy documents either by national authorities such as FEMA or global organisations such as the Red Cross and examine to which extent preparedness is present within a population and what hinders this preparedness. According to Kirschenbaum [22], this is a form of bureaucratic pragmatism. Household preparedness is understood as ‘an active state of readiness’ by having implemented many of the same measures that are suggested for authorities, organisations, or companies. Such an operationalisation has to a large degree excluded the social, cultural, and material resources that are not directly linked to planning activities [this argument has also been explored by e.g. [24–27]].

We have labelled this paradigm ‘formal preparedness’. In contrast, the article aims to empirically explore ‘informal preparedness’, which is inspired by theories of social practice [28,29], and entails the ability to mobilise competences and materials from everyday practices as preparedness resources. While there is a large body of research devoted to how practice theory can be used to identify more or less sustainable energy consumption patterns (e.g. [30–35]), only a few studies have investigated how households in developed countries perform energy-dependant practices without energy [15,36–40]. We use blackouts to explore how the embodied competences of practitioners, acquired throughout a life course and formed by material surroundings and social relations, influence preparedness.

The social practice perspective centres everyday practices as a pivotal context where people engage with infrastructure. Many of these practices take place within the household, here defined as a socio-material unit of interlinked practices. Consequently, the household is an interlinkage between people and houses, and differences in family composition and the material characteristics of the house affect how everyday practices are performed [41]. We are interested in understanding what resources household members draw on to deal with blackouts within this context. Trentmann [42] calls it the elasticity of practices; how much can we adapt a practice before it breaks? Small details of everyday life like how to cook a meal without electricity, recognize the wind direction that might lead to tree falls and damage the power lines, or knowing from whom you can borrow a power generator, matter enormously to understand preparedness. Given the recent turn towards active citizen participation in societal resilience, a stronger focus on how everyday life is organised and performed is needed to fully understand household preparedness. The article therefore asks the following research questions: (i) in what ways are embodied competences part of household preparedness? and, (ii) how do these competences differ between and within households?

We explore preparedness through a mixed methods study of Norwegian rural and urban households’ preparedness for and coping strategies during extensive blackouts, which involved in-depth interviews with 25 households followed by a representative web survey ($N = 1005$). The next section elaborates on the categorisation of formal and informal preparedness before the results section demonstrates how three constituents of an informal competence: previous experience, local geographical knowledge, and social networks affect household preparedness.

2. A social practice perspective on household preparedness

In most studies, household preparedness is conceptualised based on existing policy definitions, as stated above. A majority of studies use a quite simple operationalisation of preparedness, such as the presence of emergency supplies at home, a family evacuation plan and rehearsals, and degree of awareness of national and local emergency preparedness plans, what Kirschenbaum [22] frame as an ‘attribute-based’ approach to preparedness. When constructed into measures, studies report on how the level of this preparedness is affected by sociodemographic variables such as race, gender, education, income and age, and behaviours such as previous experience with crises (eg. [43,44]). Households are seen to be underprepared if these resources are not in place [25]. Preparedness studies are almost exclusively quantitative and follow a behaviouristic model where individual risk perceptions are correlated with preparedness behaviours [27]. Consequently, these studies suggest that informing citizens about proper preparedness measures will increase awareness and thus readiness. Such individualistic behaviour models fail to fully consider the everyday social and material resources that are mobilised in the context of crises. Our interest in this article is, therefore, to take a bottom-up perspective and start with the socially and culturally shared everyday practices of households that are not predefined preparedness measures, seldom reflected on, and not explicitly defined as capacities to be more resilient. Rather, they are routines that are already there.

In this regard, we have developed the concept of ‘informal household preparedness’ [39,45] that is based in theories of social practice [46,47]. In recent advances, these theories have been summarized as an analytical toolkit to bring attention to how the social world is continuously produced and reproduced by collective activities (e.g. [28,47,48]), suggesting that fundamental aspects of human life including knowledge, meaning, language and institutions must be understood as produced in practices and their interconnections [49]. Rather than studying individual behaviours, theories of social practice make arrangements of actions – practices – their analytical focus. The social practice perspective on preparedness is inspired by how practice theory has been used to avoid simplistic attitude-behaviour models to explain and change consumption patterns (e.g. [50,51]).

Schatzki [47] distinguishes between practices-as-entities and the performance of these practices. Practices-as-entities are organised by interconnected elements that include materialities, meanings and motivations, and competences in the form of skills and embodied knowledge [28]. The entity is an outline of these elements, which is reproduced as well as reconfigured through the performance of a practice. Thus, a practice is more than individual perceptions, it points to the interconnectedness of our perceptions, the practical knowledge of knowing how to perform a task without reflection, and the artefacts that take part in all aspects of human life [49,52].

Practical knowledge further refers to the embodied skills and experiences the individual practitioner has acquired through previously performed practices, as well as the embodiment of knowing how to act in relation to specific material surroundings and ongoing (unconscious) negotiations with social relations [53]. Although we in this article highlight how such competences affect household preparedness, competences are produced, re-produced and changed according to the other elements of materialities, and meanings such as norms, values, and beliefs. Our focus on competences is also a critique of existing preparedness studies, where behaviourism is the dominant paradigm [27]. Here, knowledge is often positioned as expert knowledge of how to best prepare, while experiential knowledge is downplayed [54]. Such a view reinforces individualisation of responsibilities, as well as having a disproportionate focus on agency rather than structures. Shifting from understanding the low level of preparedness as a knowledge deficiency of the individual to recognizing that embodied competences might, in fact, increase the level of preparedness, is a step towards expanding also the target for intervention programmes to enhance preparedness.

Most empirical studies of practices have focussed on integrative practices as sets of elements (competences, meanings and materials), their connections and how they are performed [52]. However, preparedness is not an integrative but a dispersed practice. Dispersed practices circulate through many of these integrative practices [29]. Preparedness is in this sense not performed in itself but follows the structures of the integrative practice of which it is part. A preparedness competence is composed of competences from other practices, within their logic, and without reference to preparedness. Using the account of practice theory presented by Gram-Hanssen [32], which distinguishes between explicit rules and practical understandings as elements of practices, the embodied competences are ways in which bodies are socialised into certain know-hows and routines. In contrast, a formal preparedness competence is generally defined as the extent to which practitioners draw on institutionalised knowledge and rules. Although almost non-existing in households, a formal preparedness competence also bears resources to cope with crises. For example, owning supply stocks of food and equipment are important to the level of preparedness. However, we argue that a broader view on use and maintenance competences to mobilise these materials is essential to grasp preparedness.

Table 1 summarizes the main features of the formal and informal approach to preparedness as we see them, both in terms of their disciplinary approach and the knowledge they tend to produce.

In the following, we present a mixed methods design to explore the informal expressions of household preparedness understood as an integrative part of household practices.

3. Mixed methods research

To understand the significance of competences in household preparedness, we employed a mixed methods approach that consisted of in-depth interviews and a survey. The in-depth interviews were explorative to the forms of preparedness resources and constraints that were used to deal with blackouts. The survey used these findings to create measures of preparedness resources that indicate differences between households and between social groups. As such, our approach is novel compared to most previous research within the preparedness research field, where resources are predefined.

3.1. In-depth interviews

In Norway, the geography, climate and weather conditions vary considerably between different parts of the country, which in turn affects the frequency of blackouts. Therefore, the sample consists of data from two case studies in three locations. Case Study I consists of nine visits to households in Lærdal, a small rural village in western Norway that in 2011 was hit by a hurricane. Later known as Dagmar, the hurricane caused a long-lasting electricity and ICT breakdown in the whole region. Over 570.000 households were affected, and 35.000 lost their electricity supply for more than 24 h [55]. Three years later, Lærdal also experienced an extensive fire that resulted in the evacuation of half the village, over forty buildings burnt down and critical infrastructure was disrupted [56]. This case gave us information about how blackouts affected families during a major crisis, what resources became important for them, how they were used, and whether these experiences produced any changes in their current preparedness resources. The households were recruited by a key informant, and the visits took place in 2015.

Case Study II was designed to explore how different types of households prepare for future outages. It consists of six visits to households in Grue, a rural municipality in eastern Norway that lies in a forest area with low population density, and a relatively stable climate with low temperatures. This case contrasts Lærdal in its geography, weather conditions and distance to the nearest city. Some of the interviewed families in Grue had experienced the outage caused by

hurricane Dagmar. Finally, Case Study II also include visits to 10 households in the capital Oslo in eastern Norway, which in comparison to the former two locations has a warmer climate and stable weather conditions, is an urban area with high population density, where households have access to a large range of services and where none of the interviewed households had experienced extensive outages. Whereas houses in Lærdal and Grue are mainly detached with access to non-electric heating, Oslo has a large share of small apartments without alternative heating. In Case Study II, 13 households were recruited by a recruitment agency, three were recruited using social networks, and the visits took place in 2017.

The total sample includes 42 participants (22 women and 20 men), with an average age of 47 (17–84 years), houses with and without alternative heating, as well as different family compositions and differences in experience with blackouts. The interviews had an average length of 94 min (50–170 min.) and have been fully recorded and transcribed.¹ As a consequence of different recruitment methods, Case Study I has a smaller variation of family and house characteristics than the strategically selected households in Case Study II. Also, households in Case Study I were all part of the same local community, had similar family compositions and socioeconomic status. Using a recruitment agency in Case Study II ensured a greater variation.

The methodology used in this article is made up of three techniques to produce data about how preparedness is integrated in everyday practices. First, the interviews were unstructured and consisted of 'performative questions' [57,58]. These included the scenario 'what would you do if the infrastructure broke down right now?' Second, walk-along tours of the home were carried out to identify and demonstrate preparedness resources at home [59,60], as well as to play out the scenario. Third, the placement of preparedness resources was photo documented. By anchoring the interviews to the material surroundings of the home during the walk-alongs, and to specific material resources during photographing, stories of how preparedness was performed was given prominence rather than individual perceptions of preparedness. The interconnectedness of the three techniques produced data about performances of everyday practices. A detailed account of the applied methodology can be found in [45].

A three-step process was used to analyse the data, seeking to explore the constituents of a preparedness competence. The first step was a detailed review of all transcripts to seek words or phrases used in the stories about how preparedness was performed. For example, nearby locations, tunnels, roads, streets, and the eastern wind were used to explain and predict blackouts and seek alternative infrastructures that might still be connected. These were in the second step turned into codes such as 'local knowledge', 'wind', 'geographical locations', and the full transcripts were coded using the software HyperResearch. The third step involved the construction of overreaching analytical concepts, in this example 'local geographical competence'. The photographs were catalogued according to the type of resources or constraints such as 'alternative heating source', 'food storage', and 'supplies'. The photographing session produced stories about the acquisition, maintenance, and use of material resources and that these differed between household members, which is explored in the analysis.

The in-depth interviews indicated three important constituents of an embodied preparedness competence: (i) previous experience with blackouts and living with restricted access to infrastructure; (ii) local geographical knowledge of weather and climate conditions and the built environment; and, (iii) mobilisation of social networks of family and friends, neighbourhood and community. Together with a formal competence of awareness of preparedness, knowledge of governmental information, emergency plans, and stocking of supplies, the three constituents make up the basis for the quantitative survey where they

¹ The Norwegian Centre for Research Data (NSD) has approved the project, and all participants signed a written consent form after the interview.

Table 1
The characteristics of formal and informal household preparedness.

| Characteristics | Formal household preparedness | Informal household preparedness |
|--|--|---|
| Approach | <ul style="list-style-type: none"> Stems from a policy discourse of response and recovery strategies A top-down approach that is predefined and adapted to a specific case | <ul style="list-style-type: none"> Stems from social theories of everyday life A bottom-up approach that explores social, cultural and material resources of everyday practices |
| Definition | <ul style="list-style-type: none"> Readiness to anticipate, manage and recover from crises | <ul style="list-style-type: none"> Households' ability to sustain everyday practices in case of crises |
| Study method | <ul style="list-style-type: none"> Quantitative mapping of predefined readiness measures | <ul style="list-style-type: none"> An in-depth qualitative exploration of everyday practices and quantitative measuring of resources and barriers found to matter for preparedness |
| Unit of analysis | <ul style="list-style-type: none"> Individual preparedness behaviours | <ul style="list-style-type: none"> Socially shared practices |
| Focal points in empirical studies | | |
| Engagement by households | <ul style="list-style-type: none"> Active state, readiness | <ul style="list-style-type: none"> Passive state, built into everyday practices |
| Knowledge | <ul style="list-style-type: none"> Awareness of written information such as regulations, laws, national and local emergency plans A family evacuation plan Norms, values, beliefs | <ul style="list-style-type: none"> Embodied competences generated through performing practices, such as previous experiences, local geographical knowledge and social networks |
| Material preparedness | <ul style="list-style-type: none"> Individual ownership of preparedness resources | <ul style="list-style-type: none"> Knowledge of how to acquire, use and maintain material resources within and between households |

are operationalised, and their prevalence was tested in the overall population.

3.2. Survey

A web survey was conducted among a representative sample ($N = 1005$) of Norwegians in September 2016. In the survey, a household is identified as one or more people living in the same house, and the survey respondent is the household member with full or partial responsibility for the overall household economy. Based on two question-batteries from the survey, we used the Cronbach's alpha test and factor analysis to construct one measure indicating a formal competence, and three measures indicating the constituents of an embodied competence. Multiple regression analysis was used to investigate differences in preparedness competences across social groups. Due to non-responses and removal of 'Do not know' answers, several observations were excluded, leaving a sample of 779 respondents in the regression model on formal competences and 911 respondents in the models on the constituents of an embodied competence.

3.3. Factor analysis: Measures indicating formal and embodied preparedness competences

The questionnaire included six questions referring to formal competences. To make the variables useful as items on a scale, we removed the category 'Do not know' and recoded into binary variables with value 1 = Yes or 0 = No. A Cronbach's alpha test showed a coefficient of reliability at 0.701, which is normally considered acceptable to form a scale [61], and the lowest displayed 'item-test correlation' was 0.633 (see Appendix 1). Therefore, we considered the items suitable for the construction of a summative measurement scale indicating formal competence. The summative scale was afterwards standardised.

The questionnaire also included 12 questions related to what we have defined as constituents of an embodied competence. When 'Do not know' responses were removed, the questions had five response categories ranging from 'Strongly disagree' to 'Strongly agree'. Four of the

12 question items were removed based on considerations around interpretable factors and correlation with the factors. A factor analysis with oblique rotation on the remaining eight items showed three interpretable factors of an embodied competence that were constructed into variables using the Bartlett method [62]. Because the promax rotation method was used, the three factors were allowed to correlate. Based on the factor loadings after rotation, we interpreted the first factor to indicate previous experience of blackouts or living conditions with restricted access to infrastructure, and the two items correlate almost equally with the factor. The items that correlated strongly with the second factor refer to knowledge about the local geography such as weather conditions, local terrain and potentially dangerous places. Social networks were defined as referring to relations to friends and people in the neighbourhood. The item on receiving help from neighbours had the strongest correlation with the factor, whereas the item on knowing friends near-by had the weakest correlation with the factor, which illustrated that the factor reflects local social networks rather than social networks in general. The pattern matrix is presented in Appendix 2.

The regression analysis is presented in Appendix 3 and consists of four models: (1) formal competence; (2) previous experience; (3) local geographical knowledge; and, (4) social networks. In the result sections, the models are referred to by numbers 1–4. The analysis showed large differences across the models, indicating that the two forms of competences and their constituents relate to different types of households. In the following, we analyse the results from the regression analysis together with the qualitative material starting with a brief outline of the formal competence, followed by the three constituents of an embodied competence: previous experience; local geographical knowledge; and, social networks.

4. Preparedness competences

4.1. Formal competence

Formal and informal competences are employed as contrasting

concepts to study household preparedness. Whereas a high level of formal preparedness would entail an aware, informed and active household that has obtained explicit knowledge about preparedness measures and implemented them at home, the informal competence is not attributed to preparedness as such but is nevertheless mobilised through embodied skills when blackouts occur. The interviews showed that very few had ever talked about what they would do in case of a blackout, which confirmed by the survey where only 16% stated that they had talked about preparedness for blackouts [63]. Moreover, the concept of preparedness was perceived to belong to a policy discourse and not an everyday language, and very few of the interviewed families were aware of or used governmental preparedness information (such as websites, documents, plans etc.). Instead, other actors such as local and national authorities, grid companies, and even other households were expected to take responsibility in the case of blackouts [64]. Furthermore, 78% of the survey respondent perceived blackouts to be of low risk. In accordance with previous research, we also found that few perceived blackouts to be dangerous, some even considered them cosy [15,37]. Yet, the cosiness of blackouts is a frame used only when it was perceived to be controllable with one's existing resources and when information from authorities about the duration of the blackout, as well as digital communication with family and friends, was in place [39].

While the interviews did not indicate any variation in formal competence across social groups, model 1 in the regression analysis shows that people aged 60 to 69 scored higher on formal competence compared to the reference group of people aged 20 to 29, and also the group aged 50 to 59 is significantly different from the younger reference group at a 90% significance level. This indicates that older people have a stronger formal competence, which might relate to experience with crises where formal information played a different role and was more relevant, for example before the introduction of ICT services. Model 1 also shows that those living in smaller cities tended to have a stronger formal competence compared to those living in larger cities, but there is no significant difference to those living in villages or rural areas. Although formal competence was low, the interviews also indicated that rural households more often knew about local meeting places in case of emergencies than urban households. This is probably related to previous experiences with emergencies that required evacuation in the rural areas we visited, as well as to extensive local geographical knowledge and social relations also with municipality employees and local rescue services. Thus, the formal competence seems to be strengthened through experiential knowledge and social networks.

Overall, our findings indicate quite clearly that there is no expressed motivation to be prepared for blackouts across households, and actions are not taken with preparedness in mind. If we are to look for preparedness not as an integrative practice, we must seek its constituents as dispersed amongst other practices. In the following sections, we turn focus to the competences that are generated from previous experiences, used to manage local geographical conditions, and used to mobilise social networks where knowledge and materials flow, and how these matter to preparedness.

4.2. Previous experience

When the significance of previous experience for future preparedness is studied, the concept is usually defined as experience with previous emergencies, crises or disasters [65–69]. Here, we expand the concept to also consider how living with limited infrastructure produces differently performed practices that in turn might increase preparedness. Previous experience understood as part of an embodied preparedness competence includes knowing of and the ability to mobilise know-hows and material resources required to sustain infrastructure dependant practices during blackouts. The older participants who had experienced blackouts in their childhood, or a daily life with limited electricity and no ICT infrastructure, claimed to be prepared for a future blackout like this participant expressed:

People were not dependant on electricity before, so if the electricity was gone for two weeks it did not matter to us (...) what we used electricity for was primarily lighting and cooking. We had no devices, or a water pump, that was electric. If the electricity disappeared then we were all set, we had kerosene lamps and woodstoves and everything (Man, 84, Lærdal).

The older participants were not worried about blackouts because they had already experienced many, and in addition to knowing what to do, they had kept the objects that were considered necessary for future blackouts. Even though some of the practices, like lighting a room with an oil lamp, were abandoned, the competences and materials from these practices remained and could serve as preparedness resources. Remnants from previous practices thus seemed to survive even with access to infrastructure.

Older participants in the rural areas had more experience than those of the same age in the urban area, which is in line with the regression analysis in model 2, showing that people in rural areas score higher on previous experience compared to those from the city, and people from smaller cities score higher, although the significance level is lower at 95%. This might indicate that older households should not merely be considered vulnerable in case of blackouts [27], older rural households in particular do have important know-how and materials of how to live 'off-grid' that might not be integrated in younger households' practices.

The participants also drew on previous experience of cabin life and hiking. These are quite common leisure activities in Norway, and most of the participants engaged in these practices. Statistics Norway finds that 78% of Norwegians had been on short hiking trips in 2019 and that almost half the population have access to cabins [70,71]. Heidenstrøm and Kvarnlöf [39], have previously argued that the changes made in daily practices such as lighting, heating, cooking and cleaning in non-electric cabins are built-in preparedness resources to cope with blackouts. This has shown to be the case regardless of the residential area, age and gender. Although preparedness is not the goal or meaning of leisure-related practices, preparedness becomes an intrinsic competence needed to accomplish these practices, meaning that preparedness is less salient than the concept of formal preparedness indicates.

Finally, competences produced as a result of previous experience with blackouts were important for future preparedness, as exemplified with a household that talked about hurricane Dagmar:

Woman: I do not know, but maybe after hurricane Dagmar, we might have become more aware of electricity breakdowns, but...

Man: At least it was like that during Christmas when it was windy. (...) Then, I remember that we filled bottles with water, and took out matches and candles

Woman: Yes, experiences after Dagmar, or is it?

Man: It could be

Woman: Yes, even though we do not think about it like that

Man: At least we were prepared

Woman: Not entirely reflexive, but yes Dagmar might have contributed to it (Woman, 40, Man, 39, Grue).

Hurricane Dagmar had revealed to this family that the water infrastructure could potentially be disrupted during a blackout. Hence, they knew that when a similar wind occurred, a preventive action would be to fill bottles of water and to secure lighting with candles and matches. However, a similar study by Rinkinen [36] found that even though blackouts were reflexive moments, and handled by adjusting daily practices, these adjustments were not sustained and gave no further reflection on energy consumption levels. Importantly, although Dagmar caused a higher level of reflexivity and awareness, the participants did not frame these skills as preparedness, which might indicate that further explicit preparedness measures will not be taken.

Urban households had a lower level of experience with blackouts, and even though they owned material resources like candles and matches, they did not have the same level of know-how to predict the consequences of weather events. From the regression analysis, model 2 further indicates that single households have less experience with blackouts, which might be a result of a high concentration of single households in urban areas. Interestingly, model 2 also indicates differences within the households, stating that men tended to have a stronger preparedness competence than women based on previous blackout experience, although the estimate is only significant at a 95% significance level. In the interviews, however, individual experience with blackouts was considered as belonging to the whole household.

4.3. Local geographical knowledge

Local geographical knowledge has to the authors' knowledge not been paid attention to in preparedness studies. We define it here as know-how of how the immediate landscape, weather conditions, and climate affect the stability of the infrastructure. Also, it includes practices where the locally built environment such as base stations, power lines, tunnels, roads and key locations (e.g. evacuation sites and emergency meeting places) are significant. In his work on the interconnectedness of nature and society, Ingold [72], Ingold [73] shows that people gain skills from living in a particular environment, creating a dynamic and ever-changing relationship between what surrounds us and our actions.

Nature has a central role in Lærdal, it affects daily practices as well as being at the core of the community identity. In Lærdal, the valley formation produces a strong wind the villagers have learned to live with, and that caused the 2014 fire to spread extensively. One of the participants explained the characteristics of this wind:

During the fire, it was the eastern wind. It is at its worst down here in the village. It travels through the valley, swipes through the valley, so it was worst down here. During the hurricane Dagmar, it was the south east wind and that usually gets right in here [in the valley], but when it travels through a south-eastern valley, then it strikes right here and then bounces back again. There is this narrow path that gets the worst conditions, that is right where my sister and I grew up, and that area has been destroyed many times (Woman, 55, Lærdal).

A precise vocabulary using cardinal directions to explain how the wind travels, and how the wind's path is determined by the valley formations was a skill that the inhabitants in Lærdal had acquired through experience, and that was incorporated into their everyday practices, expressed by another participant:

Interviewer: *When the wind blows, did you avoid using the wood stove for example, or did you do anything differently, do you remember?*

Man: *No, I do not think so. We were so used to the eastern wind, to put it simply; we took it for granted. We were used to the east wind, but we could not always use the woodstove because the wind was too strong. Here, outside, I always keep it tidy and make sure there are no loose objects.*

Interviewer: *Do you do that because of the wind?*

Man: *Yes, because of the wind. Like now, the past few days it has been windy, and I have tidied the yard (...) These are the kinds of things that the villagers from Lærdal have learned to do because of the wind (Man, 72, Lærdal)*

The materiality of nature, and in particular weather and climate conditions, shaped practices in the rural areas and these ways of adjusting to local conditions produced a higher level of preparedness. Moreover, knowing how the electricity infrastructure was organised, knowing the location of the power lines and how the climatic conditions and weather potentially affected the distribution of electricity in

the area, was another form of preparedness related geographical local knowledge that ran through several practices, such as adjusting use of mobile phones to locations with mobile coverage, and choosing a subscription with the company that offered the best mobile coverage. In Lærdal, such knowledge was mobilised in the days after the fire when people drove to near-by tunnels and base stations to gain access to mobile coverage [74]. How local climate conditions and infrastructure entangle the everyday practices of these families shows the close interplay of the social and material world within a specific place and suggests that preparedness should be studied as localised practices [75].

Model 3 in the regression analysis clearly shows that people living in rural areas score higher on local geographical knowledge compared to people from the city. The same goes for people from smaller cities, although the estimate is weaker, and for people from villages, although the estimate is less significant. This corresponds with the interviews, where the urban households did not express the same local geographical knowledge compared to the rural households. This is related to the fact that the local geography, the climatic conditions and topography have significantly less impact on daily life in the city. Urban households also talked less about the locally built environment, including the electricity infrastructure. Their lack of engagement in the local geographical surroundings might also be explained by the urban households' understanding of the distribution of responsibility for preparedness between themselves as private citizens and public authorities. The urban households expected authorities to deal with blackouts much quicker than the rural households. Thus, the differences in expectations of the formal preparedness system are also significant for the household preparedness level.

Moreover, model 3 in the regression analysis clearly shows differences in local geographical knowledge between men and women, where men scored higher. In the interviews, we found that men had more engagement and competences about practices that involved surrounding infrastructures such as power lines and base stations, fuel-based products such as cars, tractors, generators, ovens, flashlights and tools. Women had a higher level of engagement in domestic practices that involved acquiring, cooking and storing food, alternative lighting and heating, laundry and use of clothing, which is consistent with research on gender and housework [76]. These differences in knowledge type between men and women might indicate that the level of preparedness is dependant on family composition. Interestingly, the gender differences were not as clear regarding weather and climate where women and men living in the same rural area had similar knowledge. The knowledge of how to deal with the local climate and weather conditions seemed to be created through experience with these conditions.

4.4. Social networks

Social networks are defined here as the extent of connections between the households and others such as the extended family, friends and neighbours. These connections can be strong (close relationships) or weak (acquaintances, secondary connections) [77]. Previous research has identified social networks and social capital, drawing on Putnam [78], as important resources to prepare for and manage crises (e.g. [79,80–87]). Furthermore, research has shown that citizens come together in 'emergent groups' to deal with disasters within the community [88,89]. Communities with a high level of social capital are generally found to be more able to cope with crises. However, Cheshire [10] points out that existing norms of a neighbour relation will come into play in a crisis. These norms are based on already existing latent patterns, rather than active work to be resilient within the community. This leads us to the important point that a community is constantly shaped by social and cultural norms and values, and that we must look at how these norms and values shape practices to grasp community resilience.

In the small village of Lærdal, existing social networks had played a

significant role during the fire, as this participant talked about:

(...) we know these people, they are part of the community, right. Of course, after the fire, the local doctor called and asked whether we were ok, a follow-up of everyone that was involved. I think they called absolutely everyone; they called me several times (...). There were obviously a lot of resources, and they worked around the clock in the days after. But I know these people, one of them is a parent at the school, he called. You know everybody, right. It's very special. You know everybody, including the mayor, all the volunteers (Woman, 48, Lærdal).

The expression 'everybody knows everybody' was typical in the Lærdal interviews, which as a value, affected how social networks were performed in this context. Four aspects of social networks seemed to be of importance to preparedness: (i) individuals who had formal roles (the local doctor, the mayor) were known to the community and knew the community, including individuals with fewer preparedness resources; (ii) there was some form of contact between all community members; (iii) formal and informal roles and responsibilities were mixed; and, (iv) other community members were frequently referred to as knowledgeable about the local infrastructure, weather conditions, or they had access to information and knew how to act in a crisis. The participants also provided this knowledge to others.

Extensive local social networks were not found in urban households. In accordance with previous studies such as Sampson [90], the main tendency in the material is that urbanisation is negatively associated with local social relationships and a sense of community. The regression analysis proved the occurrence of strong social networks in rural areas. Model 4 shows that people living outside cities score higher with increasing strength further from the city. This indicates quite clearly that people in less densely populated places have stronger social networks.

However, we also found that smaller neighbourhoods such as a street or an apartment building in the urban area in some cases brought forth social networks that resembled the relations in the rural areas. A couple living in an apartment building talked about this:

Interviewer: *Have the same people lived here for a long time?*

Man: *Yes, and we know the neighbours in this apartment block quite well*

Woman: *We have lived next door to three of them for fourteen years*

Interviewer: *You have socialized a bit with them, then?*

Woman: *Yes, it is a bit like a mini-collective here (Woman, 50, man 45, Oslo).*

Neighbourhoods and apartment buildings in urban areas might share some of the characteristics of villages in rural areas that matter to preparedness, most importantly a sense of community. This also underpins the argument made by Morgan [91] that we must look at the complexities within loose social networks (see also [92]).

The regression analysis indicates that age and family composition matter to the extent of social networks. Model 4 shows that the youngest age group (20 to 29 years) score significantly lower than the older age groups on social networks. The younger interview participants were still heavily dependant on their parents' preparedness resources, which might indicate that younger households are less prepared than older households. Model 4 further shows that people living in households with one or more children also score higher on social networks, which might indicate that having children integrate household members in practices where such networks are part, for example through institutions such as kindergartens and schools, and that same-age children have similar daily rhythms that foster social relations. Interestingly, the model also shows that women have stronger social networks than men do. We do not find a similar difference in the interviews, which might again be related to the participants' understanding of a competence as belonging to a household, and not an individual. This indicates that men could rely on the social networks of the women in the household, much in the same manner as women

might with men's technological competences and their competences from previous experiences with blackouts.

So far, we have concentrated on the social aspects of networks. However, we also find that there are material resources within existing social networks that can be mobilised in case of blackouts. From a social practice perspective, these materials are not external factors or mere instruments but are active elements that co-constitute practices [28,93]. A purpose or meaning of social networks was a flow of materialities, some of which are preparedness resources. The interviews show that material resources that belonged to other individuals in a social network were seen as accessible, explained by this participant: *'I use my friends and know that they would have the equipment that I need. Or I use other people to help me if something was to happen. You have to be a bit ahead' (Man, 45, Lærdal).* Here, preparedness is found within a continuous reproduction of friendship by exchanging things and services. Another participant was asked whether he owned a power generator and replied that: *'No, I do not own a generator, but I have access to a generator, even though I do not own it. (...) my brother has one. I think we have two; there is one at my father's place as well. It is. So, I have access to those' (Man, 40, Grue).* Access to resources did not necessarily mean that the individual household owned them; rather, expensive products were shared across these relationships and moved between the members of a social network. As Kirschenbaum [22] also points to, this finding indicates that preparedness must be understood beyond individual attributes.

5. Discussion and conclusion

In this article, we have argued that an embodied preparedness competence composed of previous experience, local geographical knowledge, and social networks is significant for the level of household preparedness for infrastructure breakdowns, and that this competence varies between and within households. Applying a mixed methods design, we sought to integrate a qualitative exploration of preparedness resources, with a quantitative analysis of how the identified resources varied across social groups. We are aware that the mixed methods design in this article also pose potential limitations. First, we are not going in-depth with the statistical modelling of differences in household preparedness. For example, it would be interesting to look at interaction effects with gender. Second, we only focus on households, leaving out interconnections with other actors such as local and national authorities. Third, we have not observed how the household members acted during blackouts. The findings are re-enactments of previous events and enactments of scenarios, meaning that we gain data of talk about performances.

However, the social practice perspective has foregrounded interconnected resources that have been given little attention so far, but that matter to preparedness. Fig. 1 summarizes the preparedness competences, emphasizing that households are prepared through the embodied competence even if the formal competence is low.

The analysis has demonstrated that resources to cope with blackouts are mobilised from many existing practices, indicating that preparedness should not be understood as one integrative practice. Rather, preparedness is dispersed, following the logic of other integrative practices such as wood heating, leisure activities and cabin life [29,94]. Also, preparedness consists of competences found in other dispersed practices such as weather knowledge, local knowledge and social networks.

Furthermore, a higher competence amongst rural households suggests that preparedness should be understood as situated practices that vary across geographical areas also within the same cultural context. Differences between practitioners, such as those between generations and genders, emphasise the embodiment of competences. However, household members understood preparedness at a household rather than an individual level, indicating that an embodied competence could be shared between members. This, in turn, might suggest that single

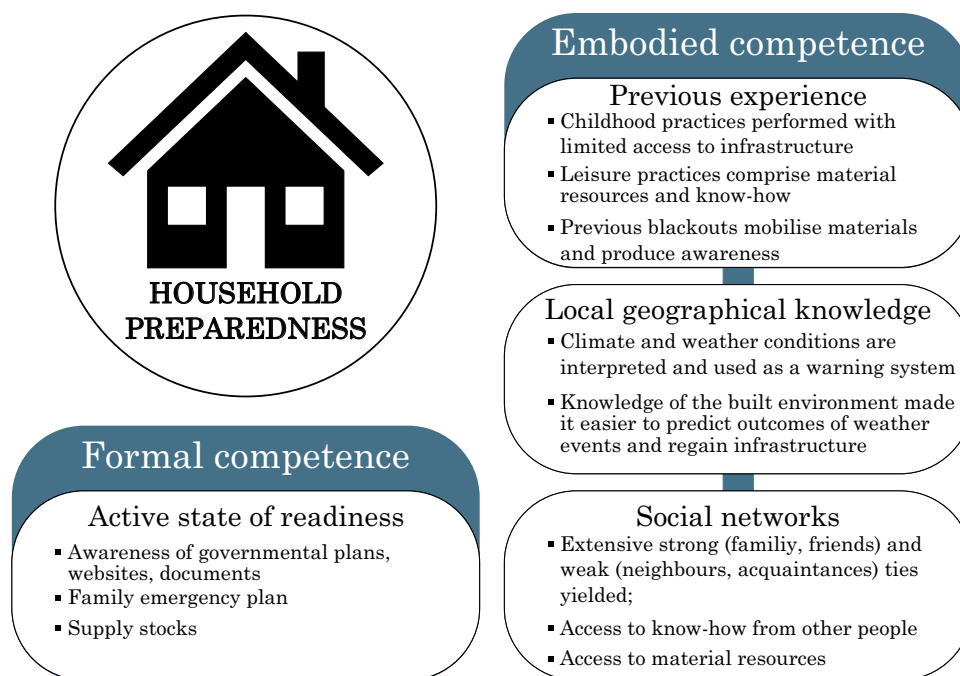


Fig. 1. Preparedness competences.

households possess fewer resources. Overall, the analysis indicates that young and urban single households have the lowest competence to cope with extensive infrastructure breakdowns.

More broadly, this article has demonstrated that there is a huge difference between the preparedness discourse that exists in policy, which is used as a baseline for empirical studies, and the preparedness resources that have proven to be significant for households dealing with blackouts. The social practice perspective acknowledges the interdependency of social, cultural, and material elements that together form bundles of everyday practices, and the analysis has demonstrated how competences from these practices increase preparedness even with a low level of reflexivity about preparedness. Furthermore, a recent review of responses by the public to major power outages by Rubin and Rogers [95], stated that studies of blackouts tend to focus on the technical impact on the existing system of infrastructures, but seldom reflect on the consequences for citizens (see also [96,97]). The present study offers an approach to understand how infrastructure shapes and is shaped by the social practices of which it is part.

It is critical to note that we do not suggest that households should rely solely on these competences when faced with blackouts. Society needs to have formal contingency plans and to be responsible for national crisis management. But, as the analysis indicates, without taking the embodied preparedness competence into account in future

preparedness policies as well as in future studies of household preparedness, the scope of what preparedness should be defined as remains rather narrow. Policies aimed to strengthen preparedness would probably be more successful if they build on the forms of resources that already exist. Instead of informing the public about preparedness as a separate task to perform, a greater understanding of how infrastructure embeds our lives, grounding policy measures in infrastructure-dependent practices, might lead to heightened awareness [98]. The practice perspective also suggests that strengthening important preparedness resources, such as knowledge about first aid, should focus on establishing competence rather than provide information. Concretely, local participatory processes led by citizens themselves could contribute to going beyond the dominant preparedness paradigm (aware and ready is a common goal that is achieved through information) that tends to be reproduced in top-down deliberations [99], and produce more relevant plans which are written by and actively used within a community, also bearing in mind that preparedness is not an individual task.

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*. Appendix 1

Appendix 1

Cronbach's Alpha test.

| Formal preparedness competence (Yes = 1) | Item-test correlation |
|--|-----------------------|
| Do you have a preparedness plan in case of accidents or crises? | 0.674 |
| Are you aware of a local meeting place organized by local authorities in case of crises? | 0.633 |
| Do you know where to find information from the government in case of a crisis? | 0.651 |
| Are you familiar with the local preparedness plan in your area? | 0.652 |
| Are you familiar with information from the government about how to plan your own preparedness in case of an emergency or crisis? | 0.655 |
| Do you know how to contact governmental emergency services in case of an emergency? | 0.709 |
| A Cronbach's alpha test scale | 0.701 |
| Homerisk survey (N = 779) | |

Appendix 2

Factor loadings after oblique promax rotation.

| <i>Informal preparedness competences</i> | <i>Pattern matrix</i> | | |
|--|-----------------------|------------------------------|---------------------|
| | Social networks | Local geographical knowledge | Previous experience |
| I/we have experienced living without electricity for a longer period of time (eg. a week) | 0.023 | 0.024 | 0.698 |
| I/we have experienced living without internet and telephone connection over a longer period of time (eg. a week) | −0.019 | 0.008 | 0.701 |
| I/we have knowledge about the local terrain and weather conditions | −0.013 | 0.685 | 0.055 |
| I/we know the safe and dangerous places in the local area | 0.055 | 0.699 | −0.005 |
| I/we know a lot of people in our neighbourhood | 0.658 | 0.090 | −0.021 |
| I/we have friends who live near-by (cycling distance) | 0.555 | 0.062 | −0.031 |
| I/we are important resources where we live and are happy to help neighbours if they need help | 0.666 | −0.025 | 0.076 |
| I/we can receive help from neighbours if we need help | 0.748 | −0.038 | −0.018 |
| <i>Proportion of variance accounted for after rotation</i> | <i>0.702</i> | <i>0.594</i> | <i>0.446</i> |
| Homerisk survey (N = 911) | | | |

Appendix 3

Regression model of four forms of household preparedness competences.

| | (1) Formal | (2) Previous experience | (3) Local geographical knowledge | (4) Social network |
|---|---------------------|-------------------------------|--|-----------------------|
| City size (Ref. 'City') | Ref. | Ref. | Ref. | Ref. |
| Smaller city | 0.367*** (0.138) | 0.251** (0.111) | 0.379*** (0.109) | 0.274*** (0.095) |
| Village | 0.158 (0.142) | 0.114 (0.115) | 0.248** (0.113) | 0.419*** (0.099) |
| Rural area | 0.174 (0.153) | 0.394*** (0.122) | 0.685*** (0.120) | 0.879*** (0.105) |
| Household income (Ref. 'Less than 200,000 NOK') | Ref. | Ref. | Ref. | Ref. |
| 400,000 to 599,999 NOK | 0.001 (0.199) | −0.093 (0.163) | 0.134 (0.160) | 0.292** (0.140) |
| 600,000 to 799,999 NOK | 0.274 (0.219) | −0.454** (0.179) | 0.110 (0.175) | 0.283* (0.153) |
| 800,000 to 999,999 NOK | 0.352 (0.234) | −0.244 (0.189) | 0.138 (0.185) | 0.244 (0.162) |
| 1000,000 NOK or more | 0.594*** (0.230) | −0.240 (0.186) | 0.217 (0.182) | 0.501*** (0.160) |
| Do not wish to answer | −0.126 (0.215) | −0.362** (0.172) | 0.056 (0.168) | 0.105 (0.147) |
| Education (Ref. 'Primary school') | Ref. | Ref. | Ref. | Ref. |
| High school | −0.459* (0.278) | 0.254 (0.211) | 0.162 (0.207) | 0.116 (0.181) |
| Vocational education | −0.483 (0.303) | 0.369 (0.229) | 0.227 (0.224) | 0.042 (0.196) |
| University degree | −0.345 (0.268) | 0.377* (0.201) | 0.194 (0.197) | 0.071 (0.172) |
| Out of workforce or other (incl. unemployed, students and stay-at-home) (Yes = 1) | 0.074 (0.163) | −0.054 (0.130) | −0.047 (0.127) | 0.167 (0.111) |
| Pensioner (Yes = 1) | −0.145 (0.266) | −0.287 (0.209) | 0.223 (0.204) | −0.002 (0.179) |
| Male (Yes = 1) | −0.031 (0.105) | 0.188** (0.086) | 0.300*** (0.084) | −0.200*** (0.074) |
| Age ([21]-[30]) | Ref. | Ref. | Ref. | Ref. |
| 30–39 | −0.013 (0.194) | −0.074 (0.161) | 0.273* (0.157) | 0.362*** (0.138) |
| 40–49 | 0.242 (0.181) | 0.200 (0.146) | 0.327** (0.143) | 0.498*** (0.125) |
| 50–59 | 0.335* (0.181) | 0.137 (0.146) | 0.221 (0.143) | 0.535*** (0.125) |
| 60–69 | 0.629*** (0.222) | 0.375*** (0.174) | 0.212 (0.170) | 0.713*** (0.149) |
| 70–80 | 0.539 (0.332) | 0.352 (0.263) | −0.051 (0.257) | 0.525** (0.225) |
| Child in household (Yes = 1) | −0.166 (0.146) | −0.157 (0.117) | 0.039 (0.114) | 0.259*** (0.100) |
| Single household (Yes = 1) | 0.016 (0.153) | −0.343*** (0.125) | −0.179 (0.122) | −0.207* (0.107) |
| Constant | 1.070*** (0.327) | −0.328 (0.262) | −0.906*** (0.256) | −1.054*** (0.224) |
| Observations | 779 | 911 | 911 | 911 |
| R-squared | 0.067 | 0.049 | 0.085 | 0.167 |

Standard errors in parentheses,.

*** $p < 0.01$,** $p < 0.05$,* $p < 0.1$.

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