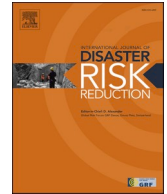




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Understanding the role of individual- and community-based resources in disaster preparedness

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ABSTRACT

Standard emergency management practice in the U.S measures disaster preparedness as an individual household attribute based on amounts of stocked supplies, hazard mitigation actions, and emergency planning. Such measures generally fail to consider how norms of trust, fairness, and reciprocity, as well as networks of social relationships—that is, social capital—can facilitate coordination and enable sharing and communal action in the face of disaster. Our study assesses how shared resources, social capital, and day-to-day resources (specifically, food and water) could influence earthquake disaster preparedness across different communities. Using Seattle as the site of investigation, the study involved a split-ballot experiment embedded in a mail survey of a random sample of households. These households were stratified by zip codes selected for their contrasting demographics ($N = 1340$). Half of the households in each zip code answered conventional individualistic measures of disaster preparedness, while the other half answered questions regarding resources they, their family, friends, and neighbors might share. In racial-majority-dominated zip codes, reported preparedness was higher when people were asked to consider shared resources. Disaster preparedness also appeared to be underestimated with the traditional measure. Households with greater bridging social capital (connections with individuals who differ in their social identity but who may share some similar interests) and longer neighborhood tenure also reported higher preparedness. Our findings suggest disaster preparedness efforts should focus on supplementing individual preparedness with daily resources, social capital, and collective shareable community assets—a focus that we call “mainstreaming.”

1. Introduction

In this study, we propose that protective behaviors and social capital are important in mitigating infrequent, episodic disasters, but they involve resources, knowledge, and relationships that are developed and used in daily life — a fact that standard emergency management practice typically ignores. Education and outreach for disaster preparedness often focus on rare, extreme events that occur seasonally at most [1]. Preparing for extreme events can be a cognitive leap for many people [2]. From 2017 to 2022, a minority

Abbreviations: ABCD, Asset-based community development; CDP, Community Disaster Preparedness; FEMA, Federal Emergency Management Agency; IDP, Individual Disaster Preparedness; OS, Other Seattle; SS, South Seattle; U.S., United States of America.

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(40%–48%) of adults in the U.S. reported preparedness efficacy. During the same time period, self-assessed preparedness peaked in 2019 (59%) and declined steadily to 45% in 2022 [3].

Alternatively, if sharing assets used in everyday life can help mitigate rare, extreme hazards, people may be more encouraged to assess what they have, to leverage and strengthen their social capital, to consider communal actions, and to take protective action. We begin by examining everyday resources, perceptions of shared resources, and social capital inherent in different types of communities. We define and assess social capital both attitudinally—as norms (informal laws that govern daily life) of trust, fairness, and reciprocity (e.g., expecting people to try to be helpful)—and behaviorally, as social networks (an individual's relationships with others, which can be through associations or organizations) [4,5]. Social capital in this sense “can improve the efficiency of society by facilitating co-ordination actions” [6]. Given that socially vulnerable groups have unequal access to social, political, and economic resources [7–13] as well as different types, qualities, and quantities of social capital [4,5,14–17], this study also explores how social capital, the availability of latent everyday resources, and their roles in disaster preparedness may differ across community types.

Disaster preparedness is based on taking the appropriate actions in advance of a disaster. People who have not taken those appropriate actions are considered unprepared, or less prepared to respond at any given time. In a systematic review of *personal disaster preparedness*, scholars found that the term often referred to the “assembly of supplies for an ‘emergency kit’ and development of a household or family plan” [18], although exact definitions varied. Emergency managers in the U.S. commonly call for people to have at least three days of supplies for evacuation, or two weeks of supplies to last until normal operations can resume [19–21]. Likewise, disaster-preparedness research and the items used to tap the key concept of disaster preparedness typically focus on individuals and households [13,18–21]. Standard practice in the United States is to measure disaster preparedness as an individual household attribute based on amounts of stocked supplies, hazard mitigation actions, and emergency planning [13]. Such measurements rarely if ever explicitly account for “the dual-use concept that highlights things people already have and use every day but can be critical to disaster response” [22]. Also rarely accounted for are the social capital and social networks that can provide resources for response and recovery efforts and are essential to the unlocking of everyday assets for shared emergency use [23].

Taking a novel approach, this study examines assets that are available on a day-to-day basis—specifically, social capital, food, and water—to ask two questions: First, do measures of earthquake preparedness that take into account shared (community) resources suggest that people and communities are more prepared for an earthquake than do measures that only take into account individual household stockpiles, resources, and capacities? Second, what is the relationship between social capital and disaster preparedness? The study uses a survey experiment to test differences between perceptions of individual and shared resources, here called individual disaster preparedness (IDP) and community disaster preparedness (CDP), respectively. Taking these factors into account, the study explores how much estimates of preparedness change when survey responses account for everyday supplies and social capital.

1.1. Background and disaster preparedness across different communities

The household emergency earthquake preparedness measurement tool was first developed by Turner, Nigg, and Heller-Paz [24]. This was a methodological advancement at the time because it provided a checklist of standardized inventories and actions of household preparedness that allowed researchers to compare across households [25]. Russell, Goltz, and Bourque [26] adapted the checklist to examine preparedness and mitigation before and after the 1986 Whittier Narrows and 1989 Loma Prieta earthquakes. In their words, “Conceptually, the preparedness questions appeared to be measuring three dimensions of preparedness: (a) survival – collecting and maintaining supplies and learning techniques such as first aid for basic survival; (b) planning – activities that reflect cognitive preparation and resource allocation, such as family instruction and purchasing earthquake insurance, respectively; and (c) hazard mitigation – securing and reinforcing a home and its contents” [26].

In 2003, under Homeland Security Presidential Directive/HSPD-8, the Federal Emergency Management Agency (FEMA) established [Ready.gov](#), the federal government's clearinghouse for disaster preparedness information, and identified four categories of personal preparedness in which individual households: “(1) stay informed about the different types of emergencies that could occur and their appropriate responses, (2) make a family emergency plan, (3) build an emergency supply kit, and (4) get involved in your community by taking action to prepare for emergencies” [27]. FEMA strongly advises individual households to protect homes from natural hazards [13]. While conceptually consistent with Turner, Nigg, and Heller-Paz's [24] categories of earthquake preparedness, FEMA's categories emphasize information and volunteering over structural hazard mitigation.

Preparedness measures overwhelmingly focus on extreme natural and human-made hazards, and not everyday hazards, such as furniture tip-over hazards. For instance, FEMA surveys ask respondents about “disaster supplies” in the home and supplies “set aside” for disasters. Typically, more privileged (i.e., higher-income, majority-race) households are more prepared according to such measures [28]. Planning, training, exercise, and reliance questions for households, communities, and institutions follow the same pattern of focusing solely on actions or relationships related to disasters. These questions provide important information for understanding what people have done to explicitly prepare for disasters, but the questions do not ask about existing and common resources that can be available for everyday use as well as for extreme events as defined in hazards research. The omission may be especially problematic for socio-economically vulnerable households that may not individually have disposable income to stockpile supplies or space to store extra supplies [29]. This motivates our first two hypotheses:

Hypothesis 1A. Estimates of preparedness will be greater when accounting for everyday supplies of food and water as compared to stockpiled supplies alone.

Hypothesis 1B. Preparedness will be greater in more privileged communities than in less privileged communities.

More generally, socially vulnerable groups face structural barriers to resilience [7–12]. This inequality tends to be exacerbated by

disasters and disaster responses [10]. While some groups do face structural barriers to resilience, it is important to remember and recognize that they also have capacities to address disasters [30]. Possessing social capital before a disaster is important because research has also shown that pre-disaster behavior mirrors post-disaster behavior [25]. To illustrate, levee failures from Hurricane Katrina led to the flooding of a low-income Vietnamese community in eastern New Orleans, leading to the evacuation or displacement of one-third of the community's population [30]. Vietnamese activists successfully worked to maintain social bonds during evacuation and recovery, contributing to a faster recovery than other communities in New Orleans with similar damage [4,31]. Social capital was a latent resource that the Vietnamese community used to respond and recover from the hurricane and other concurrent and cascading disasters. As noted by the authors reporting this success, "Other communities similarly lacking in socio-economic resources also [lacked] the social ties that would enable a more efficient and coordinated recovery – and this has dampened their resilience" [4]. This is an example of how one group of people who were deemed socially vulnerable based on class, race/ethnicity, education, and other purportedly resilience-limiting factors demonstrated that they had capacities to cope with and overcome disaster, stemming from social capital in ways that are not yet well understood in research and practice. These findings motivate our third hypothesis:

Hypothesis 1C. Estimates of preparedness based on shared resources (community disaster preparedness, CDP) will be higher than estimates of individual household disaster preparedness (IDP).

The example from Katrina also illustrates how race, class, and ethnicity, which change over time and space [11,32], may be intersectionally important determinants of disaster preparedness. A "barrio effect" has been found in some studies of immigrant communities [33]; "barrio effect" refers to "advantages that accrue to immigrants who live in close proximity to co-ethnics, mitigating many of the otherwise negative effects of living in or near high-poverty neighborhoods" [34]. For this reason, we also explore whether these relationships differ by type of community.

1.2. Towards an asset-based community readiness approach

Conventional needs-based approaches to solving community problems promote reliance on outside organizations for services and tend to reinforce feelings of dependency, inefficacy, and deficiency by low-income communities [35,36]. Asset-based community development (ABCD), as an alternative approach, instead focuses on the capacities, skills, and assets of the community [35]. The approach seeks to identify and mobilize existing social and physical assets for community economic development. Social assets include the gifts, skills, and capacity of individuals to build and maintain relationships with each other and associations to solve community-identified problems. Collectively, community builders can map underutilized physical assets that can be repurposed for positive community change and enlist local institutions in the development process. Kretzmann and McKnight [35] argue that the key to neighborhood regeneration is identifying and connecting assets that complement one another and in combination together are many times more effective and powerful. In terms of being ready to handle any kind of emergency or disaster, an asset-based approach would first begin by assessing physical and social assets available for daily use and then consider how these assets could be repurposed for emergency purposes based on hazard exposure [37]. If asset gaps exist, individuals and associations can work with institutions to address them to make more targeted improvements in hazard resilience.

Social relationships are central to the asset-based community development approach. Relationships with informal and formal groups, associations, and networks are treated as both assets and as a mechanism for mobilizing other community assets [38]. Networks of social relationships are one important way in which social capital manifests itself in behaviors [5,39]. If we consider social relationships as assets, "ABCD is a practical application of the concept of social capital" [38]. As a mechanism for facilitating coordination actions, social capital can be an asset for disaster response and recovery [4,23,39–41]. The qualities of social capital are evident in and measured by attitudes, such as reciprocity [5,39]. The "touchstone of social capital" is general reciprocity, which refers to mutual trusting relationships [5]. Some trust studies have shown that resilient communities have high levels of trust before and after disasters [4,34]. Perceived fairness and general reciprocity are measures of trust that have been found to foster collaboration in recovery from disasters [40]. In light of these prior findings, we posit:

Hypothesis 2A. Perceived general reciprocity will positively influence preparedness.

Hypothesis 2B. Perceived fairness will positively influence preparedness.

Some scholars have divided social capital into three dimensions: bonding, bridging, and linking [4,5,14]. Bonding social capital can be described as relationships with individuals like oneself who have similar demographic characteristics, such as race and ethnicity, income level, and religious affiliation. These relations can be with family members, friends, and neighbors [42]. Bonding social capital is good for "undergirding specific reciprocity and mobilizing solidarity" within the group [5]. Bridging social capital comprises relationships individuals have with others who differ in their social identity (e.g., race, ethnicity, or religion), but who have the same shared interests (such as politics, environment, or profession). Bridging capital enables individuals to make connections across organizations and social groups. Each of these sets of relationships can be thought of as networks. Bridging networks allow people to tap into resources that they do not normally have access to in bonding networks. However, both types of social capital connect people of similar status. By measuring social relationships, previous research has established that professional associations reflect bridging social capital, as do environmental, conservation, and wildlife organizations [43–45]. The third dimension, *linking* social capital, refers to trusting relationships between people interacting within and across networks with different levels of power and resources [14]. Connections with people in positions of power can greatly influence the type and amounts of resources that are distributed across communities.

It is important to consider the quality and quantity of resources that people in networks can use and access, especially since

resources available to networks will differ across class groupings [15]. Bonding social capital is a source of social support, which helps people meet routine needs. For example, parents who depend on family or neighbors for childcare are people who use their networks for social support (i.e., to ‘get by’). Bridging social capital has been referred to as “social leverage” which helps people ‘get ahead.’ People who can ask a friend or acquaintance to use their personal connections to help them get a job can hence get ahead in life [5,16,46]. Bonding relationships can help people survive, while bridging and linking relationships can help people recover post-disaster [17]. Thus, the study reported here also examines how bonding and bridging social capital differ across communities, and how they might influence disaster preparedness. Previous research suggests that all groups have bonding relationships [16]. However, tightly knit racial and ethnic communities may have more bonding than other communities, as suggested by the findings in the Vietnamese community in eastern New Orleans [31]. People with low incomes tend to have bonding social capital only, whereas people with higher incomes have both bonding and bridging social capital but prefer to “preserve their social distance from most others, apart from the equally wealthy” [47]. Connecting networks across income levels are rare. Together, these findings motivate our remaining hypotheses:

Hypothesis 3A. Bonding relationships are stronger in communities where a higher proportion of residents identify as racial or ethnic minorities.

Hypothesis 3B. Bonding relationships will positively influence preparedness levels.

Hypothesis 4A. Bridging relationships will differ by community type, wherein less privileged communities have less bridging social capital than more privileged communities.

Hypothesis 4B. Bridging relationships will positively influence preparedness levels.

2. Methodology

2.1. Survey and sampling

2.1.1. Survey

Based on prior research on disaster preparedness and social capital [13,24,48–50], we developed 18 questions to measure earthquake experience, disaster preparedness, social capital, neighborhood tenure, hazard awareness, demographics, and reliance on post-disaster assistance. To maximize response rates and meaningful responses, the survey was designed to address all key constructs while keeping the response burden as low as possible. To test whether CDP is greater than IDP, we fielded two surveys [51] with different disaster preparedness questions (Table 1); all other questions were identical across the two surveys.

Table 1
Dependent variables for preparedness.

Dependent variables	Question type	Question	Response options	Code (count coding; weighted count coding)
Preparation count and weighted preparation count	IDP	Which of these preparations for a disaster do you have? (Check all that apply)	Flashlight with batteries or solar	(0, 1; 0, 2)
	CDP	Which of these preparations for a disaster do you have, or could you rely on friends, family, and neighbors for? (Check all that apply)	Radio with batteries or solar	(0, 1; 0, 2)
			First aid kit	(0, 1; 0, 2)
			Emergency plan	(0, 1; 0, 1)
			Secured heavy furniture to the walls	(0, 1; 0, 1)
			Supply of water and non-perishable food	(0, 1; 0, 3)
			None of the above	(0, 1; 0, 1) [excluded from counts]
			Preparation count	0-6
Food preparedness	IDP	How many days’ worth of food do you have at home? (Select one)	None	0
	CDP	Consider how you and your family, friends, and neighbors might share. About how many days’ worth of food do you have available, altogether? (Select one)	1–3 days	1
			4–6 days	2
			1–2 weeks	3
			3–4 weeks	4
Water preparedness	IDP	How many days’ worth of water do you have at home? (Select one)	More than 4 weeks	5
			None	0
	CDP	Consider how you and your family, friends, and neighbors might share. About how many days’ worth of water do you have available, altogether? (Select one)	1–3 days	1
			4–6 days	2
			1–2 weeks	3
			3–4 weeks	4
			More than 4 weeks	5

2.1.2. Sampling

A mail survey was sent to a random sample of 4600 Seattle households stratified by zip codes selected for their contrasting demographics (Fig. 1). Zip codes in South Seattle (SS) are more ethnically diverse and lower in socioeconomic status than zip codes in other parts of Seattle (Other Seattle, OS, Appendix A). In each zip code, participants were randomly assigned either an IDP or CDP survey.

On August 30, 2019 we sent 2800 surveys to SS and 1800 surveys to OS. We sent more surveys to SS to achieve oversampling of smaller racial and ethnic subpopulations. Each envelope contained a letter explaining the study, a survey, a pre-paid return envelope, and a two-dollar bill (pre-commitment) incentive. We also mailed two reminder postcards, on September 3, 2019, and September 6, 2019, respectively. University of Washington's Human Subjects Division reviewed the study and granted it exempt status (IRB ID STUDY000080048).

The response rate was 29.1% overall. We received from South Seattle (SS) zip codes 699 completed and partial responses (IDP = 353, CDP = 346), resulting in a 25% response rate. We received 641 completed and partial responses (IDP = 311, CDP = 330) from Other Seattle (OS) zip codes (35.6% response rate) for a total N of 1340. We used the American Association for Public Opinion Research (AAPOR) (2016) response rate 1 for mail surveys of specifically named persons [52], except that the calculations included responses from four participants as partial that AAPOR would treat as break-off responses.

2.2. Measures

2.2.1. Dependent variables

The survey included measures for different dependent variables: preparation count, preparation count weighted, food preparedness, and water preparedness (Table 1). For preparation count, the IDP survey asked, 'Which of these preparations for a disaster do you have? (Check all that apply).' The CDP survey asked, 'Which of these preparations for a disaster do you have, or could you rely on friends, family, and neighbors for? (Check all that apply).' The options were: *flashlight with batteries or solar* (hereafter, *flashlight*); *radio with batteries or solar* (hereafter, *radio*); *first aid kit*; *emergency plan*; *secured heavy furniture to the walls*; *supply of water and non-perishable food*; and *none of the above*. For preparation count, response options were coded as zero (unselected) and one (selected), for each type of preparation. Excluding 'None of the above,' the responses were summed to create counts for each respondent.

To create a measure of weighted preparation count, each item was weighted based on relative costs. A supply of water and non-perishable foods (3) costs significantly more than a flashlight (2), radio (2), or first aid kit (2). Having an emergency plan (1) and securing furniture (1) to the walls costs little if any money at all (*Sacramento Bee*, n.d., as cited in Ref. [53]). Accordingly, high-cost items were weighted higher than lower-cost items, then responses were summed to create a weighted preparation-count variable (excluding *None*). These two measures account for supplies deliberately set aside for a disaster.

For food preparedness, the IDP survey asked, 'How many days' worth of food do you have at home? (Select one).' The CDP survey asked, 'Consider how you and your family, friends, and neighbors might share. About how many days' worth of food do you have available, altogether? (Select one).' The six options were *None*, *1–3 days*, *4–6 days*, *1–2 weeks*, *3–4 weeks*, or *More than 4 weeks*. For water, the survey used the same question and response options for food, but the word 'food' and was replaced with 'water' in the question. We calculated grouped means for later analyses.¹ These measures estimate what survey participants have available to them on an everyday basis.

2.2.2. Control variables

We also measured several factors found in previous studies to influence people's preparedness and that might be confounded with the study variables of interest. These included earthquake experience, housing type, income, and demographics.

All else equal, people with earthquake experience are more likely to be prepared than those without experience [49,54,55], as found for other hazards [56]. The survey thus asked respondents if they had personal experience of an earthquake (*no*, *yes*, and *not sure*). We transformed this measure of earthquake experience into a binary variable for regression analysis, with *yes* in one category and *no* and *not sure* in the other. To encourage recollection of their earthquake experiences, the survey asked additional questions of respondents who reported having earthquake experience, including an open-ended question about where and when they experienced their most memorable earthquake and the strength of the shaking they felt (excluded from these analyses, see [51]).

The amount of money a person has can influence their ability to purchase supplies and engage in other mitigation actions [28]. Hence, we controlled for household income, an ordinal variable with eight response categories ranging from *less than \$25,000* to *\$200,000 or more*, which we transformed into three categories (Table 2). The cut-off points were below the federal poverty line (coded as 0) and above the Seattle median household income for 2020 (coded as 2). Everything in between was coded as one (1). In addition, because people living in single-family housing are more likely to be prepared [13], partly due to space issues inherent in multi-family housing [29], the survey asked respondents about the type of building in which they resided. Housing type was a categorical variable with response options including: *single-family*, *multi-family*, *other (specify)*, and *don't know*. We transformed this into a binary variable

¹ In calculating the midpoints, we adopted common-sense interpretations of the ranges that would still make them contiguous but mutually exclusive. Thus, we calculated the midpoint of "1–3 days" as 2 days and the midpoint of "4–6 days" as 5 days. To calculate the midpoint of "1–2 weeks," we identified the range as beginning at 7 days (the lower limit of one week) and ending at 20 days since the next response option started at 3 weeks (21 days). This resulted in a midpoint of 13.5 days. Similarly, the range of "3–4 weeks" began with 21 days and ended at 28 days since the next response category was "more than 4 weeks." Using this range, we calculated the midpoint of "3–4 weeks" as 24.5 days. Because there was no obvious midpoint of the "more than 4 weeks" range, we treated this response category conservatively by interpreting the lower end of the range as 29 days (to correspond to "more than 4 weeks" and not overlap with the previous range), plus one week (29 + 7 = 36 days) as the upper end of the range, resulting in an estimated midpoint of 32.5 days.

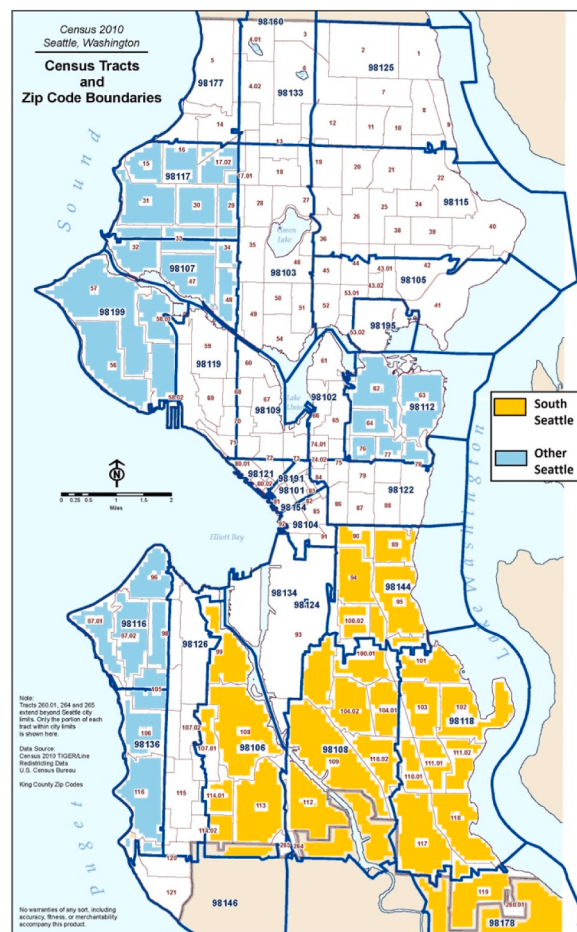


Fig. 1. Map of study area.

for regression analysis, in which living in a *single-family* home was coded as one (1) and all other categories were collapsed and coded as zero (0).

We included several additional demographic data points as control variables. Age can be a factor in preparedness in many ways. As people age, they may earn more money and gain more knowledge about safeguarding against hazards. However, older adults can have declining incomes when they retire and less money to stock up on supplies, and may lack the physical capabilities to secure furniture to the wall. Using the respondent's birth month and year, we calculated age as a continuous variable. Although findings have been mixed, gender has been found to play a role in preparedness [12]. For example, males tend to have higher levels of preparedness than others [8]. Men and women also have different types of social relationships, which give them access to different resources [15]. For these reasons, earthquake experience, income, housing type, age, and gender are included in the study as control variables.

The survey asked respondents to self-identify their gender, options included *male*, *female*, and *other*. We transformed gender into a binary variable for the regression analysis where *other* was recoded as one. As disasters exacerbate existing inequalities experienced by gender diverse groups in disasters [57], we collapsed *female* and *other* into one category representing non-dominant gender groups in society.

2.2.3. Predictor variables

For bonding and bridging social-capital variables, respondents were asked, 'In the past 12 months, were you a member or participant in a (*check all that apply*).' The response options were *cultural, educational or hobby organization; labor union; professional association; immigrant or ethnic association or club; sports or recreation organization; environment, conservation, or wildlife organization; religious-affiliated group; service club; political party or club; other (specify); and none*. Following previous research, we classified cultural, educational, or hobby organization; labor union; immigrant or ethnic association or club; sports or recreation organization; and religious-affiliated group as bonding social capital. Similarly, we classified professional association; environment, conservation, or wildlife organization; service club; and political party or club as bridging social capital [43–45]. We reviewed 88 *other (specify)* responses and reclassified 63 of them into either bonding or bridging social-capital categories. For example, one respondent reported being a member of the Filipino community. This was recoded into the immigrant or ethnic association or club response option, which is a bonding social capital category. The remaining 25 responses in the *other (specify)* category were not readily classified as bonding or

Table 2
Comparison of population and unweighted sample demographics.

	POPULATION				SAMPLE				REPRESENTATION			
	SS		OS		SS		OS		SS		OS	
Race or Origin	Count	%	Count	%	Count	%	Count	%	z	p	z	p
Asian	41,731	26.3	10,627	6.8	138	20.3	38	6.0	-3.60	<0.001	-0.805	0.421
Black/African American	32,312	20.4	3,153	2.0	62	9.1	8	1.3	-7.41	<0.001	-1.266	0.206
Hispanic	16,010	10.1	8,662	5.6	29	4.3	17	2.7	-5.09	<0.001	-3.193	0.001
Other	2,912	1.8	702	0.5	17	2.5	6	1.0	1.39	0.165	1.795	0.073
Two or more races	11,146	7.0	8,811	5.7	42	6.2	30	4.8	-0.83	0.407	-0.098	0.922
White	54,423	34.3	123,753	79.5	393	57.7	531	84.3	13.00	<0.001	3.010	0.003
Total	158,534	99.9	155,708	100.1	681	100.0	630	100.0				
Income	Count	%	Count	%	Count	%	Count	%	z	p	z	p
Less than \$25,000	10,495	17.3	6,352	8.9	72	10.9	28	4.6	-4.47	<0.001	-3.823	<0.001
\$25,000-\$74,999	19,887	32.8	16,609	23.3	197	29.8	146	24.0	-1.69	0.091	0.419	0.675
\$75,000+	30,270	49.9	48,357	67.8	392	59.3	434	71.4	4.97	<0.001	1.951	0.052
Total	60,652	100.0	71,318	100.0	661	100.0	608	100.0				
Age	Count	%	Count	%	Count	%	Count	%	z	p	z	p
18–34 years	40,614	32.1	38,293	29.8	112	17.2	116	18.8	-8.44	<0.001	-6.089	<0.001
35–54 years	45,795	36.2	50,505	39.3	280	42.9	245	39.7	3.69	<0.001	0.207	0.836
55–64 years	18,635	14.7	18,634	14.5	96	14.7	91	14.7	0.00	1.000	0.144	0.989
65+ years	21,327	16.9	21,029	16.4	165	25.3	165	26.7	5.93	<.001	7.043	<0.001
Total	126,371	100.0	128,461	100.0	653	100.0	617	100.0				
Gender	Count	%	Count	%	Count	%	Count	%	z	p	z	p
Male	78,547	49.6	77,588	49.8	334	48.8	311	49.1	-0.42	0.674	-0.354	0.723
Female/other	79,987	50.5	78,120	50.2	351	51.2	322	50.9	0.37	0.711	0.354	0.723
Total	158,534	100.1	155,708	100.0	685	100.0	633	100.0				

Source of population statistics: ACS 2019 (5-Year Estimates), Social Explorer; U.S. Census Bureau

bridging and so were coded as *none*. We summed counts of membership in organizations to create composite indices of bonding and bridging capital, respectively, as other scholars have done [45]. The total number of bonding relationships, *bonding counts*, ranged from 0 to 5. *Bridging counts* were also summed, and ranged from 0 to 4.

For perceived fairness, we asked respondents to identify which of two statements resonated more with them: *Most people would try to take advantage of you if they got the chance* or *Most people would try to be fair*. The responses were coded as *not fair* (0) or *fair* (1), respectively. For perceived reciprocity we asked respondents to identify which of these two statements resonated most with them: *Most of the time people try to be helpful* or *Most of the time people are mostly just looking out for themselves*. Responses were coded as *reciprocal* (1) or *not reciprocal* (0), respectively. In order to identify their distinct contributions, we do not aggregate these attitudinal measures of social capital (fairness and reciprocity) with our behavioral measures of bonding and bridging, which some scholars have done [58].

The survey also measured the type of community respondents lived in. This variable indicates whether the respondent lives in a predominately minority community of South Seattle (SS) or a predominantly White community of Other Seattle (OS) zip codes. Living in SS zip codes was coded as one (1) and living in OS zip codes as zero (0).

As noted above, the two survey versions assigned (randomly within zip code) included questions about individual disaster preparedness (IDP) or community disaster preparedness (CDP), coded as 0 and 1, respectively. Interactions between the social capital questions (bonding and bridging) and survey version (i.e., question type) were also examined in the study.

For race and origin, the survey asked, “What is your race or origin? Check all that apply.” The response categories included: *White; Black or African American; Native Hawaiian or other Pacific Islander; American Indian or Alaska Native; Hispanic, Latino, or Spanish origin (specify); Asian (specify); and Other race or origin (specify)*. Respondents who self-identified as more than one race or origin were recategorized as *Two or more races*. Respondents who self-identified as *Native Hawaiian or other Pacific Islander* or *American Indian or Alaska Native* were recoded as *Other*. Dummy variables were created for race and origin, with White as the (0) reference category for the regression analysis.

For neighborhood tenure the survey asked, “How long have you lived in your neighborhood?” The three response categories were *0–2 years* (0), *3–5 years* (1), and *more than 5 years* (2).

2.3. Data analysis

We used SPSS version 27 to conduct all statistical analyses. Data were weighted to be representative of the populations in South Seattle and Other Seattle, respectively. We used four variables—race or origin, income, age, and gender—to create raked weights [59], which are weights adjusted iteratively so that the weighted data fit the marginal population proportions for those variables. We used population proportions from the 2019 American Community Survey for the raking process.

We conducted Chi-square and t-tests to test whether the survey framing (IDP vs CDP) or community type (SS vs. OS) influenced reported preparedness. Independent sample t-tests were also used to test whether community types (OS vs SS) were associated with

patterns of social relationships (bonding and bridging). Independent tests of differences in proportions (Wald) were used to look at differences in perceptions of fairness and reciprocity by community type. Multivariate linear regressions were conducted to investigate the influences of social capital and other variables of interest on measures of disaster preparedness. Survey responses were transformed for the multivariate linear regression analyses, as described above.

3. Results

3.1. Sample

In regard to race or origin, the South Seattle (SS) sample was less representative than the Other Seattle (OS) sample as compared to the population of each sample area (Table 2). In SS there was overrepresentation of White respondents and underrepresentation of Asian, Black/African American, and Hispanic respondents. In OS, the differences between the sample and population were less stark. White respondents again were overrepresented in the sample as compared to the population in the OS zip codes sampled, Hispanics were underrepresented, and there was no statistical difference between the proportions of Asian and Black/African respondents in the sample and their corresponding population proportions in OS.

In SS, respondents earning less than \$25,000 were underrepresented in the sample (10.9%) as compared to the population (17.3%) whereas respondents earning more than \$75,000 were overrepresented in the sample (59.3%) as compared to the population (49.9%). In OS, respondents earning less than \$25,000 were underrepresented in the sample (4.6%) as compared to the population (8.9%). All other categories of income were well represented (Table 2).

All respondents were 18 years old or older. In OS, respondents ages 18–34 years were underrepresented in the sample (18.8%) as compared to the population (39.3%). Respondents ages 65+ were overrepresented in the OS sample (26.7%) as compared to the population (16.4%). The other categories of age were well represented. In SS, respondents ages 18–34 were underrepresented in the sample (17.2%) as compared to the population (32.1%). Age categories 34–54 and 65+ years were overrepresented in the sample (42.9% and 25.3% respectively) as compared to the population (36.2% and 16.9% respectively) in SS. Respondents in the 55–64 years category were well represented. Overall, both samples skewed older than the population (Table 2).

Gender was almost evenly split between male and female or other gender in the samples and populations in both SS and OS (Table 2).

3.2. Summary statistics

Summary statistics and all analyses are based on weighted data as described in section 2.3.

3.2.1. Experience with earthquakes

The majority of respondents reported having experience with earthquakes. More respondents in Other Seattle (OS) (80.9%) reported having experience than people in South Seattle (SS) (76.4%).

3.2.2. Neighborhood tenure and housing type

The majority of respondents had lived in their neighborhoods for more than five years (54.9% in SS and 50.6% in OS). Over a quarter of respondents in SS (27.8%) and OS (29.5%) were new to their neighborhood (0–2 years). Slightly more respondents in OS (19.9%) reported living in their neighborhood for 3–5 years than respondents in SS (17.4%). The majority of respondents reported living in a single-family home (68% in SS and 63.4% in OS). In SS, the remaining respondents reported living in multi-family (31.2%) or other (0.6%) housing types, with some respondents (0.2%) reporting that they did not know what kind of housing type they lived in. These numbers for OS were 35.6%, 0.7% and 0.2% respectively.

3.2.3. Food and water

The survey asked respondents two types of questions about food and water, as shown in Table 1. One question asks about a purposefully set-aside supply of food and water. As shown in Fig. 2, roughly 57–58% of respondents in both IDP and CDP surveys reported having a supply of water and non-perishable foods, and roughly 42–43% reported having nothing. The other question asked

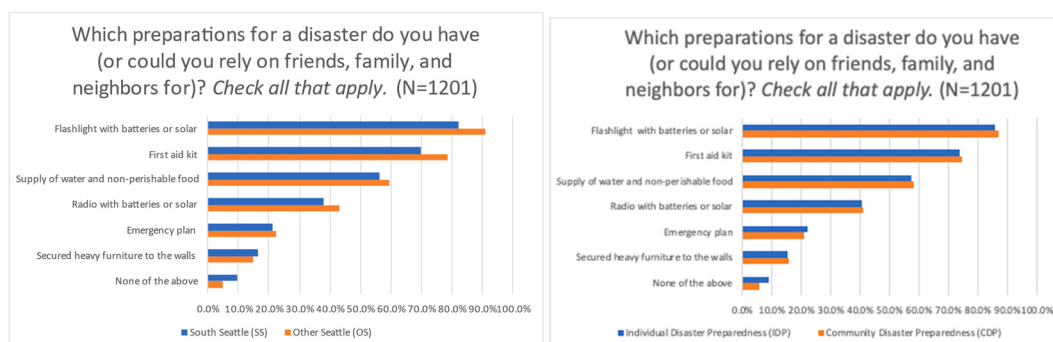


Fig. 2. Preparations by community type (left) and question type (right).

Table 3
Mean number of days' worth of food by community and question type.

COMMUNITY TYPE	SS		OS		ALL	
QUESTION TYPE	IDP	CDP	IDP	CDP	IDP	CDP
RESPONSE OPTIONS (MIDPOINT IN DAYS)	%	%	%	%	%	%
None (0)	2.80	4.60	0.50	2.20	1.70	3.40
1–3 days (2)	26.90	30.00	28.10	30.10	27.40	30.00
4–6 days (5)	31.10	30.00	37.40	33.50	33.90	31.80
1–2 weeks (13.5)	27.90	28.90	28.70	22.10	28.30	25.40
3–4 weeks (24.5)	6.90	4.60	4.40	7.30	5.80	6.00
More than 4 weeks (32.5)	4.40	1.90	0.90	4.80	2.80	3.40
Grouped mean	8.93	7.64	7.63	8.63	8.41	8.15

Total N = 1,201. IDP question: How many days' worth of food do you have at home? (Select one). CDP question: Consider how you and your family, friends, and neighbors might share. About how many days' worth of food do you have available, altogether? (Select one).

about the availability of food and water, which should be more likely to elicit assessments of everyday supplies (Table 3). Over a third of respondents (33.8–36.9%) reported having over 1–2 weeks of food available. The majority of respondents (61.3–61.8%) reported having 1–6 days' worth of food. Very few respondents reported having no food (1.7–3.4%), in contrast to the responses to the question about purposefully set-aside supplies of food and water. These results support H1A (*estimates of preparedness will be greater when accounting for everyday supplies of food and water as compared to stockpiled supplies alone*).

Overall, everyday shared community (CDP) food resource estimates did not differ from individual household (IDP) food resource estimates ($X^2_{(5, N = 1201)} = 4.949$, $p = 0.422$), against expectations for H1C (*estimates of preparedness measured as resources that respondents, their family, friends, and neighbors might share (CDP) will be higher than estimates of IDP*). Independent sample *t*-tests also revealed no statistical difference between average IDP ($M = 8.41$, $SD = 7.428$) and average CDP ($M = 8.15$, $SD = 7.761$), ($t_{(1199)} = 0.478$, $p = 0.451$), against expectations for H1C (Table 3). However, differences did surface between IDP and CDP within each community type. In SS, on average reported food resources were greater in individual reports (IDP) ($M = 8.93$, $SD = 8.195$) than when people were asked about sharing with their family, friends, and neighbors (CDP) ($M = 7.64$, $SD = 7.001$), ($t_{(618)} = 2.031$, $p = 0.007$), against expectations for H1C. In OS, the results were reversed: On average, people who were asked about sharing food resources (CDP) reported having more food available to them ($M = 8.63$, $SD = 8.401$) than those who were asked the more conventional question about individual household resources (IDP) ($M = 7.63$, $SD = 6.313$), ($t_{(579)} = -1.493$, $p < 0.001$), supporting H1C.

More respondents reported having no water in the IDP survey (13.1%) as compared to in the CDP survey (10.8%), although there was no significant difference in the IDP and CDP distributions overall ($X^2_{(5, N = 1,202)} = 6.088$, $p = 0.298$), contrary to H1C (Table 4). Similarly, an independent sample *t*-test revealed no statistical difference between mean days of water available reported in the IDP ($M = 5.556$, $SD = 6.715$) and in the CDP ($M = 5.648$, $SD = 6.900$), ($t_{(1199)} = -0.478$, $p = 0.451$) overall, against expectations of H1C. In SS, individual households (IDP) reported having more days of water on average ($M = 6.24$, $SD = 7.55$) than CDP respondents ($M = 5.65$, $SD = 7.0454$), ($t_{(618)} = 2.031$, $p = 0.007$), contrary to H1C. In contrast, in OS, CDP respondents reported have more days of water on average ($M = 5.57$, $SD = 7.0454$) than IDP respondents ($M = 4.68$, $SD = 5.388$), ($t_{(576)} = -1.939$, $p = 0.004$), supporting H1C.

3.2.4. Preparations

Majorities of respondents living in SS and OS (Fig. 2) respectively reported having a *flashlight* (82.8%; 91.0%), *first-aid kit* (69.9%; 78.16%), and *supply of water and non-perishable foods* (56.3%; 59.4%), whereas fewer reported having a *radio* (38.1%; 43.4%), *emergency plan* (21.1%; 22.3%), *secured heavy furniture to walls* (16.4%; 14.7%), or no preparations (9.8%; 4.8%). The percentage of respondents who had zero to six preparation items differed significantly by community type ($X^2_{(6, N = 1202)} = 19.597$, $p = 0.003$ (Fig. 3). Preparation counts were lower for SS respondents ($M = 2.84$, $SD = 1.607$) than for respondents in OS ($M = 3.09$, $SD = 1.42$), ($t_{(1199)} = -2.871$, $p < 0.001$), consistent with H1B.

Distributions of *weighted preparation count* also differed by community type ($X^2_{(11, N = 1203)} = 27.242$, $p = 0.004$). Similar to the

Table 4
Mean number of days' worth of water by community and question type.

COMMUNITY TYPE	SS		OS		ALL	
QUESTION TYPE	IDP	CDP	IDP	CDP	IDP	CDP
RESPONSE OPTIONS (MIDPOINT IN DAYS)	%	%	%	%	%	%
None (0)	12.90	10.50	13.40	11.00	13.10	10.80
1–3 days (2)	40.10	45.50	45.80	43.60	42.70	44.50
4–6 days (5)	21.50	24.80	24.80	25.00	23.00	24.90
1–2 weeks (13.5)	19.20	12.30	13.50	15.40	16.70	13.90
3–4 weeks (24.5)	2.60	4.70	1.80	2.60	2.20	3.60
More than 4 weeks (32.5)	3.70	2.20	0.70	2.40	2.30	2.30
Grouped mean	6.24	5.65	4.68	5.57	5.54	5.67

Total N = 1,202. IDP question: How many days' worth of water do you have at home? (Select one). CDP question: Consider how you and your family, friends, and neighbors might share. About how many days' worth of water do you have available, altogether? (Select one).

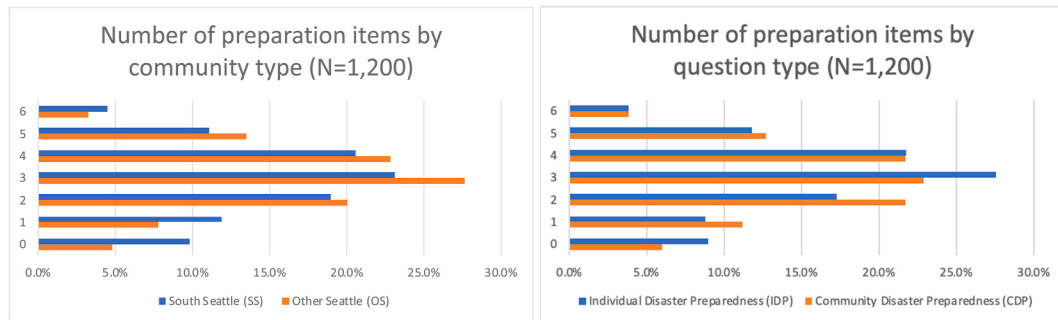


Fig. 3. Number of preparation items by community type (left) and question type (right).

unweighted preparation count, the mean for SS ($M = 5.87$, $SD = 3.254$) was significantly lower than the mean for OS ($M = 6.41$, $SD = 2.867$), ($t_{(1199)} = -3.046$, $p = 0.002$), supporting H1B.

To the extent that question type made a difference in *preparation count* and *weighted preparation count* in the two regions (Fig. 2), we found only one significant difference. Namely, those in OS who answered the IDP were more likely to report *None of the above* (7%) than those who answered the CDP (2.9%), ($t_{(577)} = 2.194$, $p = 0.039$), supporting H1C. Hence, we focus on describing preparedness in SS and OS.

3.2.5. Social capital by community type

On attitudinal measures of social capital, most respondents in SS and OS reported that most people would try to be fair (70.4% and 80.8%, respectively; $Z = 5.267$, $p < 0.001$) than would try to take advantage of them if they got the chance (SS 29.6%; OS 19.2%). Similarly, most respondents reported that most of the time people would try to be helpful (SS 63.9%; OS 75.8%; $Z = 5.936$, $p < 0.001$) instead of people mostly just looking out for themselves (SS 36.1%; OS 24.2%). While perceptions of fairness and reciprocity were quite high overall, for both measures of trust, they were significantly lower in SS than in OS. Perceived fairness and reciprocity were also positively correlated (Spearman's $\rho = 0.485$, $p < 0.001$).

Although social relations measured as mean bonding counts were marginally higher in SS ($M = 0.88$, $SD = 1.036$) than in OS ($M = 0.81$, $SD = 0.858$), the difference was not statistically significant ($t_{(1186)} = -1.204$, $p = 0.229$), contrary to H3A (*bonding relationships are stronger in communities where a higher proportion of residents identify as racial or ethnic minorities*). However, bridging counts were on average higher in OS ($M = 0.79$, $SD = 0.916$) than in SS ($M = 0.61$, $SD = 0.868$), ($t_{(1184)} = -3.562$, $p < 0.001$), supporting H4A (*bridging relationships will differ by community type, wherein less privileged communities have less bridging social capital than more privileged communities*).

3.3. Model results

Multivariate linear regressions were run using all dependent variables. For reporting purposes, we focus on the preparation count regression.² Standardized coefficients are reported and variables that are significant at the 5% and 10% levels are bolded (Table 5).

3.3.1. Survey framing and community type

As noted earlier, we expected asking respondents to take into account sharing (CDP) would elicit higher estimates of resources for disaster preparedness than an individual framing (IDP). The CDP framing did influence several estimates of preparedness, which were higher in the CDP than the IDP framing as expected when examined without controls. However, after controlling for other variables, the regression results showed no significant influence of CDP framing, contrary to our hypotheses. Furthermore, while the expectation that respondents in OS would be more prepared than those in SS was largely upheld, after controlling for other factors in the regression estimates of preparedness counts the differences between the two areas were no longer significant (Table 5).

To examine one possible explanation of some of these differences—that bonding and bridging are differentially important by community type—interaction terms were created for bonding and bridging counts by community type (SS vs OS) and added to the model, but the interactions were highly correlated with the bonding and bridging count variables in the model and were not statistically significant, for which reason they were removed from the final model (see Appendix B).

3.3.2. Social capital

Having ties in the community contributed to increased preparedness levels (Table 5). As expected, *bridging* relationships were positively associated with preparedness levels, supporting H4B (Spearman's ρ between *preparedness counts* and *bridging* = 0.169, $p < 0.001$; Beta coefficient = 0.127, $p < 0.001$). We also expected bonding count, perceived general reciprocity, and perceived fairness to have significant positive coefficients (H3B, H2A, and H2B, respectively). But although pairwise correlations with preparedness counts were all positive and significant at $p < 0.001$ (Spearman's ρ between preparedness counts and *bonding* 0.109, *fairness* 0.108,

² Diagnostics for multicollinearity showed that all variables had a variance inflation factor (VIF) of less than 2. A standard rule of thumb is that VIFs greater than 4 warrant more investigation and VIFs greater than 10 are signs of multicollinearity. Thus, multicollinearity does not appear to be an issue in the model.

Table 5Linear regression of preparation count. Adj $R^2 = 0.150$.

	PREPARATION COUNT		
	Standardized Coefficients (Beta)	t	p
(Constant)		9.266	<.001
Bonding count	0.045	1.560	0.119
Bridging count	0.127	4.242	<.001
Perceived fairness	0.049	1.542	0.123
Perceived reciprocity	−0.022	−0.689	0.491
Community disaster preparedness	−0.006	−0.224	0.823
South Seattle	−0.017	−0.548	0.584
Asian	−0.030	−0.948	0.343
Black/African American	−0.109	−3.423	<.001
Hispanic	−0.029	1.011	0.312
Other race	0.006	0.230	0.818
Two or more races	−0.008	−0.269	0.788
Neighborhood tenure	0.070	2.177	0.030
Single-family home	0.060	2.009	0.045
Earthquake experience	0.075	2.605	0.009
Age	0.227	6.718	<.001
Female/other gender	−0.055	−1.948	0.052
Income	0.088	2.823	0.005

reciprocity 0.114), their coefficients in the regression were small.

3.3.3. Demographic and socioeconomic variables

As expected, the coefficient for income was positive and significant in the model. Preparedness levels also increased with age, as expected. The coefficient for female and other gender was negative as expected and marginally significant, all else equal.

As expected, results varied across the five categories of race and origin in the model. Black or African Americans were less prepared compared to the reference category of Whites, after controlling for other factors. No other racial or ethnic categories were significantly different from the reference category.

The coefficients for neighborhood tenure and single-family home were positive and significant. Having earthquake experience was also associated with increased preparedness (Table 5).

4. Discussion and conclusion

4.1. Disaster preparedness measures and findings

This study contributes a novel approach to research on earthquake and disaster preparedness by examining the potential benefits of measuring community assets and reframing preparedness in terms of asset-based community readiness. It does so by assessing both behavioral and attitudinal measures of social capital and using question framing to experimentally assess how considering shared day-to-day resources might influence disaster preparedness across community types.

Our findings suggest that conventional disaster preparedness may be underestimated when not accounting for day-to-day resources that could be used in disaster situations, such as food, water, and social capital, and when the estimation task does not explicitly mention sharing. Study participants' estimates of preparedness that accounted for everyday resources (H1A) were higher than those that did not. While reports of preparedness were higher overall in more privileged communities (OS) than in less privileged (SS) (H1B), as found in previous studies [13,60], in more privileged communities (OS), respondents asked to consider sharing resources (CDP) reported higher estimates of preparedness (H1C). Further, fewer CDP than IDP respondents overall reported having no food or water available (also supporting H1C). Even our relatively subtle framing seems to have effectively evoked consideration of social capital and influenced estimates of preparedness. However, our regression analysis showed that asking about sharing did not affect preparedness estimates after controlling for other factors. These nuances suggest a need to unpack the relationships between determinants of preparedness further in future research.

Higher disaster preparedness was associated with greater social capital in our survey results as hypothesized, but for only one type of social capital—bridging. Our other findings regarding social capital were less clearcut. After controlling for other factors, we did not find associations between preparedness and general reciprocity (H2A), fairness (H2B), or bonding (H3A, H3B). This surprised us, since previous studies of social capital have found that close-knit ties with family, friends, and neighbors can help people survive on a day-to-day basis and during a disaster [31,61]. We did find more bridging in predominately White communities (OS) than in SS (H4A), in addition to higher preparedness for those reporting more bridging, overall (H4B). Survey participants in SS also reported lower trust that did those in OS, measured as expectations of fairness and reciprocity.

The absence of observed association between bonding and preparedness could be due to omitted attributes in our measures of bonding or preparedness. For example, caregiving is something people do for close-knit ties, but was not explicitly referenced in our measure of bonding. We also want to note that the growth of online communities has changed the boundaries of social capital and interpersonal relationships. Researchers have found that bonding and bridging ties can be maintained and created online [62,63]. This may mean that people have more ways to prepare, respond, and recover from disasters than assessed in this study. Future studies could

include other measures of bonding and other types of preparedness items that serve dual purposes, to better understand the influence of bonding on preparedness.

As in previous studies [60], minority communities (SS) in our study reported lower preparedness on average as compared to White communities (OS) (section 3.2.4). However, controlling for other factors eliminated significant differences by community and by race or ethnicity, with the exception of Black and African Americans. In the analysis of this study, we wanted to disaggregate racial and origin categories to understand disparities within and across those categories. However, despite oversampling in SS, samples of some groups were small, and it also proved challenging to obtain population-level data on group subsets by zip code to weight the observations appropriately for a more intersectional model [64]. The method we ultimately used was limiting as it hides differences within large categories of race, as the COVID-19 pandemic highlighted [65–68]. Public policy makers who have disaggregated race and ethnicity data will have more information on where to equitably allocate resources. Moreover, our survey was written in English and was not inclusive of other language speakers. Local governments and organizations could also use culturally and linguistically appropriate tools to understand preparedness in diverse communities [69–72].

Wallis, Fischer, and Abrahamse [73] found that neighborhood attachment was associated with community preparedness behavior; people who were attached to their neighborhood tended to store enough emergency supplies to help others not in their household. Moreover, they found that neighborhood attachment mediated the relationship between home ownership, length of residence, and preparedness. Others have found strong correlations between neighborhood attachment and length of residency [74]. Although we did not measure neighborhood attachment per se, we did find that people who had lived in their neighborhood longer were more prepared for an earthquake or other disaster, all else equal. This is an important finding in an era of historic urban growth along with rising rents and home prices in Seattle. South Seattle residents have been at the highest risk of displacement [75] in recent years, which may translate into reduced emergency preparedness. This suggests that local municipalities interested in enhancing preparedness and resilience can do so by finding ways to prevent displacement.

4.2. An asset-based community readiness approach

Despite recognition of the importance of community assets in disaster preparedness and response and their variation across communities, assessments of disaster preparedness in the U.S. typically measure amounts of stocked supplies, hazard mitigation actions, and emergency planning in individual households. They do not typically focus on measures of social capital or of other common assets, such as day-to-day resources. Our findings suggest that these standard practices for measuring disaster preparedness have perhaps inadvertently contributed to an over-emphasis on stockpiling in emergency management messaging. Messaging for disaster preparedness has to date been primarily focused on preparing for rare, large-scale disasters that may limit emergency response capabilities. Emergency managers have emphasized the need for everyone to be prepared for such disasters.

However, it can be difficult for people to prepare for uncertain episodic and rare events, especially if they are financially strapped or otherwise disadvantaged. An alternative approach could build upon current assets and capabilities for achieving or maintaining safety and quality of life on a daily basis. By using this approach, emergency managers might encourage more people to continue preparing for occasional disasters and encourage government institutions to provide social support and fund systemic solutions to readiness challenges, including mitigation of chronic stresses, for those who have plateaued in their capabilities. In sum, building community ties, encouraging sharing, and fostering a sense of stability and investment in neighborhoods, are prerequisites to effective preparedness in lower-income households. Taken together, we call this an everyday asset-based community readiness approach, or “mainstreaming” readiness for short.

Given that people have readily available assets that can be used during a disaster, an asset-based community readiness approach to preparedness appears to be viable and to have broad potential. An illustration of the potential opportunities for this approach comes from the application of this thinking in a community disaster preparedness training class that the lead author hosted at an ethnic community meeting. She asked people to assess what kinds of food, water, and medical supplies people have in their homes. Then she asked them to write down on a white kitchen garbage bag what they could pack and use in an emergency evacuation scenario. An asset-based community readiness approach encourages people to approach disaster preparedness in this way, especially if they are unable to explicitly set aside supplies for disasters. One participant said,

“This is so much more manageable and doable. I can pack food, water, and supplies I already have in my home. It’s harder to stockpile supplies for an event that may or may not happen in my lifetime. I cannot afford to stockpile supplies, but I can assess what I have and plan to bring it with me if I need to.”

As this remark reveals, an asset-based approach improved the training participant’s disaster preparedness efficacy, a key influencer in preparedness [3]. Emergency managers can add this approach to preparedness messaging as a way to positively engage people in preparedness discussions. Training programs and messaging around preparedness could start by asking people to assess current physical and social assets that exist and are used to address everyday emergencies or hazards. Emergency managers can highlight how everyday resources can also help in extreme disasters and can encourage people to share resources as they are able. This should enable communities to identify and acquire additional disaster preparedness capabilities.

4.3. A call for renewed attention to resource sharing in disaster preparedness and emergency management

In conclusion, this study provides evidence that measures of disaster preparedness deserve renewed attention from researchers. Our framing experiment showed that everyday asset framing can change estimates of preparedness, although regression results suggested that the framing effects may have been contingent on factors such as resource scarcity, neighborhood tenure, and social capital. Perhaps more notably, survey participants’ estimates of everyday resource availability were higher than their more conventional

estimates of resources available in the event of a disaster. Additional experimental as well as more ethnographic research is warranted to further investigate these findings and to address potential study limitations, such as the specific survey items we used to measure bonding, and the potential for survey response bias.

As often happens in disasters [23], the response to COVID-19 revealed that many people share resources, including delivering food to seniors, and forming mutual aid groups to support those most in need [76]. We think there could be more research on sharing resources during emergency situations. Moreover, social relationships are a vital component to advancing an asset-based community readiness approach to disaster preparedness. Ordinary people have knowledge, skills, and capacities that can be mobilized for positive action. When people's capabilities have plateaued, government systems and structures should be altered to advance readiness for individuals and communities, using appropriate messaging and analysis tools to reach diverse populations, and taking into account their assets, including social capital.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

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Appendix A. Study area selection and sampling

Table 1
Study area selection in Seattle, WA, based on ACS 2017 (5-year estimates) Census Data

Study area	Seattle Zip Codes	Total Population	% White Alone	% Speak English Less than "Very Well"	% Bachelor's Degree +	Med HH Income	% Owner Occupied
South Seattle	98178	27,279	0.286	0.205	0.276	72,478	0.613
South Seattle	98108	24,134	0.306	0.288	0.319	55,314	0.546
South Seattle	98118	46,800	0.330	0.227	0.381	62,504	0.578
South Seattle	98144	30,850	0.483	0.170	0.503	71,628	0.472
South Seattle	98106	26,244	0.487	0.150	0.368	62,726	0.492
Not in study	98104	14,143	0.515	0.173	0.407	37,610	0.107
Not in study	98134	844	0.538	0.083	0.325	58,125	0.304
Not in study	98146	27,587	0.564	0.173	0.294	61,160	0.599
Not in study	98121	16,466	0.649	0.032	0.725	94,813	0.205
Not in study	98133	48,390	0.656	0.123	0.438	60,409	0.475
Not in study	98122	37,270	0.657	0.059	0.653	72,018	0.334
Not in study	98105	47,128	0.659	0.085	0.752	56,015	0.352
Not in study	98125	40,803	0.663	0.122	0.545	61,014	0.472
Not in study	98126	23,360	0.679	0.095	0.509	73,698	0.570
Not in study	98101	12,408	0.703	0.068	0.600	68,750	0.188
Not in study	98109	27,002	0.725	0.046	0.745	95,719	0.293
Not in study	98102	24,703	0.787	0.018	0.743	83,403	0.291
Not in study	98115	51,523	0.803	0.036	0.731	100,794	0.625
Not in study	98119	25,036	0.810	0.031	0.733	85,171	0.416
Not in study	98177	20,278	0.822	0.036	0.629	100,036	0.775
Not in study	98103	51,385	0.832	0.026	0.739	91,740	0.474
Other Seattle	98136	16,364	0.832	0.029	0.607	97,673	0.673
Other Seattle	98107	24,384	0.835	0.019	0.725	83,581	0.384
Other Seattle	98199	21,660	0.839	0.029	0.680	103,309	0.646
Other Seattle	98112	24,720	0.850	0.027	0.788	110,051	0.548
Other Seattle	98116	25,694	0.851	0.017	0.650	100,711	0.593
Other Seattle	98117	33,610	0.867	0.024	0.680	102,519	0.722

Appendix B. Other model results

Table 1

Model results for weighted preparation count, food, and water.

	WEIGHTED PREPARATION COUNT			FOOD			WATER		
	Standardized Coefficients (Beta)	t	p	Standardized Coefficients (Beta)	t	p	Standardized Coefficients (Beta)	t	p
(Constant)		9.484	<.001		12.512	<.001		7.644	<.001
Bonding count	0.038	1.312	0.190	0.042	1.357	0.175	0.026	0.856	0.392
Bridging count	0.117	3.922	<.001	0.045	1.411	0.158	0.012	0.388	0.698
Perceived fairness	0.044	1.406	0.160	0.087	2.594	0.010	0.022	0.658	0.510
Perceived reciprocity	−0.023	−0.725	0.469	−0.059	−1.734	0.083	0.038	1.112	0.266
Community Disaster Preparedness	−0.004	−0.129	0.897	−0.045	−1.528	0.127	0.015	0.527	0.598
South Seattle	−0.030	−0.959	0.338	0.014	0.430	0.667	0.018	0.541	0.589
Asian	−0.018	−0.567	0.571	−0.017	−0.501	0.616	0.066	1.982	0.048
Black/African American	−0.101	−3.160	0.002	−0.046	−1.361	0.174	0.007	0.211	0.833
Hispanic	−0.006	−0.221	0.825	−0.015	−0.481	0.631	0.137	4.490	<.001
Other	0.003	0.117	0.907	0.002	0.080	0.936	0.027	0.922	0.356
Two or more races	−0.024	−0.842	0.400	−0.015	−0.500	0.617	−0.001	−0.017	0.986
Neighborhood tenure	0.077	2.404	0.016	0.099	2.905	0.004	0.022	0.652	0.515
Single-family home	0.053	1.768	0.077	0.076	2.369	0.018	0.058	1.841	0.066
Earthquake experience	0.083	2.891	0.004	0.021	0.670	0.503	0.039	1.285	0.199
Age	0.235	6.955	<.001	0.045	1.236	0.217	0.155	4.354	<.001
Female/other gender	−0.049	−1.756	0.079	0.023	0.753	0.452	−0.034	−1.142	0.254
Income	0.092	2.948	0.003	−0.023	−0.684	0.494	−0.041	−1.230	0.219

Standardized coefficients are reported and variables that are significant at the 5% and 10% levels are bolded.

Table 2

Linear regression of preparedness count with interaction terms.

	PREPARATION COUNT			VIF
	Standardized Coefficients (Beta)	t	p	
(Constant)		8.995	<.001	
Bonding count	0.062	1.364	0.173	2.831
Bridging count	0.105	2.591	0.010	2.221
Bonding counts * South Seattle	−0.029	−0.529	0.597	4.026
Bridging counts * South Seattle	0.037	0.816	0.415	2.772
Perceived fairness	0.048	1.515	0.130	1.371
Perceived reciprocity	−0.021	−0.658	0.511	1.415
CDP	−0.006	−0.217	0.829	1.026
South Seattle	−0.023	−0.531	0.596	2.532
Asian	−0.030	−0.951	0.342	1.352
Black/African American	−0.107	−3.316	<.001	1.407
Hispanic	−0.027	−0.939	0.348	1.152
Other	0.006	0.226	0.822	1.040
Two or more races	−0.008	−0.266	0.791	1.088
Neighborhood tenure	0.069	2.163	0.031	1.398
Single-family home	0.062	2.061	0.040	1.224
Earthquake experience	0.075	2.595	0.010	1.129
Age	0.228	6.720	<.001	1.561
Female or Other Gender	−0.054	−1.916	0.056	1.069
Income	0.087	2.775	0.006	1.336

References

- [1] Ready Campaign, Plan Ahead for Disasters, Ready.gov, 2021. <https://www.ready.gov/> (accessed 22 June 2021).
- [2] D. Paton, Disaster preparedness: a social-cognitive perspective, *Disaster Prev. Manag.* 12 (2003) 210–216, <https://doi.org/10.1108/09653560310480686>.
- [3] Federal Emergency Management Agency (FEMA), National Household Survey, 2022. <https://fema-community-files.s3.amazonaws.com/2022-National-Household-Survey.pdf> (accessed 8 January 2023).
- [4] D.P. Aldrich, *Building Resilience: Social Capital in Post-disaster Recovery*, University of Chicago Press, 2012.
- [5] R.D. Putnam, *Bowling Alone: The Collapse and Revival of American Community*, Simon and Schuster, 2000.
- [6] R.D. Putnam, R. Leonardi, R.Y. Nanetti, *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, 1994.
- [7] P. Blaikie, T. Cannon, I. Davis, B. Wisner, *At Risk: Natural Hazards, People's Vulnerability, and Disasters*, Routledge (2014). <https://doi.org/10.4324/9780203714775>.

- [8] M. Fordham, D.S.K. Thomas, B.D. Phillips, W.E. Lovekamp, Understanding social vulnerability, in: D.S.K. Thomas, B.D. Phillips, W.E. Lovekamp, A. Fothergill (Eds.), *Social Vulnerability to Disasters*, CRC Press, 2013, pp. 1–29. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=understanding+social+vulnerability+fordham&btnG=.
- [9] A. Oliver-Smith, R.E. Goldman, Planning goals and urban realities: post-disaster reconstruction in a third world city, *City Soc.* 2 (1988) 105–126, <https://doi.org/10.1525/city.1988.2.2.105>.
- [10] J. Howell, J.R. Elliott, Damages done: the longitudinal impacts of natural hazards on wealth inequality in the United States, *Soc. Probl.* 66 (2019) 448–467, <https://doi.org/10.1093/socpro/spy016>.
- [11] K. Tierney, Social inequality, hazards, and disasters, in: Ronald J. Daniels, Donald F. Kettl, Howard Kunreuther (Eds.), *On Risk and Disaster: Lessons from Hurricane Katrina*, University of Pennsylvania Press, Philadelphia, 2006, pp. 109–128, <https://doi.org/10.9783/9780812205473.109>.
- [12] J.A. Nukpezah, I. Soujaa, Creating emergency prepared households—What really are the determinants of household emergency preparedness? *Risk Hazards Crisis Publ. Pol.* 9 (2018) 480–504, <https://doi.org/10.1002/rhc.3.12142>.
- [13] Federal Emergency Management Agency (FEMA), *Preparedness in America*, 2014. https://www.ready.gov/sites/default/files/2020-08/Preparedness_in_America_August_2014.pdf (accessed 29 May 2019).
- [14] S. Szreter, M. Woolcock, Health by association? Social capital, social theory, and the political economy of public health, *Int. J. Epidemiol.* 33 (2004) 650–667, <https://doi.org/10.1093/ije/dyh013>.
- [15] N. Lin, Inequality in social capital, *Contemp. Sociol.* 29 (2000) 785–795, <https://doi.org/10.2307/2654086>.
- [16] X. de Souza Briggs, Brown kids in white suburbs: housing mobility and the many faces of social capital, *Hous Policy Debate* 9 (1998) 177–221, <https://doi.org/10.1080/10511482.1998.9521290>.
- [17] R.L. Hawkins, K. Maurer, Bonding, bridging and linking: how social capital operated in New Orleans following Hurricane Katrina, *Br. J. Soc. Work* 40 (2010) 1777–1793, <https://doi.org/10.1093/bjsw/bcp087>.
- [18] S. Kohn, J.L. Eaton, S. Feroz, A.A. Bainbridge, J. Hoolachan, D.J. Barnett, Personal disaster preparedness: an integrative review of the literature, *Disaster Med. Public Health Prep.* 6 (2012) 217–231, <https://doi.org/10.1001/dmp.2012.47>.
- [19] American Red Cross, *Survival Kit Supplies*, 2021. <https://www.redcross.org/get-help/how-to-prepare-for-emergencies/survival-kit-supplies.html> (accessed 22 July 2021).
- [20] T. Pittman, 14 Days (Not 3) Is the New Emergency Kit Standard, *King 5 News*, 2017. <https://www.king5.com/article/news/local/disaster/14-days-not-3-is-the-new-emergency-kit-standard/281-453947654> (accessed 23 June 2021).
- [21] Seattle Office of Emergency Management, *Prepare*, (n.d.), <https://www.seattle.gov/emergency-management/prepare> (accessed 22 June 2021).
- [22] American Red Cross, Federal Emergency Management Agency, *Summary Report on Awareness to Action: A Workshop on Motivating the Public to Prepare*, 2013. https://www.ready.gov/sites/default/files/2020-08/awareness_to_action_workshop_report.pdf (accessed 24 February 2021).
- [23] R.R. Dynes, Social capital: dealing with community emergencies, *Homel. Secur. Aff.* 2 (2006) 1–26. <http://hdl.handle.net/10945/25095>.
- [24] R.H. Turner, J.M. Nigg, D.H. Paz, *Waiting for disaster: Earthquake watch in California*, Univ of California Press, 1986.
- [25] K.J. Tierney, M.K. Lindell, R.W. Perry, *Facing the Unexpected: Disaster Preparedness and Response in the United States*, Joseph Henry Press, 2001, <https://doi.org/10.17226/9834>.
- [26] L.A. Russell, J.D. Goltz, L.B. Bourque, Preparedness and hazard mitigation actions before and after two earthquakes, *Environ. Behav.* 27 (1995) 744–770, <https://doi.org/10.1177/0013916595276002>.
- [27] Ready.gov, *About the Ready Campaign*, 2021. <https://www.ready.gov/about-us> (accessed 4 August 2021).
- [28] Federal Emergency Management Agency (FEMA), *2017 National Household Survey Results: Preparedness in America*, 2017. <https://fema-community-files.s3.amazonaws.com/2017-National-Household-Survey.pdf> (accessed 17 October 2022).
- [29] D.P. Eisenman, D. Glik, R. Maranon, L. Gonzales, S. Asch, Developing a disaster preparedness campaign targeting low-income Latino immigrants: focus group results for project PREP, *J. Health Care Poor Underserved* 20 (2009) 330–345, <https://doi.org/10.1353/hpu.0.0129>.
- [30] F. Jacobs, Black feminism and radical planning: new directions for disaster planning research, *Plann. Theor.* 18 (2019) 24–39, <https://doi.org/10.1177/1473095218763221>.
- [31] B. Li, *We Are Already Back: The Post-Katrina Struggle for Survival and Community Control in New Orleans East's Vietnamese Community of Versailles*, 2011, <https://doi.org/10.15779/Z38QC6X>.
- [32] B. Bolin, L.C. Kurtz, Race, class, ethnicity, and disaster vulnerability, in: H. Rodríguez, W. Donner, J. Trainor (Eds.), *Handbook of Disaster Research*, Springer, 2018, pp. 181–203, https://doi.org/10.1007/978-3-319-63254-4_10.
- [33] P.A. Jargowsky, Immigrants and neighbourhoods of concentrated poverty: assimilation or stagnation? *J. Ethnic Migrat. Stud.* 35 (2009) 1129–1151, <https://doi.org/10.1080/13691830903006150>.
- [34] M. VanLandingham, *Weathering Katrina: Culture and Recovery Among Vietnamese Americans*, Russell Sage Foundation, 2017.
- [35] J.P. Kretzmann, J. McKnight, *Building communities from the inside out: A Path Toward Finding and Mobilizing a Community's Assets*, The Asset-Based Community Development Institute, Chicago, 1993. <https://books.google.com/books?id=HkxHAAAMAAJ&dq=editions:UOM39015034308521>.
- [36] H. Nel, A comparison between the asset-oriented and needs-based community development approaches in terms of systems changes, *Practice* 30 (2018) 33–52, <https://doi.org/10.1080/09503153.2017.1360474>.
- [37] R.C. Freitag, D.B. Abramson, M. Chalana, M. Dixon, Whole community resilience: an asset-based approach to enhancing adaptive capacity before a disruption, *J. Am. Plann. Assoc.* 80 (2014) 324–335, <https://doi.org/10.1080/01944363.2014.990480>.
- [38] A. Mathie, G. Cunningham, From clients to citizens: Asset-based Community Development as a strategy for community-driven development, *Dev. Pract.* 13 (2003) 474–486, <https://doi.org/10.1080/0961452032000125857>.
- [39] D.P. Aldrich, M.A. Meyer, Social capital and community resilience, *Am. Behav. Sci.* 59 (2015) 254–269, <https://doi.org/10.1177/0002764214550299>.
- [40] D.P. Aldrich, Social, not physical, infrastructure: the critical role of civil society after the 1923 Tokyo earthquake, *Disasters* 36 (2012) 398–419, <https://doi.org/10.1111/j.1467-7717.2011.01263.x>.
- [41] R.R. Dynes, The importance of social capital in disaster response, *Preliminary Paper #327*, <https://udspace.udel.edu/server/api/core/bitstreams/1a7260c4-2c8f-4c8b-95e8-19104f11a4b9/content>.
- [42] M. Woolcock, Social capital in theory and practice: reducing poverty by building partnerships between states, markets and civil society, in: *International Social Science Council Comparative Research Programme on Poverty, Social Capital and Poverty Reduction: Which Role for the Civil Society Organization?* UNESCO programme and meeting document no. SHS.2003/WS/30 (2002) pp. 19–46, <https://unesdoc.unesco.org/ark:/48223/pf0000132556> (accessed 8 Aug. 2023).
- [43] S.-W. Kwon, C. Heflin, M. Ruef, Community social capital and entrepreneurship, *Am. Socio. Rev.* 78 (2013) 980–1008, <https://doi.org/10.1177/0003122413506440>.
- [44] P. Paxton, Association memberships and generalized trust: a multilevel model across 31 countries, *Soc. Forces* 86 (2007) 47–76, <https://doi.org/10.1177/0003122413506440>.
- [45] K.T. Smiley, J. Howell, J.R. Elliott, Disasters, local organizations, and poverty in the USA, 1998 to 2015, *Popul. Environ.* 40 (2018) 115–135, <https://doi.org/10.1007/s11111-018-0304-8>.
- [46] T. Claridge, *Functions of Social Capital - Bonding, Bridging, Linking*, Social Capital Research, 2018, pp. 1–7. <https://www.socialcapitalresearch.com/wp-content/uploads/2018/11/Functions-of-Social-Capital.pdf> (accessed 20 January 2023).
- [47] S. Szreter, The State of Social Capital: Bringing Back in Power, Politics, and History, *Theory and Society* 31 (2002) 573–621, <http://www.jstor.org/stable/3108542>. (accessed 8 August 2023).
- [48] M.S. Akbar, D.P. Aldrich, Determinants of post-flood social and institutional trust among disaster victims, *J. Contingencies Crisis Manag.* 25 (2017) 279–288, <https://doi.org/10.1111/1468-5973.12152>.
- [49] P.T. Dunn, A.Y.E. Ahn, A. Bostrom, J.E. Vidale, Perceptions of earthquake early warnings on the U.S. West Coast, *Int. J. Disaster Risk Reduc.* 20 (2016) 112–122, <https://doi.org/10.1016/j.ijdrr.2016.10.019>.

- [50] B.M. Reininger, M.H. Rahbar, M.J. Lee, Z. Chen, S.R. Alam, J. Pope, B. Adams, Social capital and disaster preparedness among low income Mexican Americans in a disaster prone area, *Soc. Sci. Med.* 83 (2013) 50–60, <https://doi.org/10.1016/j.socscimed.2013.01.037>.
- [51] L.T. Nguyễn, A. Bostrom, P. Moy, Community Disaster Preparedness to Earthquakes in Washington State: Research Design Documents and Survey Instruments in English, *DesignSafe-CI*, v1, 2022. <https://doi.org/10.17603/ds2-ptta-x060>.
- [52] American Association for Public Opinion Research, Standard Definitions Final Dispositions of Case Codes and Outcome Rates for Surveys, 2016, 61. <https://aapor.org/wp-content/uploads/2022/11/Standard-Definitions20169theditionfinal.pdf> (accessed 28 August 2022).
- [53] California Earthquake Authority, How to Make an Earthquake Emergency Kit, 2021. <https://www.earthquakeauthority.com/Blog/2019/How-to-Make-an-Earthquake-Emergency-Kit> (accessed 22 June 2021).
- [54] J.S. Becker, D. Paton, D.M. Johnston, K.R. Ronan, A model of household preparedness for earthquakes: How individuals make meaning of earthquake information and How this influences preparedness 64, 2012, pp. 107–137, <https://doi.org/10.1007/s11069-012-0238-x>.
- [55] J.S. Becker, D. Paton, D.M. Johnston, K.R. Ronan, J. McClure, The role of prior experience in informing and motivating earthquake preparedness, *Int. J. Disaster Risk Reduc.* 22 (2017) 179–193, <https://doi.org/10.1016/j.ijdrr.2017.03.006>.
- [56] A.M. van Valkengoed, L. Steg, Meta-analyses of factors motivating climate change adaptation behaviour, *Nat. Clim. Change* 9 (2019) 158–163, <https://doi.org/10.1038/s41558-018-0371-y>.
- [57] B. Balgos, J.C. Gaillard, K. Sanz, The waria of Indonesia in disaster risk reduction: the case of the 2010 Mt Merapi eruption in Indonesia, *Gend. Dev.* 20 (2012) 337–348, <https://doi.org/10.1080/13552074.2012.687218>.
- [58] A. Rupasingha, S.J. Goetz, D. Freshwater, The production of social capital in US counties, *J. Soc. Econ.* 35 (2006) 83–101, <https://doi.org/10.1016/J.SOCEC.2005.11.001>.
- [59] A. Mercer, A. Lau, C. Kennedy, For Weighting Online Opt-In Samples, What Matters Most?, 2018. Washington DC, <https://www.pewresearch.org/methods/2018/01/26/how-different-weighting-methods-work/> (accessed 17 May 2022).
- [60] Federal Emergency Management Agency (FEMA), 2017 National Household Survey Results: Preparedness in America, 2017. <https://fema-community-files.s3.amazonaws.com/2017-National-Household-Survey.pdf> (accessed 17 October 2022).
- [61] R.L. Hawkins, K. Maurer, Bonding, bridging and linking: how social capital operated in New Orleans following hurricane Katrina, *Br. J. Soc. Work* 40 (2010) 1777–1793, <https://doi.org/10.1093/bjsw/bcp087>.
- [62] C.W. Steinfield, N. Ellison, C. Steinfield, C. Lampe, Spatially Bounded Online Social Networks and Social Capital Spatially Bounded Online Social Networks and Social Capital: the Role of Facebook, 2006. <https://www.researchgate.net/publication/249976902> (accessed 17 August 2022).
- [63] N.B. Ellison, C. Steinfield, C. Lampe, The benefits of facebook “friends”: social capital and college students’ use of online social network sites, *J. Computer-Mediated Commun.* 12 (2007) 1143–1168, <https://doi.org/10.1111/J.1083-6101.2007.00367.X>.
- [64] C. Edlagan, K. Vaghul, How Data Disaggregation Matters for Asian Americans and Pacific Islanders-Equitable Growth, Evidence for a stronger economy, Washington Center for Equitable Growth, 2016. <https://equitablegrowth.org/how-data-disaggregation-matters-for-asian-americans-and-pacific-islanders/> (accessed 22 September 2022).
- [65] M. Secaira, Abigail Echo-Hawk on the Art and Science of “Decolonizing Data, Crosscut, 2019. <https://crosscut.com/2019/05/abigail-echo-hawk-art-and-science-decolonizing-data> (accessed 25 April 2022).
- [66] P.A. McElfish, R. Purvis, D.E. Willis, S. Riklon, COVID-19 disparities among Marshallese pacific islanders, *Prev. Chronic Dis.* 18 (2021) 1–7, <https://doi.org/10.5888/PCD18.200407>.
- [67] M. Srikrishnan, The First Year of COVID Filipinos Were Among Hardest Hit, but Hidden by Data, Voice of San Diego, 2021. <https://voiceofsandiego.org/2021/12/06/the-first-year-of-covid-filipinos-were-among-hardest-hit-but-hidden-by-data/> (accessed 22 September 2022).
- [68] M. Ramirez, Arab Americans, Deem “White” in Government Records, Suffer an Unseen COVID-19 Crisis, USA Today, 2021. <https://www.usatoday.com/story/news/nation/2021/02/28/covid-19-cases-arab-americans-hit-hard-but-not-counted-data/4498387001/> (accessed 22 September 2022).
- [69] L.T. Nguyễn, A. Bostrom, P. Moy, M. Gonzalez Macedonio, Community Disaster Preparedness to Earthquakes in Washington State: Survey Instruments in Spanish, *DesignSafe-CI*, v1, 2022. <https://doi.org/10.17603/ds2-ptta-x060>.
- [70] L.T. Nguyễn, A. Bostrom, P. Moy, A. Alqadhib, Community Disaster Preparedness to Earthquakes in Washington State: Survey Instruments in Arabic, *DesignSafe-CI*, v1, 2022. <https://doi.org/10.17603/ds2-1ztt-6y49>.
- [71] L.T. Nguyễn, A. Bostrom, P. Moy, J. Strickler, E. Franchomme, Community Disaster Preparedness to Earthquakes in Washington State: Survey Instruments in French, *DesignSafe-CI*, v1, 2022. <https://doi.org/10.17603/ds2-dvcm-9987>.
- [72] L.T. Nguyễn, A. Bostrom, P. Moy, D.H. Hoang, Community Disaster Preparedness to Earthquakes in Washington State: Survey Instruments in Vietnamese, *DesignSafe-CI*, v1, 2022. <https://doi.org/10.17603/ds2-fs6v-5737>.
- [73] A. Wallis, R. Fischer, W. Abrahamse, Place attachment and disaster preparedness: examining the role of place scale and preparedness type, *Environ. Behav.* 54 (2022) 670–711, <https://doi.org/10.1177/00139165211064196>.
- [74] S.F. McCool, S.R. Martin, Community attachment and attitudes toward tourism development, *J. Trav. Res.* 32 (1994) 29–34. <https://doi.org/10.1177/004728759403200305>.
- [75] Seattle Office of Planning & Community Development, Seattle 2035 Growth and Equity: Analyzing Impacts on Displacement and Opportunity Related to Seattle’s Growth Strategy, Seattle, May, 2016, pp. 1–68. <https://www.seattle.gov/documents/departments/opcd/ongoinginitiatives/seattlescomprehensiveplan/finalgrowthandequityanalysis.pdf> (accessed 21 June 2021).
- [76] S. Lofton, M. Kersten, S.D. Simonovich, A. Martin, Mutual aid organisations and their role in reducing food insecurity in Chicago’s urban communities during COVID-19, *Publ. Health Nutr.* 25 (2022) 119–122, <https://doi.org/10.1017/S1368980021003736>.