Article

What Methods Do Social Scientists Use to Study Disasters? An Analysis of the Social Science Extreme Events Research Network

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Abstract

Methods matter. They influence what we know and who we come to know about in the context of hazards and disasters. Research methods are of profound importance to the scholarly advancement of the field and, accordingly, a growing number of publications focus on research methods and ethical practices associated with the study of extreme events. Still, notable gaps exist. The National Science Foundation-funded Social Science Extreme Events Research (SSEER) network was formed, in part, to respond to the need for more specific information about the status and expertise of the social science hazards and disaster research workforce. Drawing on data from 1,013 SSEER members located across five United Nations (UN) regions, this article reports on the demographic characteristics of SSEER researchers; provides a novel inventory of methods used by social science hazards and disaster researchers; and explores how methodological approaches vary by specific researcher attributes including discipline, professional status, researcher type based on level of involvement in the field, hazard/disaster type studied, and disaster phase studied. The results have implications for training, mentoring, and workforce development initiatives geared toward ensuring that a diverse next generation of social science researchers is prepared to study the root causes and social consequences of disasters.

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Introduction

Globally, tens of millions of people have their lives disrupted or completely upended by extreme events annually (GRID, 2017). Monetary damages associated with natural hazards have been on a sharp incline for decades, and 2017 was the single costliest disaster loss year ever recorded in the United States and the second costliest in global history (Munich RE, 2018). According to Wallemacq and House (2018), disaster losses driven by extreme weather and other natural hazards exceeded $2.9 trillion between 1998 and 2017. While the United States and other high-income countries were home to the highest absolute economic losses, low- and middle-income countries experienced disproportionately higher annual average percentage losses (Lee et al., 2014).

Amid these alarming reports of escalating risks and rising disaster losses, there are also some signs of progress. Human deaths linked to natural hazards have not been concurrently increasing; in fact, disaster-related deaths around the world have declined substantially over recent decades (Roser & Ritchie, 2019), although the global COVID-19 pandemic now stands as an especially deadly outlier. Experts often point to various evidence-based interventions that have helped avert natural hazards-related deaths such as stronger building codes and standards, stricter land use enforcement policies, enhanced weather forecast technologies, advanced early warning systems, and improved risk communication strategies (Gruntfest, 2018; McNutt, 2017; Mileti, 1999; Tierney et al., 2001). Such major technical, social, and policy changes have led to new mitigation and adaptation efforts globally (Fuchs et al., 2011; McPhillips et al., 2018; Meyer, 2018; Wilby & Keenan, 2012).

Many of these advancements would not have occurred without a sustained investment from federal agencies and academic institutions in hazards and disaster research and its societal applications (Mileti, 1999; White & Haas, 1975). Such research has led to fundamental scientific discoveries in a wide range of areas including, for example, preparedness among potentially vulnerable populations (Thomas et al., 2013), protective action decision-making (Lindell & Perry, 2012), organizational behavior and emergency response (Dynes, 1997; Dynes & Tierney, 1994), spontaneous volunteerism (Kendra & Wachtendorf, 2016), transportation engineering and evacuation decision making (Lindell et al., 2019), crime reduction (Harper & Frailing, 2016), equitable investments in mitigation strategies (Sutley et al., 2017), and housing recovery policies (Sutley & Hamideh, 2017).

As the hazards and disaster research field has grown in size and prominence, so too have the number of calls for more sustained training and mentoring support for a diverse next generation of hazards and disaster researchers and practitioners (see, e.g., Anderson, 1990; Andrulis et al., 2007; Louis-Charles & Dixon, 2015; Peek, 2006; Tierney, 2002). The 2006 National Research Council (NRC) consensus study, *Facing Hazards and Disasters: Understanding Human Dimensions*, underscored the importance of such workforce development investments as follows: “The size and composition of the

hazards and disaster workforce will significantly determine the extent to which the social sciences, in general, can respond forcefully to twenty-first century demands for basic social science knowledge and its application" (NRC, 2006, p. 317).

The Committee on Disaster Research in the Social Sciences that authored that landmark report, however, went on to state that: "The committee *does not have a precise accounting* of the numbers of social scientists from respective disciplines currently engaged in hazards and disaster research. Neither government agencies nor professional associations systematically collect data on this research workforce" (NRC, 2006, p. 320, italics added). This represents an important gap because, without such information, it is impossible to ensure that the field "will be of adequate size, reflect the diversity of the nation, and include researchers who have both basic and applied research interests and are capable of carrying out disciplinary, multidisciplinary, and interdisciplinary research" (NRC, 2006, p. 319).

The National Science Foundation (NSF)-funded Social Science Extreme Events Research (SSEER) network was formed, in part, to respond to the need for more specific information about the status and expertise of the social science hazards and disaster research workforce. Core to the mission of SSEER is to *identify* and *map* social scientists involved in hazards and disaster research in order to *highlight* their expertise and *connect* social science researchers to one another, to interdisciplinary teams, and to communities at risk to hazards and affected by disasters. Ultimately, the goals of SSEER are to *amplify* the contributions of social scientists, to *advance* the field through expanding the available social science evidence base, and to *enhance* collective well-being. SSEER is part of a much larger ecosystem of extreme events research and reconnaissance networks designed to help coordinate disciplinary communities in engineering and the sciences, while also encouraging cross-disciplinary information sharing and interdisciplinary integration (Peek et al., 2020).

This article describes an ongoing SSEER effort to generate the first-ever census of social scientists who study hazards and disasters. Drawing on data from SSEER members, this article reports on the demographic characteristics of SSEER researchers; provides a novel inventory of methods used by social science hazards and disaster researchers; and explores how methodological approaches vary by specific researcher attributes including discipline, professional status, researcher type based on level of involvement in the field, hazard/disaster type studied, and disaster phase studied. While the SSEER network database does not yet represent a complete count of all social scientists in the United States or globally who study hazards and disasters, the available data provide a unique opportunity to respond to calls to characterize the status of the social science hazards and disaster research workforce. This work ultimately helps advance our understanding of the size, composition, and skill set of this rapidly evolving research community.

Background on SSEER

A census is the periodic process of systematically collecting information about the members of a given population. Traditional censuses can be elaborate, complex, and

costly to carry out; they are also unrivaled in terms of providing a comprehensive snapshot of an entire population at a specific period of time (United Nations, 2017).

There has never been a complete census of the hazards and disaster research field. There are at least three explanations for this gap. First, it is difficult and complicated to identify who is a hazards or disaster researcher in the context of a global, multidisciplinary research landscape. Consider, for example, that the field is composed of researchers from nations around the world who speak different languages. These researchers are trained in many different disciplines in the sciences, engineering, and the humanities, and they are affiliated with a wide range of academic, private sector, nonprofit, and government organizations (for more on the difficulty, and importance, of identifying researchers across domains, see Peek et al., 2020).

Second, the field has expanded dramatically during the 21st century. While the core social science-oriented hazards and disaster workforce has its deepest disciplinary roots in sociology and geography (Anderson & Mattingly, 1991; NRC, 2006), the field now has members from across the social sciences. This rapid expansion of the field has been driven, in part, by the increasing frequency and intensity of disasters globally. The past two decades have been punctuated by catastrophic events such as the 9/11 terrorist attacks, the 2004 Indian Ocean earthquake and tsunami, Hurricane Katrina in 2005, the 2010 Haiti earthquake, Hurricane Maria in 2017, and the COVID-19 pandemic. These and thousands of other disasters not only caused widespread destruction and societal disruption; they also spurred researchers from across the disciplinary spectrum into the field. Many of these new researchers have made important contributions to knowledge. But the highly event-driven nature of disaster research and the fact that involvement of researchers may be sporadic and intermittent (Dynes, 1994; Tierney, 2007) further complicates the ability to conduct an accurate census.

Third, it is costly and time- and labor-intensive to carry out a census of a large group of people. For this and many other reasons, prior efforts to characterize the hazards and disaster research community have often relied on estimates based on membership in professional organizations (NRC, 2006). For example, the American Association of Geographers, the International Sociological Association, and the Society for Applied Anthropology have specific sections or working groups dedicated to hazards or disaster research. Members often must pay a fee to join, however, thus limiting accessibility and resulting in a count that only includes those able and willing to pay. Specialty membership in these organizations "provides some additional clues about the size of the workforce in the social sciences," although the profile is clearly incomplete (NRC, 2006, p. 325).

The Natural Hazards Center at the University of Colorado Boulder has also been integral to connecting and sharing information with members of the hazards and disaster field. Since its founding in 1976, the Center has served as the nation's NSF-designated information clearinghouse for the societal dimensions of hazards and disasters. As part of its mission, the Center has maintained a database of professionals in the hazards and disaster research and practice community who have, for example, subscribed to

publications, attended meetings, or signed up for grant or training opportunities. The database includes the names, affiliations, contact information, and institutional categorization for well over 12,000 active subscribers. While this database is helpful for contacting and communicating with researchers and practitioners, it does not include more detailed information about researcher discipline or other key variables relevant to the analysis of the status of the social science workforce, which is our primary interest here.

As a result of the challenges to identifying who counts as a member of the social science hazards and disaster research community, strategies to recruit new researchers from the existing pool of social scientists have often been partial or ad hoc (NRC, 2006). Calls from Anderson (1990) and others to increase the numbers of persons from historically underrepresented groups in the field—including women as well as racial and ethnic minorities, from both within and outside traditional social science disciplines—have contributed to the creation of transformational mentoring initiatives such as the NSF Enabling the Next Generation program, the William Averette Anderson Fund, and the Minority SURGE Capacity in Disasters project. But these initiatives require comprehensive baseline information on the demographic composition of the field to monitor progress. Indeed, it is through this process of identifying and then connecting next generation researchers that vital professional networks can be strenthened both within and across organizations (Bennett et al., 2011). This can also help promote problem-focused and solutions-oriented convergence research that is deeply integrative and collaborative (Peek et al., 2020).

There is a need for more systematic and comprehensive information about the status of the hazards and disaster research workforce and the various skills that they bring to the study of hazards and disasters. Research methods are of special interest here because they are foundational to all empirical efforts and they profoundly influence *what we know* and *who we come to know about* in the context of hazards and disasters (Drabek, 1970; Mileti, 1987; Stallings, 2002).

Although a growing number of articles, books, edited volumes, and special journal issues—including this one in *American Behavioral Scientist*—focus specifically on methodological approaches for hazards and disaster research, this remains an underdeveloped area of inquiry (Frailing & Van Brown, 2020). Consider, for example, that there is no current, systematic inventory of social science methods and approaches that are widely used in hazards and disaster research. The limited number of disaster research-focused methodological textbooks in the social and behavioral sciences (Norris et al., 2006; Phillips, 2014; Stallings, 2002) and public health (Institute of Medicine, 2015) are outstanding resources, but they do not consider the full range of approaches currently used by social scientists. This is, in part, because the social science methodological landscape has been rapidly transformed by the advent of big data, the introduction of new computational methodologies, and the increased participation of social scientists in interdisciplinary teams that are developing and using new methods and approaches (see, e.g., DeRouen & Smith, 2020; Gharaibeh et al., 2019; Nateghi et al., 2019; Reilly et al., 2018).

Methods and Data

In an effort to learn more about the composition of the social science hazards and disaster research workforce and to establish an ongoing census, our SSEER research team began by developing a brief survey questionnaire for social scientists (see: converge.colorado.edu/join-SSEER). The survey, which can be completed in about 7 minutes, was designed to assess the researcher's disciplinary background, highest level of academic training, and years in the field. The survey asks respondents to identify the research methods they use, phases of disaster management they study, general types of hazards and disasters they study, the names of specific disaster events they have researched, and keywords that highlight their expertise. Respondents are also asked to select their level of involvement in hazards and disaster research, answer a series of demographic questions, provide their work address, and confirm their consent to be geolocated and added to the online SSEER mapping platform (see: converge.colorado.edu/research-networks/sseer). The SSEER database makes it possible, for the first time, to not only analyze basic data regarding *what* social science disaster researchers study and *how* they study it but also to visualize *where* they are located in relation to the disasters they study. As the SSEER network continues to grow, and as future iterations of the census are released, the database will also make it possible to provide demographic snapshots as well as longitudinal portraits of the evolution of the social science research community.

Our analysis in this article draws on SSEER data that was collected from the 1,013 social scientists who completed the SSEER survey between August 2018 and March 2020. All data were downloaded, cleaned, and coded by members of the SSEER research team at the CONVERGE facility at the Natural Hazards Center at the University of Colorado Boulder. Key variables that informed the analyses presented here include: primary professional status; primary social science discipline; primary methods and approaches to data collection and/or analysis; disaster phases studied; types of hazards and disasters studied; researcher type; researcher geographic location; and demographic information. We completed all descriptive data analyses using Microsoft Excel and RStudio.

Analysis and Findings

The following sections describe the composition of the SSEER network. First, we present basic demographic and locational information regarding the current SSEER membership. Second, we offer an inventory of methods and approaches to data collection and analysis that social science researchers reported using. Third, we present descriptive statistics to further explore how methodological use varies by specific researcher attributes.[1]

Demographic Composition and Location of SSEER Respondents

The SSEER network included 1,013 members as of March 2020. SSEER respondents ranged in age from 21 to 78 years. The average age of SSEER researchers is 41.4 years

Table 1. Gender Identity of SSEER Respondents.

	Frequency	Percentage
Female	527	52.02
Male	426	42.05
Some other Answer[a]	60	5.92
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.
[a]Includes: non-binary/third gender, prefer not to answer, prefer to self-describe, and missing.

(median = 39.0 years), and 9.62 years is the average length of research experience in the hazards and disaster field.

Respondents were asked to indicate which of the following terms best represents their gender identity: male, female, nonbinary/nonconforming, prefer not to answer, or prefer to self-describe. As shown in Table 1, of the SSEER network members, 527 identified as female (52.02%), 426 identified as male (42.05%), and 60 respondents chose some other answer (5.92%).

SSEER survey respondents were asked to select which racial and ethnic categories best describe their identity. When prompted, most SSEER respondents said they identified as White (59.62%). Fewer SSEER members identified as Asian/Asian American (13.03%), Hispanic/Latino (5.92%), or Black/African American (4.64%). A small percentage of respondents selected two or more racial or ethnic categories (2.76%) or another provided identity option such as American Indian or Alaska Native/Native Hawaiian Pacific Islander or Arab/Arab American/Middle Eastern. We included "prefer not to answer" and "prefer to self-describe" response options, in recognition that some respondents both inside and outside the United States may be uncomfortable with available fixed identity categories (for more on challenges to and issues with traditional racial categorizations in the United States, see Omi & Winant, 2014). A sizeable minority (13.23%) of SSEER respondents were coded as "missing" because they did not respond to the race/ethnicity question, chose "prefer not to answer," or selected "prefer to self-describe" (see Table 2).

Most SSEER members reported a doctoral degree as their highest educational attainment level (62.59%). A smaller but still substantial proportion of members reported having earned a master's degree (26.26%), while far fewer SSEER members selected bachelor's degree (6.61%) or associate's degree (0.99%) as their highest level of educational attainment (see Table 3).

We asked SSEER respondents for their complete professional address, which the SSEER research team then geocoded, mapped, and categorized according to the United Nations (UN) region and subregion where the researcher is located. As shown in Table 4, the vast majority of SSEER respondents are located in the Americas UN region (80.85%). The remaining members reside in the following UN regions: Europe (8.29%), Asia (5.33%), Oceania (4.15%), South America (2.96%), and Africa (1.18%).

Table 2. Racial/Ethnic Identity of SSEER Respondents.

	Frequency	Percentage
White	604	59.62
Asian/Asian American	132	13.03
Hispanic/Latino	60	5.92
Black/African American	47	4.64
Two or More Racial/Ethnic identities	28	2.76
Some other Provided Racial/Ethnic Identity	8	0.79
Missing	134	13.23
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.

Table 3. Educational Attainment among SSEER Respondents.

	Frequency	Percentage
Doctoral Degree	634	62.59
Master's Degree	266	26.26
Bachelor's Degree	67	6.61
Associate's Degree	10	0.99
Missing or Other[a]	36	3.55
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.
[a]Includes respondents who selected professional degree.

Table 4. Location of SSEER Respondents by UN Region.

	Frequency	Percentage
Americas	819	80.85
Europe	84	8.29
Asia	54	5.33
Oceania	42	4.15
Africa	12	1.18
Missing	2	0.20
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research; UN = United Nations.

Additional analyses revealed that of the 819 SSEER respondents in the Americas, 740 are located in the United States (73.05% of the total percentage of SSEER respondents); the country with the next-highest representation in the SSEER database is Canada, which includes 43 members (4.24%), followed by the United Kingdom's 26 members (2.57%). These numbers reveal that although the Americas region dominates

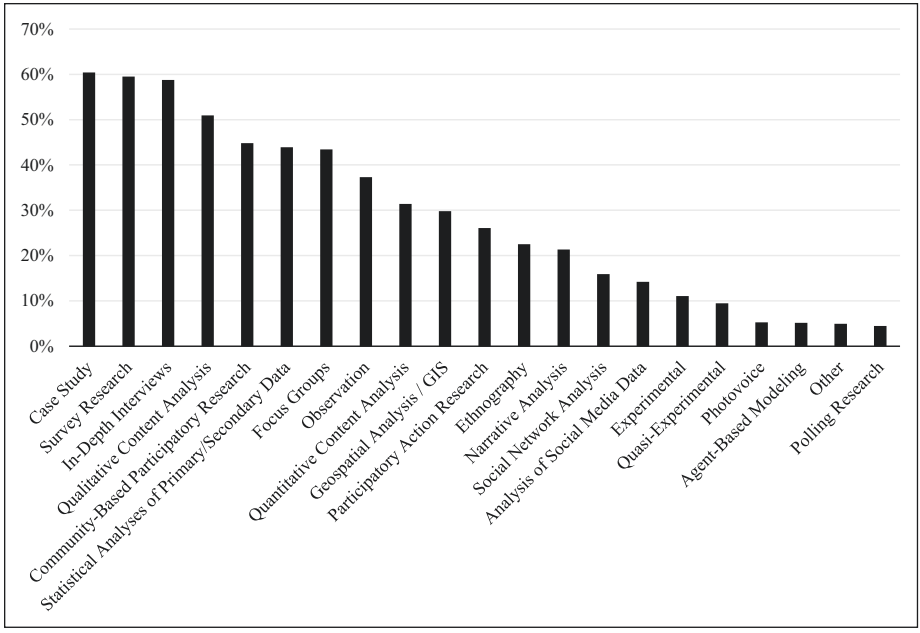

Figure 1. Research methods used by SSEER respondents.
Note. SSEER = Social Science Extreme Events Research.

SSEER membership, very few researchers from the region reside in Central, South, or Latin America.

Research Methods and Researcher Attributes

Social scientists use a range of methods and approaches to collect and analyze data. To capture the diverse skill set within the social science hazards and disaster research community, the SSEER survey includes a list of research methods and approaches to analysis that commonly appear in social science methods textbooks and the available literature on social science methods in hazards and disaster research. Respondents are asked to "select all" of their primary approaches to data collection and analysis or to write in other methods used.

As summarized in Figure 1, case study (60.41%) was the most commonly selected methodological approach, followed closely by survey research (59.53%) and in-depth interviews (58.74%). Just over half of all respondents included qualitative content analysis (50.94%) among their selections. Other popular methodologies selected by SSEER members included community-based participatory research (44.82%), statistical analyses of primary or secondary data (43.93%),[2] focus groups (43.44%), and observation (37.31%). Rounding out the top 10 most frequently selected methods are quantitative content analysis (31.39%) and geospatial analysis/geographic information system (GIS; 29.81%).

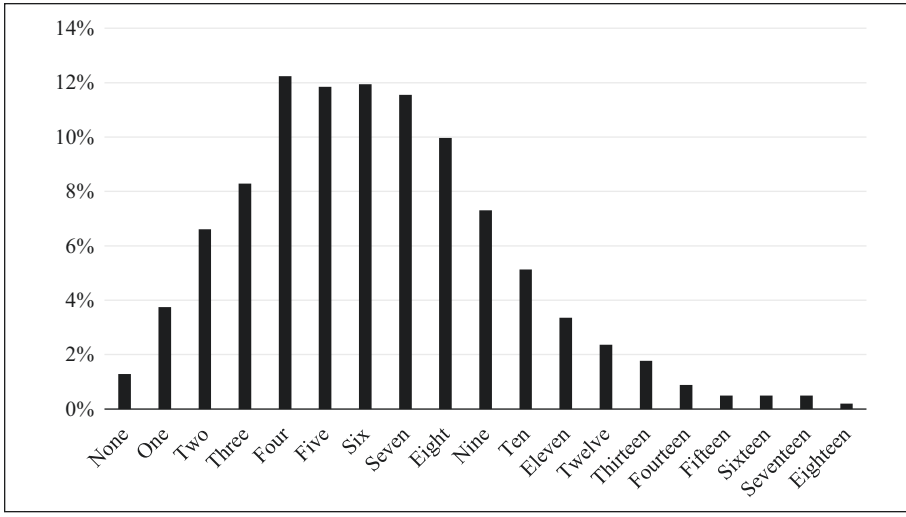

Figure 2. Number of research methods used by SSEER respondents.
Note. SSEER = Social Science Extreme Events Research.

Of the different primary methods respondents could choose from, SSEER researchers selected between 1 and 18 different approaches used in their research. Most SSEER respondents selected six different primary approaches. As shown in Figure 2, about one fifth of researchers selected three or fewer primary methods (19.15%), while a large majority of respondents indicated use of four or more primary approaches (80.85%).

Researcher Discipline

SSEER respondents were asked to identify their primary disciplinary background(s) from a set of options representing a range of disciplines often included under the umbrella of "social sciences." We acknowledge that social sciences—here defined in basic terms as disciplines focused on the scientific study of human society and social and organizational relationships—are undeniably complex and involve many unique disciplines and fields. In developing the final list of disciplinary categories included in the survey, we drew on our own knowledge of the field and reviewed many scholarly and online sources to identify the most regularly featured social science disciplines.

As shown in Figure 3, our final set of response options in the SSEER survey includes 20 disciplines. Respondents are asked to "select all" of their disciplines or to write in other disciplines. Just over half of all respondents (n = 509, 50.25%) selected more than one discipline. An additional 2.96% wrote in some other social science discipline, while 3.15% wrote in an additional nonsocial science discipline to describe their educational background or training (to be in the SSEER network,

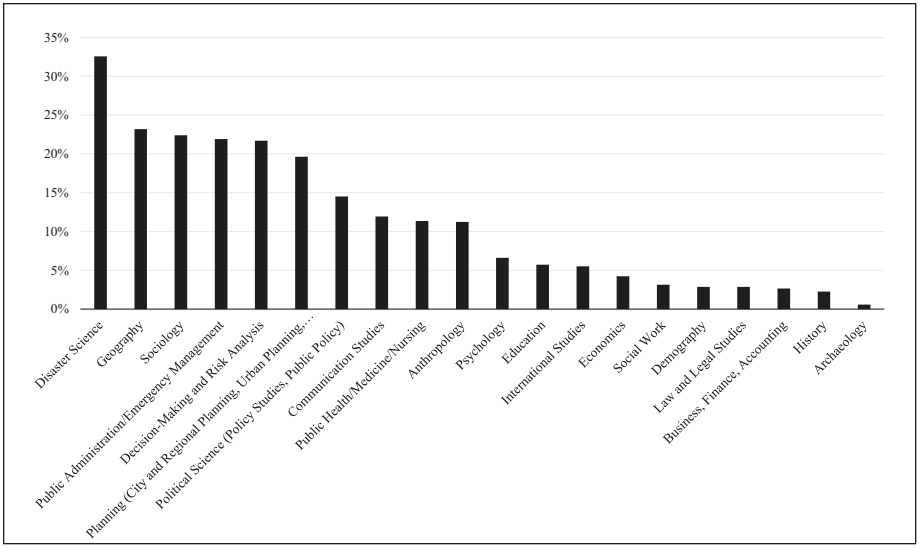

Figure 3. Primary disciplines identified by SSEER respondents.
Note. SSEER = Social Science Extreme Events Research.

researchers must identify with at least one social science discipline). A plurality of respondents (32.58%) chose disaster science as the category that best represented their disciplinary background.

Following disaster science as the most commonly selected option, about one in five SSEER respondents selected the disciplines of geography (23.2%), sociology (22.41%), public administration/emergency management (21.92%), and decision-making and risk analysis (21.72%). Rounding out the top 10 most selected disciplines were planning (city and regional planning/urban planning/landscape architecture; 19.64%), political science (policy studies, public policy; 14.51%), communication studies (11.94%), public health/medicine/nursing (11.35%), and anthropology (11.25%).

Research Methods and Researcher Discipline. The cross-tabulation in Table 5 shows the five most common disciplines selected by SSEER members (disaster science, geography, sociology, public administration/emergency management, and decision-making and risk analysis) as they relate to the 10 most commonly selected methods. This table illustrates that although SSEER members across the five most common disciplines are most likely to use case studies (60.41% of respondents), different disciplines draw more or less on certain methodological approaches. For example, case study methods were most commonly used among those who identified disaster science (67.66%), geography (67.66%), and public administration/emergency management (66.67%) as their primary discipline. Sociologists are most likely to use in-depth interviews (74.01%) and those in decision-making and risk analysis most commonly selected survey research (66.82%).

Table 5. SSEER Respondents by Most Common Research Methods and Disciplines.

	Disaster Science		Geography		Sociology		Public Administration/ Emergency Management		Decision-Making and Risk Analysis		Total by Method	
	N	%	N	%	N	%	N	%	N	%	N	%
Case Study	231	67.66	159	67.66	137	60.35	148	66.67	139	63.18	612	60.41
Survey Research	193	58.48	156	66.38	134	59.03	134	60.36	147	66.82	603	59.53
In-depth Interviews	194	58.79	138	58.72	168	74.01	127	57.21	125	56.82	595	58.74
Qualitative Content Analysis	183	55.45	123	52.34	130	57.27	126	56.76	122	55.45	516	50.94
Community-Based Participatory Research	168	50.91	115	48.94	103	45.37	105	47.30	103	46.82	454	44.82
Statistical Analyses of Primary/Secondary Data	145	43.94	127	54.04	98	43.17	98	44.14	120	54.55	445	43.93
Focus Groups	159	48.18	104	44.26	114	50.22	99	44.59	113	51.36	440	43.44
Observation	137	41.52	85	36.17	96	42.29	95	42.79	87	39.55	378	37.31
Quantitative Content Analysis	114	34.55	87	37.02	54	23.79	78	35.14	93	42.27	318	31.39
Geospatial Analysis / GIS	122	36.97	152	64.68	41	18.06	57	25.68	95	43.18	302	29.81
Total by Discipline[a]	330	100.00	235	100.00	227	100.00	222	100.00	220	100.00	1013	100.00

Note. SSEER = Social Science Extreme Events Research; GIS = geographic information system.
[a]Because SSEER respondents could select all applicable choices for this survey question, the total represents the sum for each response choice by discipline.

Table 6. Professional Status of SSEER Respondents.

	Frequency	Percentage
Academic Researcher	586	57.85
Student	176	17.37
Government Researcher	94	9.28
Non-Profit Researcher	46	4.54
Independent Researcher	43	4.24
Private-Sector Researcher	26	2.57
Other[a]	42	4.15
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.
[a]Includes Others, Retired, and Missing.

Researcher Professional Status. As shown in Table 6, most SSEER respondents self-identify as academic researchers (57.85%). Nearly one fifth are students (17.37%). Less common among SSEER respondents are government researchers (9.28%), non-profit researchers (4.54%), independent researchers (4.24%), and private-sector researchers (2.57%).

Research Methods and Researcher Professional Status. The cross-tabulation in Table 7 shows the seven types of professional status available on the SSEER survey as they relate to the ten most commonly selected methods. This table illustrates that members across professional statuses are most likely to use case studies (60.41% of members). This is also the most common method used among government researchers (53.1%), nonprofit researchers (73.9%), independent researchers (88.3%), and those researchers in the other category (57.14%). Students reported being most likely to use in-depth interviews (59.09%), while academic and private sector researchers most commonly selected survey research (65.7% and 69.23%, respectively).

Researcher Type

Previously, scholars have introduced simple typologies to help characterize the status of the social science hazards and disaster research workforce (NRC, 2006; Peek et al., 2019). Drawing on those prior efforts, our SSEER survey asks respondents to rate their level of involvement in hazards or disaster research by choosing one of the following researcher types:

- *Core researcher*: Strongly self-identifies as a hazards/disaster researcher, has a deep commitment to the field, and has engaged in hazards and disaster research for a sustained amount of time.
- *Periodic researcher*: Is not primarily engaged in hazards and disaster research but focuses on related topics from time to time throughout one's professional career.

Table 7. SSEER Respondents by Most Common Research Methods and Professional Status.

	Academic Researcher		Student		Government Researcher		Non-Profit Researcher		Independent Researcher		Private-Sector Researcher		Other		Total by Method	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Case Study	352	60.07	97	55.11	50	53.19	34	73.91	38	88.37	17	65.38	24	57.14	612	60.41
Survey Research	385	65.70	86	48.86	48	51.06	27	58.70	21	48.84	18	69.23	18	42.86	603	59.53
In-Depth Interviews	363	61.95	104	59.09	38	40.43	28	60.87	27	62.79	14	53.85	21	50.00	595	58.74
Qualitative Content Analysis	299	51.02	86	48.86	49	52.13	27	58.70	25	58.14	11	42.31	19	45.24	516	50.94
Community-Based Participatory Research	261	44.54	77	43.75	37	39.36	29	63.04	19	44.19	12	46.15	19	45.24	454	44.82
Statistical Analyses of Primary/ Secondary Data	298	50.85	68	38.64	28	29.79	16	34.78	14	32.56	11	42.31	10	23.81	445	43.93
Focus Groups	265	45.22	59	33.52	39	41.49	26	56.52	18	41.86	14	53.85	19	45.24	440	43.44
Observation	209	35.67	58	32.95	36	38.30	22	47.83	19	44.19	11	42.31	23	54.76	378	37.31
Quantitative Content Analysis	199	33.96	50	28.41	27	28.72	16	34.78	9	20.93	7	26.92	10	23.81	318	31.39
Geospatial Analysis/ GIS	176	30.03	63	35.80	28	29.79	11	23.91	6	13.95	8	30.77	10	23.81	302	29.81
Total by Professional Status	586	100.00	176	100.00	94	100.00	46	100.00	43	100.00	26	100.00	42	100.00	1013	100.00

Note. SSEER = Social Science Extreme Events Research; GIS = geographic information system.

Table 8. SSEER Respondents by Researcher Type.

	Frequency	Percentage
Core Researcher	457	45.11
Emerging Researcher	243	23.99
Periodic Researcher	203	20.04
Situational Researcher	63	6.22
Missing	47	4.64
Total	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.

- *Situational researcher*: Not previously trained or involved in the hazards and disaster field but had the opportunity to study new phenomena or processes based on a situational event; for example, a researcher who undertook a study after his or her community was affected by a major disaster.
- *Emerging researcher*: Includes students and others who are new to the field and who are still learning about its disciplinary, multidisciplinary, or interdisciplinary histories, theories, methods, and approaches. Emerging researchers may have limited experience or may not have yet conducted their own original empirical research.

As shown in Table 8, most respondents described themselves as core researchers (45.11%). About an equal number of respondents identified as emerging researchers (23.99%) and periodic researchers (20.04%), with a smaller percentage indicating that they view themselves as situational researchers (6.22%).

Research Methods and Researcher Type. The cross-tabulation in Table 9 shows the four researcher types available on the SSEER survey as they relate to the 10 most commonly selected methods. This table demonstrates that across researcher types, most respondents used case studies (60.41%). The majority of core researchers chose survey research (66.52%), while emerging researchers most often selected in-depth interviews (58.85%). Periodic researchers selected the case study method and survey research most often (both at 58.13%), while situational researchers most frequently chose case study, survey research, and in-depth interviews (52.38% for all three).

Hazard/Disaster Type

SSEER respondents could select from three broad hazard/disaster types—natural hazards, technological disasters, and terrorist acts or other acts of intentional violence—and several hazards and disaster subtypes applicable to their research. As shown in Table 10, almost all SSEER members had studied some type of natural hazard (92.99%) including, for example, meteorological, hydrological, or geophysical extreme events,

Table 9. SSEER Respondents by Most Common Research Methods and Researcher Type.

	Core Researcher		Emerging Researcher		Periodic Researcher		Situational Researcher		Unknown Researcher Level		Total by Method	
	N	%	N	%	N	%	N	%	N	%	N	%
Case Study	297	64.99	135	55.56	118	58.13	33	52.38	29	61.70	612	60.41
Survey Research	304	66.52	130	53.50	118	58.13	33	52.38	18	38.30	603	59.53
In-Depth Interviews	288	63.02	143	58.85	107	52.71	33	52.38	24	51.06	595	58.74
Qualitative Content Analysis	265	57.99	110	45.27	95	46.80	25	39.68	21	44.68	516	50.94
Community-Based Participatory Research	227	49.67	104	42.80	71	34.98	32	50.79	20	42.55	454	44.82
Focus Groups	225	49.23	91	37.45	79	38.92	25	39.68	20	42.55	440	43.44
Observation	182	39.82	88	36.21	65	32.02	26	41.27	17	36.17	378	37.31
Statistical Analysis of Primary or Secondary Data	233	50.98	97	39.92	82	40.39	19	30.16	14	29.79	445	43.93
Quantitative Content Analysis	159	34.79	65	26.75	62	30.54	16	25.40	16	34.04	318	31.39
Geospatial Analysis / GIS	148	32.39	77	31.69	52	25.62	15	23.81	10	21.28	302	29.81
Total N for each type of Researcher	457	100.00	243	100.00	203	100.00	63	100.00	47	100.00	1013	100.00

Note. SSEER = Social Science Extreme Events Research; GIS = geographic information system.

Table 10. Type of Hazards/Disasters Studied by SSEER Respondents.

	Frequency	Percentage
Natural Hazards	942	92.99
Technological Hazards	280	27.64
Terrorist Acts	184	18.16

Note. SSEER = Social Science Extreme Events Research. Respondents could select more than one hazard or disaster type.

while far fewer studied technological disasters (27.64%) or terrorist acts or other acts of intentional violence (18.16%).

Research Methods and Hazard/Disaster Type. The cross-tabulation in Table 11 shows the three hazard/disaster types available on the SSEER survey as they relate to the 10 most commonly selected methods. This table shows that SSEER members across hazards/disaster type studied most often said they use the case study approach (64.97%). The case study is the most common approach used by researchers studying technological disasters (67.50%) and terrorism or other acts of intentional violence (65.22%). Natural hazards researchers most often indicated using case studies and survey research as their primary methodological approaches (both 60.83%).

Disaster Phase

When completing the survey, SSEER respondents identified each disaster phase they have researched in the past. They could select all phases they have studied across the disaster life cycle, including disaster preparedness, emergency response, short-term reconstruction, long-term recovery, and mitigation (Mileti, 1999). As shown in Table 12, most SSEER researchers had studied disaster preparedness (77.3%), while nearly two thirds studied mitigation (62.88%). Over half of all SSEER respondents indicated that they studied emergency response (57.65%) and/or long-term recovery (57.45%). Researchers were least likely to indicate that they had focused on short-term reconstruction (36.53%).

Research Methods and Disaster Phase. The cross-tabulation in Table 13 shows the five disaster phases as they relate to the 10 most commonly selected methods. Most researchers across phases indicated using case studies as a primary approach (60.41%), with those studying mitigation (64.68%), emergency response (64.04%), long-term recovery (65.29%), and short-term reconstruction (67.03%) selecting the case study method most frequently. Those SSEER members who study disaster preparedness selected survey research (61.94%) most often, although a nearly equal percentage (61.05%) said they use the case study approach.

Table 11. SSEER Respondents by Most Common Research Methods and Hazards/Disaster Type.

	Natural Hazards		Technological Hazards		Terrorist Acts		Total by Method	
	N	%	N	%	N	%	N	%
Case Study	573	60.83	189	67.50	120	65.22	612	64.97
Survey Research	573	60.83	170	60.71	109	59.24	603	64.01
In-Depth Interviews	562	59.66	174	62.14	109	59.24	595	63.16
Qualitative Content Analysis	482	51.17	166	59.29	106	57.61	516	54.78
Community-Based Participatory Research	430	45.65	134	47.86	78	42.39	454	48.20
Statistical Analyses of Primary/Secondary Data	424	45.01	121	43.21	77	41.85	445	47.24
Focus Groups	414	43.95	133	47.50	82	44.57	440	46.71
Observation	349	37.05	133	47.50	79	42.93	378	40.13
Quantitative Content Analysis	304	32.27	98	35.00	68	36.96	318	33.76
Geospatial Analysis/GIS	292	31.00	75	26.79	38	20.65	302	32.06
Total by Type of Hazard	942	100.00	280	100.00	184	100.00	942	100.00

Note. SSEER = Social Science Extreme Events Research; GIS = geographic information system.

Table 12. Disaster Phases Studied by SSEER Respondents.

	Frequency	Percent
Disaster Preparedness	783	77.3
Mitigation	637	62.88
Emergency Response	584	57.65
Long-Term Recovery	582	57.45
Short-Term Reconstruction	370	36.53

Note. SSEER = Social Science Extreme Events Research. Respondents could select more than one disaster phase.

Discussion and Conclusion

Teams of social scientists first began systematically studying disasters in the late 1940s and early 1950s (Quarantelli, 1987; Tierney, 2019). In the decades since, there have been several calls to learn more about the composition of this research workforce to ensure that it is prepared to meet the challenges posed by a highly unequal social world and an ever more turbulent natural world. In their report on the status of the field, the Committee on Disaster Research in the Social Sciences acknowledged, however, that "it is difficult to be very precise about the demographic structure of hazards and disaster research due to the absence of good data" (NRC, 2006, pp. 322-323). This article responds to that gap by summarizing the results of the first census of social scientists who study hazards and disasters. Our analysis of the SSEER network data has allowed us to characterize the demographic composition, methods and approaches, and other attributes among this dynamic research community.

As of March 2020, 1,013 individuals across five UN regions have completed the SSEER survey. Of those researchers, 740, or 73.05%, are located in the United States. This information alone represents an important finding, as previous best estimates placed the size of the U.S.-based social science hazards and disaster research workforce at "approximately 200" persons (NRC, 2006, p. 320).

Our analyses reveal some additional promising news regarding the demographic diversity and functional skill set (NRC, 2014) of this research community. Consider, for example, that despite the continuing underrepresentation of women in top leadership positions in hazards-focused federal mission agencies and academic disaster research centers, our work shows that more than half of the 1,013 hazards and disasters researchers in the SSEER database identify as female (52.02%). While this does not guarantee shifts at the top of organizational hierarchies, it does portend a more diverse future workforce in terms of gender representation.

The Committee on Disaster Studies also emphasized concerns with workforce shortfalls that could occur due to retirements without replacements and the overall "graying" of the field (NRC, 2006, p. 323). The SSEER database includes researchers who are between 21 and 78 years old, with an average age of about 41 years. With proper support, we believe that current and future cohorts are poised to sustain and continue to grow this vital research community.

Table 13. SSEER Respondents by Most Common Research Methods and Disaster Phase.

	Disaster Preparedness		Mitigation		Emergency Response		Long-term Recovery		Short-term Reconstruction		Total by Method	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Case Study	478	61.05	412	64.68	374	64.04	380	65.29	248	67.03	612	60.41
Survey Research	485	61.94	389	61.07	355	60.79	343	58.93	221	59.73	603	59.53
In-Depth Interviews	467	59.64	369	57.93	356	60.96	367	63.06	225	60.81	595	58.74
Qualitative Content Analysis	419	53.51	345	54.16	322	55.14	307	52.75	204	55.14	516	50.94
Community-Based Participatory Research	372	47.51	307	48.19	270	46.23	304	52.23	182	49.19	454	44.82
Statistical Analyses of Primary/Secondary Data	347	44.32	296	46.47	246	42.12	259	44.50	167	45.14	445	43.93
Focus Groups	363	46.36	293	46.00	267	45.72	265	45.53	173	46.76	440	43.44
Observation	298	38.06	241	37.83	243	41.61	250	42.96	174	47.03	378	37.31
Quantitative Content Analysis	266	33.97	227	35.64	199	34.08	183	31.44	119	32.16	318	31.39
Geospatial Analysis/GIS	233	29.76	226	35.48	168	28.77	184	31.62	119	32.16	302	29.81
Total by Phase	783	100.00	637	100.00	584	100.00	582	100.00	370	100.00	1,013	100.00

Note. SSEER = Social Science Extreme Events Research.

Our data on the racial and ethnic composition of the workforce requires further analysis, especially in light of missing data. It does indicate, however, a continued underrepresentation of Black and African American, Latino/a, American Indian, and Arab/Arab American researchers in the United States and beyond. This makes clear that there is a continuing and urgent need to invest in and expand training and mentoring programs and other initiatives designed to help ensure that social science researchers are reflective of the diverse communities that they study.

While the case study method was selected most frequently, SSEER researchers indicated that they often rely on other methods such as survey research, in-depth interviews, qualitative content analysis, community-based participatory research, statistical analyses of primary or secondary data, focus groups, observation, quantitative content analysis, and geospatial analysis/GIS. The fact that more than 80% of SSEER respondents indicated that they use four or more research methods suggests a functionally strong skill set among members of the community. At the same time, continued heavy reliance on case study approaches may diminish the opportunity for robust, longitudinal comparisons across time and place that can help enhance predictive understanding necessary to reduce the vulnerability and enhance the resiliency of individuals and communities affected by natural hazards (Peacock et al., 2008).

Our research also offers important insights regarding specific researcher attributes related to discipline, professional status, researcher type based on level of involvement in the field, hazard/disaster type studied, and disaster phase studied. Here, again, the story of the SSEER data is one of a larger and more diverse field than perhaps previously imagined. For instance, while sociology and geography have long been identified as the dominant perspectives in the field (NRC, 2006; Quarantelli, 1987; White & Haas, 1975), SSEER researchers identify with a much wider range of disciplines. In fact, the discipline that was most often chosen was disaster science. This is interesting, as disaster science is not a traditional or widely recognized discipline within the social sciences. We included disaster science as an option on the SSEER survey, however, in response to the growth of degree programs in this area of study and because it is increasingly used as an organizing framework for meta-analyses (Elsevier, 2017) and research agenda-setting (Wachtendorf, 2019). The fact that so many respondents chose disaster science to represent their disciplinary expertise—even including those with terminal degrees in traditional social science disciplines—speaks to the potential power of this particular unifying identity label in the field.

By asking researchers, for the first time, to categorize themselves based on their level of involvement, our analysis of the SSEER data offers new insights regarding researcher types. Specifically, we found that most SSEER respondents describe themselves as core researchers (45.11%), meaning they view themselves as highly involved in and deeply committed to hazards and disaster research. In addition, about an equal number of respondents identified as emerging researchers (23.99%) and periodic researchers (20.04%), with a smaller percentage indicating that they are situational researchers (6.22%). We recognize that researchers may move across these categories over time as they become more or less involved based on personal and professional commitments. This represents a “healthy fluidity” in the field (NRC,

2006, p. 322) and, importantly, an opportunity to recruit more core researchers from the existing pool of emerging, situational, and periodic researchers. An increased number of core researchers can help to strengthen the field while ensuring its continued expansion into new theoretical and empirical areas of inquiry (Tierney, 2007).

By conducting cross-tabulations of the data, we were able to characterize how key researcher attributes are associated with the use of common methods and approaches. While there was variability across research methods and researcher attributes, certain patterns emerged. Perhaps most striking was that regardless of which attribute we examined—such as discipline, professional status, or disaster phase—the case study approach, survey research, and in-depth interviews remained the methods of choice, while geospatial analysis and quantitative content analysis were much less commonly utilized, at least among the 10 most often selected methods.

In order for social science researchers to be prepared to meet 21st-century demands, it is vital that they receive holistic professional development and research training (Moseley, 2004; Neal, 2000). This might include, for instance, some combination of formal classroom study and mandatory fieldwork (Moseley, 2004) designed to equip students and other emerging researchers with the theoretical, methodological, and applied knowledge and skills necessary to understand and respond to a range of increasingly complex hazards and cascading disaster situations (Cutter, 2018; Mohammad & Peek, 2019).

In addition, social scientists—who have been largely excluded from the convergence revolution that is fundamentally transforming the biomedical sciences and engineering—need more advanced methodological training to ensure that they are poised to lead interdisciplinary and transdisciplinary teams that are now addressing some of the world's most pressing social, environmental, and technical challenges (see Peek et al., 2020). There should be more funding available for methodological training for social scientists, as well as continued and enhanced support for the research that follows. Any such training should, of course, be coupled with an equally in-depth focus on the ethical conduct of hazards and disaster research (Browne & Peek, 2014; Gaillard & Peek, 2019; Henderson & Liboiron, 2019; Kelman, 2005; Packenham et al., 2017; Van Brown, 2020). These types of workforce investments will pay substantial dividends through further broadening the horizons of scientific inquiry and discovery; more social science leadership could also help mitigate the unintended consequences of issuing technical fixes for what are fundamentally human problems.

Challenges and Limitations

As with any study, there are limitations to our data and approaches to analysis. First, our survey instrument was administered only in English. Although English is a global language that is widely used in scientific communities around the world, there are undoubtedly large numbers of hazards and disaster researchers who have been excluded from this English-only survey. We hope to overcome this limitation by offering more language options in future iterations of the survey and the census reporting that follows.

A second limitation is related to the first. Because the SSEER survey was designed by researchers located in the United States and was written initially in the English language by a native English speaker, some concepts and ideas are likely not transferable to other languages or cultures. For example, the racial and ethnic categories included in the SSEER survey were informed by the U.S. Census and other federal entities. These census categories have long been debated as problematic *within* the United States, to say nothing of issues *outside* the nation. Some SSEER respondents reside in countries that do not have the same racial and ethnic categories or have removed these types of questions altogether from census forms due to constitutional concerns. We are aware of these and other language and cultural constraints and have attempted to interpret the data with respect and caution.

A third limitation results from our use of our Natural Hazards Center publications, social media, and other networks for the initial distribution of the call to join SSEER (Peek, 2018). This may have promoted membership among hazards and disaster researchers who are already familiar with and connected to the Center. In light of our recognition of both the strengths and limitations of our existing networks, we worked diligently to encourage the sharing and distribution of the SSEER survey across platforms to address common concerns about selection bias in research (Sterba & Foster, 2011) and the potential for convenience sampling (Battaglia, 2011). As SSEER membership has expanded, we have noted a marked increase in sign-ups from those who are not otherwise connected to the Center, which we believe bodes well for the future of this network and our potential to eventually generate a truly global census.

A fourth limitation emanates from our own resources and capacity as a research team. Most traditional censuses require a substantial financial and human resource commitment, and they are conducted at a specific point in time and then are updated on a regular basis. For instance, a census of the U.S. population is taken every 10 years, as mandated by the Constitution. While our goal, too, is to offer a regular snapshot of the social science hazards and disaster community, we have had to design our census differently, where we update the data monthly based on voluntary signups to the SSEER survey. Because of the rapid growth of this network, which expanded to 1,013 members in a matter of less than 2 years, it has taken our team a substantial amount of time to clean, code, organize, and analyze the data—only a fraction of which is represented here. Now that we have our framework in place, our hope is that we can issue updates on the state of the social science hazards and disaster research workforce more regularly as the network continues to grow.

As disasters increase in frequency and magnitude, and as more people are exposed to their effects, the social science hazards and disaster research community must be prepared to respond by bringing the full force of our knowledge and expertise to bear. The SSEER network is made up of a diverse, highly skilled group of researchers with the potential to mobilize to apply their knowledge and expertise to help reduce the harm and suffering caused by disasters. It is important to continue to monitor the status of this research workforce so we can see not just who counts themselves among the ranks of social science hazards and disaster researchers, but so we can identify what matters most when investing in the future vitality of this research community.

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Notes

1. Because of the large number of categories in some of the survey response options, and because respondents could "select all" choices that applied for many variables of interest, we do not present chi-square analyses here. For more on the logic of when to use this statistical approach, see McHugh, 2013.
2. The SSEER survey includes these two discrete response options: "statistical analysis of primary data" and "statistical analysis of secondary data." Most researchers who engaged in one form of statistical analysis used both. Therefore, for the purposes of our analyses, we combined the responses into one variable, without excluding those who chose only one form of statistical analysis or the other.

References

Anderson, W. A. (1990). Nurturing the next generation of hazards researchers. *Natural Hazards Observer*, *15*(2), 1-2.

Anderson, W. A., & Mattingly, S. (1991). Future directions. In T. E. Drabek & G. J. Hoetmer (Eds.), *Emergency management: Principles and practice for local government* (pp. 311-335). International City Management Association.

Andrulis, D. P., Siddiqui, N. J., & Gantner, J. L. (2007). Preparing racially and ethnically diverse communities for public health emergencies. *Health Affairs*, *26*(5), 1269-1279. https://doi.org/10.1377/hlthaff.26.5.1269

Battaglia, M. (2011). Convenience sampling. In P. J. Lavrakas (Ed.), *Encyclopedia of survey research methods* (pp. 149-150). Sage.

Bennett, S., Agyepong, I. A., Sheikh, K., Hanson, K., Ssengooba, F., & Gilson, L. (2011). Building the field of health policy and systems research: An agenda for action. *PLoS Medicine*, *8*(8), e10001081. https://doi.org/10.1371/journal.pmed.1001081

Browne, K. E., & Peek, L. (2014). Beyond the IRB: An ethical toolkit for long-term disaster research. *International Journal of Mass Emergencies and Disasters*, *32*(1), 82-120.

Cutter, S. L. (2018). Compound, cascading, or complex disasters: What's in a name? *Environment: Science and Policy for Sustainable Development*, *60*(6), 16-25. https://doi.org/10.1080/00139157.2018.1517518

DeRouen, J., & Smith, K. (2020). Reflective listening visualization: Enhancing interdisciplinary disaster research through the use of visualization techniques. *Risk Analysis*. Advance online publication. https://doi.org/10.1111/risa.13464

Drabek, T. E. (1970). Methodology of studying disasters: Past patterns and future possibilities. *American Behavioral Scientist*, *13*(3), 331-343. https://doi.org/10.1177/000276427001300303

Dynes, R. (1994). *Some comments on the research enterprise studying disaster: Cautions on fieldwork*. Disaster Research Center, University of Delaware.

Dynes, R. (1997). *Disasters, collective behavior, and social organization*. University of Delaware Press.

Dynes, R., & Tierney, K. J. (Eds). (1994). *Disasters, collective behavior, and social organization*. University of Delaware Press.

Elsevier. (2017). *A global outlook on disaster science*. https://www.elsevier.com/research-intelligence/research-initiatives/disasterscience2017

Frailing, K., & Van Brown, B. (2020). Introduction to methods matter in disaster research. *American Behavioral Scientist*, *64*, 1047-1049. https://doi.org/10.1177/0002764220938111

Fuchs, S., Kuhlicke, C., & Volker, M. (2011). Editorial for the special issue: Vulnerability to natural hazards: The challenge of integration. *Natural Hazards*, *58*(2), 609-619. https://doi.org/10.1007/s11069-011-9825-5

Gaillard, J. C., & Peek, L. (2019). Disaster-zone research needs a code of conduct. *Nature*, *575*, 440-442. https://doi.org/10.1038/d41586-019-03534-z

Gharaibeh, N., Oti, I., Meyer, M., Hendricks, M., & Van Zandt, S. (2019). Potential of citizen science for enhancing infrastructure monitoring data and decision-support models for local communities. *Risk Analysis*. Advance online publication. https://doi.org/10.1111/risa.13256

GRID. (2017). *Global report on internal displacement*. Norwegian Refugee Council, Internal Displacement Monitoring Centre.

Gruntfest, E. (2018). *Weather and society: Toward integrated approaches*. Wiley-Blackwell. https://doi.org/10.1002/9781118525913

Harper, D. W., & Frailing, K. (Eds.). (2016). *Crime and criminal justice in disaster* (3rd ed.). Carolina Academic Press.

Henderson, J., & Liboiron, M. (2019). Compromise and action: Tactics for doing ethical research in disaster zones. In J. Kendra, S. G. Knowles, & T. Wachtendorf (Eds.), *Disaster research and the second environmental crisis* (pp. 295-318). Springer. https://doi.org/10.1007/978-3-030-04691-0_15

Institute of Medicine. (2015). *Enabling rapid and sustainable public health research during disasters*. The National Academies Press.

Kelman, I. (2005). Operational ethics for disaster research. *International Journal of Mass Emergencies and Disasters*, *23*(3), 141-158. https://pdfs.semanticscholar.org/e7ec/68de698c9fdc749827c93802d11a8f34ec14.pdf

Kendra, J. M., & Wachtendorf, T. (2016). *American Dunkirk: The waterborne evacuation of Manhattan on 9/11*. Temple University Press.

Lee, A. C. K., Booth, A., Challen, K., Gardois, P., & Goodacre, S. (2014). Disaster management in low- and middle-income countries: Scoping review of the evidence base. *Emergency Medicine Journal*, *31*(1), 78-83. https://doi.org/10.1136/emermed-2013-203298

Lindell, M. K., Murray-Tuite, P., Wolshon, B., & Baker, E. J. (2019). *Large-scale evacuation: The analysis, modeling, and management of emergency relocation from hazardous areas*. Routledge. https://doi.org/10.4324/9781315119045

Lindell, M. K., & Perry, R. W. (2012). The Protection Action Decision Model: Theoretical modifications and additional evidence. *Risk Analysis*, *32*(4), 616-632. https://doi.org/10.1111/j.1539-6924.2011.01647.x

Louis-Charles, H., & Dixon, B. (2015). *A blueprint for change: An emerging initiative paves the way for increased diversity in hazards mitigation*. Natural Hazards Center, University of Colorado Boulder. https://hazards.colorado.edu/article/a-blueprint-for-change-an-emerging-initiative-paves-the-way-for-increased-diversity-in-hazards-mitigation

McHugh, M. L. (2013). The chi-square test of independence. *Biochemical Medicine*, *23*(2), 143-149. https://doi.org/10.11613/BM.2013.018

McNutt, M. K. (2017). Convergence in the geosciences. *GeoHealth*, *1*(1), 2-3. https://doi.org/10.1002/2017GH000068

McPhillips, L. E., Chang, H., Chester, M. V., Depietri, Y., Friedman, E., Grimm, N. B., Kominoski, J. S., McPhearson, T., Mendez-Lazaro, P., Rosi, E. J., & Shiva, J. S. (2018). Defining extreme events: A cross-disciplinary review. *Earth's Future*, *6*(3), 441-455. https://doi.org/10.1002/2017EF000686

Meyer, M. (2018). Social capital in disaster research. In H. Rodríguez, W. Donner, & J. Trainor (Eds.), *Handbook of disaster research* (2nd ed., pp. 263-286). Springer. https://doi.org/10.1007/978-3-319-63254-4_14

Mileti, D. S. (1987). Sociological methods and disaster research. In R. Dynes, B. de Marchi, & C. Pelanda (Eds.), *Sociology of disasters: Contributions of sociology to disaster research* (pp. 57-69). Franco Angeli.

Mileti, D. S. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Joseph Henry Press.

Mohammad, L., & Peek, L. (2019). Exposure outliers: Children, mothers, and cumulative disaster expsoure in Louisiana. *Journal of Family Strengths*, *19*(1), Article 4. https://digitalcommons.library.tmc.edu/jfs/vol19/iss1/4/

Moseley, L. (2004). Educational needs for disaster management. *Australian Journal of Emergency Management*, *19*(4), 28-31. http://www.austlii.edu.au/au/journals/AUJlEmMgmt/2004/54.pdf

Munich, RE. (2018). *Hurricanes cause record losses in 2017: The year in figures*. https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/natural-disasters/2017-year-in-figures.html

Nateghi, R., Sutton, J., & Murray-Tuite, P. (2019). The frontiers of uncertainty estimation and communication in interdisciplinary disaster research and practice. *Risk Analysis*. Advance online publication. https://doi.org/10.1111/risa.13337

National Research Council. (2006). *Facing hazards and disasters: Understanding human dimensions*. The National Academies Press.

National Research Council. (2014). *Convergence: Facilitating transdisciplinary integration of life sciences, physical sciences, engineering, and beyond*. The National Academies Press.

Neal, D. (2000). Developing degree programs in disater management: Some reflections and observations. *International Journal of Mass Emergencines and Disasters*, *18*(3), 417-437.

Norris, F. H., Galea, S., Friedman, M. J., & Watson, P. J. (Eds.). (2006). *Methods for disaster mental health research*. The Guilford Press.

Omi, M., & Winant, H. (2014). *Racial formation in the United States* (3rd ed.). Routledge. https://doi.org/10.4324/9780203076804

Packenham, J. P., Rosselli, R. T., Ramsey, S. K., Taylor, H. A., Fothergill, A., Slutsman, J., & Miller, A. (2017). Conducting science in disasters: Recommendations from the NIEHS Working Group for Special IRB Considerations in the review of disaster related research. *Environmental Health Perspectives*, *125*(9), 1-6. https://doi.org/10.1289/EHP2378

Peacock, W. G., Kunreuther, H., Hooke, W. H., Cutter, S. L., Chang, S. E., & Berke, P. R. (2008). *Toward a resiliency and vulnerability observatory network: RAVON* (Hazard Reduction and Recovery Center Reports, 08-02R). http://hrrc.arch.tamu.edu/_common/documents/08-02.pdf

Peek, L. (2006). Transforming the field of disaster research through training the next generation. *International Journal of Mass Emergencies and Disasters*, *24*(3), 371-389. http://www.ijmed.org/articles/40/download/

Peek, L. (2018). *A call to social scientists*. Natural Hazards Center, University of Colorado Boulder. https://hazards.colorado.edu/news/director/a-call-to-social-scientists

Peek, L., Tobin, J., Adams, R., Wu, H., & Mathews, M. (2020). A framework for convergence research in the hazards and disaster field: The natural hazards engineering research infrastructure CONVERGE facility. *Frontiers in Built Environment*. DOI: 10.3389/fbuil.2020.00110

Peek, L., Wu, H., & Mathews, M. (2019). *The 2018 Social Science Extreme Events Research (SSEER) Census*. CONVERGE, Natural Hazards Center, University of Colorado Boulder. https://converge.colorado.edu/research-networks/sseer/researchers-census/2018

Phillips, B. (2014). *Qualitative disaster research*. Oxford University Press.

Quarantelli, E. L. (1987). Disaster studies: An analysis of the social and historical factors affecting the development of research in the area. *International Journal of Mass Emergencies and Disasters*, *5*(3), 285-310.

Reilly, A. C., Dillon-Merrill, R. L., & Guikema, S. D. (2018). Agent-based models as an integrating boundary object for interdisciplinary research. *Risk Analysis*. Advance online publication. https://doi.org/10.1111/risa.13134

Roser, M., & Ritchie, H. (2019). Natural disasters. *Our World in Data*. https://ourworldindata.org/natural-disasters

Stallings, R. A. (Ed.). (2002). *Methods of disaster research*. Xlibris.

Sterba, S. K., & Foster, E. M. (2011). Self-selected sample. In P. J. Lavrakas (Ed.), *Encyclopedia of survey research methods* (pp. 807-808). Sage.

Sutley, E. J., & Hamideh, S. (2017). An interdisciplinary system dynamics model for post-disaster housing recovery. *Sustainable and Resilient Infrastructure*, *3*(3), 109-127. https://doi.org/10.1080/23789689.2017.1364561

Sutley, E. J., van de Lindt, J. W., & Peek, L. (2017). Community-level framework for seismic resiliency, Part I: Coupling socioeconomic characteristics and engineering building systems. *Natural Hazards Review*, *18*(3). https://doi.org/10.1061/(ASCE)NH.1527-6996.0000239

Thomas, D. S. K., Phillips, B. D., Lovekamp, W. E., & Fothergill, A. (Eds.). (2013). *Social vulnerability to disasters* (2nd ed.). CRC Press.

Tierney, K. J. (2002). The field turns fifty: Social change and the practice of disaster research. In R. A. Stallings (Ed.), *Methods of disaster research* (pp. 349-374). Xlibris.

Tierney, K. J. (2007). From the margins to the mainstream? Disaster research at the crossroads. *Annual Review of Sociology*, *33*, 503-525. https://doi.org/10.1146/annurev.soc.33.040406.131743

Tierney, K. J. (2019). *Disasters: A sociological approach*. Polity Press.

Tierney, K. J., Lindell, M. K., & Perry, R. W. (2001). *Facing the unexpected: Disaster preparedness and response in the United States*. Joseph Henry Press.

United Nations. (2017). *Principles and recommendation for population and housing censuses, Revision 3*. Author.

Van Brown, B. (2020). Disaster research "methics": Ethical and methodological considerations of researching disaster-affected populations. *American Behavioral Scientist*, *64*, 1050-1065. https://doi.org/10.1177/0002764220938115

Wachtendorf, T. (2019). A case for the grand challenge of disaster science. In J. Kendra, S. G. Knowles, & T. Wachtendorf (Eds.), *Disaster research and the second environmental crisis* (pp. 343-351). Springer. https://doi.org/10.1007/978-3-030-04691-0_17

Wallemacq, P., & House, R. (2018). *Economic losses, poverty, and disasters: 1998-2017*. Centre for Research on the Epidemiology of Disasters, United Nations Office for Disaster Risk Reduction.

White, G. F., & Haas, J. E. (1975). *Assessment of research on natural hazards*. MIT Press.

Wilby, R. L., & Keenan, R. (2012). Adapting to flood risk under climate change. *Progress in Physical Geography*, *36*(3), 348-378. https://doi.org/10.1177/0309133312438908

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Haorui Wu is an assistant professor in the School of Social Work at Dalhousie University. With an interdisciplinary background in social work, architecture, urban planning, and urban design, his community-based interdisciplinary research and emerging practice examine various socio-ecological vulnerabilities. His work also addresses the social and health needs of residents in disaster-stricken regions. His scholarship advances community resilience and sustainability in the global context of climate change, disaster, and willful acts of violence. He received his doctorate at the University of British Columbia and also served as a postdoctoral research associate at the Natural Hazards Center at the University of Colorado Boulder.