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A Review Of Mental Health Screening Tools Used In Disaster Research

Ashley Rose Moore
mooreashley266@gmail.com

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A Review of Mental Health Screening Tools Used in Disaster
Research

Ashley Moore

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Yale University School of Public Health

Sarah Lowe, PhD

Trace Kershaw, PhD

Abstract

Introduction: The effects of disasters are widespread and heavily studied. While attention to disasters' impacts on mental health is growing, knowledge about these effects is fragmented due to the wide variety of assessment tools used in post-disaster settings. The purpose of this study is to review mental health assessment tools and their use in populations affected by disasters.

Methods: A systematic search was conducted in PubMed, PsycINFO, and Google Scholar for commonly-used tools that assess PTSD, anxiety, depression, substance use disorder, and general mental health in disaster settings. Next, a search for scientific studies that used the selected tools in disaster-affected populations was conducted to collect the data for analysis. Data were extracted on study outcomes produced from these tools as well as study characteristics and then analyzed to compare across tools within each symptom assessed.

Findings: Ten assessment tools for analysis were identified. Seventy-eight studies using these tools were collected. Most of the tools did not have a suggested cutoff score for determining probable diagnosis. Most of the studies identified were conducted in Asia and used the Impact of Events Scale - Revised (IES-R). The outcomes, including prevalence, sample size, sample type, disaster type, and continent did not significantly vary across all of the tools, with the exception of PTSD tools, which were significantly more likely to be used in studies with non-representative samples. Studies in North America disproportionately used the IES-R to study hurricanes.

Conclusion: Although the studies show similar results across tools, the variety of tools and cutoff scores still prevent adequate synthesis of the mental health effects of disasters. It is recommended that researchers and humanitarian workers consider the context of the tool that they plan to use and use a tool with a specified cutoff that has been successfully used in similar settings.

Acknowledgements

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Introduction

Disasters not only damage physical structures, but also result in physical and emotional harm among those who experience them. A natural disaster is a naturally-occurring event that is so devastating to a population and region that it requires support from external sources.[1] An average of 348 disaster events occur every year.[1] Most disasters from 1998 to 2017 were extreme weather events, such as floods, droughts, and heat waves.[1] In addition to the economic and structural impacts of disasters, the trauma of disasters can induce psychological distress among survivors. Synthesized research about disaster mental health shows that posttraumatic stress disorder, major depressive disorder, and substance use disorder are common outcomes among those who experience a natural disaster.[2] Psychological distress and psychiatric disorders have been shown to increase after a natural disaster when compared to pre-disaster data.[3] Disaster mental health research is heavily focused on posttraumatic stress disorder (PTSD) and indicates that the prevalence of PTSD and depression in these settings is much higher than in the general population.[4] In addition, low-income countries are generally more vulnerable to disasters due to greater disaster frequency and infrastructure damage.[5]

Great variability exists among the methods for evaluating mental health in post-disaster settings.[2] The lack of standardization in assessment approaches hinders researchers' and humanitarian organizations' ability to ascertain the true impact of disasters on mental health. For example, a review by Nera, Nandi, and Galea estimated a 30-40% prevalence of PTSD among disaster survivors using screening tools, which vastly differed from another study using diagnostic interviews that resulted in a 16% post-disaster PTSD prevalence estimate.[6] In-depth diagnostic interviews may be the gold standard for mental health assessment,[7] but research in disaster settings and populations affected by disasters warrants more brief and easy-to-use tools that do not require a clinician assessment. In addition, rapid screening tools can be useful in decision-making and program planning due to their ability to obtain the burden of mental distress in a time-limited situation.

While many reviews exist on the mental health impact of natural disasters,[2-4,6] few actually examine how these outcomes are measured. One review examined the mental health assessment tools used for research on children affected by disasters.[8] However, this review excluded populations older than 18 years, limiting the generalizability to broader populations. Another review highlighted the challenges and best practices for mental health assessment in low-resource settings.[9] However, the review was not disaster-specific and did not discuss actual tools used for measurement. An additional review provided an in-depth discussion of mental health screening tools, but only those used in refugee children populations, again limiting the generalizability of the study.[10] To this date, no review exists that focuses on mental health assessment tools used in general populations affected by disasters.

Accurate measurement of mental health is crucial for identifying those in distress and producing evidence that informs disaster preparedness and response programs. The purpose of this critical

review is to evaluate the appropriateness and assessment variability of different tools for studying or assessing the mental health effects of disasters in the general population.

Methods

Assessment tool search

I compiled a list of mental health assessment tools using Google Scholar, PsycINFO, and PubMed search engines. Each tool had to be individual, brief (less than 30 minutes), developed in or after 1990, and non-diagnostic to be included in the study. A combination of the following Medical Subject Headings (MeSH) was used for this search: "symptom assessment," "standards," "emergencies," "disasters," "humanitarian assistance," "mental health," "posttraumatic stress disorder," "depression," "substance use disorders." I collected information from references in review studies to obtain comprehensive information about the tools and ascertain which tools are commonly used in post-disaster settings. I used PsycTESTS to obtain concrete information about the length, purpose, existence of translations, and psychometric properties for each tool. I excluded tools that evaluate community needs, assess lifetime mental illness, or involve in-depth interviews. I selected the most recent version if multiple versions of the tool existed.

Study search

I used the PRISMA checklist to guide the study search.[11] I searched PubMed and Google Scholar for peer-reviewed literature that used at least one of the selected assessment tools in disaster settings and used a combination of the following keywords in the full text: [assessment tool (not MeSH)] *and* "disasters" or "natural disasters." Inclusion and exclusion criteria are summarized in Table 1.

Table 1. Inclusion and exclusion criteria for study search

Criteria type	Inclusion	Exclusion
Year in which study was conducted	2000 – 2019	Before 2000
Disaster type	Natural (hurricanes, earthquakes, storms, floods, tsunamis, typhoons), technological (ferry disaster, major explosion)	Terrorism, conflict

Age of study population	Adolescents & children (<18 years) and adults (>= 18 years)	N/A
Study population characteristics	Persons affected by a disaster, including refugees and displaced persons	Veterans not affected by a disaster, persons not directly affected by disaster
Study type	Epidemiological	Systematic or literature review, intervention evaluation, meta-analysis

If no studies corresponded with a particular tool, then that tool was dropped from the list.

Researchers at the Centre for Research on the Epidemiology of Disasters were consulted regarding study or tool eligibility throughout the data collection process.

Data Analysis

The data analysis for this paper was generated using SAS software.[12]

Data Extraction

To examine the tools based on the studies that used them, I extracted the disaster type, continent, sample size, sample type (representative or not), prevalence, and mean score reported in the studies. For studies that reported only stratified prevalence or means, I extracted that data for descriptive purposes but did not include it in the overall analysis because stratified measures do not represent the total prevalence obtained using a tool. One study only reported an item mean score, and this study was also excluded from the analysis.

Overall Analysis

To examine the descriptive information for each tool, I first computed the mean, minimum, and maximum prevalence, mean score, and sample size among all of the studies using the given tool. Second, I ran a one-way ANOVA to analyze variation in prevalence and sample size by tool within each symptom category (e.g., PTSD, depression). Second, I ran a logistic regression analysis stratified by tool to examine the use of representative versus non-representative sample types among tools within the symptom categories. Finally, I ran a chi square with Fisher's exact test and standardized residuals to examine variation in tools by disaster and tools by continent within the symptom categories.

For tools that were used in more than 20 studies, I ran further analyses. Specifically, I ran a chi square analysis with Fisher's exact test to examine the difference between continent and disaster
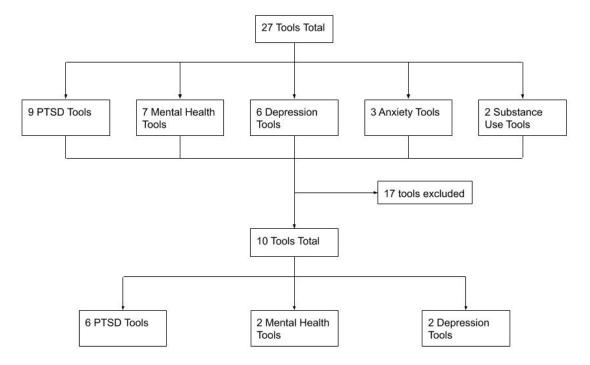
among the studies. Then I ran a standardized residuals analysis. I also ran a one-way ANOVA to examine variation in sample size, prevalence, and mean score by continent and disaster, in addition to logistic regression to examine the sample type by continent and disaster.

Results

Tool Search Results

The assessment tool search resulted in a total of 27 tools for analysis consisting of nine tools for PTSD, seven tools for general mental health, six tools for depression, three tools for anxiety, and two tools for substance use disorder. Figure 1 outlines the tool search strategy. Sixteen tools were excluded from the study due to a lack of evidence regarding their use in populations affected by disasters. Another tool was excluded due to it being developed before 1990. Due to exclusion criteria, all tools assessing substance use disorder and anxiety were excluded.

Figure 1. Tool Selection

Ten tools remained for analysis: six tools for PTSD, two tools for depression, and two tools for general mental health. All tools but the Screening Questionnaire for Disaster Mental Health (SQD) originated in English. All of the tools reported adequate psychometric properties, aside from the tools that have not yet been validated. The tool characteristics can be found in Table 2.
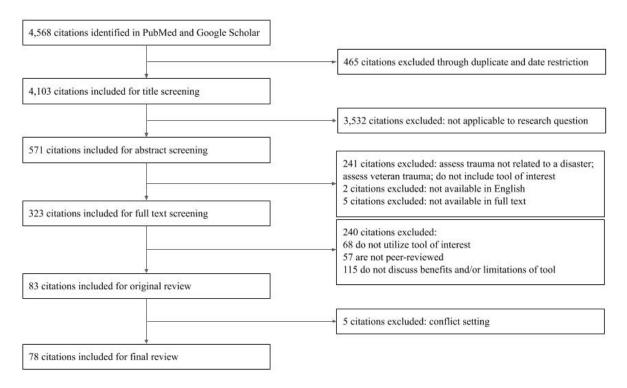
Table 2. Tool Characteristics

Tool	Year	Validity	Reliability	Length	Score range	Suggested cutoff	Versions other than English
Depression tools							
Beck Depression Inventory II[13] (BDI-II)	1996	Good content and convergent validity	Alpha = 0.93	21 items	0 – 63	None	Arabic, Japanese, Portuguese, Swahili, Xhosa
Patient Health Questionnaire 9[14] (PHQ-9)	1999	Good criterion, construct, and external validity	Alpha = 0.89	9-10 items	0 – 27	5/9 symptoms present indicates major depression	Afaan Oromo, Chichewa, Farsi, Haitian Creole, Korean, Nepali, Somali, Spanish, Vietnamese
PTSD tools							
Children's PTSD Symptom Scale[15] (CPSS)	2001	Convergent validity = 0.80; 95% of cases were correctly identified	Alpha = 0.89	24 items	0 – 51	None	Kirundi
Davidson Trauma Scale[16] (DTS)	1997	Good concurrent, construct, and predictive validity	Good test-retest and split-half reliability and internal consistency	17 items	0 – 68	None	Korean
Impact of Events Scale - Revised[17] (IES-R)	1997	Construct validity = 0.84	Alpha = 0.96	22 items	0 – 88	None	Arabic, Bosnian, Chinese, German, Korean, Persian, Sinhala
PTSD Checklist - Specific[18] (PCL-S)	1993	Good convergent validity	Good test-retest reliability and internal consistency	20 items	17 – 85	None	Norwegian
PTSD Symptom Scale - Self Report[19] (PSS-SR)	1993	Concurrent validity = 0.68	Good test-retest reliability and internal consistency	17 items	0 – 51	None	Norwegian

SPAN Self-Report Screen[20] (SPAN)	2002	Unknown	Unknown	4 items	0 – 20	Sum score of 5 indicates positive result	None
General mental health tools							
Screening Questionnaire for Disaster Mental Health[21] (SQD)	2007	Convergent validity = 0.94	Alpha = 0.83	12 items	0 – 12	None	Japanese
WHO-UNHCR Assessment Schedule of Serious Symptoms in Humanitarian Settings[22] (WASSS)	2012	Unknown	Unknown	6 items plus a household roster	--	None	None

Study Search Results

Seventy-eight studies are included in this analysis. The full search process is shown in Figure 2.

Figure 2. Study Search

Data Extraction Results

The frequency of continents included in the studies are as follows: 55 studies were conducted in Asia, 16 in North America, five in Europe, and two in Australia. Forty-two studies were conducted among populations affected by an earthquake, 12 by a hurricane, six by a tsunami, and 18 by other disasters (e.g., bushfire, flood, volcano, snowstorm). The studies and their characteristics can be found in Supplemental Table 1.

Overall Analysis Results

Prevalence in studies was measured by the proportion of those who met the criteria for probable diagnosis by falling above the set cutoff score determined by the researchers of the studies. Studies that used tools that measure PTSD did not differ significantly by prevalence ($F[5,23]=0.99$, $p=0.444$). Studies that used tools to measure depression also did not differ significantly by prevalence ($F[1,3]=0.76$, $p=0.448$). No studies that used tools to measure general mental health reported a prevalence value. The average (mean) outcomes for all of the tools can be found in Table 4.

Twenty-seven of the studies used a representative sample, while 51 did not. Studies that used tools to assess PTSD symptoms were significantly different in terms of sample type (OR=0.57, 95% CI 0.34 to 0.98, $p=0.040$). Specifically, studies that use tools to assess PTSD were 0.57 times as likely to have a representative sample than a non-representative sample. Studies that used tools to assess depression did not differ significantly by sample type (OR=0.80, 95% CI 0.04 to 14.64, $p=0.880$). In addition, all of the studies that used tools to assess general mental health used representative samples.

In terms of sample size, the average sample size for all studies was 908.83 (min=34, max=13,129). Studies that used tools to assess PTSD did not differ significantly in sample size ($F[5,59]=0.73$, $p=0.605$). Studies that used tools to assess depression also did not differ significantly in sample size ($F[1,8]=0.03$, $p=0.873$). Finally, studies that used tools to assess general mental health did not differ significantly in sample size ($F[1,1]=2.78$, $p=0.344$).

The Fisher's exact test output indicated that the tools within all symptom categories did not differ significantly by disaster type or continent. Specifically, studies that used tools that assess PTSD were not significantly different by disaster type ($X^2(15)=13.94$, $p=0.684$) or continent ($X^2(15)=12.83$, $p=0.506$). Studies that used tools that assess depression were also not significantly different by disaster type ($X^2(2)=1.11$, $p=0.574$) or continent ($X^2(3)=2.86$, $p=0.414$). Finally, studies that used tools that assess general mental health did not differ significantly by disaster type ($X^2(1)=0.75$, $p=0.387$) or continent ($X^2(1)=0.75$, $p=0.387$).

Table 4. Study and Tool Outcomes

Tool	Number of studies*	Average prevalence	Average mean score	Average sample size
Depression tools				
BDI II	3	19.85%	18.50	529.67
PHQ-9	7	10.70%	8.76	585.00
PTSD tools				
CPSS	11	16.78%	12.86	730.64
DTS	3	37.95%	--	697.00
IES-R	44	32.37%	23.49	965.29
PCL-S	8	19.53%	32.90	796.33
PSS-SR	2	6.70%	18.50	683.00
SPAN	2	20.90%	--	3,332.00
General mental health tools				
SQD	2	--	--	1,089.50
WASSS	1	--	--	513.00

*Note: does not add up to 78 because some studies used multiple tools

IES-R Analysis Results

Only the IES-R was used in a sufficient amount of studies (n=44) to be individually analyzed. Among all studies that used this tool, there is a significant relationship between continent and disaster, $X^2(9)=40.23$, p<0.001. The standardized residuals analysis indicates that within North America, the frequency of studies examining the effects of hurricanes was significantly greater than what was expected, with a standardized residual of 6.060. In addition, studies that examined hurricanes in Asia occurred less frequently than expected, with a standardized residual of -4.565. In Europe and Australia, none of the disaster frequencies were different from expected. The sample size ($F[3,37]=0.68$, p=0.571), sample type (OR=1.22, 95% CI 0.74 to 2.03, p=0.433), prevalence ($F[3,15]=0.35$, p=0.786), and mean ($F[3,6]=0.37$, p=0.779) did not differ significantly by disaster. Additionally, sample type (OR=1.72, 95% CI 0.54 to 5.54, p=0.360), prevalence ($F[2,16]=0.36$, p=0.702), and mean ($F[2,7]=1.91$, p=0.217) did not differ significantly by continent. However, the sample size by continent did differ significantly, ($F[3,37]=3.75$, p=0.019). Specifically, the sample sizes of studies conducted in Europe were significantly greater than those in the other three continents.

Discussion

This study is among the first to analyze mental health assessment tools and the studies that use them in the context of natural disasters. I searched the literature for commonly-used mental health assessment tools for populations affected by disasters and found a variety of different tools that assess PTSD, depression, and general mental health, but most of the tools in the final list measure PTSD symptoms. Then I performed another search of peer-reviewed literature to obtain studies that used these tools. More than half of the studies use the IES-R, a tool that assesses PTSD.

Most of the studies were conducted in Asia, followed by North America. In addition, most of the studies examined the effects of earthquakes. This is likely related with the specific disaster event studied, as the Wenchuan Earthquake and the Great East Japan Earthquake are among the most frequently studied disasters in studies included for this review. While Asia bears the burden of the majority of disasters globally, research has clearly neglected the effects of disasters in Africa, Australia, and Europe.[1]

In terms of the tools' psychometric properties, most of the tools exhibit high reliability and validity. The length of the tools ranges from 4 to 24 items. Only a fraction of the tools has an established cutoff score. The more widely-used tools have been translated to up to eight different languages, while other tools only exist in English. All but one of the tools were originally developed in English.

Most of the scales were not significantly different in terms of their prevalence estimates, or the sample sizes or sample type of the studies that used them. However, tools that assess PTSD were more likely to be used in studies with non-representative samples than representative samples, which may affect the generalizability of those studies. Tool use frequency did not differ significantly among different types of disasters or continents.

Most of the tools that assess mental health after disasters focus on PTSD. This finding is expected due to PTSD being the most studied outcome after a disaster. The IES-R is by far the most used tool out of all of the studies included. However, this tool is not necessarily the most used in PTSD research and is only one tool among many that assess PTSD.[8] While the inclusion/exclusion criteria for this review may have contributed to the disproportionate appearance of the IES-R in the literature, it is likely that the tool was heavily used due to its ease and perceived appropriateness for disaster-affected populations.

The tools have a wide range of items and translations, and this review provides researchers with a table to quickly reference to determine which tool would be most useful in the context of their research. However, the fact that only two tools have suggested cutoff scores raises some concerns. To be sure, the ability to set the cutoff allows for control over sensitivity and specificity depending on the population. However, inconsistencies of cutoffs across studies prevents the synthesis of this evidence and reduces researchers' ability to compare findings. To

increase consistency, researchers can refer to other similar studies to determine what cutoff they should use.

The post-disaster mental health prevalence estimates did not significantly differ by the tool used. This finding indicates that while the studies' tools vastly differ, the mental health effects of disasters do not significantly vary. This deviates from what was expected, especially due to the inclusion of studies that examine a variety of different mental health outcomes.

The IES-R is the only tool with enough studies to run an analysis on the variations of disaster type and continent studied. The results indicated that there is a difference from what is expected in studies conducted in North America and Asia that examine hurricanes. Specifically, the IES-R was used in studies on the mental health effects of hurricanes more frequently in North America and less frequently in Asia than expected. The results for North America could be due to the IES-R being used frequently to study the effects of Hurricane Katrina. On the other hand, the IES-R was heavily used to study the effects of earthquakes in Asia, particularly the Great East Japan Earthquake and the Wenchuan Earthquake. The sample type, sample size, prevalence, and mean did not differ significantly by disaster among studies that used the IES-R. This is also true in terms of continent, with the exception of sample size. The sample sizes of studies conducted in Europe using the IES-R were significantly larger than those of studies in other continents.

This study shows the wide variability in tools used to assess the mental health effects of disasters. While these brief tools are useful for both researchers and humanitarian workers, it is important to keep in mind the implications of tool use. First, those who use these tools should use evidence-based methods to determine the appropriate cutoff. They must consider what methodology other studies have used if they want to build on existing knowledge. Second, all but one of these tools was developed for English-speaking populations. Some of the items carry cultural meaning that may not translate to all populations. Finally, the most-used tool may not be the most appropriate tool to use. Two of the tools, the SQD and WASSS, were specifically developed for disaster settings. While these tools may not have the most evidence backing them, they could provide the most relevant information regarding the mental health effects of a given disaster.

Limitations

This study contains some key limitations. First, the review was not fully systematic due to the use of Google Scholar as a search engine. However, Google Scholar provided a wide array of literature and allowed for the inclusion of articles that might otherwise have been overlooked. Second, including tools only developed after 1990 may have left out some useful tools. However, this was necessary in order to include timely information about assessment tools. Third, I excluded studies that were not published in English. This method may result in the absence of valuable evidence published in other languages. Finally, the study search strategy

likely left out a substantial number of post-disaster studies conducted in the past decade, and therefore the study-level data may not be representative of the literature.

Conclusion

Despite these limitations, this study provides an extensive review of a variety of different tools used in disaster-affected populations. The list of tools can be used as a guide for both researchers and humanitarian workers who wish to identify those in distress. Those who use these tools must consider their accuracy and appropriateness. The ultimate goal is to prevent and manage the harm that disasters inflict on mental health, and accurate assessment tools can facilitate mental health promotion.

This literature search uncovered three gaps in disaster mental health research. First, there is no standard tool used to assess the mental health effects of disasters. Second, few tools have been developed specifically for disaster settings, and those that do exist are not frequently used. It is possible that the mental health responses to disasters do not map on to the psychiatric diagnostic criteria that inform the development of assessment tools. Third, there is a dearth of disaster mental health research in Africa, Australia, and Europe. While the effects of trauma are gaining prominence in public health discourse, it is crucial that these gaps be addressed in order to fully understand the mental health effects of disasters.

Supplemental Table 1. Study Characteristics

Author, Year	Continent	Disaster type	Sample selection & characteristics	Sample size	Sub-estimates	Prevalence estimate	Mean score
Depression tools							
Beck Depression Inventory II							
Thordardottir, et al. 2018[23]	Europe	Earthquake	Random sample of Icelandic individuals living in the area of the disaster	1,301	--	6.70%	--
Hunt, et al. 2008[24]	North America	Hurricane	Online convenience sample of people who lost pets during Hurricane Katrina	65	--	--	17-20
Schwind, et al. 2019[26]	Asia	Earthquake	Purposive sample of adults in Sindhupalchok village	223	--	33%	--
Patient Health Questionnaire – 9							
Anastario, et al. 2008[26]	North America	Hurricane	Systematic random sample of internally-displaced women in MS and LA	195	--	--	--
Pietrzak, et al. 2012[27]	North America	Hurricane	Random sample of adults in Galveston and Chambers Counties, Texas	658	--	5-5.6%	--

Agyapong, et al. 2018[28]	North America	Wildfire	Convenience sample of adult inhabitants of Fort McMurray	486	--	14.80%	--
Bryant, et al. 2017[29]	Australia	Bushfire	Purposive sample of adults affected by the fires	558	--	--	--
Sakuma, et al. 2015[30]	Asia	Earthquake	Convenience sample of local disaster relief and reconstruction workers	1,294	Municipality workers: 15.9% Medical: 14.3% Firefighters: 3.8%	--	--
Ueda, et al. 2017[31]	Asia	Earthquake	Convenience sample of local social welfare workers	822	--	12.30%	--
Bhattarai, et al. 2018[32]	Asia	Earthquake	Convenience sample of individuals who sustained a spinal cord injury from the Nepal earthquake	82	--	--	8.76
PTSD tools							
Child Posttraumatic Symptom Scale							
Martin, et al. 2016[33]	North America	Flood	Convenience sample of adolescents from schools near the Nashville, TN flood	127	--	--	5.55

Langley, et al. 2013[34]	North America	Hurricane	Purposive sample of children displaced by Hurricane Katrina	195	--	36.90%	--
Silwal, et al. 2018[35]	Asia	Earthquake	Convenience sample of children from schools in municipalities affected by the earthquake	893	Sindhupalchok: 39.5% Kathmandu: 10.7%	--	--
Wu, et al. 2015[36]	Asia	Earthquake	Random sample of students from Wenchuan county	376	--	--	13.03
Ying, et al. 2013[37]	Asia	Earthquake	Random sample of students from Wenchuan and Maoxian counties	3,052	--	8.60%	--
Zhou, et al. 2016[38]	Asia	Earthquake	Random sample of students in Lushan county	310	--	--	14.73
Zhou, et al. 2017[39]	Asia	Earthquake	Random sample of students from Wenchuan and Maoxian counties	1,504	--	--	--
Zhou, et al. 2017[40]	Asia	Earthquake	Random sample of students from Wenchuan and Maoxian counties	736	--	--	15.97

Zhou, et al. 2018[41]	Asia	Earthquake	Random sample of students from Wenchuan and Maoxian counties	391	--	--	--
Zhou, et al. 2019[42]	Asia	Earthquake	Random sample of students from Wenchuan and Maoxian counties	391	--	--	14.93-15.1
Schwind, et al. 2019[43]	Asia	Earthquake	Purposive sample of households worst hit by the earthquake in Phulpingdanda village	62	--	4.84%	--
Davidson Trauma Scale							
Ali, et al. 2012[44]	Asia	Earthquake	Purposive sample of refugees who were in close proximity to the earthquake	300	--	41.30%	--
Zuniga, et al. 2019[45]	North America	Earthquake	Probabilistic sample of people whose residences were in close proximity to the epicenter of the earthquake	1,539	--	34.60%	--
Guo, et al. 2004[46]	Asia	Earthquake	Convenience sample of on-site rescue workers of the Chi-Chi earthquake	252	Professional: 19.8% non-professional: 31.8%	--	--
Impact of Events Scale - Revised							

Ashok, et al. 2019[47]	Asia	Flood	Purposive sample of heads of households affected by the flood	302	--	51.30%	--
Dyster-Aas, et al. 2012[48]	Asia	Tsunami	Convenience sample of Swedish tourists exposed to the 2004 Southeast Asian tsunami	1,501	14 months: severe injury: 34.95, light injury: 29.52, no injury: 22.55; 36 months: severe: 25.7, light: 22.32, none: 15.18	--	--
Heir, et al. 2009[49]	Asia	Tsunami	Convenience sample of Norwegian tourists affected by the Southeast Asian tsunami	899	Non-danger exposed: 0.93, Danger exposed: 1.45	--	--
Sharma, et al. 2015[50]	Asia	Flood	Convenience sample of adults directly exposed to Uttarakhand floods	86	--	58%	--
Arnberg, et al. 2011[51]	Europe	Ferry disaster	Purposive sample of Swedish survivors of the MS Estonia disaster	34	--	27%	--
Ben-Ezra, et al. 2014[52]	North America	Hurricane	Online convenience sample of individuals exposed to Hurricane Sandy	1,000	--	23.60%	--

Chan, et al. 2011[53]	Asia	Earthquake	Random sample of adults who experienced the Sichuan earthquake	1,482	Guankou: 55.6% Jiannan: 26.4%	--	--
Chan, et al. 2012[54]	Asia	Earthquake	Random sample of bereaved and non-bereaved adults who experienced the Sichuan earthquake	1,725	Bereaved: 50.2% Non-bereaved: 27.1%	--	--
Chan, et al. 2013[55]	North America	Hurricane	Convenience sample of low-income mothers who survived Hurricane Katrina	386	--	--	26.6
Chen, et al. 2014[56]	Asia	Mudslide	Random sample of people who experienced the mudslide from the Wenchuan earthquake	1,039	--	18.70%	--
Davis III, et al. 2010[57]	North America	Hurricane	Purposive sample of displaced and non-displaced university students in New Orleans	136	Displaced: 20.59% Non-displaced: 14.71%	--	--
Fushimi 2012[58]	Asia	Earthquake	Purposive sample of firefighters who participated in the rescue efforts for the GEJE	117	Check 1: 5.22 Check 2: 2.06 Check 3: 0.96	--	--

Fussell, et al. 2014[59]	North America	Hurricane	Convenience sample of low-income parents who survived Hurricane Katrina	392	--	--	33.25
Goto, et al. 2006[60]	Asia	Volcano	Random sample of adults who experienced the Miyake Island volcano disaster	231	--	--	--
Guo, et al. 2017[61]	Asia	Earthquake	Convenience sample of individuals in villages affected by the Wenchuan earthquake	1,369	--	5.30%	--
Guo, et al. 2014[62]	Asia	Earthquake	Convenience sample of individuals who experienced the Sichuan earthquake	1,066-1,344	8%-58.2%	--	--
Guo, et al. 2015[63]	Asia	Earthquake	Sample of individuals who experienced the Wenchuan earthquake	1,314	--	31.40%	--
Johannesson, et al. 2011[64]	Asia	Tsunami	Convenience sample of Swedish tourists exposed to the 2004 Southeast Asian tsunami	3,457	--	--	--

Johannesson, et al. 2011[65]	Asia	Tsunami	Convenience sample of Swedish tourists who lost a loved one in the 2004 Southeast Asian tsunami	486	Exposed: 46% Not exposed: 33%	--	--
Kuijer, et al. 2014[66]	Oceania	Earthquake	Convenience sample of individuals living in Christchurch	185	Earthquake 1: 14.7% Earthquake 2: 22.4%	--	--
Kvestad, et al. 2019[67]	Asia	Earthquake	Convenience sample of Nepalese mothers who experienced the earthquake	552	--	7.10%	17
Liu, et al. 2012[68]	Asia	Earthquake	Random sample of Qiang women who experienced the Wenchuan earthquake	270	--	52.20%	--
Onose, et al. 2017[69]	Asia	Earthquake	Convenience sample of patients with heart failure in Japan	3,930-5,827	7.4%-15.7%	--	--
Othman, et al. 2016[70]	Asia	Flood	Convenience sample of individuals living in Kelentan and who experienced the floods	149	Intrusion: 1.26 Avoidance: 0.69 Hyperarousal: 0.19	--	--
Pan, et al. 2015[71]	Asia	Earthquake	Purposive sample of students from a school near the epicenter of the earthquake	373	--	29.60%	--

				N			
Paxson, et al. 2012[72]	North America	Hurricane	Convenience sample of low-income mothers who survived Hurricane Katrina	532	T1: 45% T2: 33%	--	--
Qu, et al. 2012[73]	Asia	Earthquake	Random sample of pregnant women who experienced the Sichuan earthquake	311	--	12.20%	--
Rhodes, et al. 2010[74]	North America	Hurricane	Convenience sample of low-income parents who survived Hurricane Katrina	392	--	47.70%	--
Roncone, et al. 2013[75]	Europe	Earthquake	Convenience sample of help-seeking individuals who experienced the earthquake	91	--	56%	38.4
Shigemura, et al. 2014[76]	Asia	Technological	Purposive sample of employees of nuclear power plants that were damaged due to a tsunami	1,411	--	--	--
Takeda, et al. 2013[77]	Asia	Earthquake	Sample of female high school students who experienced the GEJE	1,180	--	10%	--
Tsujiuchi, et al. 2016[78]	Asia	Nuclear disaster	Representative sample of households affected by the	350	--	59.40%	--

			Fukushima nuclear disaster				
Wu, et al. 2011[79]	Asia	Snowstorm	Purposive sample of students living in Hunan during a snowstorm disaster	968	--	14.50%	--
Wu, et al. 2015[80]	Asia	Earthquake	Convenience sample of Chinese survivors of an earthquake	318	--	--	38.02
Itzhaky, et al. 2018[81]	Asia	Earthquake	Representative sample of Israeli backpackers who experienced the earthquake in Nepal	137	--	--	Item score mean: 2.18
Cadichon, et al. 2017[82]	North America	Earthquake	Purposive sample of Haitian students with no psychological support who experienced the earthquake	723	--	35.82%	--
Cetin, et al. 2005[83]	Asia	Earthquake	Purposive sample of soldiers who participated in rescue work after the earthquake	434	--	--	27.7

Diene, et al. 2012[84]	Europe	Industrial disaster	Random sample of employees at businesses in buildings damaged by the explosion	13,129	Men: 12% Women: 18%	--	--
Ehring, et al. 2011[85]	Asia	Earthquake	Representative sample of Pakistani relief workers who responded to the earthquake	267	--	42.60%	--
Henderson, et al. 2015[86]	Asia	Tsunami	Random sample of households in the area of the tsunami in Sri Lanka	404	--	--	15.2
Inoue, et al. 2015[87]	Asia	Earthquake	Purposive sample of patients who visited a psychiatric hospital after the earthquake	612	--	--	18.6
Lebowitz, et al. 2019[88]	Asia	Flood	Convenience sample of elderly Jôsô city residents who experienced the flood	Evacuated: 444 Damaged house: 394	Evacuated: 14.43 Damaged house: 17	--	--
Pyari, et al. 2016[89]	Asia	Tsunami	Representative sample of residents living in villages that were damaged by the tsunami	485	--	32.58%	--
Warsini, et al. 2015[90]	Asia	Volcano	Random sample of adults who experienced the volcano eruption	348	--	--	17.9

PTSD Checklist							
Sakuma, et al. 2015[91]	Asia	Earthquake	Convenience sample of local disaster relief and reconstruction workers	1,294	Municipality workers: 6.6% Medical: 6.6% Firefighters: 1.6%	--	--
Ueda, et al. 2017[92]	Asia	Earthquake	Convenience sample of local social welfare workers	822	--	4.00%	--
Lenane, et al. 2019[93]	North America	Hurricane	Random sample of adults with hypertension who experienced Hurricane Katrina	2,194	--	8.60%	--
Dar, et al. 2018[94]	Asia	Flood	Purposive sample of individuals who experienced the flooding in Kashmir	87	--	--	--
Duan, et al. 2015[95]	Asia	Earthquake	Community sample of adults who experienced the Sichuan earthquake	340	Without PTSD: 2.01 With PTSD: 3.26	--	--
Labarda, et al. 2018[96]	Asia	Typhoon	Convenience sample of individuals participating in a disaster relief program	T1: 223 T2: 138	T1: 23.3% T2: 18.8%	--	--
Schwartz, et al. 2018[97]	North America	Hurricane	Convenience sample of adults who experienced Hurricane Harvey	41	--	46%	32.9

Xu, et al. 2014[98]	Asia	Earthquake	Purposive sample of adult women who lost a child in the Sichuan earthquake	Without child: 116 With child: 110	Without child: 77.6% With child: 38.2%	--	--
PTSD Symptom Scale - Self Report							
Thordardottir, et al. 2018[23]	Europe	Earthquake	Random sample of Icelandic individuals living in the area of the disaster	1,301	--	6.70%	--
Hunt, et al. 2008[24]	North America	Hurricane	Online convenience sample of people who lost pets during Hurricane Katrina	65	--	--	17-20
SPAN Self-Report Screen							
Guo, et al. 2004[46]	Asia	Earthquake	Convenience sample of on-site rescue workers of the Chi-Chi earthquake	252	Professional : 19.8% non-professional: 31.8%	--	--
Chen, et al. 2007[99]	Asia	Earthquake	Convenience sample of individuals whose houses were damaged in the Chi-Chi earthquake	6,412	--	20.90%	--
General mental health tool							
Screening Questionnaire for Disaster Mental Health							

Masedu, et al. 2014[100]	Europe	Earthquake	Online random sample of individuals directly exposed to the L'Aquila earthquake	890	Depression (men): 20.5% PTSD (men): 27.9% Depression (women): 36% PTSD (women): 34.2%	--	--
Telles, et al. 2009[101]	Asia	Flood	Representative sample of individuals in a relief camp who experienced the flood in Bihar	1,289	given but only broken down into 10 different estimates	--	--
WHO-UNHCR Assessment Schedule of Serious Symptoms in Humanitarian Settings							
Kane, et al. 2018 (160)	Asia	Earthquake	Representative sample of individuals who experienced Nepal earthquakes	513	Anhedonia: 40.1% Anger: 33.7%	--	--

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