

Women's Mental Health and Intimate Partner Violence Following Natural Disaster: A Scoping Review

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Conflicts of interest: none

Keywords: intimate partner violence; mental health; natural disaster; PTSD; women's health

Abbreviations:

FEMA: Federal Emergency Management Agency
GBV: gender-based violence
IPV: intimate partner violence
PTSD: posttraumatic stress disorder

Received: November 16, 2015

Revised: March 7, 2016

Accepted: April 1, 2016

Online publication: September 19, 2016

doi:10.1017/S1049023X16000911

Abstract

Introduction: Survivors of natural disasters in the United States experience significant health ramifications. Women particularly are vulnerable to both post-disaster posttraumatic stress disorder (PTSD) and depression, and research has documented that these psychopathological sequelae often are correlated with increased incidence of intimate partner violence (IPV). Understanding the link between these health concerns is crucial to informing adequate disaster response and relief efforts for victims of natural disaster.

Purpose: The purpose of this review was to report the results of a scoping review on the specific mental health effects that commonly impact women following natural disasters, and to develop a conceptual framework with which to guide future research.

Methods: A scoping review of mental and physical health effects experienced by women following natural disasters in the United States was conducted. Articles from 2000–2015 were included. Databases examined were PubMed, PsycInfo, Cochrane, JSTOR, Web of Science, and databases available through ProQuest, including ProQuest Research Library.

Results: A total of 58 articles were selected for inclusion, out of an original 149 that were selected for full-text review. Forty-eight articles, or 82.8%, focused on mental health outcomes. Ten articles, or 17.2%, focused on IPV.

Discussion: Certain mental health outcomes, including PTSD, depression, and other significant mental health concerns, were recurrent issues for women post-disaster. Despite the strong correlation between experience of mental health consequences after disaster and increased risk of domestic violence, studies on the risk and mediating factors are rare. The specific challenges faced by women and the interrelation between negative mental health outcomes and heightened exposure to IPV following disasters require a solid evidence base in order to facilitate the development of effective interventions. Additional research informed by theory on probable health impacts is necessary to improve development/implementation of emergency relief policy.

Bell SA, Folkerth LA. Women's mental health and intimate partner violence following natural disaster: a scoping review. *Prehosp Disaster Med.* 2016;31(6):648–657.

Introduction

Research has identified and attempted to explain the significant correlation between experience of natural disaster and comorbid psychological consequences, including posttraumatic stress disorder (PTSD) and depression.^{1–6} Moreover, the experience of natural disaster often is related to increased rates of intimate partner violence (IPV) among survivors.^{7–11} However, knowledge of the specific mental health consequences of disasters experienced by women is limited,¹² and even less has been done to identify the risk and mitigating factors that may be used to identify and provide relief for women in disaster situations.^{13,14} If research is to be relevant in impacting national policy and legislation for natural disaster preparation and relief, the health consequences faced by vulnerable populations post-disaster must be delineated and data made accessible to policymakers. Therefore, the purpose of this study was to assess the existing literature in order to identify the most prevalent mental and psychological health consequences experienced by women

following natural disasters in the United States and to understand the link, if any, between post-disaster trauma and IPV.

Natural Disaster in the United States

Definitions for disaster vary, though the term has been understood as a “calamitous event that effects a large population and generally results in injury, death, and destruction of property.”¹⁵ Since 1990, the United States has experienced an average of 53 major disasters each year, with approximately 11 disasters annually warranting federal assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act.¹⁶ As the United States continues to experience both population growth and continued development/urbanization, the probability that a given individual will directly be exposed to, or affected by, a natural disaster over the course of their lifespan is likely to increase dramatically; the risk inherent in geographic vulnerability is only exacerbated by climate change.¹⁷

Disaster and Mental Health: A Gendered Approach

Significant headway has been made in delineating the most common human health consequences of natural disasters. Norris et al’s review of empirical disaster research, published in 2002, provided a careful synthesis of 20 years of disaster research literature. Focusing on mental health outcomes, Norris’s article provided significant insight into the disaster experience internationally and at all stages of the life cycle, and included 42 samples of adult survivors experiencing natural disasters in the United States.⁶ Information and data on the mental, physical, and psychosocial sequelae triggered by natural disasters among many populations have since proliferated,^{1,18-20} and subsequent research has linked natural disasters to a variety of mental health concerns, including PTSD, depression, anxiety, elevated stress and suicide rates, sleep problems, and drug use.^{1,2,21-26}

Within this gendered context, women suffer disproportionate rates of IPV under normal circumstances, but when combined with the stressors experienced post-disaster such as disrupted social networks and loss of resources, the potential for IPV can increase.²² When looking at extant disaster literature, however, a focus on the health consequences of disasters specific to women is rare, and a study comprehensively assessing those health consequences most likely to be experienced by women following natural disasters in the United States is needed. Articles not restricted to (1) health consequences experienced by women (2) following natural disasters (3) in the United States limit researchers’ ability to identify the specific health risks that can inform future policy development and implementation.

Moreover, much of the existing research, and particularly that predating Norris’s 2002 article, continues to use dated research; many of the studies included in Norris’s article were conducted before a gendered approach to disaster research became a significant academic and policy goal. For this reason, the current study reviewed literature published after 2000 in order to allow for some overlap with the Norris article. Scoping reviews serve to map a broad section of the evidence base around a topic, characterize the quality of the evidence base in terms of type of studies, allowing for the identification of gaps in knowledge and formulation of research questions.²⁷ Therefore, a scoping review was conducted to determine the mental health and safety consequences of natural disaster most prevalent in women living in the United States.

Search Terms	
-Disasters: disasters, post-disaster, climatic processes, hurricane, tornado, typhoon, cyclone, earthquake, flood, storms, drought, tsunamis. -Women: Women, female, gender.	
Inclusion Criteria	Exclusion Criteria
-English-language articles -Published between 2000 and 2015 -Examined adult survivors’ health outcomes -Natural disasters that occurred in the United States	-Unrelated to a natural disaster -Addressed men or children only -Not original research

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Table 1. Search Terms and Review Criteria

Methods

Search Strategy

A search strategy was developed with the assistance of a health sciences informationist at a large research university in the United States. Inclusion and exclusion criteria were determined a priori. Six databases (PubMed [National Center for Biotechnology Information; Bethesda, Maryland USA]; PsycINFO [American Psychological Association; Washington DC, USA]; Cochrane [The Cochrane Collaboration; Oxford, United Kingdom]; JSTOR [ITHAKA; New York, New York USA]; Web of Science [Thomson Reuters; New York, New York USA]; and databases available through ProQuest [Ann Arbor, Michigan USA], including ProQuest Research Library) were searched for articles published from 2000 through 2015 that assessed the health consequences most likely to be experienced by women following natural disaster. Using ProQuest, which provides advanced indexing, allows for a more diverse number of sources in the area of study to be reached.

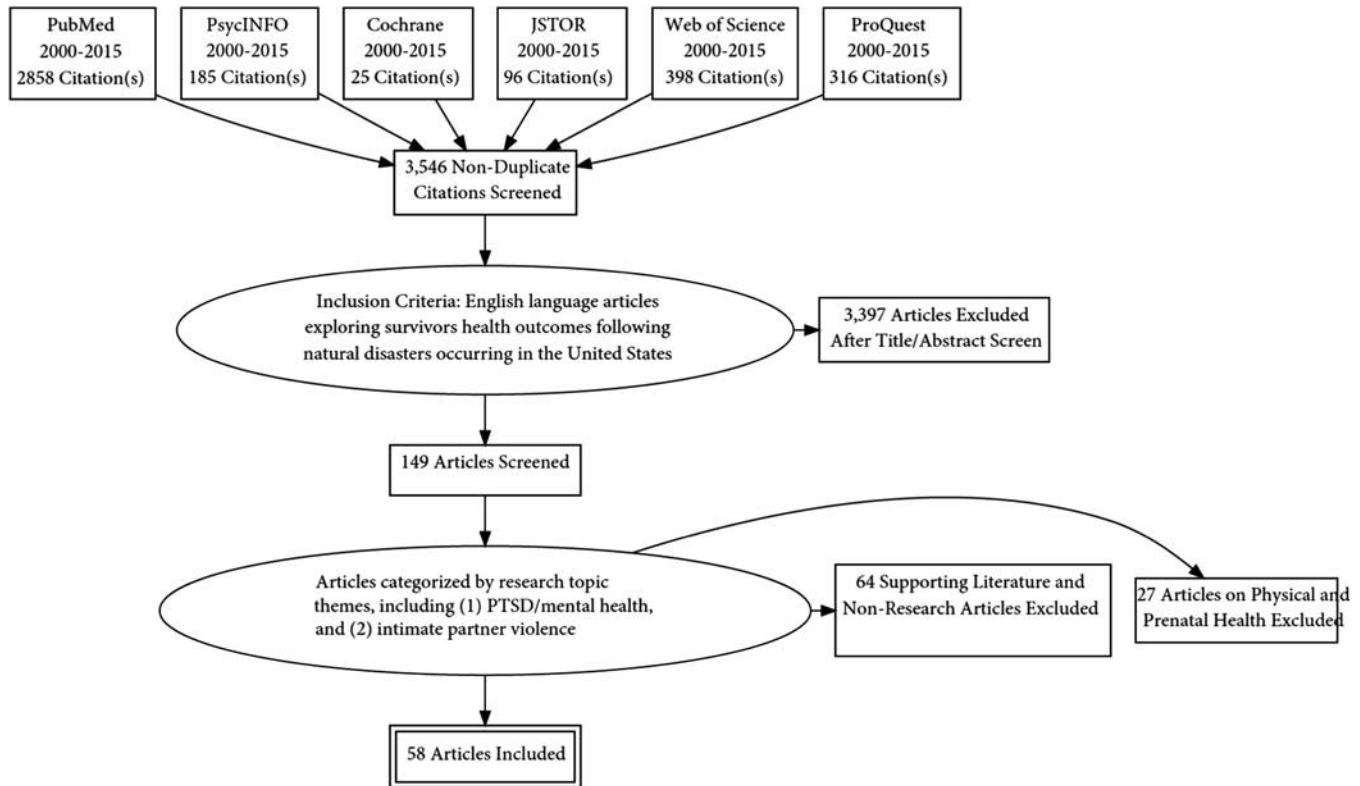
The core search was conducted in PubMed and combined keywords in the title and abstract with medical subject headings. Other searches were variations of the core search. The initial searches were conducted from February 23 through March 18, 2015 (Table 1; Figure 1).

Study Selection

Initial inclusion criteria were (1) English-language articles (2) published between 2000 and 2015 that (3) explored adult survivors’ health outcomes (4) following natural disasters (5) occurring in the United States. Duplicate records, articles with similar keywords but unrelated topics, and non-research articles were eliminated. While the intention was to identify the impacts of natural disaster on women’s health, articles that assessed health consequences in both male and female victims were retained. Natural disasters were distinguished from mass-violence disasters (including gun-related massacres and terrorist attacks) and technological disasters (including nuclear, industrial, and transportation accidents).^{6,28} Both in-depth studies of a single disaster event and those comparing multiple disaster events or reviewing the literature related to specific complaints were included.

Data Extraction

Information on author, year, title of study, journal, health outcome measured, disaster type and date, study population and sample



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Figure 1. PRISMA Diagram.

Abbreviation: PTSD: posttraumatic stress disorder.

size, study methodology, aims of study, summarized results and implications, and validated outcome assessment instruments were collected in an Excel (Microsoft Corp.; Redmond, Washington USA) workbook. At each stage of the review process, one researcher reviewed titles and abstracts for possible inclusion and a second reviewer independently assessed the relevance of the initially-selected titles and abstracts for exclusion. Differences in results pulled into a separate file and reviewers resolved them through discussion until consensus was reached. Because the intent of this scoping review was to assess the most common post-disaster mental health symptoms and IPV impacts experienced by women in the United States, an assessment of the quality of studies reviewed was not conducted.²⁹ However, study designs and levels of evidence were identified as part of this review in order to identify gaps in research as well as appropriate next steps. The Oxford Centre for Evidence-Based Medicine (University of Oxford; Oxford, England) levels of evidence and evidence grading system was used (Table 2 and Table 3).

Results

Of the 3,878 articles originally identified, 332 were removed as duplicates. Of the 3,546 remaining, 149 articles met the initial criteria for inclusion. The titles and abstracts of these 149 relevant articles were reviewed. Supporting literature and non-research articles, including reviews, commentaries, and editorials, were labeled and removed (64 articles; 43.0%). Articles focused exclusively on physical health and prenatal/maternal health also were excluded (27 articles; 18.1%). The remaining articles focused on

PTSD/mental health impacts and IPV following natural disasters; these were selected for full-text review (58 articles; 38.9%) and constitute the 58 primary literature articles included in this scoping review (Appendix 1; available online only).

The 58 articles under full-text review represented 12 separate natural disasters occurring from 1993 through 2012 (Table 4). The disasters differed significantly in severity, with fatalities ranging from none during the Santa Barbara County (California USA) wildfires in 2008-2009 to 1,833 deaths caused by Hurricane Katrina (Louisiana USA) in 2005.^{5,30} Hurricane Katrina was the most-costly natural disaster, with estimated damages of US \$108 billion, while the Buffalo Creek, Colorado (USA) wildfire and subsequent flood of 1996 cost only US \$20.25 million.³⁰⁻³²

The 58 articles chosen for full-text review were categorized loosely based on identified themes in research topics. These included: (1) PTSD/mental health in non-pregnant women (38 articles; 65.5%); (2) PTSD/mental health in pregnant and postpartum women (10 articles; 17.2%); (3) IPV (six articles; 10.3%); and (4) IPV in conjunction with mental health concerns (four articles; 7.0%; Table 5).

The most common design used was post-event, cross-sectional studies (42 articles; 72.4%). Nineteen studies (32.7%) were longitudinal, with 12 articles (20.7%) collecting data both pre- and post-disaster, and seven articles (12.1%) collecting data only after the disaster. Fifty-two articles (89.7%) used data from a single, disaster-exposed group, while three articles (5.2%) used qualitative data. Sample sizes ranged from 40 to 6,309 participants with an average of 552.6 study participants. Follow-up times and points of assessment varied considerably across the studies and

Disaster	Date and Location	Deaths	Homes Damaged/ Destroyed	Estimated Costs ^a	Number of Articles
Earthquake	Northridge, California, 1994	33-73	114,000	\$25 billion	1
Flood	Mississippi River, Illinois & Missouri, 1993	47	50,000	\$20 billion	3
Flood	Iowa, 2008	24	6,600	\$6 billion	1
Hurricane	Hurricane Floyd, North Carolina, 1999	52	63,000	\$4.5-6 billion	1
Hurricane	Hurricane Ike, Texas, 2008	84	102,607	\$29.5 billion	1
Hurricane	Hurricane Katrina, 2005	1,833	300,000	\$108 billion	45
Hurricane	Hurricane Sandy, 2012	159	650,000	\$67 billion	2
Hurricane	Hurricanes Charley, Frances, Ivan, and Jeanne, Florida, 2004	146	664,200	\$45 billion	2
Tornado	Rural Minnesota, 1998	2	2,500	\$225 million	1
Wildfire	San Diego County, California, 2007	10	1,600	\$1.5 billion	1
Wildfire	Santa Barbara, California, 2008-09	0	314	\$30.4 million	1
Wildfire, Subsequent Flood	Buffalo Creek, Colorado, 1996	2	58	\$20.25 million	1

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Table 2. Comparison of Disasters Included in the Review^a Cost in US \$.

	Mental	Mental/Maternal	IPV/Mental	IPV
Earthquake	2	0	0	0
Fire	3	0	0	0
Flood	1	1	2	0
Hurricane	30	9	2	6
Tornado	1	0	0	0
Fire + Flood	1	0	0	0

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Table 3. Studies on the Health Impacts of Natural Disasters in the United States

Abbreviation: IPV, intimate partner violence.

	No. Articles (%)	Level of Evidence ^a
Post-event, Cross-sectional Design	42 (72.4%)	Level 4
Post-event, Longitudinal Design	7 (12.1%)	Level 2b, 3b
Pre- and Post-event, Longitudinal Design	12 (20.7%)	Level 3b
Two Comparison Groups: Disaster-exposed, Non-disaster Exposed	52 (89.7%)	Level 2b, 3b
Qualitative	3 (5.2%)	Level 5

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Table 4. Study Designs Included in Review^a Centre for Evidence-Based Medicine. (2009). Oxford Centre for Evidence-based Medicine – Levels of Evidence. University of Oxford: Oxford, England.

#	Reference	Sample Size	Disaster Type, Location, and Date	Health Effect or Concern	Level of Evidence	Evidence Grade	Study Design
1	Brock RL, et al. (2014).	145 women	Floods, Iowa, 2008	Mental/Maternal Health	Level 3b	C	Longitudinal cohort
2	Ehrlich M, et al. (2010).	208 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 4	C	Cross-sectional descriptive
3	Harville EW, et al. (2009).	292 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 2b	C	Prospective cohort
4	Harville EW, et al. (2010).	292 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 2b	B	Prospective cohort
5	Harville EW, et al. (2011).	102 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 2b	B	Prospective cohort
6	Oni O, et al. (2012).	192 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 4	C	Prospective cohort
7	Oni O, et al. (2015).	146 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 4	C	Prospective cohort
8	Paxson C, et al. (2012).	532 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 3b	C	Longitudinal cohort
9	Savage J, et al. (2010).	199 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 4	D	Cross-sectional descriptive
10	Xiong X, et al. (2008).	301 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 2b	B	Prospective cohort
11	Xiong X, et al. (2010).	301 women	Hurricane Katrina, Louisiana, 2005	Mental/Maternal Health	Level 2b	C	Prospective cohort
12	Adeola FO. (2009).	1510 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 2b	B	Longitudinal cohort
13	Amstadter AB, et al. (2009).	614 adults	Florida Hurricane Season, 2004	Mental Health	Level 4	C	Cross-sectional descriptive
14	Benight CC, Harper ML. (2002).	50 adults	Fire and subsequent flood (2 mo. later), Colorado, 1996	Mental Health	Level 3b	C	Longitudinal cohort
15	Boscarino JA, et al. (2014).	200 adults	Hurricane Sandy, New Jersey, USA	Mental Health	Level 4	D	Outcomes
16	Brown JS, et al. (2010).	59 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Longitudinal cohort
17	Cepeda A, et al. (2010).	200 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Prospective cohort
18	Chan CS, Rhodes JE. (2013).	386 women	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
19	Chan CS, et al. (2012).	386 women	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Prospective cohort
20	Davis TE, et al. (2010).	68 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Prospective cohort
21	DeSalvo KB, et al. (2007).	1542 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Cross-sectional descriptive
22	Felix ED, Afifi W. (2015)	402 adults	Wildfires, California, 2008-2009	Mental Health	Level 3b	C	Prospective cohort

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Table 5. Study Characteristics (continued)

#	Reference	Sample Size	Disaster Type, Location, and Date	Health Effect or Concern	Level of Evidence	Evidence Grade	Study Design
23	Galea S, et al. (2008).	810 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Cross-sectional descriptive
24	Ginexi EM, et al. (2000).	1725 adults	Floods (Midwest), 1993 (Iowa)	Mental Health	Level 3b	C	Prospective cohort
25	Greenough PG, et al. (2008).	499 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Prospective cohort
26	Hamama-Raz Y, et al. (2014).	1000 adults	Hurricane Sandy, New York, USA	Mental Health	Level 4	C	Cross-sectional descriptive
27	Jones RT, et al. (2003).	46 adults	Wildfire, San Diego, 2007	Mental Health	Level 4	C	Prospective cohort
28	Joseph NT, et al. (2014).	215 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
29	Kamo Y, et al. (2011).	122 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	D	Qualitative
30	Kim SC, et al. (2008).	222 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Cross-sectional descriptive
31	Kissinger P, et al. (2007).	164 women	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Cross-sectional descriptive
32	Kulkarni M, Pole N. (2008).	880 adults	Earthquake, Northridge, California, 1994	Mental Health	Level 3b	C	Cross-sectional descriptive
33	Larrance R, et al. (2007).	366 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Cross-sectional descriptive
34	Leon KA, et al. (2007).	1542 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Cross-sectional descriptive
35	Lowe SR, Rhodes JE. (2013).	386 women	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
36	Mills MA, et al. (2007).	132 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Cross-sectional descriptive
37	Polusny MA, et al. (2008).	105 adults	Tornadoes, rural Minnesota, 1998	Mental Health	Level 4	C	Cross-sectional descriptive
38	Rateau MR. (2009).	501 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Cross-sectional descriptive
39	Reuther ET, et al. (2010).	609 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	D	Cross-sectional descriptive
40	Rhodes J, et al. (2010).	392 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
41	Richter R, Flowers T. (2008).	50 women	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	D	Cross-sectional descriptive
42	Sareen H, Shoaf KI. (2000).	1212 adults	Earthquake, Northridge, California, 1994	Mental Health	Level 4	D	Cross-sectional descriptive
43	Sastry N, Gregory J. (2013).	3525 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
44	Scheeringa MS, Zeanah C. (2008)	59 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 3b	C	Prospective cohort

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Table 5. Study Characteristics (*continued*)

#	Reference	Sample Size	Disaster Type, Location, and Date	Health Effect or Concern	Level of Evidence	Evidence Grade	Study Design
45	Tally S, et al. (2013).	754 adults	Wildfire, San Diego, 2007	Mental Health	Level 4	D	Cross-sectional descriptive
46	Timpson S, et al. (2009).	216 adults	Hurricane Katrina, Louisiana, 2005	Mental Health	Level 4	C	Longitudinal cohort
47	Ursano RJ, et al. (2014).	296 women	Hurricanes, Florida, 2004	Mental Health	Level 4	D	Longitudinal descriptive
48	Wu ZH, et al. (2015).		Hurricane Ike, Texas, 2008	Mental Health	Level 3b	C	Longitudinal descriptive
49	Anastario MP, et al. (2008).	195 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Cross-sectional descriptive
50	Anastario M, et al. (2009).	420 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Cross-sectional descriptive
51	Fagen JL, et al. (2011).	215 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Longitudinal descriptive
52	Frasier PY, et al. (2004).	785 women	Hurricane Floyd, North Carolina, 1999	IPV/GBV	Level 4	C	Cross-sectional descriptive
53	Fredman SJ, et al. (2010).	205 women	Floods (Midwest), 1993 (St. Louis, Missouri)	Mental Health	Level 4	C	Cross-sectional descriptive
54	Harville EW, et al. (2011).	123 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Cross-sectional descriptive
55	Lowe SR, et al. (2012).	40 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Qualitative
56	Picardo CW, et al. (2010).	66 women	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	D	Qualitative
57	Schumacher J, et al. (2010).	445 adults	Hurricane Katrina, Louisiana, 2005	IPV/GBV	Level 4	C	Outcomes study
58	Taft CT, et al. (2009).	205 women	Floods (Midwest), 1993 (Illinois & Missouri)	IPV/GBV	Level 4	C	Cross-sectional

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Table 5 (continued). Study Characteristics

Abbreviations: GBV, gender-based violence; IPV, intimate partner violence.

ranged from 1-14 days post-disaster to 53-61 months post-disaster (Table 2).

Of the 59 studies, 47 (81.0%) used validated outcome assessment instruments. Several studies drew information from narrative or semi-structured interviews with study participants (13 articles; 22.4%) and surveys or question lists designed specifically for use in that particular study (18 articles; 30.5%).

Discussion

This scoping review exposes significant deficiencies in the extant literature and highlights critical areas of concern. It also integrates evidence on knowledge gaps, where high levels of evidence indicate previous work has had a significant impact on field, while lower levels of evidence suggest a lack of vital research in the area. In particular, although higher rates of post-disaster PTSD, depression, and anxiety for women as compared to men are reported,^{1,33,34} little progress has been made to standardize

research across disaster types and affected populations in order to identify the aggravating and alleviating factors that contribute to mental health concerns, and even less has been accomplished across disciplines to target clinical care towards those most in need, or to influence legislation and disaster relief policy. The dearth of relevant data is most apparent in understanding the compounded relationship between post-disaster psychological illness and increased incidence of IPV and gender-based violence (GBV).¹⁰

That women experience significantly higher rates of post-disaster mental illness than men has been well documented.^{6,28,35} As a gendered approach to disaster research becomes more recognized, however, it increasingly is understood that post-disaster mental illness is particularly acute for women who are also minorities, poor, elderly, or the primary caregivers for their children.^{1,17,36-39} These impacts are cumulative with vulnerability to health trauma increasing as socioeconomic status declines.

Adeola's study of mental health and psychosocial distress in survivors of Hurricane Katrina indicates that African Americans are more likely than their white counterparts to experience an array of psychosocial problems, including feelings of depression, anxiety, and worries about the future.¹ While this study indicated that employment and income are significant *inverse* predictors of psychosocial distress following natural disaster, minority women are a population least likely to have means of support, such as a steady job or source of income.¹ The sense of powerlessness and helplessness associated with survivors' perceptions of having been victimized or taken advantage of by opportunists was also a critical factor elevating psychosocial dysfunction.¹ Similarly, among survivors of the 1994 Northridge Earthquake in California, Asian Americans were more than twice as likely to experience psychiatric distress warranting clinic attention than their European American counterparts.³⁸ Among pregnant and postpartum women, non-tangible loss of resources was a significant predictor of depression, with African American women, women in their mid-twenties, and women without a college degree more likely to report high loss of resources.^{40,41}

Several hypotheses for the disparate impact of post-disaster psychological trauma in women have been advanced. Exposure to natural disaster, often measured by survivors' experience of lacking basic necessities such as food, water, and medical care, have been cited as predictors of poor mental health outcomes following natural disaster.^{3,42} Evacuation, extended displacement, and resource loss, such as the loss of one's home, also have been correlated to experience of increased symptoms of depression and PTSD.^{4,33,43} However, this has not been clearly established, nor have the reasons why women have consistently higher rates of disaster exposure than men.^{1,44}

It has also been posited that survivors' early symptoms may serve as predictors of poor mental health outcomes.^{18,19} Because many women assume primary responsibility for housing and childcare in their families, their ability to provide adequate self-care in the immediate aftermath of natural disasters is limited, and post-traumatic stress symptoms may be latent.^{3,36} In the immediate aftermath of Hurricane Sandy (2012; New York USA), for example, men and women reported similar rates of post-traumatic stress symptoms, though women were more likely to report recollections of previous disasters and fear of future disaster events.³⁶ Similarly, in a combination wildfire-flood disaster occurring in Colorado, limited gender disparity was found in participants' acute stress response two weeks after the flood, but significantly greater symptoms of PTSD were reported in female participants one year later.¹⁸

While psychological symptoms often abate following natural disaster,^{6,45} the ultimate improvement of post-disaster psychological sequelae has been linked to social and environmental factors experienced by survivors. Particularly, those exposed to unsafe neighborhoods, high crime rates, poor housing, and social isolation experienced persistent emotional distress.^{42,46} Women, particularly low-income and racial minorities, are more likely to experience catastrophic property loss during natural disaster, leaving them vulnerable to higher rates of long-term displacement and corresponding loss of community ties post-disaster.⁴⁷ This finding correlates directly with evidence that post-disaster psychological symptom improvement rates are slower and less consistent for women than for men.^{18,42} Additionally, racial minorities in particular are likely to encounter greater difficulties recovering from natural disasters.⁴⁴

Much less attention has been given to women's experience of post-disaster IPV. Rates of IPV increase, often dramatically, after disaster.^{8,11,48} For example, population estimates of GBV following Hurricane Katrina were as high as 17% for sexual abuse and 25% for IPV.⁸ Other studies, however, show contrary results, specifically where IPV following natural disaster has not increased.^{49,50} In fact, some have found that natural disasters can in fact enhance a relationship.⁹ These studies repeatedly cite status as an internally displaced person,^{8,50-52} loss of social networks and cultural integration,^{8,51,53} and poverty/low socioeconomic status as aggravating factors. Protective factors against post-disaster IPV include non-urban settings, a strong sense of community and social cohesion among the studied population,^{49,51,52} and integration into the workforce.^{49,50}

These factors are often the same as those identified for women who experience post-disaster psychological trauma generally. The experience of post-disaster IPV and post-disaster negative mental health outcomes are not distinct: women who experience post-disaster IPV are significantly more likely to exhibit PTSD symptoms.⁹ In an integrative data analysis of disaster-related stressors experienced by survivors of Hurricane Katrina,³ the threat to physical integrity of self and others was identified as having the strongest association with posttraumatic stress and general psychological distress. Experiences of GBV increased from 4.6 to 16.3/100,000 per day in a displaced population following Hurricane Katrina.⁷ This study also revealed that many of the women who are most at-risk for GBV and IPV also exhibited strong symptoms of depression, including sleep and appetite dysregulation, poor self-esteem, and suicidal ideation.⁷ The 1993 Midwestern floods study revealed that, while positive intimate relationships may buffer individuals from the development of PTSD symptoms post-disaster, poor relationship adjustment is significantly associated with the development of PTSD symptoms.⁹

It should therefore come as no surprise that women who experienced post-disaster IPV and GBV particularly were vulnerable to major depressive disorder, increased symptoms of depression, and suicidal ideation.⁸ As an example, female survivors of Hurricane Katrina living in Federal Emergency Management Agency (FEMA; Washington, DC USA) travel trailer parks one year after the hurricane who reported post-disaster IPV were 10.4 times more likely to report symptoms of major depressive disorder than women without post-disaster IPV.⁸ Similarly, IPV post-disaster physical and psychological victimization were associated with hurricane-related PTSD.¹³ In particular, certain PTSD symptoms are positively correlated with post-disaster experience of violence. For women living in FEMA travel trailer parks eight months after Hurricane Katrina, the odds of exposure to GBV generally were 3.8 times higher among women with appetite dysregulation, 2.3 times higher among women with low self-esteem, and 2.7 times higher among women with suicidal ideation in comparison to those without.⁷

However, very little headway has been made into analyzing the long-term effects of post-disaster IPV on women's health, particularly whether IPV ultimately improves for women following natural disasters. Some evidence shows that rates of IPV increase in the protracted time period post-disaster, especially if other exacerbating factors, such as displacement, are not relieved. In a study of survivors living in FEMA travel trailers following Hurricane Katrina, the overall prevalence of recent IPV increased from 2.5% six months after the hurricane to 7.6% two years after the hurricane.⁸ Similarly, a study of women exposed to massive

flooding in the St. Louis, Missouri (USA) area found that, in the short-term, experience of loss resulting from natural disaster was correlated with positive relationship adjustment, while women who experienced negative relationship adjustment were more likely to exhibit PTSD symptoms.⁹ In general, however, the dearth of research in this field and the lack of generalizability of study results significantly impair the ability of policymakers to anticipate the needs of women who may still be experiencing increased rates of IPV several years after a natural disaster.

There may be hope. While women may experience stronger psychological effects than men, they may be more resilient, particularly when their social support networks remain accessible.³³ In a study of evacuees who experienced the three consecutive wildfires in California (USA), Felix et al. found that, while women retrospectively reported greater disaster-related stressors and worse mental health at the time of disaster than their male counterparts, women's social support networks played a direct and significant role in maintaining mental health; social support was not correlated to mental health at the time of fire or survey for males.^{5,54} For pregnant and post-partum women who survived flooding of the Mississippi River in Iowa (USA) in 2008, both general social support and intimate partner support significantly impacted maternal mental health, mitigating the likelihood of perinatal depression.^{55,56}

Limitations

This scoping review was not without limitations. It is possible that some relevant articles were missed, despite the use of stringent and systematic search methodology as well as iterative steps to

minimize any such omissions. Additionally, the inclusion and exclusion criteria employed, while carefully selected, may have been too narrow to include all relevant studies. Finally, while this review focused specifically on natural disasters in the US, findings are not generalizable to either man-made or technological disasters or disasters occurring outside of the US.

Conclusion

The best strategy to address the concerns highlighted in this study is through preparedness. The health consequences that women are likely to experience following natural disaster provide a useful guide for policymakers working to develop effective programs for disaster preparedness and relief. The evidence shown in this review that women are more likely to experience PTSD symptoms and other indicators of poor mental health should inform disaster preparedness planning surrounding the importance of offering early treatment and interventions. In particular, studies generating high levels of evidence, such as intervention development surrounding mental health care tailored to women after natural disaster, are a key component in successful disaster recovery. Awareness campaigns targeted towards decreasing IPV potentially can help decrease risk, as could including the need for women's refuges in post-disaster planning. Finally, an intersectionality approach, where considering the cumulative impacts of race, gender, and economics, can help to guide effective interventions.

Supplementary Material

To view supplementary material for this article, please visit <http://dx.doi.org/10.1017/S1049023X16000911>

References

- Adeola FO. Mental health and psychosocial distress sequelae of Katrina: an empirical study of survivors. *Hum Ecol Rev.* 2009;16(2):195-210.
- Cepeda A, Valdez A, Kaplan C, Hill LE. Patterns of substance use among Hurricane Katrina evacuees in Houston, Texas. *Disasters.* 2010;34(2):426-446.
- Chan CS, Rhodes JE. Measuring exposure in Hurricane Katrina: a meta-analysis and an integrative data analysis. *PLoS One.* 2014;9(4).
- Davis TE, Grills-Taquechel AE, Ollendick TH. The psychological impact from Hurricane Katrina: effects of displacement and trauma exposure on university students. *Behav Ther.* 2010;41(3):340-349.
- Felix E, Afifi W. The role of social support on mental health after multiple wildfire disasters. *J Community Psychol.* 2015;43(2):156-170.
- Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry.* 2002;65(3):207-239.
- Anastario MP, Larrance R, Lawry L. Using mental health indicators to identify post disaster gender-based violence among women displaced by Hurricane Katrina. *J Womens Health (Larchmt).* 2008;17(9):1437-1444.
- Anastario M, Shehab N, Lawry L. Notice concerning copyright restrictions. *Disaster Med Public Health Prep.* 2009;3(1):18-26.
- Fredman SJ, Monson CM, Schumm JA, Adair KC. Associations among disaster exposure, intimate relationship adjustment, and PTSD symptoms: can disaster exposure enhance a relationship? *J Trauma Stress.* 2010;23(4):446-451.
- Larrance R, Anastario M, Lawry L. Health status among internally displaced persons in Louisiana and Mississippi travel trailer parks. *Ann Emerg Med.* 2007;49(5):590-601.
- Picardo CW, Burton S, Naponick J. Physically and sexually violent experiences of reproductive-aged women displaced by Hurricane Katrina. *J Louisiana State Med Soc.* 2010;162(September/October):282-290.
- Corraro JE. Disaster-related mental health needs of women and children. *MCN Am J Matern Child Nurs.* 2008;33(4):242-248.
- Taft CT, Monson CM, Schumm JA, Watkins LE, Panuzio J, Resick PA. Posttraumatic stress disorder symptoms, relationship adjustment, and relationship aggression in a sample of female flood victims. *J Fam Violence.* 2009;24(6):389-396.
- Rosborough S, Chan JL, Parmar P. Responding to gender-based violence in disasters: grappling with research methods to clear the way for planning. *Disaster Med Public Health Prep.* 2009;3(1):8-10.
- Agency for Healthcare Research and Quality. *Pediatric Terrorism and Disaster Preparedness: A Resource for Pediatricians.* Elk Grove Village, Illinois USA: The American Academy of Pediatrics; 2006.
- FEMA. Disaster Declarations by Year. FEMA Web site; 2014. <https://www.fema.gov/disasters/grid/year>. Accessed October 4, 2015.
- Greenough PG, Lappi MD, Hsu EB, et al. Burden of disease and health status among Hurricane Katrina-displaced persons in shelters: a population-based cluster sample. *Ann Emerg Med.* 2008;51(4):426-432.
- Benight CC, Harper ML. Coping self-efficacy perceptions as a mediator between acute stress response and long-term distress following natural disasters. *J Trauma Stress.* 2002;15(3):177-186.
- Boscarino JA, Hoffman SN, Adams RE, Figley CR, Solhkhah R. Mental health outcomes among vulnerable residents after Hurricane Sandy: implications for disaster research and planning. *Am J Disaster Med.* 2014;9(2):107-120.
- Ginexi EM, Weihs K, Simmens SJ. Natural disaster and depression: a prospective investigation of reactions to the 1993 Midwest Floods. *Am J Community Psychol.* 2000;28(4):495-518.
- Leon KA, Hyre AD, Ompad D, Desalvo KB, Muntner P. Perceived stress among a workforce 6 months following Hurricane Katrina. *Soc Psychiatry Psychiatr Epidemiol.* 2007;42(12):1005-1011.
- Lowe SR, Rhodes JE, Scoglio AAJ. Changes in marital and partner relationships in the aftermath of Hurricane Katrina: an analysis with low-income women. *Psychol Women Q.* 2012;36(3):286-300.
- Oni O, Harville EW, Xiong X, Buekens P. Impact of coping styles on post-traumatic stress disorder and depressive symptoms among pregnant women exposed to Hurricane Katrina. *Am J Disaster Med.* 2012;7(3):199-209.
- Paxson C, Fussell E, Rhodes J, Waters M. Five years later: recovery from posttraumatic stress and psychological distress among low-income mothers affected by Hurricane Katrina. *Soc Sci Med.* 2012;74(2):150-157.
- Timpson S, Ratliff E, Ross M, et al. A psychosocial comparison of New Orleans and Houston crack smokers in the wake of Hurricane Katrina. *Subst Use Misuse.* 2009;44(12):1695-1710.
- Wu ZH, Stevens RG, Tennen H, North CS, Grady JJ, Holzer C. Sleep quality among low-income young women in southeast Texas predicts changes in perceived stress through Hurricane Ike. *Econ Soc.* 2000;29(1):160-178.
- Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol.* 2005;8(1):19-32.

28. Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: part II. Summary and implications of the disaster mental health research. *Psychiatry*. 2002;65(3):240-260.
29. Armstrong R, Hall BJ, Doyle J, Waters E. "Scoping the scope" of a Cochrane review. *J Public Health (Bangkok)*. 2011;33(1):147-150.
30. Knabb RD, Rhone JR, Brown DP. Tropical cyclone report: Hurricane Katrina. *Natl Hurric Cent*. 2006. http://nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf. Accessed October 4, 2015.
31. Schrader A. Experts learn from two Colorado sites. *Denver Post*. 2000. <http://extras.denverpost.com/news/news0819a.htm>. Accessed October 4, 2015.
32. Wolf T. *In Fire's Way: A Practical Guide to Life in the Wildfire Danger Zone*. Albuquerque, New Mexico USA: University of New Mexico Press; 2003.
33. Brown JS, Cherry KE, Marks LD, et al. After Hurricanes Katrina and Rita: gender differences in health and religiosity in middle-aged and older adults. *Health Care Women Int*. 2010;31(11):997-1012.
34. Chan CS, Rhodes JE, Perez JE. A prospective study of religiousness and psychological distress among female survivors of Hurricanes Katrina and Rita. *Am J Community Psychol*. 2012;49(1-2):168-181.
35. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. *Epidemiol Rev*. 2005;27:78-91.
36. Hamama-Raz Y, Palgi Y, Shrira A, Goodwin R, Kaniasty K, Ben-Ezra M. Gender differences in psychological reactions to Hurricane Sandy among New York metropolitan area residents. *Psychiatr Q*. 2015;86(2):285-296.
37. Joseph NT, Matthews KA, Myers HF. Conceptualizing health consequences of Hurricane Katrina from the perspective of socioeconomic status decline. *Heal Psychol*. 2014;33(2):139-146.
38. Kulkarni M, Pole N. Psychiatric distress among Asian and European American survivors of the 1994 Northridge Earthquake. *J Nerv Ment Dis*. 2008;196(8):597-604.
39. Rhodes J, Chan C, Paxson C, Rouse CE, Waters M, Fussell E. The impact of Hurricane Katrina on the mental and physical health of low-income parents in New Orleans. *Am J Orthopsychiatry*. 2010;80(2):237-247.
40. Ehrlich M, Harville E, Xiong X, Buekens P, Pridjian G, Elkind-Hirsch K. Loss of resources and hurricane experience as predictors of postpartum depression among women in southern Louisiana. *J Womens Health (Larchmt)*. 2010;19(5):877-884.
41. Harville EW, Xiong X, Pridjian G, Elkind-Hirsch K, Buekens P. Postpartum mental health after Hurricane Katrina: a cohort study. *BMC Pregnancy Childbirth*. 2009;9(21).
42. Kim SC, Plumb R, Gredig Q-N, Rankin L, Taylor B. Medium-term post-Katrina health sequelae among New Orleans residents: predictors of poor mental and physical health. *J Clin Nurs*. 2008;17(17):2335-2342.
43. Jones RT, Ribbe DP, Cunningham P, Weddle JD. Psychosocial correlates of wildfire disaster: post disaster adult reactions. *Fire Technol*. 2003;39(2):103-117.
44. Mills MA, Edmondson D, Park CL. Trauma and stress response among Hurricane Katrina evacuees. *Am J Public Health*. 2007;97(No. S1):S116-S123.
45. Lowe SR, Rhodes JE. Trajectories of psychological distress among low-income, female survivors of Hurricane Katrina. *Am J Orthopsychiatry*. 2013;83(2 Pt 3):398-412.
46. DeSalvo KB, Hyre AD, Ompad DC, Menke A, Tynes LL, Muntner P. Symptoms of posttraumatic stress disorder in a New Orleans workforce following Hurricane Katrina. *J Urban Health*. 2007;84(2):142-152.
47. Sastry N, Gregory J. The effect of Hurricane Katrina on the prevalence of health impairments and disability among adults in New Orleans: differences by age, race, and sex. *Soc Sci Med*. 2013;80:121-129.
48. Schumacher JA, Coffey SF, Norris FH, Tracy M, Clements K, Galea S. Intimate partner violence and Hurricane Katrina: predictors and associated mental health outcomes. *Violence Vict*. 2010;25(5):588-603.
49. Fagen JL, Sorensen W, Anderson PB. Why not the University of New Orleans? Social disorganization and sexual violence among internally displaced women of Hurricane Katrina. *J Community Health*. 2011;36(5):721-727.
50. Frasier PY, Belton L, Hooten E, et al. Disaster down east: using participatory action research to explore intimate partner violence in eastern North Carolina. *Heal Educ Behav*. 2004;31(4 Suppl):69S-84S.
51. Jenkins P, Phillips B. Battered women, catastrophe, and the context of safety after Hurricane Katrina. *NWSA J*. 2008;20(3):49-68. <http://search.ebscohost.com/login.aspx?direct=true&db=ssf&AN=508007256&site=ehost-live>. Accessed October 4, 2015.
52. Clemens P, Hietala JR, Rytter MJ, Schmidt RA, Reese DJ. Risk of domestic violence after flood impact: effects of social support, age, and history of domestic violence. *Appl Behav Sci Rev*. 1999;7(2):199-206.
53. Santa Cruz Commission for the Prevention of Violence against Women. *Violence Against Women in the Aftermath of the October 17, 1989 Earthquake*. Santa Cruz, California USA: Commission for the Prevention of Violence against Women; 1990.
54. Galea S, Tracy M, Norris F, Coffey SF. Financial and social circumstances and the incidence and course of PTSD in Mississippi during the first two years after Hurricane Katrina. *J Trauma Stress*. 2008;21(4):357-368.
55. Brock RL, O'Hara MW, Hart KJ, et al. Partner support and maternal depression in the context of the Iowa floods. *J Fam Psychol*. 2014;28(6):832-843.
56. Harville EW, Taylor CA, Tesfai H, Xiong X, Buekens P. Experience of Hurricane Katrina and reported intimate partner violence. *J Interpers Violence*. 2011;26(4):833-845.