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Aaron D. Marshall Date

Injuries to Professional Volunteer Responders Post Tropical-Cyclone Event; a Systematic Review

By

Aaron D. Marshall

Degree to be awarded: MPH

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Injuries to Professional Volunteer Responders Post Tropical-Cyclone Event; a Systematic Review

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An abstract of

A thesis submitted to the Faculty of the

Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of

Master of Public Health

in the Hubert Department of Global Health

2018

Abstract:

Background: Tropical cyclones include Hurricanes, Typhoons and Tropical Storms. These events change communities, with a global reach and catastrophic effects. Volunteers often assist communities affected by tropical cyclones with rescue, response, and recovery. These volunteers can experience injury or illness or die while assisting after tropical cyclones. It is unknown what evidence exists on injury, illness, or deaths and prevention strategies or surveillance systems of professional volunteer disaster responders after tropical cyclone disasters.

Methods: We conducted a systematic literature review of applicable and available public health, emergency management, humanitarian assistance, and disaster response literature from 2005-2018, providing data on the tropical cyclone researched, nature of injury, illness or death, year of impact of the tropical cyclone, disaster type, location of impact, article type, and country of research origin.

Results: Through our searches we identified 1,045 resources, resulting in 261 original pieces of research, and 122 articles included in our review. 2 (<2%) of the 122 articles assessed the injuries, illnesses, and deaths specifically related to professional volunteer responders during a tropical cyclone event. 36 (30%) of the 122 articles were published in 2005, 30 (25%) of the articles were focused on Hurricane Katrina, 81 (66%) of the 122 articles assessed the nature of injury, illness, or death as unintentional injuries, illnesses, or deaths in tropical cyclone disasters, 44 (36%) of the 122 articles assessed mental or spiritual health as the nature of injury illness or death in tropical cyclone disasters and 41 (34%) of the 122 articles assessed trauma as the nature of injury illness or death in tropical cyclone disasters.

Conclusions: While there is a body of evidence on health impacts of tropical cyclones, little, if any evidence exists on the injury, illness, or deaths of professional volunteer responders active in the rescue, response, or recovery phase of a tropical cyclone disaster occurring since 2005. Implementation of the Emergency Responder Health Monitoring and Surveillance (ERHMS) framework would greatly benefit the efforts of understanding these tropical cyclone disasters and their impacts on professional volunteer responders active in assisting affected communities.

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Acknowledgments

First, I'd like to thank my family and friends for believing in me, and supporting this endeavor. A Masters degree in Public Health is no small feat; and from phone calls in the middle of the night to spontaneous vacations to get my mind off a thesis, my family and friends were the greatest support possible. My Mother, Carolyn Perkins and my Father, John Marshall and Grandfather, Daniel Marshall are the three best examples of consummate professionals in medicine I've ever had the pleasure of knowing, working alongside, and learning from. I have them to thank for instilling a desire to serve those affected by disasters, emergencies, and crises. Their support of this thesis, and of my choices to serve others on what may be their worst days will never be forgotten.

I'd like to thank my colleagues in Team Rubicon, and on the National Incident Management Team for their constant support and dedication to those affected by disasters and those responding to disasters. I've spent the better part of three years on this thesis and the graduate degree it culminates, their calls, support, and compassion for communities has made this a swift and easy transition from student to professional. They embody the ethos of "Engage, Enable, Empower, and Inspire" which I live daily, and which assisted in the development and publication of this thesis.

Finally, I'd like to thank the faculty, staff and students of the Rollins School of Public Health at Emory University. Their care, compassion, and commitment to my success was not easy. I certainly raised a little hell during my time there, and I am incredibly thankful and in debt for the professionalism and profound respect I was granted, even when I didn't really deserve it. Dr. Mohammed Ali has been an incredible mentor, thesis advisor, thesis chair, and friend. From our first meeting in his office to the phone calls over this thesis, I have always been impressed by Dr. Ali's dedication to his students and I am so thankful for his choice to believe in me over this half-baked, luke-warm idea which eventually became a thesis and the culmination of much hard work.

I also owe a huge debt of gratitude to Lara S. Martin, the faculty and staff of the Center for Humanitarian Emergencies at Emory, and the Complex Humanitarian Emergencies Certificate Program for their uncompromising support throughout this process. I owe you all for this degree and the incredible friendship. I will forever say that I studied Complex Humanitarian Emergencies.

I've spent the past 7 years responding to over 130 international and domestic disasters and crises alongside Team Rubicon, an organization dedicated to uniting the skills and experiences of veterans and first responders, rapidly deploying vanguard emergency response teams to assist communities after disasters. My work in the field, specifically in the experiences of responding to multiple hurricanes, typhoons and tropical cyclones is the focus of this thesis. The origin of this work comes from my personal experiences as both professional volunteer responder, victim, and survivor of tragic accidents while assisting communities on their worst days in the wake of hurricanes, typhoons and tropical cyclones. When responding to Hurricanes Katrina in 2005, Ike in 2008, Sandy in 2012, Haiyan in 2013, Joaquin in 2015, Matthew in 2016, Harvey, Irma, and Maria in 2017 and Florence, Michael, and Yutu in 2018, I understood that some of the life-threatening injuries and deaths of fellow professionals could be easily prevented. While this thesis feels like the culmination of years of work, I know and trust that it is only the very beginning in what can only be known as a front row seat to the greatest show on earth.

This research was performed throughout three of the most active hurricane seasons in the southeastern United States; 2016, 2017, and 2018. I was forward deployed into a Hurricane disaster in the United States for over 400 days over these three seasons as a rescuer, responder, coordinator, commander, and leader of nearly 2,000 volunteers actively engaged in rescue, response, and recovery activities. I can thankfully say that every volunteer in my charge came home, however I know that many could benefit from the understanding borne of and concluded from this thesis. This thesis is as much for me, as it is a commitment and thank-you to each one of them.

Table of Contents:

Acronyms:

ARC	- American Red Cross
CDC	- Centers for Disease Control and Prevention
ERHMS	- Emergency Responder Health Monitoring and Surveillance Framework
FEMA	- US Federal Emergency Management Agency
NIOSH	- National Institutes for Occupational Safety and Health
NIMS	- National Incident Management System
PRISMA	- Preferred reporting items for systematic reviews and meta-analyses
US	- United States of America
USG	- United States Government
USCG	- United States Coast Guard
WHO	- World Health Organization
WMO	- World Meteorological Organization

Introduction:

In the balance of time between the 2005 and 2018 Atlantic Hurricane Seasons, there has been an enormous increase in the actions of volunteers after tropical cyclone disasters. Volunteers professionalized and have assisted in rescue, response, and recovery actions after tropical cyclones. The United States Government (USG) recognizes that citizen and community volunteers account for the majority of responders to tropical cyclone events.[41] When trained and credentialed, these volunteers act as professional volunteer responders. [41]

The same increase in professionalization of volunteers is occurring outside of the U.S., since cyclone Nargis in 2008 [18] . The effects of this storm on Myanmar highlighted the successes of volunteers on the international humanitarian and disaster response community.

As exposure of professional volunteer responders to more dangerous disaster scenarios increases, there has been a gap identified in current, available research. This gap exists between professional volunteer responders in disasters and our understanding of their risk of injuries, illness, and deaths from tropical cyclone events.

This thesis systematically reviews and reports on the current research available on injuries, illnesses, and deaths of volunteer, professional disaster responders after tropical cyclone events. This thesis develops a greater breadth of knowledge in what activities are most dangerous in the field for professional volunteer responders after a tropical cyclone event.

This thesis uses a systematic process to review the literature and ascertain threats and hazards that professional volunteers are exposed to in responding to a tropical cyclone event.

Overview:

The overview section provides insight into the effects of tropical cyclones. The section provides a primer regarding the effects of tropical cyclones on professional volunteer responders.

The World Health Organization (WHO) defines a disaster as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses, and impacts, which exceeds the ability of the affected community or society to cope using its own resources." [45] Disasters are caused by unmitigated risk; or the confluence of hazards and vulnerabilities. [49]

The impacts of tropical cyclones include hazards include wind and water events. Unmitigated hazards cause injuries, illness, and death among at-risk populations. Our population of interest was those responding to the disaster.[49]

Tropical Cyclones are the most destructive weather systems.[26] The impact from cyclones generally extends over a wide area, with mortality, injury, and property loss resulting from strong winds and heavy rains. Often secondary events such as storm surges, flooding, landslides, and tornadoes exacerbate effects of these systems. Although improved warning systems in most cyclone-prone areas of the world today prevent or reduce deaths, meteorological elements, increased population growth, and the development of human settlements along coastal areas continue to present risks associated with cyclone-related mortality and morbidity. [26]

The World Meteorological Organization (WMO) defines tropical cyclones as a warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. [50] Tropical cyclones form when wind speed reaches maximum sustained winds of 74 miles per hour or higher. Tropical

cyclones are an umbrella term for tropical storms, cyclones, hurricanes, and typhoons and they are classified depending upon where the storm originates. The graphic below further defines naming conventions of these storms. [26]

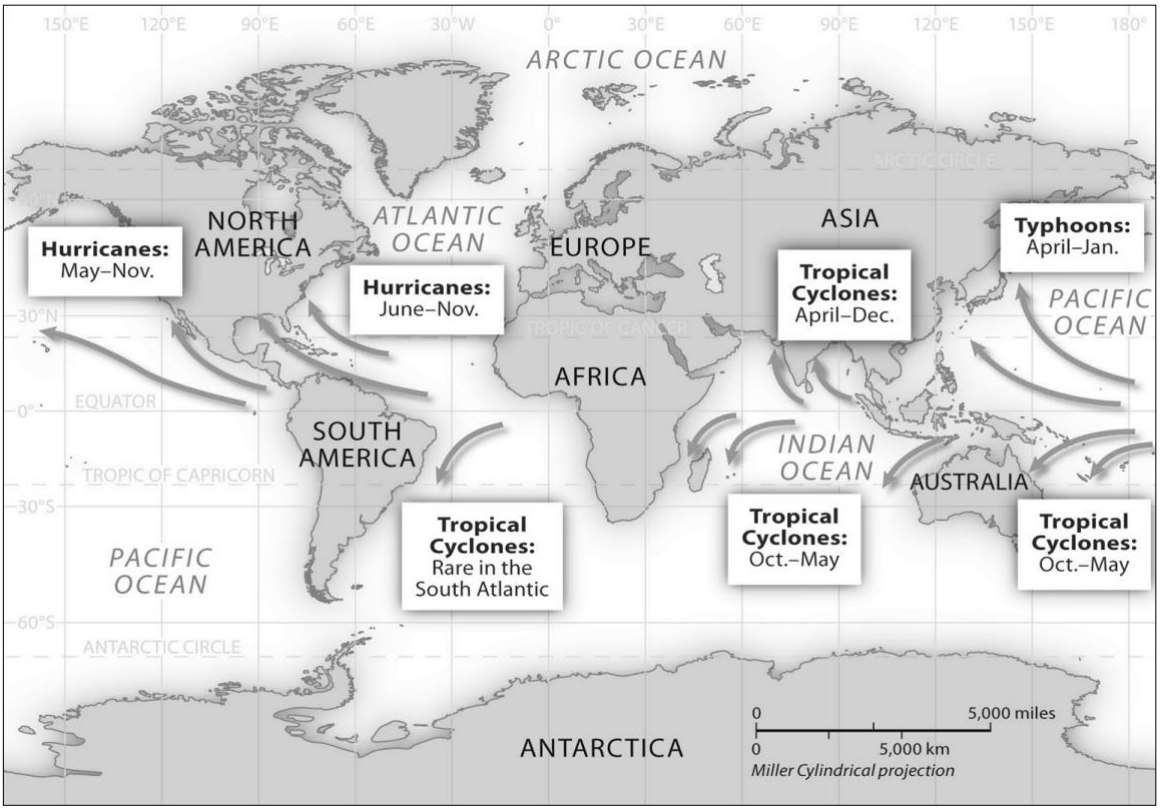

Figure 1: World Regional Geography: People, Places and Globalization. The Saylor Fund, 2012.

As shown by the graphic, Hurricanes affect North America between May and November. Tropical Cyclones affect South America rarely, but do affect Africa and Australia between October and May, and South Asia between April and December. Typhoons affect East Asia between April and January.[5]

Monitoring, tracking, and warnings regarding these incredibly destructive systems occurs far ahead of time.[1] Each Continent has a regional coordination center that is responsible for warning,

prediction, and relating information on the system to relevant authorities.[42] The strength and severity of the storm changes the scale with the system, based on geography. Winds typically are the defining factor of a storms intensity and impact. The 195km/h winds from Typhoon Haiyan impacting the Philippines in 2013 were the worst storm damage ever noted from a tropical cyclone.[46] Atmospheric pressure also defines size and scope of tropical cyclones. Lower atmospheric pressure defines stronger storms; the lowest pressure recorded was with Typhoon Tip in 1979; which reached 870mb atmospheric pressure. [5]

Tropical cyclone impacts pose public health risks. The public health risks can be even more dangerous for professional volunteer responders.[26]

Tropical Cyclones produce storm surge and large waves that pose the greatest threat to life and property along the coast.[1] Storm Surge is defined as: an abnormal rise of water generated by a storm's winds. [31] Another major threat to communities includes heavy rains and inland flooding with Tropical Cyclones. These heavy rains result in deadly, destructive floods which affect infrastructure, property, and individuals. Heavy rains cause inland flooding, which can affect areas far away from the coast. [31] Flash Flooding and River Flooding cause the greatest loss of life in areas not considered coastal. High winds can cause damage to infrastructure, often carrying debris long distances, posing large hazards to unfortified structures. Rip currents are formed from dangerous waves breaking along the coast, producing tides and surf - even far away from the storm. [31] Tornadic activity during Hurricanes consists of small, short-duration tornadoes which typically do not experience dramatic growth. These tornadoes can only do a small amount of damage and form either on the outlying edge of the storm or near the center of the eyewall. [31]

Storm surges cause the most direct injuries and deaths after a Hurricane in the U.S. [5] One out of every five or six Atlantic basin tropical cyclones causes loss of life in the U.S.; of those hurricanes,

on average, two to three tropical cyclones per year cause U.S. fatalities.[31,5] Around 2,544 people have died in the U.S. or its coastal waters from tropical cyclones in the 50-year period of 1963–2012. [31,5]

In the U.S., over half of the Nation's economic productivity is located within coastal zones. Three quarters of the ports of the U.S., one quarter of major roads of the U.S., and ten percent of rail lines within the Gulf Coast region lie below four feet in elevation. [31,5] Roughly ninety percent of the deaths in 294 Atlantic Hurricanes occurred in water-related incidents, most by drowning. [31,5] Storm surge was responsible for about half of the fatalities from records of 294 Atlantic Hurricanes. [31,5]

Before the introduction of warning systems that can result in timely evacuation and sheltering, drowning from storm surge accounted for an estimated ninety percent of all tropical cyclone event-related deaths. [26] This percentage remains much the same today in areas where cyclone forecasting and warning, although improved, have yet to be disseminated to all public sectors. [26]

This pattern of death continues outside of the U.S. For example, in Bangladesh and the Philippines, factors such as inadequate housing and population density exacerbate risks for drowning from storm surge. [26] Tropical cyclone event-related morbidity generally includes trauma, gastrointestinal illnesses, and dermal conditions in these tropical cyclones outside of the U.S.. Structural collapse and wind-strewn debris account for many of the injuries observed during a tropical cyclone outside of the U.S.. In particular, blunt trauma due to structural collapse may cause mortality during the rescue and response phase to these tropical cyclones. [26]

While there is a generally agreed upon understanding of tropical cyclone events, there is not a generally agreed upon term for first responders. There is no definition of the term first responder.[25]

The term is used popularly or colloquially to refer to law enforcement, fire, and emergency medical personnel, especially after the events of September 11, 2001.

This thesis uses the term professional volunteer responders as the population of interest. Professional Volunteer Responders are people who volunteer and are affiliated with an agency actively responding to a disaster. Affiliation with a volunteer agency restricts the population of responders to those not receiving payment for emergency services or disaster assistance provided.[41] This terminology affects the research, as there is not much evidence on those providing disaster assistance as a member of an affiliated agency. This term is used throughout the thesis, and is of particular importance to the systematic review of the literature, findings, discussion, and conclusions. The USG defines professional volunteer responders in the context of the National Incident Management System (NIMS) as "a volunteer is any individual accepted to perform services by the lead agency (which has authority to accept volunteer services) when the individual performs services without promise, expectation, or receipt of compensation for services performed". [39]

Emergency management and disaster response professionals rely on a group of both professional responders and, to varying degrees, volunteers affiliated with official volunteer agencies, such as Voluntary Agencies Active in Disaster or VOADs. [41] These responders are not individuals who are from the affected population or community, but rather those who belong to an affiliated agency providing assistance as requested from the local community. "Professionals and volunteers with official agencies tend to be viewed as legitimate actors" [41] which is the genesis of the term "Professional Volunteer Responder", legitimate actors within disaster assistance.

The Systematic Review & Research Questions:

A systematic review locates, appraises, and synthesizes the best available evidence relating to a specific research question. This is designed to provide informative and evidence-based answers to complex questions. This information can be combined with professional judgment to make decisions about how to deliver interventions or to make changes to policy. [48]

A systematic review is considered the best, and is known as the gold standard in academic research for understanding a topic. Systematic reviews synthesize the findings of several studies investigating the same questions. Systematic reviews follow well- defined and transparent steps and require the following: definitions of the question or problem, identification, and critical assessment of the available evidence, and synthesis of the findings and the drawing of relevant conclusions. [48]

Research Questions:

The Core Research Questions we explored in this thesis were:

- What are the factors which influence professional volunteer responder illness, injury, or deaths after a tropical cyclone event and what can be done to enhance professional volunteer responder safety in a tropical cyclone event?

The Secondary Research Questions we explored in this thesis were:

- Since 2005; What are the most commonly reported methods being used to decrease rates of Professional Volunteer Responders illness, injury, or deaths after a tropical cyclone event?
- Since 2005; have the factors in Professional Volunteer Responders related to illness, injury, or deaths after a tropical cyclone event changed over time?

- In responses outside of the Continental U.S.; what is the reported relationship between country of origin, training and rates of Professional Volunteer Responders illness, injury or deaths after a tropical cyclone event?
- Since 2005, what have been shown to be the most effective programs for decreasing rates of Professional Volunteer Responders illness, injury, or deaths after a tropical cyclone event?

Thesis Statement:

This thesis examines the tropical cyclones, a form of complex humanitarian emergencies that include cyclones, typhoons, and hurricanes. This thesis examines professional volunteer responders and their capacity and capabilities. This thesis examines occupational safety, injuries, deaths, incidents, and accidents while responding to a tropical cyclone event. This thesis is a systematic review of the literature related to injuries, illnesses, and deaths from tropical cyclone disasters on professional volunteer responders.

Hurricane Katrina and Cyclone Nargis were both watershed events for the international and domestic humanitarian and disaster response community. These responses to tropical cyclone events resulted in vast amounts of research.

Methods:

The process for the systematic review involved: development of a purpose statement, documenting the search process including applying limitations on the search process, creating an inclusion and exclusion criteria, documenting the search terms and processes, and understanding limitations. The process the involves retrieving the articles, assessing them for relevance, and reviewing the accuracy of the articles. We also assessed articles for relevance, accuracy, and quality.

Purpose Statement:

The purpose of this thesis was to review the currently available literature which identifies, defines, reports, or documents experiences of professional volunteer responder illnesses, injuries, or deaths after a tropical cyclone event.

Search Protocol:

We conducted the review with the search process outlined below. Search terms were used to find articles within four online resources (detailed below). Articles were retrieved. Only full text available articles were reviewed. Articles were reviewed according to the search parameters. Articles were assessed for relevance, accuracy, and quality.

Search Process:

We reviewed previous literature and identified that no previous review or applicable literature could be found on injuries to professional volunteer responders post tropical cyclone event. During the search process, we identified a criteria and protocol for the search strategy and researched relevant articles.

Scholastic Resources:

We searched the following databases: PubMed Central, the National Library of Medicine's premier online database; Disaster Literature, the resource guide for

disaster medicine and public health; Homeland Security Digital Library, the U.S. Federal Emergency Management Agency (FEMA) online scholarly resource management repository; Relief-web.com and Humanitarian Response.info; two repositories for grey-literature, reports, case studies, periodicals and scholarly research on disasters and complex humanitarian emergencies. We added all of the resources identified to an Endnote library, and also used Google Scholar and Google Sheets for reference identification and analysis.

Search Terms:

For Tropical Cyclone – Hurricane, Typhoon, Tropical Event, Tropical Storm, Cyclone. For Injury, Illness, or Death – Injury, Trauma, Death, Mortality and Morbidity. For Responder – First Responder, Professional Volunteer Responders, Rescuer, Response Expert, Response Specialist. 18 Search terms were used throughout the search process for this systematic review. Search was conducted methodically using the four distinct resources noted in the Scholastic Resources.

	Concept 1	Concept 2	Concept 3
Key Term	Tropical Cyclone	Injury	Responder
Controlled Language Term	a. Hurricane b. Typhoon c. Cyclone d. Tropical Storm e. Tropical Event	a. Death b. Mortality c. Morbidity d. Loss of Life e. Trauma	a. Professional Volunteer Responder b. First Responder c. Rescuer d. Response Expert e. Response Specialist

Table 1: Key Terms and Controlled Language Terms

Inclusion Criteria:

We included articles meeting the following inclusion criteria: articles were published between January 1 2005 and June 1 2018; Articles were published

literature from peer reviewed articles from professional journals or publications. Articles were original thought, and were applicable to professional volunteer responders. Articles were in English.

Exclusion Criteria:

We excluded articles not meeting the inclusion criteria. If articles were published before January 1 2005 or after June 1 2018 they were excluded. If articles were not in English, they were excluded. If articles were not applicable to responders, they were excluded. If articles were not published, scholarly literature they were excluded.

Limitations:

One key limitation for this Systematic Review was that we had to rely on available data and there were very few studies that were applicable to responders, the disaster type and kind we had focused on, as well as the timeframe. Additionally we limited to studies written in English which could miss relevant data. Further limits were applied to the type of article and information that was utilized. This includes a three schedule prioritization for the type of literature:

1. Published Literature
2. Scholarly, Peer Reviewed Articles
3. Published Reports and Case Studies

A known limitation of the methods of this systematic review are the publication of articles in relation to complex humanitarian emergencies and disasters. The publication of these articles are often not timely, given the dichotomous nature of disasters. This sensitivity of this data and information is understood throughout the systematic review.

Retrieval:

We reviewed the published literature carefully to determine applicability and whether articles met our inclusion and exclusion criteria. We then divided literature by qualitative and quantitative study design. We further divided literature by published text, case reports and journal articles. We retrieved all literature using a reference management database (EndNote) and manipulated the references using google sheets. We tabulated the literature by search term, engine located and date. To avoid duplication; a master list was created within Sheets and preserved.

Critical Review:

During the critical review, we examined biases in reporting and selection of articles and references. While we retrieved the literature, all references were tabulated, collated, and uploaded to the reference management system EndNote. We then copied and pasted the references and literature into google sheets to be able to manipulate it. We then searched through EndNote for full text articles. Bias on reporting and selection of the articles were decreased by this process.

Assessment:

We conducted our review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses or PRISMA guidelines, the evidence-based minimum set of items for reporting in systematic reviews and meta-analyses. As a result, we ensured that our reporting of systematic reviews included descriptions of the identification, screening, eligibility, and inclusion selection assessment. [51]

We identified 1,045 documents through the search process. While searching, we found that 784 of the documents were duplicates. We retrieved 261 documents after completing the search process. We applied the inclusion and exclusion criteria, which resulted in 136 articles remaining. We then found 122 of these articles had full text available. We found 89 qualitative articles and 16 quantitative articles. We found 17 case reports or published text. We found 2 of the articles are directly relevant to all three aspects of this review, responders, tropical cyclone events and illnesses, injuries or deaths.

Resource Documents Identified:	**1,045** Resources
Duplicates Removed:	**784** Resources
Remaining Original Documents:	**261** Resources
Inclusion & Exclusion Criteria Applied:	**136** Resources
Full Text Available:	**122** Resources
Qualitative:	**89** Articles
Quantitative:	**16** Articles
Case Reports & Published Text:	**17** Resources
Quoting "Responders, Tropical Cyclones and Injuries, Illness, Deaths":	**2** Articles

Table 2: PRISMA Flow Chart with Analysis of Resources and Articles, Marshall 2018

Findings:

We classified the 122 articles identified in this section by: the year that the disaster happened, the name of the tropical cyclone event of which the article is identified, type of disaster the article is related to – including hurricane, typhoon or tropical cyclone – and other, where the tropical cyclone event occurred – outside or inside of the continental U.S. or otherwise, location of landfall of the tropical cyclone event, and publication type.

We identified 122 articles, only 2 (<2%) of the articles catalogued the experiences of professional responders assisting after tropical cyclone events. We found the articles, "Injuries and Illnesses Among American Red Cross (ARC) Responders—United States, 2008–2012" and "Disaster-related exposures and health effects among US Coast Guard (USCG) responders to Hurricanes Katrina and Rita: a cross-sectional study" were of particular value to this systematic review. We found only one, Injuries and Illnesses American Red Cross Responders, address the experiences of volunteers in disasters.

We found all the information for the findings directly from the articles, after an exhaustive read of all 122 articles. Charts and analysis were built with information ascertained from the systematic review. We found Analysis of trends within the literature and both are identified in graphical representation by figures, and in direct summary of the articles and figures.

We performed an analysis focused on characteristics of the articles as they relate to injuries, illnesses and deaths of professional volunteer responders during these tropical cyclone events. Analysis assists in the total understanding of the systematic review. The analysis provides clarity on the review, as well as on the findings of the articles.

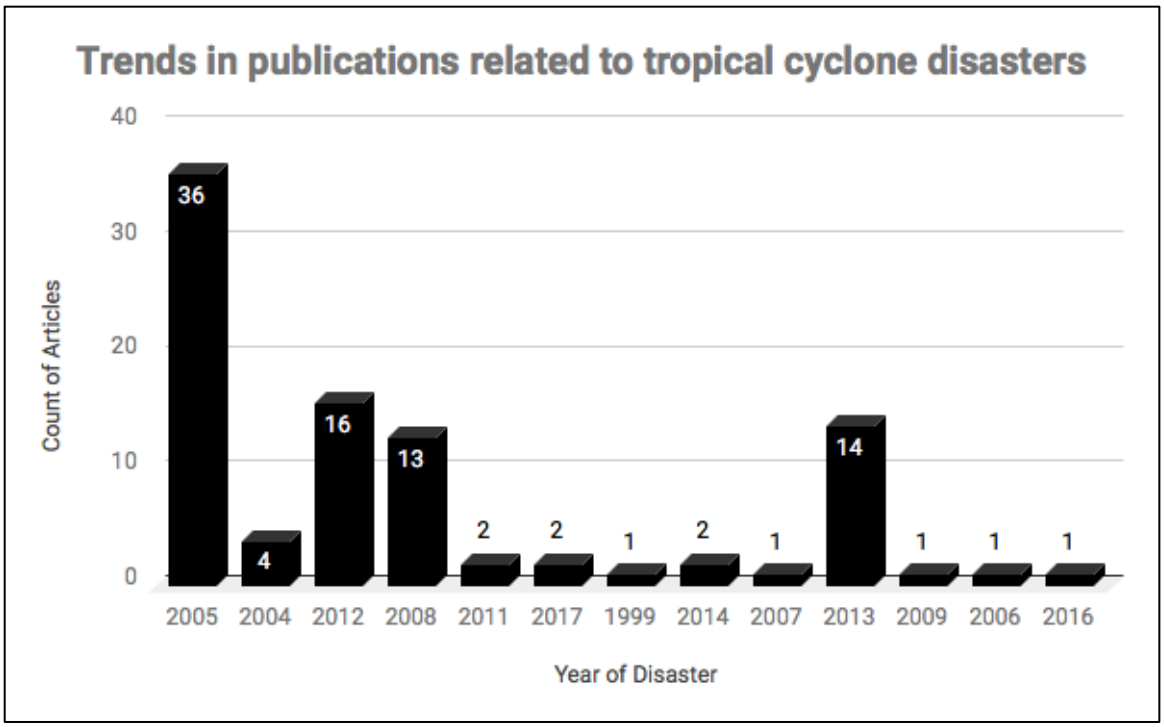

Figure 2: Count of Articles and Year of Disaster, Marshall 2018

Figure 2 describes the articles reviewed and the year that the principal disaster of the article occurred. 36 (30%) of the 122 articles were produced for a disaster in 2005; 16 (13%) of the 122 articles are in reference to 2012 disasters, 14 (12%) of the 122 articles are in reference to 2013 disasters and 13 (11%) of the 122 articles are in reference to 2008 disasters.

Analyzing the articles within this systematic review by "Year of Disaster" was the first measurable undertakings of the review. Many articles were written in different years then when the articles primary disaster occurred. In the case that the article was in reference to multiple disasters, the first year in question of the article was provided.

The 2005 Atlantic hurricane season was a landmark year for disasters. By almost all standards of measure, the 2005 Atlantic hurricane season was the most active of record. [4] Twenty-eight storms

occurred, including 27 tropical storms and one subtropical storm. 1500 deaths occurred in the U.S. from Hurricane Katrina. Hurricane Katrina is the deadliest U.S. hurricane since 1928. Over $100 billion in damages in the U.S. was attributed to Hurricane Katrina and the 2005 season, making this season the costliest hurricane season ever. [4]

In 2013, Typhoon Haiyan, one of the strongest tropical cyclones ever recorded, devastated portions of Southeast Asia. It is the deadliest Philippine typhoon on record, killing at least 6,268 people. Typhoon Haiyan is also the strongest storm recorded at landfall, and the strongest typhoon by wind speed. The storm caused nearly $4.55 Billion in damages to the Philippines. [22, 46]

The 2012 Atlantic hurricane season was the first season with impacts on the U.S. since 2008 and Hurricane Ike. Sandy brought hurricane-force winds to the U.S. coast, but wasn't a Hurricane when it made landfall. Sandy caused nearly $50 billion in damages, making Sandy the second- costliest cyclone to hit the U.S. behind Katrina. 147 direct deaths are attributed to Sandy. At least 87 indirect deaths were associated with Sandy or its remnants in the U.S.. [21, 19, 16, 5]

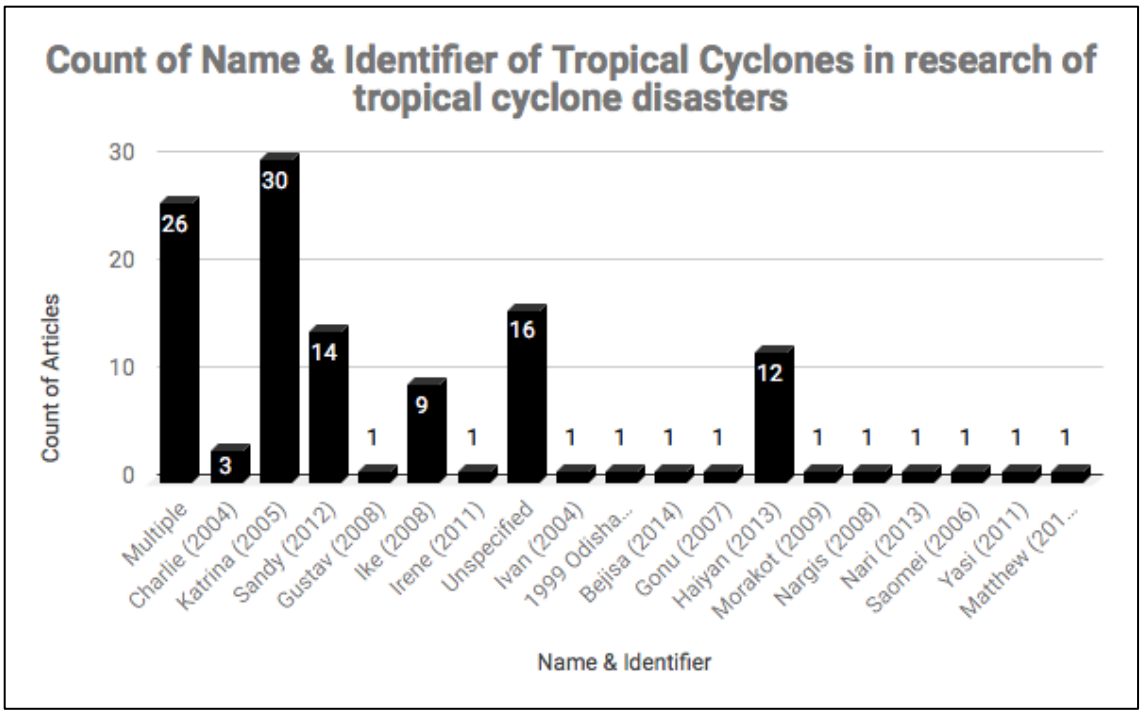

Figure 3: Count of Articles and Named Disaster Identifier, Marshall 2018

Figure 3 describes the articles reviewed and the named disaster or identifier of the disaster that occurred. 30 (25%) of the 122 articles are related to the named tropical cyclone Hurricane Katrina in 2005; 26 (21%) of the 122 articles are related to multiple named tropical cyclones. 16 (13%) of the 122 articles are related to an unspecified tropical cyclone. 14 (12%) of the 122 articles are related to the named tropical cyclone Hurricane Sandy in 2012 and 12 (10%) of the 122 articles are related to the named tropical cyclone to Typhoon Haiyan in 2013.

The name of each storm associated with individual articles was identified during this systematic review. Hurricane Katrina was the subject of approximately 30 articles identified during the review process. The unspecified and multiple columns, appears to hold a large amount of the studies conducted. These were conducted on either multiple events, including Hurricanes, Typhoons and Tropical Cyclones or remained unspecified during the process of the review. The latest named storm to be identified during this portion of the review is Hurricane Matthew in 2016, but with only 1 article reviewed.

Hurricane Sandy, Typhoon Haiyan and Hurricane Ike rounded out the last portion of the highly marked named storms. The spread of the named storms identified during the research of this systematic review highlighted the need to take a global approach to the understanding of tropical cyclone impacts. It is understood that these disasters are not solely a North American problem, but moreover a global problem encountered by multiple communities throughout the world, where there are coastlines with individuals residing in dangerous places. [20]

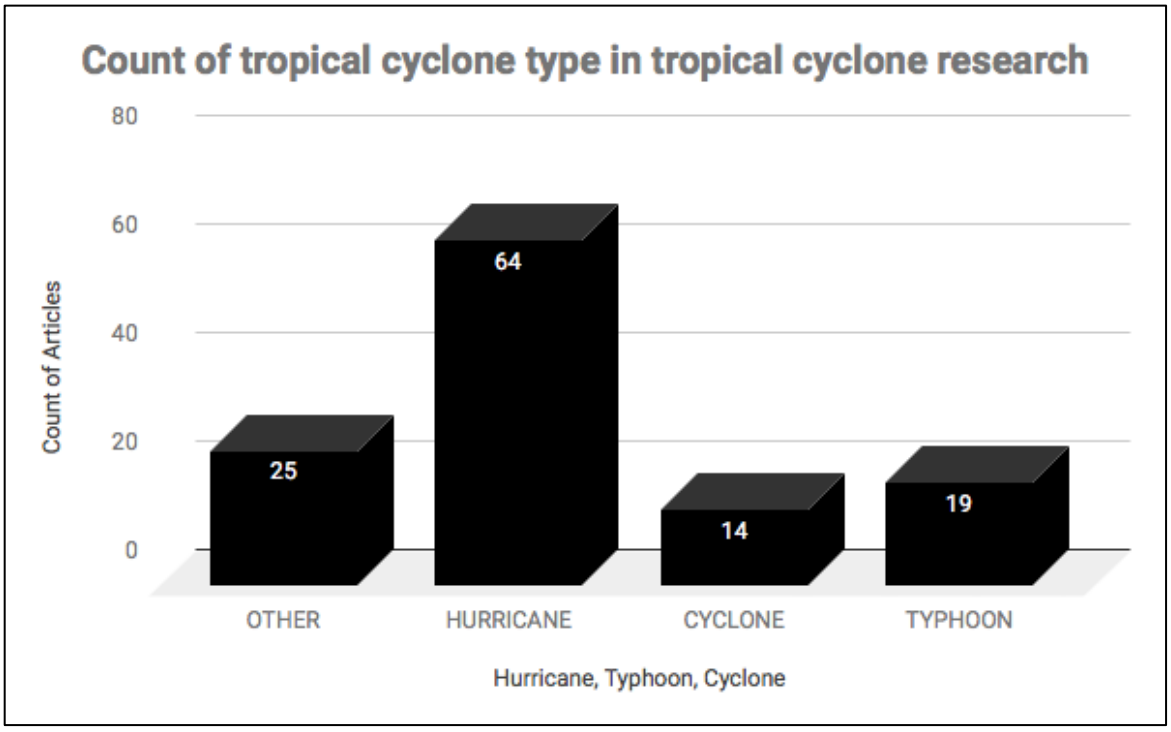

Figure 4: Count of Articles and Event Type Researched, Marshall 2018

Figure 4 describes the articles reviewed and the disaster event type that occurred, including Hurricane, Tropical Cyclone, Typhoon or other event. 64 (53%) of the 122 articles are related to a Hurricane event researched. 25 (20%) of the 122 articles are related to other types of events researched. 19 (16%) of the 122 articles are related to a Typhoon event researched. 14 (11%) of the 122 articles are related to a Cyclone event researched.

In the case that multiple types of events were researched, the primary event of the article was counted. 64 (53%) of the 122 articles were related to Hurricane events researched. 25 (20%) of the 122 articles were related to other events researched, which included sub-tropical cyclones and tropical storms which were unnamed. 19 articles were related to typhoon events researched. 14 articles were related to tropical cyclone events.

64 (53%) of the 122 articles researched were in reference to Hurricanes, however this is not to say that 64 of the hurricane articles were US based, nor that articles were on 64 individual hurricane events. As stated earlier, Hurricanes are identified in the Atlantic and Pacific basins, if north of the equator. Cyclones and Typhoons occur in the Pacific and Indian basin, dependent on where the storm forms, and at which velocity it strikes. Of the 25 other articles, many were on tropical storms, or identified tropical systems which did not become Hurricanes, Tropical Cyclones or Typhoons.

Current analysis and trends noted by the National Hurricane Center and other meteorological agencies note that Hurricanes, Typhoons and Tropical Cyclones occur at generally the same frequency per year, when adjusted for time. Subsequently, reporting and research on such events should be even throughout their distribution, as reported by the literature it is not even throughout. [4, 5, 36, 8, 30]

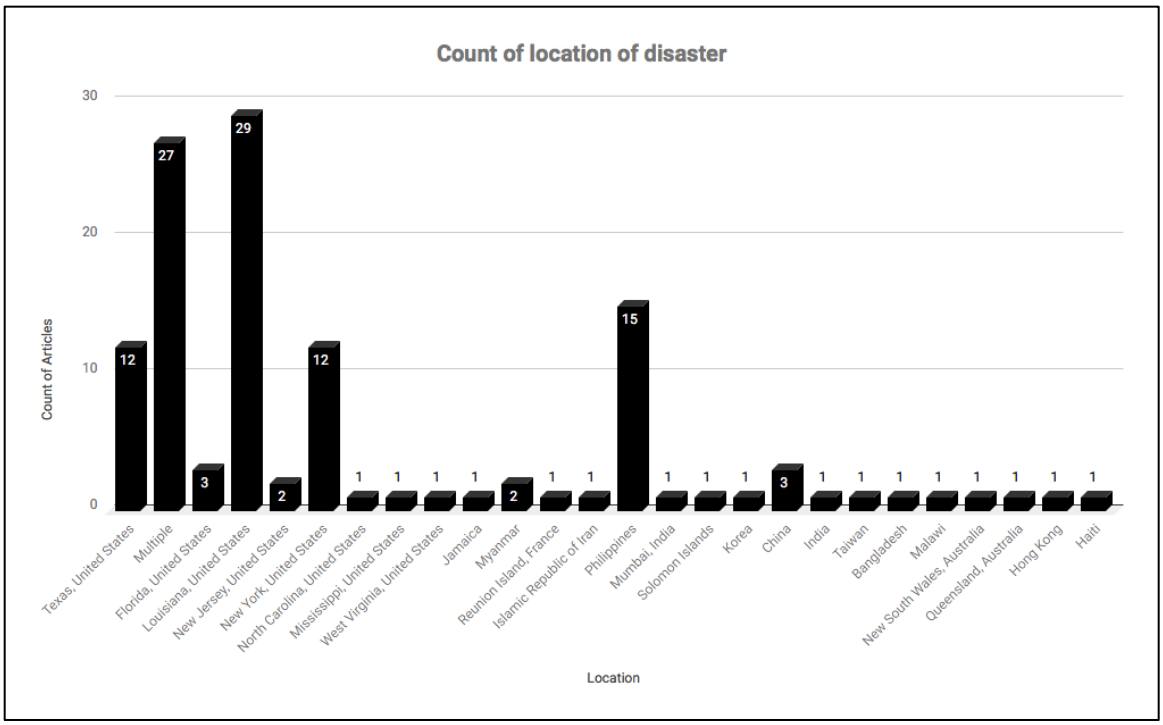

Figure 5: Count of Articles by Disaster Location, Marshall 2018

Figure 5 describes the articles reviewed and the location of the disaster event that occurred. Location of which the primary disaster occurred was noted. In the event that an article researched multiple states or countries, it was noted as multiple. 29 (24%) of the 122 articles were based in Louisiana, U.S.; 27 (22%) of the 122 articles were noted as occurring in multiple states or countries, 15 (12%) of the 122 articles were based in the Philippines 12 (10%) of the 122 articles were based in New York, U.S. and 12 (10%) of the 122 articles were based in Texas, U.S.. China and Florida, U.S. both had 3 articles associated, while Myanmar (Burma) and New Jersey U.S. had 2 articles associated.

North Carolina U.S., Mississippi U.S., and West Virginia, U.S. had an individual article, as did Jamaica, Reunion Island of France, Iran, Mumbai India, India outside of Mumbai, Solomon Islands, the Republic of Korea, Taiwan, Bangladesh, Malawi, New South Wales and Queensland, Australia, Hong Kong and Haiti with single articles. In noting the location of which the disaster occurred for this systematic review; it became evident that "United States" was not as appropriate to investigate

the totality of where these disasters occurred. Of the locations identified, 8 were states within the continental U.S. (Texas, Florida, Louisiana, New Jersey, New York, North Carolina, Mississippi and West Virginia). These 8 states accounted for 61 of the articles identified.

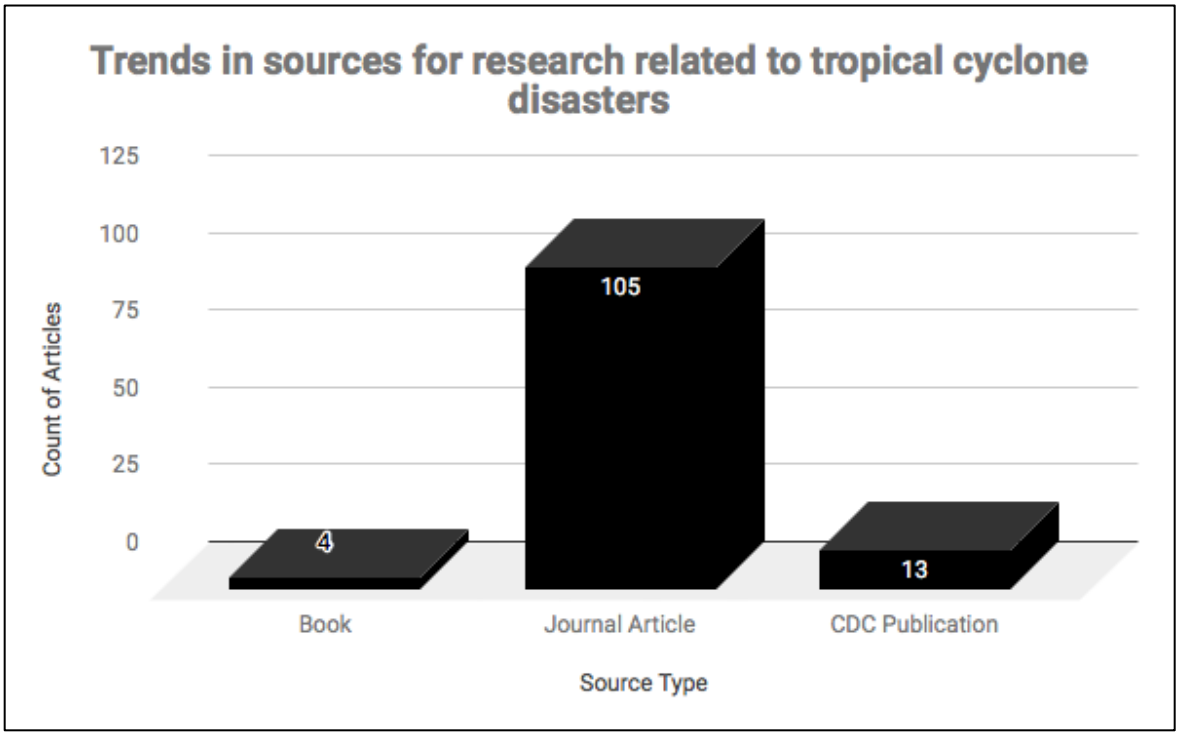

Figure 6: Trends in sources for research related to tropical cyclone disasters, Marshall 2018

Figure 6 describes the articles reviewed and the type of the article which the article was published as. Of the articles and resources identified; all of those included were either Centers for Disease Control and Prevention (CDC), publications, journal articles or books. These CDC publications include the Mortality and Morbidity Weekly Reports (MMWR), Case Reports, and Event Reports. The primary agency responsible for the CDC publications is the National Institutes of Occupational Safety and Health (NIOSH).

105 (86%) of the 122 articles used in this systematic review, were from scholarly, peer-reviewed journals. 13 (11%) of the 122 articles were reports from the CDC, there were no other included

reports from any other agency other than the CDC which focused on tropical cyclone events included within the research parameters. 4 (3%) of the 122 were textbooks, as noted previously in the methods section.

The amount of scholarly research currently available, in reference to tropical cyclone events is commensurate with other amounts of research provided. The CDC and NIOSH were responsible for 12 of the 13 articles published by the CDC, and provide a great avenue related to the concentration of the vulnerabilities of professional volunteer responders to the hazards experienced in responding to tropical cyclone events.

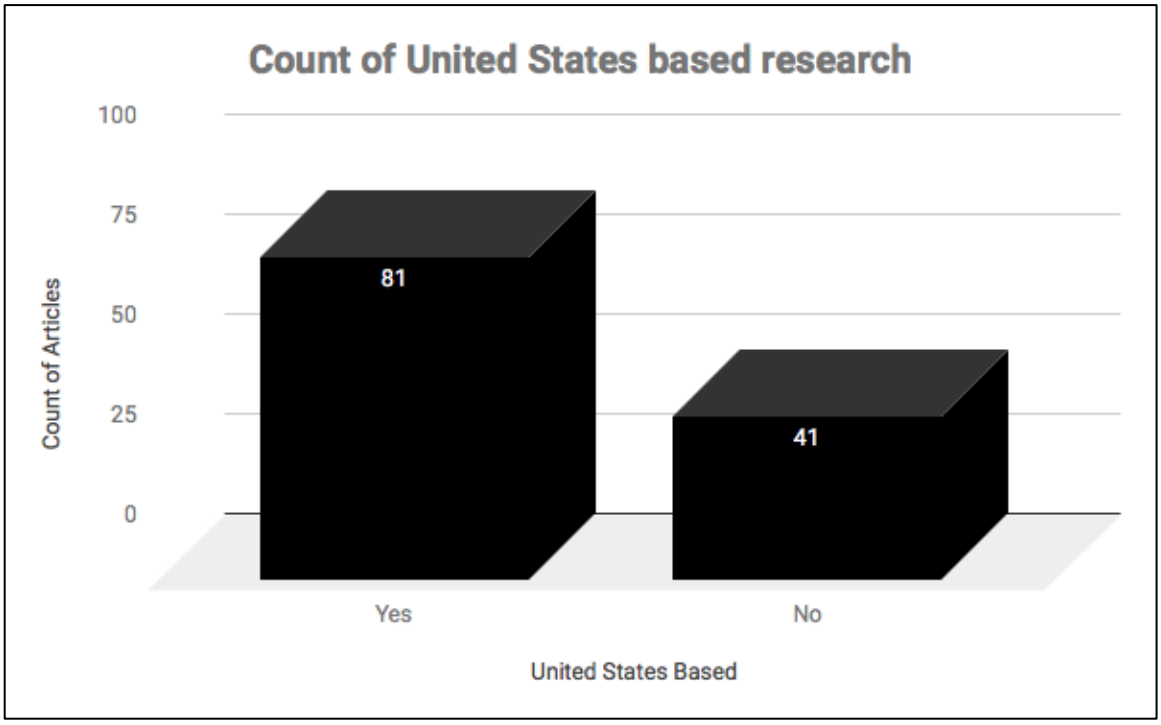

Figure 7: Count of United States based research articles, Marshall 2018

Figure 7 describes the articles reviewed and if the primary research of the article was performed in the U.S.. 81 (66%) of the 122 articles conducted research within the Continental U.S., while 41 (34%) of the 122 did not conduct research within the Continental U.S.. Of the articles identified, research conducted in the U.S. was determined by reviewing the methods sections and understanding the concept of the research. It can be understood that many of the articles identified

were supported by U.S. based institutions, or conducted with U.S. based disasters, however this mirrors previous points about where disasters occurred; and subsequently where the research was conducted.

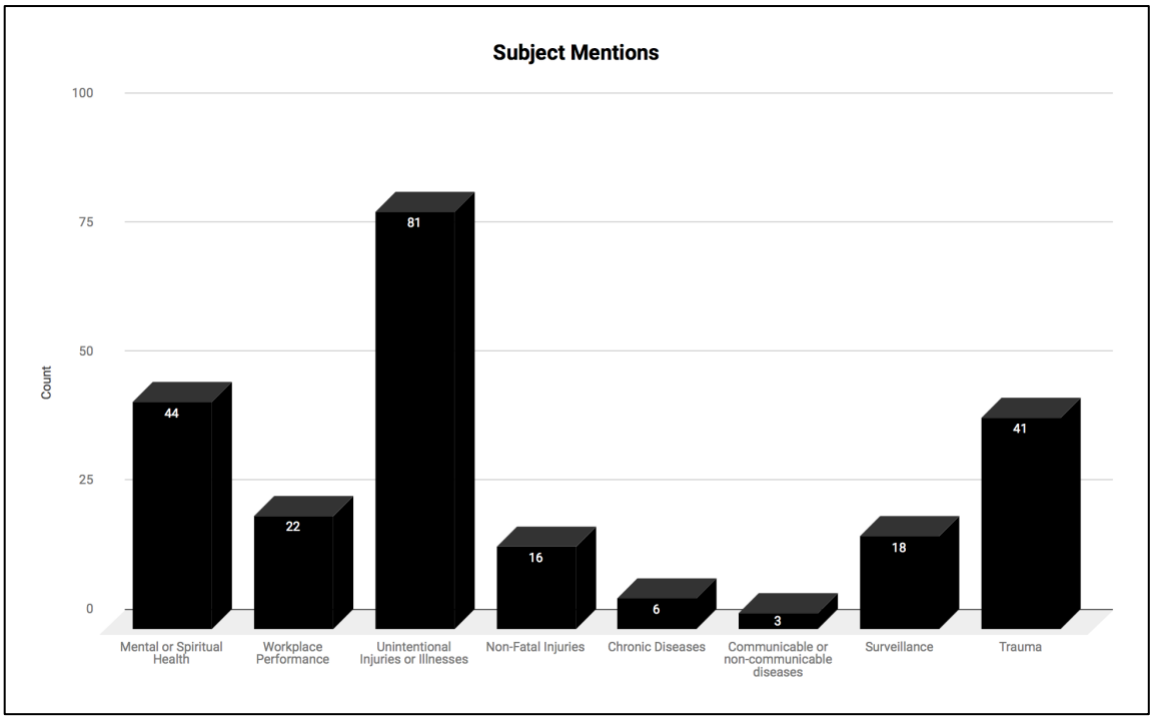

Figure 8: Injury Subject Mentions of 122 articles, Marshall 2018

Figure 8 describes the articles reviewed and the primary subject mentioned within the article as it related to injury, illness or death. The primary focuses of the articles, and the primary cause of injury, illness or death of responders are mental and spiritual health, workplace performance, unintended injuries and illness, non-fatal injuries, chronic diseases, communicable & non-communicable diseases, mortality and morbidity surveillance, and trauma.

44 (36%) of the 122 articles referenced mental and spiritual health following tropical cyclone events. The focuses of these articles are on responder health and wellbeing, as well as mental, and spiritual wellbeing. The articles insist that spiritual wellbeing plays a primary factor in illness or injury.

Many of these articles referenced suicide as a primary cause of injury or death for responders. These articles did not extrapolate on mental health consequences in disasters, or specify that their primary focus was on responders. The articles also included that mental and spiritual health is often overlooked as a primary injury or illness type, and provided insight into the changes that need to occur within the adherence to mental and psychological intervention with responders. One article noted the broad range of health and mental health consequences as a result of work-based exposures to natural or man-made disasters. The article concludes that there "is a lack of appropriate event-based psychological or mental health support resources for tropical cyclone events." [2] The article identifies that the cumulative nature of mental and psychological stress may be a cause of injury or illness to professional volunteer responders.

22 (18%) of the 122 articles reference workplace performance. Workplace performance is often described as the way in which those who respond to disasters can improve including use of appropriate tools or technological innovations to be safe. All articles referenced how paid staff of fire departments, police departments, emergency medical care facilities or emergency management agencies could improve their work performance in the face of disaster and tropical cyclone events. One article noted that hospital staff may need to look for areas of higher ground during tropical cyclone events and be prepared to move rapidly when storm surge occurs. [24]

81 (66%) of the 122 articles referenced unintentional injuries and illnesses. The unintended injuries noted within the research included: chainsaw strikes, heavy equipment injuries, vehicle accidents, insect bites or stings, strains, sprains and orthopedic injuries, burns, carbon monoxide, lacerations, contusions, abrasions, punctures, illnesses from water, illnesses from food, cold and flu like illnesses, cold and heat related injuries and illnesses.

None of the articles performed a comprehensive review of injuries after a hurricane. None of the articles controlled for professional volunteer responders actively responding to a disaster. However; many attempted to provide insight based on case reporting and studies based on emergency department admissions information. [16, 6, 19, 21] Of those which looked at emergency department admissions, one article provides more quantitative information related to Hurricane Sandy. Given that Hurricane Sandy was the most destructive landmark and watershed event after Hurricane Katrina in the U.S., this quantitative understanding of the injuries after Hurricane Sandy gives great insight. This article identifies dangers of cleanup activities and the application to public health practice after a tropical cyclone event. "Most reported injuries occurred after Sandy had passed and were associated with clean-up and repair activities." [6] Injuries such as lacerations of upper extremities and back strains, were also the most frequently reported in this study of Hurricane Sandy. [16, 6, 19, 21] The article concludes that Tropical Cyclone events were already known to cause unintended physical injury or illness either directly, where debris is blown or thrown or where people return to affected areas and perform clean-up. In the aftermath of Hurricane events in the U.S., the upper extremities sustain lacerations and the back is affected by soft tissue injury consistent with strains or sprains. [6]

16 (13%) of the 122 articles specifically referenced non-fatal injuries. Of these, all were also related to unintentional injuries or illnesses. Of these, the non-fatal injuries included were wound management after injuries, care, treatment and management of trauma after disasters and catastrophic injuries including chainsaw accidents and heavy equipment accidents in the time after responding to disasters, this also includes motor vehicle injuries and crashes. There is substantial information provided by the CDC on the dangers of chainsaws and heavy equipment, as well as non-fatal injuries from dangerous equipment after disasters. [16, 6, 19, 21] One article found that occupational risks for non-fatal injuries were consistent with "flood cleanup, exposure to electrical

hazards and motor vehicle accidents." This was especially evident during Hurricane Sandy in the U.S., where there was severe disruption to transportation infrastructure.

6 (5%) of the 122 articles reference chronic diseases. Of these articles, only one provides direct examples of the impact for chronic disease care, specifically for heart disease in responding firefighters. Heart disease is identified as one of the largest threats to professional volunteer responders when not responding to disasters; or while in "staging" awaiting a response request.

3 (2.5%) of the 122 articles specifically mention communicable or non-communicable diseases. All of these articles are related to individual responders with pre-existing conditions. These articles note an exacerbation of symptoms associated with pre-existing conditions, such as diabetes or chronic respiratory diseases.

18 (15%) of the 122 articles are related to surveillance: both the need to increase active surveillance of healthcare trends after tropical cyclone events and disasters, or the analysis of surveillance systems after tropical cyclone events and disasters. An article notes that an effective mechanism that "performed a longitudinal e-mail survey that assessed preventive measures taken before and during deployment, exposures to hazards while deployed, and health outcomes at 1, 3, and 6 months post- deployment". The recommendations make effective point about the lack of surveillance specific to professional volunteer responders.[37]

41 (34%) of the 122 articles associated Trauma with tropical cyclone events. Care should be taken to describe Trauma in this use as physical trauma, and not psycho-social trauma as in Post-Traumatic Stress or mental and psychological health. Trauma was noted as the primary association with tropical cyclone events in 5 articles applicable to professional volunteer responders, the greatest association of the systematic review. This is the only time that quantitative evidence of the

injury to a professional volunteer responder from a tropical cyclone event were evidenced during the systematic review.

We found only two articles which stated the injuries, illnesses and deaths of professional volunteer responders, injuries and illnesses, after tropical cyclone disasters. These articles are "Injuries and Illnesses Among American Red Cross (ARC) Responders—United States, 2008–2012" and "Disaster-related exposures and health effects among US Coast Guard (USCG) responders to Hurricanes Katrina and Rita: a cross-sectional study".

From these two articles, we found that the injuries to a professional volunteer responder include lacerations, sprains / strains, exposure to chemical or biological agents and motor vehicle accidents. The article concluded that “Hurricanes had the highest rates of injuries (14/1000 responders) and illnesses (18/1000 responders)” [33] for professional volunteer responders. Most commonly reported injuries in a tropical cyclone include lacerations/abrasions, strains/sprains, and falls. The most common rate of hospitalizations were from car accidents or exposure to chemicals after a Hurricane. [33]

The article noted value in identifying professional volunteer responders as subjects, explicitly stating “Oftentimes, injury and illness rates for responders have been difficult to compare with rates for full-time workers. Volunteers make up an important part of any disaster response, yet little is known about their work-related safety and health”. [7]

Known vulnerabilities from the USCG response to Hurricane Katrina are to animal bites, contaminated floodwaters, environmental injuries and illnesses, and penetrating trauma. These vulnerabilities were the most likely to result in hospitalization of professional volunteer responders. One article concludes that the most frequent exposures to responders among the USCG during

Hurricane Katrina and Rita were "animal/insect vectors (n = 1309; 46%) and floodwaters (n = 817; 29%)". [33] The articles adds that the most frequent health effects among the USCG during Hurricane Katrina and Rita were "sunburn (n = 1119; 39%) and heat stress (n = 810; 30%)". [33] "Few studies, have focused on disaster responder populations, thus they face poorly characterized risks and unknown short- and long-term health consequences." [33] This cross-sectional study represents the first large-scale effort to evaluate exposures and health effects in deployed disaster responders.

Discussion:

The key findings of this systematic review are that, with regard to the data regarding injuries, illness, or death among volunteer responders, there are very few, if any, data on this topic. There is a lack of diversity of research in this area, insufficiency of related articles, lack of responder specific research, and lack of injury specific research. The key findings conclude that there is not sufficient research into the impacts of tropical cyclones outside of the continental U.S..

This systematic review has provided valuable insight into disaster research. The discussion addresses the findings of the review and expands on conclusions. It will also address each of the research questions from this systematic review, in addition to the points brought forward from the findings analysis.

The systematic review illustrates a lack of sufficient literature and research on tropical cyclone disasters. The sporadic nature of the research conducted is not conducive to analysis of trends. This limitation prevents the successful understanding of dangers from tropical cyclone disasters. Throughout the systematic review, the findings showed there are not many opportunities to establish and perform good, hard science within the immediate aftermath of a disaster. This is a limitation on the type of research performed after disasters, because traditional academic practice is not to become involved in the event. The findings from this analysis show a correlation between the deadliness and costliness of the tropical cyclone, and the research performed. There were greater amounts of scholarly, peer reviewed research performed for storms during the years of 2005 and 2012 than for other years. There also have not been studies performed more recently than 2016.

In the immediate aftermath of a disaster the priorities are the preservation of life and property. As evidenced by this systematic review, there are incredibly important insights which provide a vanguard understanding of the problems associated with responding to a tropical cyclone event. It

is imperative that the frequency of the research is increased, and that the research is performed during or very soon after a disaster.

The dichotomous environment experienced after a tropical cyclone event impact is not overall conducive to the success of any scientific attempts, as there are many outlying exterior factors which can negatively affect individual scientific research.

As noted within the review, the majority of the articles reviewed were from disasters occurring in 2005, when Hurricane Katrina hit New Orleans; however, a similar correlation does not occur with the publication date, as seen in the findings. There was subsequently a great influence of research for Hurricane Sandy in 2012, without a substantial amount of research performed for storms which occurred in-between 2005 and 2012. One article noted that despite the obvious risks posted to those assisting after a Hurricane in the U.S., there was "little comprehensive accounting" [6, 19,] for injuries and illnesses in the wake of a major hurricane among those working in rescue, response, and recovery.

There should be more effective processes to make research and publication easier, faster and quicker within academic publication parameters. It was found that most of the scholarly, peer reviewed research used in this thesis and the systematic review was far removed from the time at which the disaster response occurred. One substantive recommendation is the ability to embed researchers within disaster responder teams, and understand what best practices exist for specific agencies or organizations, developing a feedback mechanism and a way to learn quickly and effectively while responding to a tropical cyclone event or disaster, and sharing that information and best practices to save lives and alleviate suffering.

As the worlds of professional emergency management, humanitarian assistance, and disaster response attempts to professionalize, definitions and opportunities for sufficient and appropriate scholastic inquiry must be reiterated, rewarded, and pursued. It is the recommendation of this thesis that researchers can, and should, go into the field and collect quantitative and qualitative data related to rescue, response, and recovery during disasters.

There are few instances where the researched content met the stipulations of being applicable to responders. One limitation of this review is that there are not often articles published within academic journals which are specifically designed for use in the field. This approach of translation science needs to be further identified within the research approach of most scholarly articles, and pushed further within reviews.

More information was provided on disasters, their impacts, injuries, and those responding to them in the publications of trade journals, grey literature, and published reports or case studies. This does not always meet the traditional definitions of scholarly, peer reviewed literature, and as such it should be reiterated that more scholastic capabilities of research are pushed to the field.

Given the extremely limited data on injuries, illnesses, and deaths experienced by volunteer, responders, there was no data regarding prevention strategies. A single article noted "Despite pre-deployment and on-site education, use of preventive measures such as vaccination, appropriate clothing, hydration, sunscreen, and insect repellant was variable." [37] At this time and to the extent of our knowledge and this review, there are no commonly reported methods which have a demonstrable decrease in the rate of illnesses, injuries, or deaths among volunteers responding to tropical cyclone events.

Again, given the limited data regarding volunteer responders, we could not assess the relationships between country of origin, training, and rates of Professional Volunteer Responders illness, injury or deaths after a tropical cyclone event.

There does not exist substantial information of the approach of international agencies, or very many other countries outside of the U.S., on managing professional volunteer responders after a tropical cyclone event. The Philippines provided the most information outside of the Continental U.S. on tropical cyclones and typhoons, especially in the aftermath of typhoon Haiyan. There exists a substantial need to understand what other countries do to support professional volunteer responders, and the abilities are certainly there, however this needs to be effectively reported within the scholarly literature.

To our knowledge, there is little to no information provided by agencies within the United Nations ecosystem on how to effectively support and protect professional volunteer responders while responding to tropical cyclone events, which could be of extreme benefit to those assisting after a disaster. The countries primarily affected by these disasters are not well represented within the current available research. Additionally, there are no clear estimates of how many responders are hurt, and what are the mechanisms of their injuries or illnesses.

Sufficient research does not exist on adoption of standard of practice in the safety and health of professional volunteer responders in tropical cyclone events. The American Red Cross (ARC) notes that Volunteers make up an important part of any disaster response, yet little is known about their work-related safety and health.

There has not been any implementation of the Emergency Responder Health Monitoring and Surveillance Framework in any scholarly, peer reviewed article. The Emergency Responder Health

Monitoring and Surveillance (ERHMS) system is a health monitoring and surveillance framework that includes recommendations and tools specific to protect emergency responders during all phases of a response, including pre-deployment, deployment, and post-deployment phases." This framework builds on systems and practices currently in use, and should prove useful to persons or organizations involved in all stages of a response.

It would be beneficial to be able to examine the information related to injuries, illnesses and deaths of responders; such as those from the ARC with a direct understanding of the training provided to such individual professional volunteer responders. There currently does not exist a mechanism for understanding hospital admissions information to specifically control for those who are responding to the immediate aftermath of a tropical cyclone event. The framework is designed to be utilized not just with tropical cyclone events, but all disasters. There should be care taken to approach further research with this tool appropriately; specially controlling for those who are professional volunteer responders. Agencies or organizations actively engaged in US-based or international responses to tropical cyclone disasters should use this framework, and subsequently report on such use.

Conclusion:

This thesis and systematic review set forward to examine the factors which influence professional volunteer responder illness, injury or deaths after a tropical cyclone event. The research conducted and the systematic review performed provide valuable input to the field of emergency management, humanitarian assistance, disaster response and public health. The systematic review explained how little is known about the factors which influence professional volunteer responder illness, injury or deaths after a tropical cyclone event and what can be done to enhance professional volunteer responder safety in a tropical cyclone event.

Lacerations, sprains / strains, exposure to chemical or biological agents and motor vehicle accidents are the largest hazards identified and animal bites, contaminated floodwaters, environmental injuries and illnesses, and penetrating trauma were the most likely to result in hospitalization.

The systematic review noted that there is not sufficient research to analyze trends or build consensus on injuries to professional volunteer responders after tropical cyclone events outside of the U.S.. The systematic review illustrated that there is a severe lack of available research and literature, and recommends that further research be conducted on the injuries, illness and deaths of professional volunteer responder after a tropical cyclone event.

Instituting the ERHMS framework may be helpful in the future responses to tropical cyclone events. The intent of the framework is to identify hazards, vulnerabilities, and exposures; prevent or mitigate them soundly, provide protection and the ability to still work, and help responders return to a normal lifestyle after responding.

Appendix A: Meteorological Definitions

Cyclone:

An atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Tropical Cyclone:

A warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. In this they differ from extratropical cyclones, which derive their energy from horizontal temperature contrasts in the atmosphere (baroclinic effects).

Hurricane / Typhoon:

A tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 64 kt (74 mph or 119 km/hr) or more. The term Hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term Typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline.

Major Hurricane/Typhoon:

A hurricane that is classified at the Saffir Simpson Category 3 or higher.

Tropical Disturbance:

A discrete tropical weather system of apparently organized convection -- generally 100 to 300 nmi in diameter -- originating in the tropics or subtropics, having a nonfrontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

Tropical Depression:

A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 km/hr) or less.

Tropical Storm:

A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) ranges from 34 kt (39 mph or 63 km/hr) to 63 kt (73 mph or 118 km/hr).

Tropical Cyclone Season:

The portion of the year having a relatively high incidence of Tropical Cyclones. The hurricane season in the Atlantic, Caribbean, and Gulf of Mexico runs from June 1 to November 30. The Typhoon season in the Eastern Pacific basin runs from May 15 to November 30. The Cyclone season in the South Pacific basin runs from June 1 to November 30.

Saffir-Simpson Hurricane Wind Scale:

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale provides examples of the type of damage and impacts in the U.S. associated with winds of the indicated intensity.

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Appendix C: Tables

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
A field epidemiological study on the risk factors of injury caused by typhoon.	Gong, Z. Y.	Journal Article	Quantitative	Cross Sectional	2005	Multiple	TYPHOON	No	China
A decision process for determining whether to conduct responder health research following large disasters	Decker, J. A.	Journal Article	Report	Other	UNK	Multiple	OTHER	Yes	Multiple
A personal reflection: nursing in times of disaster	Mather, M. E.	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Accident and disaster epidemiology	Lechat, M. F.	Journal Article	Report	Other	UNK	Unspecified	OTHER	No	Multiple
Acute Chemical Incidents With Injured First Responders, 2002-2012	Melnikova, N.	Journal Article	Quantitative	Cross Sectional	2005	Multiple	OTHER	Yes	Multiple
Adaptation and promotion of emergency medical service transportation for climate change	Pan, C. L.	Journal Article	Quantitative	Cross Sectional	2009	Morakot (2009)	TYPHOON	No	Philippines
Adding Insult to Injury: Five Years After Katrina	Nelson, Roxanne	Journal Article	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Aftermath of Typhoon Haiyan: the imminent epidemic of waterborne illnesses in Leyte, Philippines	Dolhun, E.	Book	Book	Other	2013	Haiyan (2013)	TYPHOON	No	Philippines
An assessment of disaster-related mortality post-Haiyan in Tacloban City	Ching, Paola Katrina	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
An assessment of drinking-water quality post-Haiyan	Magtibay, B.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Analysis of Disaster Response Plans and the Aftermath of Hurricane Katrina: Lessons Learned From a Level I Trauma Center	Brevard, Sidney B.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Assessment of the efficacy of the first water system for emergency hospital use	Long, S. C.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Multiple
Attitudinal Determinants of Local Public Health Workers' Participation in Hurricane Sandy Recovery Activities	Errett, NA.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Be safe, be prepared: emergency system for advance registration of volunteer health professionals in disaster response	Peterson, C.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Multiple
Being Both Helpers and Victims: Health Professionals' Experiences of Working During a Natural Disaster	Hugelius, K.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Challenges in disaster data collection during recent disasters	Morton, M.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Changing the paradigm of emergency response: The need for first-care providers	Bobko, J. P.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Multiple
Chemical contamination assessment of Gulf of Mexico oysters in response to hurricanes Katrina and Rita	Johnson, W. E.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Climate Change and Health on the U.S. Gulf Coast: Public Health Adaptation is Needed to Address Future Risks	Petkova, Elisaveta P.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	HURRICANE	Yes	Multiple
Climate change threats to population health and well-being: the imperative of protective solutions that will last	Kjellstrom, Tord	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	No	Multiple
Climate Change, Extreme Weather Events, and Human Health Implications in the Asia Pacific Region	Hashim, J. H.	Journal Article	Quantitative	Cross Sectional	2012	Multiple	CYCLONE	No	Multiple
Community assessment for public health emergency response following Hurricane Ike--Texas, 25-30 September 2008	Zane, D. F.	Journal Article	Quantitative	Case Control	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Community Support as a Moderator of Postdisaster Mental Health Symptoms in Urban and Nonurban Communities	Price, Matthew	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Crisis Decision-Making During Hurricane Sandy: An Analysis of Established and Emergent Disaster Response Behaviors in the New York Metro Area	Chandler, T.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Cyclone deaths in Bangladesh, May 1985: who was at risk	Siddique Ak Fau - Eusof, A.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	CYCLONE	No	Bangladesh
Deaths Associated with Hurricane Sandy — October–November 2012	Casey-Lockyer, Mary	CDC Publication	Report	Other	2012	Sandy (2012)	HURRICANE	Yes	New York, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Defining Population Health Vulnerability Following an Extreme Weather Event in an Urban Pacific Island Environment: Honiara, Solomon Islands	Natuzzi, E. S.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	No	Solomon Islands
Disaster aftermath: a first-person perspective as a responder and caregiver	Mistric, M. L.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Disaster-Related Exposures and Health Effects Among US Coast Guard Responders to Hurricanes Katrina and Rita: A Cross-Sectional Study	Rusiecki, Jennifer A.	Journal Article	Qualitative	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Disaster-Related Injuries and Illnesses Treated by American Red Cross Disaster Health Services During Hurricanes Gustav and Ike	Noe, Rebecca S.	Journal Article	Quantitative	Case Control	2008	Gustav (2008)	HURRICANE	Yes	Texas, United States
Disaster-Related Injury Management: High Prevalence of Wound Infection After Super Typhoon Haiyan	Kim, Y. W. Auid-Orcid http orcid org	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Effects on health of volunteers deployed during a disaster	Swygard, H.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Emergency Department Presentations following Tropical Cyclone Yasi	Aitken, Peter	Journal Article	Quantitative	Cohort	2011	Yasi (2011)	CYCLONE	No	New South Wales, Australia
Emergency preparedness and public health: The lessons of hurricane sandy	Powell, T.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Emergency Response and Public Health in Hurricane Katrina: What Does it Mean to Be a Public Health Emergency Responder?	VanDevanter, Nancy	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Epidemiology of injuries due to tropical cyclones in Hong Kong: A retrospective observational study	Rotheray, K. R.	CDC Publication	Report	Other	UNK	Multiple	CYCLONE	No	Hong Kong
Evaluating the Use of an Electronic Death Registration System for Mortality Surveillance During and After Hurricane Sandy: New York City, 2012	Howland, Renata E.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Evaluation of Active Mortality Surveillance System Data for Monitoring Hurricane-Related Deaths—Texas, 2008	Choudhary, Ekta	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Evaluation of the American Red Cross disaster- related mortality surveillance system using Hurricane Ike data-Texas 2008	Farag Nh Fau - Rey, Araceli	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Examining the long-term racial disparities in health and economic conditions among Hurricane Katrina survivors: policy implications for Gulf Coast recovery	Toldson, I. A.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Experience of cyclone Gonu in the Islamic Republic of Iran: lessons learned	Panahi, F.	Journal Article	Quantitative	Case Control	2007	Gonu (2007)	CYCLONE	No	Islamic Republic of Iran

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Exploring community resilience in workforce communities of first responders serving Katrina survivors	Wyche, K. F.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Exposures to thoracic particulate matter, endotoxin, and glucan during post-Hurricane Katrina restoration work, New Orleans 2005-2012	Rando, R. J.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
First Responders and Prehospital Care for Road Traffic Injuries in Malawi	Chokotho, L.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	No	Malawi
First responders: mental health consequences of natural and human-made disasters for public health and public safety workers	Benedek, D. M.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	Yes	Multiple
Five Years Later: Recovery from Post Traumatic Stress and Psychological Distress Among Low-Income Mothers Affected by Hurricane Katrina	Paxson, Christina	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Five years later: resiliency among older adult survivors of Hurricane Katrina	Rehner, T.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Florida Department of Health Workers' Response to 2004 Hurricanes: A Qualitative Analysis	Herberman Mash, Holly B.	Journal Article	Qualitative	Other	2004	Charlie (2004)	HURRICANE	Yes	Florida, United States
Foreign Medical Teams in the Philippines after Typhoon Haiyan 2013 - Who Were They, When Did They Arrive and What Did They Do?	Brolin, Kim	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Global Climate Changes, Natural Disasters, and Travel Health Risks	Diaz, James H.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	Yes	Multiple
Hazardous substances releases associated with Hurricanes Katrina and Rita in industrial settings, Louisiana and Texas	Ruckart, Perri Zeitz	CDC Publication	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment	Lane, Kathryn	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Health hazard evaluation of police officers and firefighters after Hurricane Katrina -- New Orleans, Louisiana, October 17-28 and November 30-December 5, 2005	Bernard, BP	CDC Publication	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Health impact assessment of cyclone Bejisa in Reunion Island (France) using syndromic surveillance	Vilain, P.	Journal Article	Quantitative	Case Control	2014	Bejisa (2014)	CYCLONE	No	Reunion Island, France
Health services responses to disasters in Mumbai sharing experiences	Supe, A.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	No	Mumbai, India
Hurricane Katrina and the Gulf oil spill: lessons learned	Osofsky, H. J.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Hurricane Katrina deaths, Louisiana, 2005	Brunkard, J.	Journal Article	Qualitative	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Hurricane Katrina's first responders: the struggle to protect and serve in the aftermath of the disaster	Osofsky, Howard J., Joy D. Osofsky, James Arey, Mindy E. Kronenberg, Tonya Hansel, and Michele Many.	Journal Article	Qualitative	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Hurricane Sandy (New Jersey): Mortality Rates in the Following Month and Quarter	Kim, Soyeon	Journal Article	Quantitative	Cohort	2012	Sandy (2012)	HURRICANE	Yes	New Jersey, United States
Hurricane Season Public Health Preparedness, Response, and Recovery Guidance for Health Care Providers, Response and Recovery Workers, and Affected Communities - CDC, 2017	CDC 2017 Hurricane Incident Management System Team	CDC Publication	Report	Other	2017	Multiple	OTHER	Yes	Multiple
Hurricane Season Public Health Preparedness, Response, and Recovery Guidance for Health Care Providers, Response and Recovery Workers, and Affected Communities — CDC, 2017	C. D. C. Hurricane Incident Management System Team	CDC Publication	Report	Other	2017	Multiple	HURRICANE	Yes	Multiple
Hurricanes Katrina and Rita: role of individuals and collaborative networks in mobilizing/coordinating societal and professional resources for major disasters	Mattox, Kenneth L.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Identifying and Describing the Impact of Cyclone, Storm and Flood Related Disasters on Treatment Management, Care and Exacerbations of Non-communicable Diseases and the Implications for Public Health	Ryan, Benjamin	Journal Article	Quantitative	Cross Sectional	2014	Multiple	CYCLONE	No	Multiple
Impacts of Different Grades of Tropical Cyclones on Infectious Diarrhea in Guangdong, 2005-2011	Kang, Ruihua	Journal Article	Quantitative	Cross Sectional	2005	Multiple	CYCLONE	No	China
Increased incidence of domestic animal bites following a disaster due to natural hazards	Warner, G. S.	Journal Article	Quantitative	Case Control	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Injuries after Hurricane Katrina among Gulf Coast Evacuees Sheltered in Houston, Texas	Faul, Mark	CDC Publication	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Texas, United States
Injuries and illnesses among American Red Cross responders-United States, 2008-2012	Brinker, K.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	Yes	Multiple
Injuries and Illnesses Among American Red Cross Responders—United States, 2008–2012	Brinker, Kimberly	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	Yes	Multiple
Injury Deaths Related to Hurricane Sandy, New York City, 2012	Seil, K.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Lessons learned from Hurricane Ike	Mitchell, L.	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Mental health consequences of the trauma of super-cyclone 1999 in orissa	Kar, N.	Journal Article	Quantitative	Case Control	1999	1999 Odisha Cyclone (Unnamed)	CYCLONE	No	Myanmar

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Mental Health Outcomes in Police Personnel After Hurricane Katrina	West, Christine	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Methods used by the United States National Institute for Occupational Safety and Health to monitor crystalline silica	Lorberau, C. D.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	OTHER	Yes	Multiple
Mississippi Medical Reserve Corps: Moving Mississippi From Emergency Planning to Response Ready	McCormick, L. C.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Mississippi, United States
Nonfatal injuries 1 week after hurricane sandy--New York city metropolitan area, October 2012	Brackbill Rm Fau - Caramanica, Kimberly	CDC Publication	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Operation PATWIN: HMS DARING's experience of providing humanitarian disaster relief following super-Typhoon Haiyan	Butterworth, S. J.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Oral history and Hurricane Katrina: reflections on shouts and silences	Sloan, S.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Partnered disaster preparedness: lessons learned from international events	Born, C. T.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Personal and professional challenges confronted by hospital staff following hurricane sandy: a qualitative assessment of management perspectives	Morris, A. M.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Post-Nargis medical care: experience of a Korean Disaster Relief Team in Myanmar after the cyclone	Kim, Hoon	Journal Article	Quantitative	Cross Sectional	2008	Nargis (2008)	CYCLONE	No	Myanmar
Posttraumatic Stress Disorder and Community Collective Efficacy following the 2004 Florida Hurricanes	Ursano, Robert J.	Journal Article	Quantitative	Case Control	2004	Charlie (2004)	HURRICANE	Yes	Florida, United States
Pre-deployment Heat Acclimatization Guidelines for Disaster Responders	Brearley, M. B.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Prehospital Indicators for Disaster Preparedness and Response: New York City Emergency Medical Services in Hurricane Sandy	Lancet, Elizabeth	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Preparation of medical personnel for an early response humanitarian mission - lessons learned from the Israeli defense forces field hospital in the Philippines	Erlich, T.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Preparedness for a natural disaster: how Coriell planned for hurricane Sandy	Mintzer, J. L.	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Preparedness Lessons from Modern Disasters and Wars	Dara, Saqib I.	Book	Book	Other	UNK	Multiple	OTHER	Yes	Multiple
Preparing for disaster deployment: suggestions for the disaster responder	Ottenstein, R. J.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Multiple

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Prevalence and consequences of disaster-related illness and injury from Hurricane Ike	Norris, F. H.	Journal Article	Quantitative	Cross Sectional	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Professional responsibilities versus familial responsibilities: an examination of role conflict among first responders during the Hurricane Katrina disaster	Adams, T.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Progression of the "Psychological Typhoon Eye" and variations since the Wenchuan earthquake	Li, S.	Journal Article	Quantitative	Cross Sectional	2008	Unspecified	TYPHOON	No	China
Psychological typhoon eye in the 2008 Wenchuan earthquake	Li, S.	Journal Article	Quantitative	Cross Sectional	2008	Unspecified	TYPHOON	No	China
Rapid Triage of Mental Health Risk in Emergency Medical Workers: Findings From Typhoon Haiyan	Sylwanowicz, L.	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Resilience mediates the relationship between social support and post-traumatic stress symptoms in police officers	McCanlies, E. C.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Resource loss, coping, alcohol use, and posttraumatic stress symptoms among survivors of Hurricane Katrina: a cross-sectional study	Kishore, V.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Responder safety and health: preparing for future disasters	Reissman, D. B.	Journal Article	Quantitative	Cross Sectional	UNK	Unspecified	OTHER	Yes	Multiple

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Risk and protective factors in the development of post-traumatic stress disorder symptoms among a cohort of students in two tertiary institutions post Hurricane Ivan	Thompson, E. M.	Journal Article	Qualitative	Other	2004	Ivan (2004)	HURRICANE	No	Jamaica
Risk Factors for Injury During Typhoon Saomei	Shen, Jinyu	Journal Article	Quantitative	Cross Sectional	2006	Saomei (2006)	TYPHOON	No	Philippines
Sleep and arousal as risk factors for adverse health and work performance in public health workers involved in the 2004 Florida hurricane season	McKibben, J. B.	Journal Article	Quantitative	Case Control	2004	Charlie (2004)	HURRICANE	Yes	Florida, United States
Sleep deprivation and adverse health effects in United States Coast Guard responders to Hurricanes Katrina and Rita	Bergan, Timothy	CDC Publication	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Social vulnerability and the natural and built environment: a model of flood casualties in Texas	Zahran, Sammy	Book	Book	Other	UNK	Multiple	OTHER	Yes	Texas, United States
Socio-demographic Characteristics and Leading Causes of Death Among the Casualties of Meteorological Events Compared With All-cause Deaths in Korea, 2000-2011	Lee, Kyung Eun	Journal Article	Quantitative	Cross Sectional	2005	Multiple	TYPHOON	No	Korea
Strategies of disaster response in the health care system for tropical cyclones: experience following Typhoon Nari in Taipei City	Lai, T. I.	Journal Article	Quantitative	Cross Sectional	2013	Nari (2013)	TYPHOON	No	Taiwan

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
Study Design and Results of a Population-Based Study on Perceived Stress Following Hurricane Sandy	Schwartz R	Journal Article	Quantitative	Cross Sectional	2012	Sandy (2012)	HURRICANE	Yes	New York, United States
Studying Policy Changes in Disaster Management in India: A Tale of Two Cyclones	Jha, A.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	CYCLONE	No	India
Surveillance of injuries in Eastern North Carolina following Hurricane Irene using emergency department data	Miller, J. A.	Journal Article	Quantitative	Cross Sectional	2011	Irene (2011)	HURRICANE	Yes	North Carolina, United States
The 2012 derecho: emergency medical services and hospital response	Kearns, R. D.	Journal Article	Quantitative	Cross Sectional	2012	Unspecified	OTHER	Yes	West Virginia, United States
The Canadian Armed Forces medical response to Typhoon Haiyan	Savage, LCol Erin	Journal Article	Report	Other	2013	Haiyan (2013)	TYPHOON	No	Philippines
The changing face of trauma: New Orleans before and after Hurricane Katrina	Wahl, G. M.	Journal Article	Quantitative	Cross Sectional	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
The Darwin cyclone disaster. Experience of the Queensland medical relief team	O'Shea, R. F.	CDC Publication	Report	Other	UNK	Unspecified	CYCLONE	No	Queensland, Australia
The Effect of Tropical Cyclones (Typhoons) on Emergency Department Visits	Lin, Chien-Hao	CDC Publication	Report	Other	UNK	Multiple	CYCLONE	No	Multiple
The Human Impact of Tropical Cyclones: a Historical Review of Events 1980-2009 and Systematic Literature Review	Kirsch, Thomas D.	Journal Article	Quantitative	Cross Sectional	2013	Multiple	CYCLONE	No	Multiple
The public health consequences of disasters	Noji, E. K.	Book	Book	Other	2005	Multiple	OTHER	Yes	Multiple

Title	Author	Source Type	Research Study Kind	Study Type	Year of Disaster	Name & Identifier	Hurricane, Typhoon, Cyclone	United States Based	Location
The trauma signature of 2016 Hurricane Matthew and the psychosocial impact on Haiti	Shultz, James M.	CDC Publication	Report	Other	2016	Matthew (2016)	HURRICANE	No	Haiti
Through hell and high water: New Orleans, August 29 - September 15, 2005	Cave, M.	Journal Article	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
Tracking deaths related to Hurricane Ike, Texas, 2008	Bayleyegn Tm Fau - Hellsten, John	Journal Article	Quantitative	Case Control	2008	Ike (2008)	HURRICANE	Yes	Texas, United States
Trajectories of posttraumatic stress symptomatology in older persons affected by a large-magnitude disaster	Pietrzak, Robert H.	CDC Publication	Report	Other	UNK	Unspecified	OTHER	Yes	Multiple
Typhoon survivors' subjective wellbeing—A different view of responses to natural disaster	Hamama-Raz Y	Journal Article	Quantitative	Case Control	2013	Haiyan (2013)	TYPHOON	No	Philippines
Vulnerability of Coastal Communities from Storm Surge and Flood Disasters	Bathi, J. R.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	HURRICANE	Yes	Multiple
Weather and Environmental Hazards at Mass Gatherings	Lee Soomaroo	Journal Article	Quantitative	Cross Sectional	2005	Multiple	OTHER	No	Multiple
When disaster hits, where does the standard of care go?	Cushman Esq, D.	Journal Article	Report	Other	2005	Katrina (2005)	HURRICANE	Yes	Louisiana, United States
When Is Exposure to a Natural Disaster Traumatic? Comparison of a Trauma Questionnaire and Disaster Exposure Inventory	Harville, Emily W.	Journal Article	Quantitative	Cross Sectional	UNK	Multiple	HURRICANE	Yes	Multiple
Work-Related Unintentional Injuries Associated With Hurricane Sandy in New Jersey	Marshall, E. G.	Journal Article	Qualitative	Other	2012	Sandy (2012)	HURRICANE	Yes	New Jersey, United States