education policy analysis archives

A peer-reviewed, independent,
open access, multilingual journal

Arizona State University

Volume 26 Number 100 August 13, 2018 ISSN 1068-2341

Seven School-Related Disasters: Lessons for Policymakers and School Personnel

Laura M. Stough
Donghyun Kang
&
Sungyoon Lee
Texas A&M University
United States

Citation: Stough, L. M., Kang, D., & Lee, S. (2018). Seven school-related disasters: Lessons for policymakers and school personnel. *Education Policy Analysis Archives, 26*(100). http://dx.doi.org/10.14507/epaa.26.3698

Abstract: Students are highly dependent on the emergency planning and evacuation decisions made by policymakers and school personnel when disasters occur. The purpose of this study was to examine selected cases of school-related disasters, highlighting how factors of the school context intersected with natural hazards and subsequently affected schoolchildren. Purposeful maximal sampling was used to select school-related disaster cases for their geographical diversity, different instructional contexts, and types of initiating hazards. Among these, seven cases with broad considerations pertaining to educational policy and safe school environments were selected. A within-case analysis was conducted of each case, followed by a cross-case thematic analysis. Six overarching factors were found in the thematic synthesis of the findings. First, school safety practices apply anytime children are under the supervision of school personnel, making knowledge of emergency procedures across multiple types of school settings essential. Second, elements

Journal website: http://epaa.asu.edu/ojs/
Facebook: /EPAAA
Twitter: @epaa_aape

Manuscript received: 2/9/2018
Revisions received: 5/24/2018
Accepted: 5/30/2018

that place schoolchildren at risk also place school personnel at risk. Third, teachers and school administrators need to be well-trained and knowledgeable enough to make independent decisions in emergency situations. Fourth, children must know emergency procedures so they may take independent action, given teachers are also at-risk during disasters. Fifth, most school disasters can be prevented through safe school construction. Finally, it is the responsibility of policymakers to ensure schools are safe learning environments for children. By participating in and advocating for a culture of preparedness, educational policymakers can better protect schoolchildren, as well as school personnel, in disaster situations.
Keywords: disaster; schools; policy; emergency; teachers; administrators

Siete desastres relacionados con la escuela: Lecciones para legisladores y personal de la escuela

Resumen: Los estudiantes son muy dependientes en la planificación de emergencia y la evacuación de las decisiones tomadas por los políticos y la escuela cuando los desastres se producen. El propósito de este estudio fue examinar los casos de los problemas relacionados con la enfermedad y mostrar cómo los factores de la intersección del contexto intersectorial con las poblaciones naturales y la afectación de la escuela. En el caso de los niños, los niños y las niñas, Se han encontrado seis argumentos. En primer lugar, las normas de seguridad de la escuela aplican a los niños de edad bajo la supervisión de la escuela de trabajo, haciendo un seguimiento de los procedimientos de seguridad a través de varios tipos de la escuela de configuración esencial. En segundo lugar, los elementos que sitúan a los escolares en el riesgo también a la escuela en el riesgo. En tercer lugar, los maestros y los maestros de la escuela necesitan estar bien informados y bien informados para tener decisiones independientes en situaciones de emergencia. En el caso de los niños, los hijos deben saber los procedimientos de emergencia que pueden llevar a cabo la acción independiente, dado que los maestros también están en riesgo durante los desastres. La edad, la mayoría de los profesionales de la salud pueden prevenirse a través de la escuela de seguros. Por lo tanto, es la responsabilidad de los políticos para que las escuelas son seguros de aprendizaje de los hijos para los niños. Por la defensa de la cultura de la preparación, las políticas educativas pueden mejorar el cuidado de la escuela y la escuela en situaciones de desastres.
Palabras-clave: desastres; escuelas; política; emergencia; profesores; administradores

Sete desastres relacionados à escola: Lições para legisladores e funcionários da escola

Resumo: Os estudantes são muito dependentes do planejamento de emergência e da evacuação de decisões tomadas por políticos e pela escola quando ocorrem desastres. O objetivo deste estudo foi examinar os casos dos problemas relacionados à doença e mostrar como os fatores de intersecção do contexto intersetorial com as populações naturais e a afetação da escola. No caso de crianças, meninos e meninas, seis argumentos foram encontrados. Em primeiro lugar, os padrões de segurança da escola aplicam-se a crianças mais velhas sob a supervisão da escola de trabalho, seguindo os procedimentos de segurança através de vários tipos de ambientes essenciais à escola. Em segundo lugar, os elementos que colocam as crianças em risco também na escola em risco. Em terceiro lugar, professores e professores precisam estar bem informados e bem informados para ter decisões independentes em situações de emergência. No caso de crianças, as crianças

devem conhecer os procedimentos de emergência que podem realizar ações independentes, uma vez que os professores também estão em risco durante os desastres. Idade, a maioria dos profissionais de saúde pode ser evitada através da escola de seguros. Portanto, é responsabilidade dos políticos que as escolas estejam seguras para aprender crianças para crianças. Ao defender a cultura de preparação, as políticas educacionais podem melhorar o atendimento da escola e da escola em situações de desastre.
Palavras-chave: desastres; escolas; política; emergência; professores; administradores

Introduction

Children spend a large percentage of their waking hours in school. The amount of time varies from country to country; however, over 90% of the world's child population spends at least some hours each week in a school setting (UNESCO Institute for Statistics, 2015). During the school day students are usually out of communication with family members and under the supervision of school personnel. Children are thus highly dependent on emergency planning and evacuation decisions made by policymakers, teachers, and administrators. Schoolchildren are also dependent on the quality of the construction of their school—if it can resist natural hazards, if it is built in a safe area, and if evacuation routes and sheltering space within the school are adequate. As responsibility for children shifts from parental guardians to school personnel during school activities, administrators, teachers, and other school personnel have an ethical responsibility to carefully consider the safety needs of students while they are under their supervision.

Disasters often result from a mix of natural hazards, such as tornados, earthquakes, and fires, interacting with human-related factors, such as population density, building construction standards, and evacuation behaviors. Disasters can also result from intentional causes, such as terrorist acts or school shootings. However, disasters caused by natural hazards are distinct phenomena (Norris et al., 2002) and examinations of natural hazards are typically conducted separately from other types of crises and emergencies (see Alexander, 1993; Mileti, 1999; Wisner, Gaillard, & Kelman, 2012). Natural hazards also differ with respect to the extent of property damage and injury rates they produce. In this article we similarly consider natural hazards as distinct causes of disaster and delineate our investigation from other types of crises that affect schools.

The School Context and Natural Hazards

Several aspects of the school context make children distinctively vulnerable during disaster. Schooling takes place in unique settings with respect to location, time of day, organization of activities, building construction, and need for student supervision. In addition, the adult to child ratio is much higher than in other settings: Dozens of children are often under the supervision of a single teacher. Situations in which hazards develop quickly, for example, tornados and earthquakes, can be particularly dangerous when large numbers of students are collected together (Twigg, 2015) as mortality risk typically rises when large concentrations of people are exposed to intense hazard events (United Nations International Strategy for Disaster Reduction [UNISDR], 2009). Therefore, decisions school personnel and policymakers make about school safety can affect the well-being of many children during disaster. In addition, schools often hold before or after school-day activities, sponsor field trips, and provide transportation from and to home. Emergency procedures need to be considered for each of these environments. Schools are usually large structures, with multiple classrooms, long hallways, and big gathering spaces, making evacuation more complex. School construction itself is usually overseen by governmental or educational agencies which vary in their level of expertise regarding building or safety codes. School buildings are especially vulnerable structures when poorly constructed or located in hazardous locations (Petal et al., 2015). Too,

schools often function as community centers or as shelters during following disaster (Kelman, 2011). These elements all contribute to the complexity and fragility of school-related environments during disasters.

Children's Vulnerabilities to Disaster

Studies suggest children and adolescents, even outside of school settings, are particularly at risk in disaster (e.g. Blaikie et al., 2014; Norris et al., 2002; Peek & Stough, 2010). The international Sendai Framework for Disaster Risk Reduction policy recognizes children across the world as disproportionately vulnerable in disaster (Stough & Kang, 2015). Such vulnerability is, in part, related to the unique physical, psychological, and cognitive characteristics of children during the developmental period. Children evidence relatively less strength and physical hardiness, making them more vulnerable to the effects of disasters and public health emergencies (Agency for Healthcare Research and Quality, 2010; Boon et al., 2011; Chung et al., 2009; Peek, 2008). Children's bodies are also smaller and more fragile than adult bodies and thus more susceptible to injury. Younger children are less likely to escape from disaster as they run slower and often have limited physical skills, such as the ability to swim or climb (Twigg, 2015). Additionally, children are more susceptible to chemical, biological, radiological, nuclear threats, heat waves, and war (Agency for Healthcare Research and Quality, 2010; Peek & Stough, 2010; U.S. Environmental Protection Agency, 2008).

Studies on the psychological effects of disaster on children have centered on post-traumatic stress disorder (PTSD) and multiple studies have noted PTSD symptoms among child survivors of hurricanes (Goenjian et al., 2001; Jones et al., 2001; Vernberg et al., 1996). Most studies also report academic, behavioral, and social difficulties in children readjusting to the school environment post-disaster (e.g. La Greca et al., 2002; Masten & Osofsky, 2010; Pane et al., 2008). Schonfeld (2004) suggests younger children are at risk as they often lack the experience, skills, and resources to independently meet their own mental and behavioral health needs while older children who understand the seriousness of a disaster, may experience more fear and grief or internalize feelings (Deering, 2000). However, in contrast to negative psychological findings on children post-disaster, several studies report adolescents and children can demonstrate resilience in adapting to new school environments (e.g. Barrett et al., 2008; Peek & Fothergill, 2008).

A comparatively unexamined facet is how cognition contributes to the experience of children during disaster. It is well established that children's cognition differs from adults' cognition and that conceptualization of events and objects vary given a child's developmental stage (Friedman et al., 2004; Piaget, 1952). Younger children do not perceive threats to safety as do adults and their innate curiosity may even attract them to unusual stimuli, such as the sound of an approaching tornado or rushing floodwaters ("Emergency," 2005). During disasters, children may not be able to identify themselves or to make effective decisions (Agency for Healthcare Research and Quality, 2010). Limited literacy and education levels in children may affect understanding of dangerous situations (Twigg, 2015). Children also differ cognitively from adults with respect to executive functioning—the ability to plan, monitor, and organize information—all of which will affect effective decision-making in emergency situations (Stough, Ducy, & Kang, 2017). Children and adolescents usually rely on important adults in their environment to help them interpret uncertain or frightening situations (Prinstein et al., 1996). They also model their behavioral responses on those of adults around them in a disaster (Deering, 2000; Phillips & Morrow, 2007) and thus dependent on decisions adults make in emergencies. All of these cognitive characteristics suggest a higher level of adult supervision will be needed to support children in disaster situations ("Emergency," 2005).

Research on Disasters and School Safety

Several studies have examined preparedness for natural hazards in schools. Ozman (2006) surveyed school principals and teachers to determine how well their schools were prepared for an earthquake-related disaster. The survey examined the four dimensions of planning, conveniences and equipment, implementation, and integration and culture building. Responses from 523 teachers and 66 school principals found schools evidenced low levels of preparedness for prospective earthquakes. Recommendations included developing awareness of disaster mitigation, creating a culture of disaster prevention, increasing the number of training programs, including content on preparedness in the school curriculum, and supporting school principal and teacher efforts towards school safety.

A worldwide report on natural hazards in school was published by United Nations International Strategy for Disaster Reduction (UNISDR). In the report, Bastidas and Petal (2012) reviewed existing reports about school safety from 81 countries to analyze school practices, identify current concerns, and provide recommendations. The authors stressed school personnel and administrator responsibilities toward disaster management and suggested: a) making continuity plans in the case of natural hazards, b) holding regular disaster management or safety committee meetings, c) continued maintenance of school physical infrastructure, d) practice for expected disasters, e) development of school personnel's response skills, and f) annual disaster simulation drills.

Selby and Kagawa (2012) reviewed available literature and case studies to examine disaster risk reduction curricula in schools from thirty different countries. Most countries adopted an infusion-type approach wherein disaster-related themes and topics were integrated into specific school subjects. However, disaster risk reduction was rarely taught as a primary focus within the school curriculum. The authors suggest assessment of student knowledge of disaster risk reduction and teacher professional development on the topic are needed. Similarly, Petal (2009) stated "most of the educational efforts directed towards the public and children have neither been systematically conceived nor tested, nor has their impact been scientifically evaluated" (pp. 285-286) thus, little is known about the effectiveness of such programs.

Theoretical Framework: Social Vulnerability to Disaster

To theoretically frame this study and to illustrate how school contexts can contribute to the at-risk status of children in disaster, we drew from social vulnerability theory. Social vulnerability theory views exposure to natural hazards as emerging from an amalgamation of social, economic, and political factors, which create and perpetuate the disproportionate vulnerabilities certain communities, groups, or individuals experience in disasters (Hewitt, 1983; Lewis, 1999; Phillips, 2015; Wisner, Blaikie, Cannon, & Davis, 2004). As such, the social vulnerability perspective questions the "naturalness" of "natural disasters" (O'Keefe, Westgate, & Wisner, 1976), arguing that human societal structures, rather than random natural hazards, determine who is more likely to be impacted by disasters, as well as who will have more limited resources and defenses to withstand them (Hewitt, 1997; Wisner et al., 2004).

The social vulnerability approach has particular utility in explaining the disproportionate effect of disasters on marginalized populations (Kelman & Stough, 2015; Peek et al., 2018; Stough, 2009; Wisner et al., 2014). In this view, vulnerabilities are posited as preexistent in society as chronic, common conditions (Lewis, 1999) which are simply unmasked by hazards- consequently revealing who are the most vulnerable in a given society. Risk to disaster thus reflects preexisting inequalities which are socially distributed so some groups disproportionately experience death, injury, economic loss, and psychological trauma when hazardous events occur (Wisner et al., 2004). As Edwards

(2000, as cited by Van Willigen et al., 2002) states "Disasters may not discriminate, but they do expose and underscore the inequalities that already exist in the communities they impact" (p. 98). It should be stressed the locus of *vulnerability* within the social vulnerability lens does not reside within the individual, rather it is part of socially constructed contexts enacted on certain segments of the population. Social vulnerability is created through inequities in housing, health care and social capital (Cutter & Emrich, 2006; Peacock, Morrow, & Gladwin, 1997). For example, while Hurricane Katrina destroyed housing across New Orleans, it particularly affected the poorer neighborhood of the 9th Ward, where housing was not as well constructed and built in a less protected flood plain.

The social vulnerability perspective has been used to investigate a number of socially marginalized groups experiencing disaster: People living in poverty, the elderly, children, members of racial minorities, language-minority groups, people with disabilities, those with mental health issues, or single parents all have been identified by disaster researchers as particularly susceptible to hazards (Morrow, 1999; Peacock et al, 1997; Peek & Fothergill, Phillips & Morrow, 2007; Stough, 2009; Stough & Kelman, 2018). Members of these groups share commonalities including a lack access to economic and social resources, limited autonomy and power, and low levels of social capital (Morrow, 1999). For example, tornados disproportionately kill and injure poor people who are living in trailer homes because they cannot afford other housing. Similarly, earthquakes and hurricanes disproportionately affect people who are elderly and with disabilities as they often need assistance in evacuating from these hazards (Stough & Kelman, 2018). Researchers point out often it is not one single factor of vulnerability, such as poverty, race/ethnicity, or disability, rather the interaction of multiple factors, which lead to disproportionate disaster effects (Finch, Emrich, & Cutter, 2010; Phillips & Morrow, 2007; Peek & Stough, 2010). For example, social vulnerability of the 9th Ward was evidenced not only in differences in construction and public infrastructure, but in the social capital and financial abilities of the residents to rebuild and recover from the storm.

Over the last decade, children have increasingly been studied as a group disproportionately vulnerable to disaster (Peek et al. 2018). Research highlights the particular effects disasters have on children including psychological trauma and distress, injury, and death (Stough, Ducy, & Kang, 2018). Scholars also point out that children typically experience loss of instructional time when schools are damaged, destroyed, or used as a shelter following disasters. Further, children living in poverty, who are immigrants, or who are members of other marginalized groups may experience amplified risk due to a "clustering" effect of vulnerability factors (Peek & Stough, 2010). The social vulnerability framework has explanatory utility as to why all children are not equally vulnerable to the effects of disaster: Factors such as the child's socioeconomic status, nationality, and geographic location are seen as interacting with age to determine level of impact in a given disaster.

Purpose

This study employed a social vulnerability lens to examine cases of school-related disasters occurring worldwide, highlighting how factors of the school context intersected with natural hazards in ways which affected schoolchildren. While disasters often include damage or destruction of schools, the distinctive factors related to schooling, emergency procedures, and how they intersect with hazards has been rarely examined. In addition, existing studies have not focused on the implications of school disasters for administrators, teachers, and school policymakers. The questions which guided our case study were twofold: 1) What do cases of school-related disasters tell us about how children are placed at risk in school environments? and 2) What factors should administrators, teachers, and policymakers consider in preventing and responding to school-related disasters?

Research Design and Methods

Together our research team represented substantial experience with school settings. The researchers were all certified teachers and had served as classroom teachers for at least three years in public school settings. In addition, each researcher had experiences in schools in at least two different countries and with three different languages. Additionally, the first author had prolonged observation and evaluation experiences in over four dozen schools across a dozen different school districts. These experiences contributed to our shared beliefs that school personnel are frontline responsible for the safety and well-being of children and that school policy should have an abiding concern for school safety. This orientation undoubtedly shaped both our approach to this study and the interpretation of the findings.

To address the research questions, school-related disasters which occurred over the past century were reviewed. In accordance with a constructivist framework, the paradigm assumptions of a context-dependent inquiry and an inductive data analysis were used (Guba & Lincoln, 1988). The academic literature was searched using the terms "school" or "children" in combination with "disaster" in the PsycINFO and EBSCO databases, as well as within Google Scholar. A similar search of the "grey literature" included government reports, publications from public and private organizations, news articles, magazine articles, and trade books. To supplement these documents, a search of audiovisual material including, internet sites, blogs, and YouTube videos were reviewed to obtain more detailed descriptions of selected disasters. An exploratory case study design (Yin, 2014) was chosen as preexisting models of the role of educational policymakers and personnel in school-related disasters were not available in the literature. Each disaster case was bounded by identifying the geographic location and time frame within which it occurred.

Case Selection

Criterion sampling was used to select the initial cases. First, disasters were selected when students were under the supervision of school personnel and placed at risk during school-related activities. Another selection criterion was the time period in which the disaster occurred. Although many disasters have transpired over the trajectory of history, cases were selected from the last century as they provided more relevant implications for contemporary school personnel. Supporting archival data was also more readily available on more recent disasters when compared to older disasters. As a marker of severity, we deliberately chose disasters in which physical injury to children either occurred or was narrowly avoided. As a second step, purposeful maximal sampling (Creswell, 2012) was applied to select varying cases which illustrated how different hazards intersected with the school environment. Effects of hazards on human populations are contextualized by varying social, political, and cultural factors. Thus, cases from different countries were deliberately selected for their geographical diversity, different instructional contexts, and types of initiating hazards to include the breadth of considerations associated with student safety during disaster. Among these cases, those having broad considerations pertaining to educational policy and safe school environments were selected. Using these sampling criteria, a final set of seven cases were selected. These cases included deliberately represented a wide variation of characteristics as can be seen in Table 1.

Table 1. Seven School-Related Disasters

Name	Date/ local time	Location	Type	Curricula Activities	Consequences/ Casualties
Sewol Ferry Disaster in South Korea (2014)	16 April 2014 9:00 ~ 11:30	South Korea	Vessel Sinking	Field Trip	Approx. 300 were killed
The Great East Japan Earthquake and Tsunami (2011)	11 Mar. 2011 14:46	Japan	Earthquake/ Tsunami	Regular Curricula Activities	Approx. 1,000 students were killed
The Sichuan Earthquake in China (2008)	12 May 2008 14:28	China	Earthquake	Regular Curricula Activities	Approx. 10,000 students were killed
Kumbakonam School Fire Tragedy in India (2004)	16 July 2004 Around 10:30	India	Fire	Regular Curricula Activities	94 primary students were killed
Super Outbreak Tornadoes (1974)	3 ~ 4 April 1974	U.S.	Tornadoes	After School Activities	34 people died and 1,150 injured
Aberfan Landslide Disaster (1966)	21 Oct. 1966 9:15	U.K.	Landslide	Regular Curricula Activities	116 children and 5 teachers were killed
New London School Explosion (1937)	18 Mar. 1937 15:05	U.S.	Explosion	Regular Curricula Activities	294 students and teachers were killed, 184 injured

Data Sources

After identifying the seven disaster cases, we used archival records and documents as evidence (Yin, 2014) to acquire in-depth details about each selected case. In our archival search, we ensured that information about each disaster case was verified by multiple sources. At least two highly credible sources, either peer-reviewed print, institutional publications, or highly-regarded journalistic sources, were reviewed for each school-related case. Following established qualitative methods in disaster studies, attention was paid to the context of each disaster, specifically, the time, place, and circumstance in which each disaster occurred (Phillips, 2014).

Data Analysis

To address our first research question, we analyzed the seven selected cases for how children were placed at risk in particular disasters. We employed an embedded within-case analysis (Yin,

2014) to determine situational factors which placed schoolchildren at particular risk during each disaster. As such, we analyzed how schoolchildren were affected while under the supervision of school personnel as an embedded unit of analysis within each disaster case. After each within-case description was completed, we identified explanations regarding each case (Yin, 2014). We then conducted a cross-case thematic synthesis in which common themes were identified which transcended the seven cases (see Yin, 2014). A total of six common themes were identified. To address our second research question, we then examined implications for policy and practice which could be derived from these common themes.

Validation and Transferability

Following recommendations from Creswell and Poth (2018) we engaged in three validation strategies used in qualitative research. First, we discussed and disclosed our positions as both teachers and researchers, discussing our shared concern for the safety of children in schools across the globe. Second, we corroborated our evidence through the triangulation of multiple data sources for constructing each of the cases. Multiple documents, videos, news reports, or publications were used to ensure the accuracy in constructing each case. Third, we provide a detailed description of each of the cases from which we derived common themes. In providing these case descriptions, we also allow for readers to make decisions regarding transferability (Lincoln & Guba, 1985) so that readers can determine whether themes derived from our analysis should be applied to other school disaster cases "because of shared characteristics" (Erlandson et al., 1993, p. 32). To increase the details which might increase transferability, we rewrote each school case multiple times, returning to the raw data on each case to add details and context which might be helpful to the reader. As such, our findings also reflect authenticity resulting from multiple viewpoints (Lincoln, Lynham, & Guba, 2011). Specifically, the range of cases selected represented multiple views of school disasters, the focus on school disaster was designed to raise the level of awareness among stakeholders, and the aim of our inquiry was to lead to action on the part of these stakeholders.

Findings

The following cases describe situational factors surrounding each disaster and how they affected children while under the supervision of school personnel. Each case includes analyzed explanations for how schoolchildren were placed at risk within these school environments.

The Sewol Ferry Disaster in South Korea (2014)

On April 16, 2014, the Sewol Ferry capsized and sank in the southwest sea of South Korea at the Maenggol Channel, which is notorious for its strong currents. In the ferry, 476 people were on board, including 325 high school students who were traveling to Jeju Island, a popular destination for school field trips. After capsizing, the ferry floated for about two and a half hours on the water. The captain asked all passengers to remain where they were, not changing his order even when he himself abandoned the ship. Following the crew's repeated instructions, most students and their teachers remained in their cabins to wait for rescue as seawater flooded their rooms. A total of 295 people on the ferry died, including 250 children and ten teachers, and only 172 people were rescued. The ferry was salvaged in 2017, and four more bodies were found. However, five bodies are still missing.

Post-disaster investigations found multiple causes for the disaster. First, when the ferry was purchased, modifications were made to increase the loading capacity of the ferry. These modifications caused a shift in center of gravity of the ship and resulted in imbalance. Second, sharp steering turns were made by a crew member, who had only six months experience working on the

ferry and contributed to instability in the ship's balance (Kim, 2015). Third, cargo on the ferry was overloaded and loosely tied, further contributing to the ship's imbalance when the ship made turns. Fourth, inspectors gave the ship only a cursory check and did not note the overloading (Choe, 2016). Fifth, the ballast for the ferry was only half filled in order to accommodate more cargo, making the ship even more vulnerable to tilting (Choe, 2014).

During rescue operations, both the crew of the ferry and the Korean government demonstrated incompetence in responding to the disaster. Investigations reported the crew of the Sewol ferry were poorly trained for emergency situations (Kim, 2015). When the capsizing began, they fled from the ferry without attempting to rescue passengers. In fact, the first emergency call from the ship was thus made by a student, not by the captain or the crew. The governmental coastguard who received the emergency call insisted the student give the latitude and longitude of the ship, which, understandably, the student could not provide. The coastguard arrived at the ferry 35 minutes after the initial call but was not aware that people were still aboard the ferry and therefore focused on picking up the fleeing crew members. Post disaster, experts concluded rescue operations were incompetent due to confusion in command and control, as well as a failure in communication among responsible government institutions during the disaster.

The Great East Japan Earthquake and Tsunami (2011)

The Great East Japan Earthquake and Tsunami (GEJET) took place on March 11, 2011. The magnitude of the earthquake was 9.0 and the following tsunami affected over 2000 miles of Japanese coastline. Despite the severity of the disaster, surprisingly, the confirmed death toll was only 15,893, representing 4% of the total population of the affected area (Ranghieri & Ishuwatari, 2014). The relatively low death rate has been attributed to the time of day at which the GEJET occurred: The disaster occurred in the afternoon when people were at school or work, where evacuation protocols are strongly institutionalized (Ranghieri & Ishuwatari, 2014). As a result, only 6.5% of these deaths were of children ("2011 Japan", 2016).

However, it was not the case that all schools were evacuated effectively. In Ishinomaki, Miyagi Prefecture, 70% of its students were killed in the disaster. Of the 108 children at Okawa Elementary School, 67 were confirmed dead, with seven missing, as well as 13 of the schoolteachers ("School that lost", 2011). The steel-reinforced two-story building was completely flooded to the ceiling of the second floor ("Ishinomaki to turn", 2016). According to reports by surviving children, they gathered in the schoolyard after feeling powerful earthquake movement. However, teachers were uncertain about what to do and scolded students when it was suggested they escape up the adjacent hill. Teachers ignored emergency warnings for nearly 50 minutes and remained in the schoolyard until the school was inundated by two tsunami waves (Kingston, 2016).

Two other cases illustrate factors contributing to the overall disproportionately low death toll for children in the GEJET. The first, commonly referred to as the "Kamaishi Miracle" occurred in a school district consisting of 2,900 primary and middle school students. When the earthquake hit, students and school personnel immediately evacuated to a higher point of safety 700 meters about the school, later moving to another evacuation point even 400 meters higher. Thirty minutes after the earthquake, when students heard the roar of the incoming tsunami they moved to an even higher evacuation point, with many older students helping younger students to climb to a higher area before the sea waves reached their school. These actions and decisions saved children's lives: Not a single child present in school on that day was killed (Ranghieri & Ishuwatari, 2014). Given that the earthquake and tsunami claimed 1,000 people out of 40,000 in the area and that all students at these schools survived seemed indeed to be a miracle. However, students at these schools had been well-trained in disaster evacuation program initiated in cooperation with the local Gunma University. The

program engaged the local community in preparing disaster risk maps and held evacuation drills at the elementary and junior high school and an annual drill with the local community (Ranghieri & Ishuwatari, 2014). In addition, a longstanding, traditional disaster evacuation procedure, "tendenko," was followed by the students. "Tendenko" is an evacuation procedure followed by generations of Japanese and consists of directly and immediately evacuating to higher ground, without first searching for relatives or friends (Fraser et al*.,* 2012). The practice encourages people to evacuate quickly as they assume others are also following the practice of tendenko and thus families will eventually safely reunite at the evacuation point. Many school children during the GEJET similarly enacted this principle through evacuating without delay and without waiting for direction from adults.

A second school-related example of successful evacuation took place during the GEJET. Two years before the earthquake and tsunami an evacuation stairway was constructed at the Omoto Elementary School. The school was constructed in a basin surrounded by a steep cliff, thus there was no escape route from the school in the event of a tsunami. However, students at the school provided suggestions to school administrators on how to improve disaster evacuation procedures following a regularly-scheduled tsunami evacuation drill. In response to these suggestions, a 30-meter evacuation stairway consisting of 130 steps was constructed behind the school which allowed children to quickly evacuate to a higher elevation. This simple construction saved the lives of 88 children during the GEJET (Ranghieri & Ishuwatari, 2014).

The Sichuan Earthquake in China (2008)

The Sichuan earthquake (also referred to as the Wenchuan earthquake) in China occurred on May 12, 2008. The earthquake had a magnitude of 7.9 on the Richter scale and a total of 87,150 people were killed or reported missing (Daniell, 2013). Almost 7,000 school classrooms collapsed and approximately 10,000 students died while at school during the earthquake (Wong, 2008).

Analysis of school buildings following the quake suggests much of the destruction and subsequent deaths of schoolchildren could have been avoided. Substandard building materials and shoddy construction were identified as primary causes of school collapse (Wong, 2008). Notably, many relatively new schools were flattened by the quake, while older schools were relatively less affected. Many new school buildings were also found to have serious defects in their construction, such as insufficient use of steel reinforcement rebar and floors, walls, and columns which were not attached with steel bindings (Divjak, 2008). These buildings thus tended to collapse quickly, even while neighboring buildings remained standing (Divjak, 2008). In many cases, people without building experience had been responsible for the construction of these schools. Negligence of the government in permitting and inspecting schools for safety was also found.

Among the 7,000 destroyed schools by the Sichuan earthquake, was Xinjian Primary School, which was attended by poor, rural students. Xinjian Primary School's four-story building collapsed within a few minutes following the quake and fatally crushed hundreds of young children. While there still is no official record provided by the Chinese government, family members estimated approximately 660 young students were killed in the disaster. According to engineering experts, the Xinjian Primary School construction evidenced the use of improper ratio of concrete and sand for columns, did not use sufficient iron rods in the concrete, showed insufficient wire binding to hold iron rebar together, and had inadequate concrete flooring slabs—all evidence of shoddy construction (Yardley, 2008). In addition, after the earthquake, ambulances and rescue vehicles were not able to reach the Xinjian school building easily as the driveway into the school courtyard was too narrow for these vehicles to pass (Yardley, 2008). In contrast, Beijie Primary School, located only five-minute walk away from the Xinjian Primary School, was still standing and no children lost their

lives. Of note is that Beijie Primary School was attended by children from wealthy families, including Communist Party bureaucrats, while Xinjian was operated by a small, local district with much less money (Divjak, 2008).

Another issue was standards for buildings in China range from a high grade of Level 1 to a low grade of Level 4, based on perceived importance of the building. Interestingly, China assigns school buildings only a Level 3 score (Divjak, 2008). As most buildings in Sichuan are not designed to meet the highest standards for seismic protection, regulation for school buildings is also comparatively low (Divjak, 2008). After the quake, reports suggested that low school budgets contributed to the compromised safety of children in these schools. While some school administrators were aware there were serious faults in the construction of some schools and, in fact, attempted to get funds for rebuilding them, their requests were denied or ignored by local governmental officials.

Kumbakonam School Fire Tragedy in India (2004)

One of the largest school-related disasters in Indian history occurred on July 16, 2004, in the town of Kumbakonam in the state of Tamil Nadu. In a building located between two residential buildings, three different schools were operating: the Sri Krishna Aided Private School, Saraswathy Nursery and Primary School, and Sri Krishna Girls High School. These three schools contained more than 800 students within one three-story building. When the fire initiated, teachers asked children to stay in a classroom, locked the door, and left to extinguish the fire. The fire escalated out of control and the 125 elementary children in the locked classroom were forgotten in the ensuing evacuation (Satapathy & Walia, 2006). A total of 94 children, whose ages ranged from 8 to 10 years old, were burnt to death while 18 others were seriously injured.

The investigation following the fire revealed it started in the kitchen on the first floor where the noon meal was being prepared. The kitchen's thatched roof was ignited by flames from firewood used in cooking. The fire then spread quickly across the highly flammable thatched roof, which covered many of classrooms at the school compound. While older children on the lower floor could escape, younger children on the upper floors had to use a single narrow stairway, which was full of miscellaneous materials preventing both escape from the classroom and rescue workers seeking to enter the classroom. In addition, the school had no fire extinguishers. Officials said the first-floor kitchen, thatched roof, and single escape route were all in violation of Indian fire regulations (Rohde, 2004). In some cases, teachers reportedly told their students to stay in their classrooms, telling them the smoke was simply the usual amount that emanated from the kitchen (Sampath, 2005).

The fire raged for three hours, during which rescue efforts were not effective. As firefighters could not access the classroom through the doorway, they had to break the outside concrete school walls to reach the children. In addition, fire fighters and other first responders had difficult accessing the school building as it only had one entrance, a single flight of stairs, and was located between two residential buildings (Srinivasan, 2004). Teachers at the school did not appear to be trained to handle fire evacuations. Several witnesses reported many teachers evacuated from the building alone, leaving their students behind.

Super Outbreak Tornadoes (1974)

Over two days in 1974, the most violent tornado outbreak in U.S. history was recorded. A total of 147 tornadoes, half of which were classified as F2 or higher, touched down in 13 states on either the 3rd or 4th of April. At one point, as many as 15 separate tornadoes were occurring simultaneously (Abbey & Fujita, 1983). The Super Outbreak tornadoes killed 330 people and injured 5,484 (NOAA, 2016). Of note was that nine schools were destroyed in the outbreak (Grazulis,

1993). In Xenia, Ohio, a F5 tornado touched down at 4:40 p.m. and devastated much of the town, including Xenia High School. Although school had been dismissed for the day, some students remained and were practicing for a play. The students heard the warning sirens and took cover in the main hallway. Shortly after, the tornado lifted and then dropped a school bus onto the stage where students had been practicing just moments before. Five schools, including Xenia High School, were destroyed, as were nine churches and 180 businesses. The tornado was the deadliest of the Super Outbreak, killing a total of 34 people and injuring 1,150 (Grazulis, 1993). Engineering studies done on schools damaged during the two days of the Super Outbreak confirmed inside hallways provided the safest place during the tornadoes. However, classrooms with walls to the outside or gymnasiums with wide roof spans were found to be the most dangerous places for students to shelter during storms (NOAA, 2016). This information was later used to inform future building designs of schools.

While the Super Outbreak of 1975 was notable for the number of schools that were damaged or destroyed, there were, in fact, no recorded school-related deaths. Severe weather watches began on Wednesday morning of the 3rd of April, but the storm and related tornados did not begin until later that afternoon. The first schools impacted were those in Xenia, but the tornado fortunately touched down after schools had officially been dismissed for the day. The time of day the Super Outbreak began, together with widespread storm warnings, led to school cancellations which undoubtedly saved schoolchildren's lives. In contrast, the Tri-State Tornado of 1925, which occurred during the school day, killed hundreds at schools, including 33 students at a school in DeSoto, Illinois, representing the worst tornadic death at a single school in U.S. history.

Aberfan Landslide Disaster (1966)

For over five decades, excavated waste debris from the Merthyr Vale coal mine was deposited in waste tips on the side of a high ridge in South Wales. Loose rocks and mining rubble were heaped on top of porous sandstone, which covered several underground springs. A primary school in the village of Aberfan, Pantglas Junior School, sat at the foot of the eastern slope of the ridge. On the morning of October 21, 1966, after several days of heavy rain, a 131-foot-high coal waste tip collapsed and water-saturated debris began to flow down the eastern slope at a high speed. Fog in the area prevented visibility of the landslide from the town below. By the time the mass reached the village of Aberfan, it was 39 feet deep and contained over 40,000 cubic meters of debris. "The landslide behaved like a liquid, but with twice the density of water, sufficient to demolish everything in its path" (Cherry & Petley, 2011). The landslide destroyed 20 houses, the Pantglas Junior School, and part of the senior school. The final death toll was 144. Almost half of all the children at the Pantglas Junior School were killed; 116 were children between the ages of 7 and 10, and five were teachers. The headmaster was also found dead, cradling the bodies of five children in his arms.

The timing of the disaster, at approximately 9:15 a.m., is of note in that the landslide reached the school just minutes after the elementary students had entered the school building. In addition, a school holiday was scheduled to begin that afternoon—had the landslide occurred the next day or even several hours later, the elementary schoolchildren would no longer have been in their classrooms. The secondary school, conversely, did not start until 9:30 a.m., and many of those students were still walking to school at the time of the landslide.

A tribunal was appointed to investigate the context surrounding the disaster. The specific cause was determined to be a build-up of water in the waste tip. Earlier notices that the tip was located on top of known stream and was instable had been ignored by both the mine's management and tip workers. In addition, tips at the mine were added to in a disorderly and unplanned manner.

Other tips at the mine built on top of springs or watercourses had previously failed or had given indications they were unstable. The dangerous situation at Aberfan thus had clear precedence and should have been avoided (Cherry & Petley, 2011). A governmental tribunal determined the responsibility for the disaster rested wholly with the National Coal Board (NCB) and with its Chairman, Lord Robens. However, no NCB staff were ever fired or prosecuted as a consequence of the disaster. The event remains the worst landslide disaster in the history of the United Kingdom.

New London School Explosion (1937)

On March 18, 1937, at 3:30 pm, a gas leak led to an explosion in a school in the East Texas town of New London. The school itself was new and well-constructed, having been funded through lucrative oil production in the area. However, while the school had been originally designed and constructed to be steam-heated, school officials changed the original plans in favor of gas heating (Rozelle, 2012). In addition, earlier the same year, with recommendation from the district superintendent, the School Board cancelled the school's natural gas contract and had plumbers tap into a residual natural gas line in order to save money on heating in the school building (Rozelle, 2012). At that time, many buildings and residences in East Texas similarly tapped into natural gas lines; gas extracted along with oil production was seen as a waste product and thus oil companies ignored this common practice (Rozelle, 2012). However, the connection to the residue gas line in the crawl space under the New London school was faulty and insufficient ventilation caused gas to accumulate in the space. As natural gas is odorless and colorless, the leak was not detected and gas filled the crawl space that ran the entire 253 feet of the school building. When an electric sander in a classroom near the crawlspace was turned on, the switch ignited the gas (The New London Texas School Explosion, 2016). The pressure built up to at least ninety pounds per square inch, more than any structure could tolerate (Cox, 2015). The explosion blew the roof off the school and eyewitnesses reported the building lifted off the ground and collapsed from north to south, with most of the walls tumbling inside the structure's foundation (Cox, 2015). Over 294 students and teachers were killed in the disaster, making it the deadliest school-related disaster in U.S. history ("The tragic events," 2016). An additional 184 individuals were injured (Dingus, 2001).

The state investigation found no fault with the school district or any of its employees (Cox, 2015). However, after the disaster, the Texas Legislature met in emergency sessions and enacted the Engineering Registration Act to mandate that public works must be designed and constructed under the supervision of a licensed professional engineer. As a direct result of the disaster, the Texas Legislature also passed a law requiring gas producers to add a sulphur-smelling chemical, mercaptan, to natural gas, as an aide to detect natural gas. Adding odor to natural gas to aid in detection of gas leaks is now a practice followed world-wide.

Discussion

We return here to reframe these cases employing our social vulnerability theoretical lens. The contexts for these seven cases were deliberately chosen for maximum variation with respect to geographical location, type of natural hazard, and instructional context. However, we argue that social, economic, and political factors preexisted which contributed to the vulnerability of schoolchildren *before* each of these disasters occurred. Societies construct schools which do not protect children from fires, earthquakes, explosions, or environmental hazards. Societies neglect to put in place necessary protections for schoolchildren on field trips or engaging in after school activities. Societies choose not to properly train teachers on evacuation procedures. Without these safeguards, children are placed at risk during school-related activities. The social vulnerability perspective views these socially-constructed situations as interacting with the inherent physical and

cognitive characteristics of children, thus placing schoolchildren disproportionately at risk when they are exposed to natural hazards. To reduce disaster risk, social vulnerability theory points to protective actions we as a society should take before hazards occur and suggests these actions be particularly focused on groups, such as children, which bear the disproportionate effects of disaster.

Our cross-case thematic analysis found six issues educational policymakers, administrators, and teachers should consider in preventing and responding to school-related disasters. First, school safety practices apply not only when students are at school—they apply anytime children are under the supervision of school personnel—at the school site, on a ferry in South Korea, or while practicing for a play after the school day has ended. Emergency situations can occur suddenly and unexpectedly, making knowledge of emergency procedures across the multiple settings in which schooling takes place essential for school personnel. While districts may practice one type of drill (for example, fire or earthquake drills) on the school campus on a regular basis, much more comprehensive emergency training is needed to assure student safety.

Second, it must be emphasized that factors which place schoolchildren at risk also place school personnel at risk. While it was our primary intent to focus on schoolchildren, we found teachers and other school personnel also vulnerable in school-related disasters. Often school personnel take considerable risks to protect children—thus increasing their own vulnerability to hazards. For example, during the Sewol ferry disaster, one teacher gave his life jacket to one student, went downstairs to rescue his other students, and subsequently drowned. In the Aberfan disaster, the headmaster protectively encircled several children in his arms before dying in the landslides. School contexts, which require personnel to lead and supervise evacuation and sheltering procedures for children, are also hazardous for the adults which work in them.

Third, teachers and school administrators need to be well-trained and knowledgeable about emergency procedures so they can make independent decisions in emergency situations. Children look to teachers for effective direction and reassurance in disaster. Particularly in quickly developing emergency situations, such as fires, earthquakes, or tornados, school personnel may have to decide whether to direct students to shelter-in-place or to evacuate the settings. Teachers need to determine best evacuation routes, give quick instructions to their student and ensure all children are safely evacuated. Following disaster, students often continue to need psychological support from teachers (Ducy & Stough, 2011). Divestment in teacher education and funding for teacher training not only affects the quality of education but can increase the social vulnerability of both students and teachers to disasters.

Fourth, children must be knowledgeable about emergency procedures, particularly evacuation procedures, so that they are not completely reliant on teachers for emergency instructions. Teachers and school personnel are at risk of dying or becoming incapacitated during school disasters. The more knowledgeable students are about taking evasive action, the more independently they can respond in these situations. For example, as seen in the Great Japan disaster, older students at the school assisted younger students in evacuating. Disaster practices and policy also can be strengthened by the input of students. Like teachers, children inhabit their classrooms and schools on a daily basis and may have observations and ideas to share which can improve emergency procedures. Allowing schoolchildren to be undertrained and passive actors in disaster contributes to their vulnerability in disaster. Conversely, increasing student knowledge and agency is likely to decrease vulnerability to disasters.

Fifth, most school disaster cases we reviewed could have been prevented through safe school construction. In the Sichuan earthquake, shoddy construction of some schools caused student deaths, while other structures survived the earthquake. This was also seen in the collapse of an elementary school in 2002 in San Giuliano di Puglia, Italy, where 26 children died in a school

undergoing remodeling, while other older buildings around it were left standing and successfully sheltered students. The highest level of safe engineering principles should be used in order to protect children who, as previously noted, are physically at-risk to the effects of disaster. School construction also needs to be fireproof and tornado proof to the extent possible: The Kumbakonam School Fire started and then quickly spread across a highly flammable thatched roof. Schools also should be built in areas safe from the impact of hazards: The Aberfan schools in Wales were located directly below a sliding coal tip. School design additionally needs to incorporate areas for students to shelter-in-place as well as evacuation routes, windows, and doors made for easy egress. Again, the social vulnerability perspective points out it is *preexisting factors,* such as allowing schooling to take place within unsafe construction, which contributes to vulnerability in disaster.

Finally, educational policymakers, especially school boards, have a pivotal role in establishing policies which ensure safe learning environments for children. School construction, in particular, requires careful oversight by governmental entities to ensure right action has been taken by construction companies to protect children from hazards. School engineers need to be consulted and their safety recommendations carefully followed. The New London school, though using the commonly accepted practice of "tapping into" a gas line, did not have the line inspected by certified personnel. The ship in the Sewol Ferry Disaster evidenced numerous safety violations which were overlooked. To date, the Korean government has failed to hold high-level officials accountable for this disaster, despite continuing calls from the public and parents of the dead students. In these instances, the actions of policymakers directly influenced student safety and mortality. Social vulnerability theory has previously pointed to political and policy-related decisions, for example in Hurricane Katrina (Finch, Emrich, & Cutter, 2010), which led to some segments of the population being placed differentially exposed to hazards. We stress here that it is the decisions of school boards, governments, and policymakers which allow for unsafe construction which, in turn, leads to increased child mortality in disaster.

Implications for Policy and Practice

Given our social vulnerability lens that preexisting inequalities lead to disproportionate effects on marginalized segments of society, we believe changes in current policy and practices can reduce the risk that schoolchildren and teachers experience in disaster. A number of researchers (e.g. Blaikie, Cannon, Davis, & Wisner) and world organizations (e.g. United Nations International Strategy for Disaster Reduction, 2009) have reframed discourse surrounding disasters and emphasize *disaster risk reduction* as the priority in disaster studies. Within this framework, social vulnerability theory points to reducing the disproportionate risk children, minority groups, people with disabilities, the frail elderly, and other marginalized groups live with *before* hazards such as earthquakes, fires, and hurricanes occur. Disaster risk reduction thus involves examining preexisting causes of disproportionate risk, as we have done with the seven cases in this study, and then taking action to reduce particular risks associated with these populations.

Educational policymakers are key players in ensuring that disaster risk reduction takes place (UNISDR, 2012). Foremost, school risk reduction requires a pervasive culture of preparedness. A preparedness culture entails involvement at multiple levels and consideration of the multiple locations in which schooling takes place. School personnel and educational policymakers must be active participants in this culture, advocate for this culture, and teach preparedness culture. Teachers and school administrators need to be aware of possible hazards in all environments into which they bring children and prepared to take autonomous action. While most U.S. schools have emergency response and disaster plans for when school is in session (Chung et al., 2009; Kano & Bourque,

2007), as we have illustrated, disasters also occur outside of the instructional day. Administrators can organize disaster education and involve staff in emergency planning. Teacher education programs also should consider disaster risk reduction as part of the curriculum for prospective teachers (Twigg, 2015). Schools are excellent places for disaster education and disaster risk reduction and emergency procedures should be incorporated into the school curriculum where possible (Kelman, 2011; Petal, 2008). Disaster risk education in schools is also linked to overall community preparedness as students can be instrumental in bringing knowledge and practices learned at school back home to their families.

The quality of school infrastructure directly affects the mortality of both children and school personnel during disaster. School construction and building codes should thus follow the highest standard of protection for those within. School superintendents and building principals are often consulted while new schools are being constructed and can provide important input to school boards on potential hazards to students. And, while school construction might seem out of the prevue of teachers, they can support grassroot advocacy efforts towards increased school safety. Sudden-onset hazards can be particularly destructive. In these instances, school personnel may be responsible for sheltering-in-place with their students and infrastructure needs to withstand the hazard for the duration. Teachers also spend many hours in school buildings and can monitor and report building conditions which may place schoolchildren at risk. In some communities, schools will serve as evacuation or relief centers following a disaster, so construction which can withstand the effects of natural hazards is doubly important.

Finally, school disasters can prompt new governmental and educational policy. Following the New London disaster, the state of Texas mandated that public works, including schools, must be constructed by a professional engineer, and mercaptans added to natural gas to provide an odor to natural gas. This practice is now enacted around the world. Similarly, damage done to schools in the Long Beach earthquake of 1933 led to progressive engineering standards, requiring U.S. schools be built to withstand earthquakes with minimal risk to human life and safety (Birkland, 2006). Lessons learned from the 1974 Super Tornado Outbreak let to designing future school buildings which provided more protection while sheltering-in-place during a hazardous event. School disasters have also led to increased governmental mandates that emergency preparedness and disaster risk reduction education be taught in school curriculum and teacher education programs (Petal et al. 2015). However, continued policy efforts are needed to continue to reduce risks to schools, schoolchildren, and school personnel.

Policymakers have an essential role in ensuring schools are safe locations for children to be during disasters. Petal et al. (2015) justly assert that "no society should tolerate a choice between the safety of children's lives and their education" (p. 7). Administrators and teachers have a particular responsibility to be knowledgeable about evacuation and sheltering procedures wherever and whenever school-related activities take place. When this principle is ignored appalling consequences can result. As illustrated in the seven cases above, school-related disasters often involve preexisting vulnerabilities to risk and disaster. By participating in and advocating for a culture of preparedness, policymakers can better protect schoolchildren, as well as school personnel, in disaster situations.

References

2011 Japan earthquake-tsunami fast facts (2016, March 14). *CNN News*. Retrieved from http://www.cnn.com

Abbey, R. F., & Fujita, T. T. (1983). Tornadoes: The tornado outbreak of 3–4 April 1974. *The Thunderstorm in Human Affairs*, 37-66.

Agency for Healthcare Research and Quality. (2010). *National Commission on Children and Disasters: 2010 Report to the President and Congress.* AHRQ Publication. Retrieved from http://archive.ahrq.gov/prep/nccdreport/nccdreport.pdf

Barrett, E. J., Ausbrooks, C. Y. B., & Martinez-Cosio, M. (2008). The school as a source of support for Katrina-evacuated youth. *Children Youth and Environments, 18*(1), 202-235.

Bastidas, P., & Petal, M. (2012) Assessing school safety from disasters: A global baseline report. *United Nations International Strategy for Disaster Reduction (UNISDR).* Retrieved from http://www.unisdr.org/files/35274_2012schoolsafetyglobalbaseline.pdf

Birkland, T. A. (2006). *Lessons of disaster: Policy change after catastrophic events*. Washington, DC: Georgetown University Press.

Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014). *At risk: Natural hazards, people's vulnerability and disasters*. New York: Routledge.

Boon, H. J., Brown, L. H., Tsey, K., Speare, R., Pagliano, P., Usher, K., & Clark, B. (2011). School Disaster Planning for Children with Disabilities: A Critical Review of the Literature. *International Journal of Special Education, 26*(3), 223-237.

Cherry, B., & Petley, D. (2011, October 21). Remembering Aberfan – 45 years ago today. Retrieved from http://blogs.agu.org/landslideblog/2011/10/21/remembering-the-aberfan-disaster-45-years-ago-today/

Choe, S. H. (2014, May 15). Captain and 3 officers charged with murder in Korean ferry sinking. *The New York Times*, Retrieved from http://www.nytimes.com

Choe, S. H. (2016, June 11). South Korea families watch salvaging, hope for truth. *The New York Times*. Retrieved from http://www.nytimes.com

Chung, S., Danielson, J., & Shannon, M. (2009). *School-based emergency preparedness: a national analysis and recommended protocol*. Rockville, MD: Agency for Healthcare Research and Quality.

Columbia University School of Nursing. (2005). *Emergency: Incidents affecting children*. Retrieved from http://ccnmtl.columbia.edu/projects/eprep/children/print.html

Cox, M. (2015). *Texas disasters: True stories of tragedy and survival* (2nd ed.). Guilford, CN: Globe Pequot Press.

Creswell, J. W. (2012). Qualitative inquiry and research design: Choosing among five approaches (3rd ed.). Thousand Oaks, CA: Sage Publications.

Cutter, S. L., & Emrich, C. T. (2006). Moral hazard, social catastrophe: The changing face of vulnerability along the hurricane coasts. *The ANNALS of the American Academy of Political and Social Science, 604*, 102-112. https://doi.org/10.1177/0002716205285515

Daniell, J. (2013, May 9). Sichuan 2008: A disaster on an immense scale. The BBC News. Retrieved from https://www.bbc.com/news/science-environment-22398684

Deering, C. G. (2000). A cognitive developmental approach to understanding how children cope with disasters. *Journal of Child and Adolescent Psychiatric Nursing, 13*(1), 7-16. https://doi.org/10.1111/j.1744-6171.2000.tb00070.x

Dingus, A. (2001, March). The New London school explosion. *Texas Monthly*, Retrieved from http://www.texasmonthly.com

Divjak, C. (2008, October 16). Corruption and shoddy construction behind school collapses in China earthquake. *World Socialist website*. Retrieved from https://www.wsws.org/en/articles/2008/10/chin-o16.html

Ducy, E. M., & Stough, L. M. (2011). Exploring the support role of special education teachers after Hurricane Ike: Children with significant disabilities. *Journal of Family Issues*, *32*(10), 1325-1345. https://doi.org/10.1177/0192513X11412494

Erlandson, D. A., Harris, E. L., Skipper, B. L., & Allen, S. D. (1993). *Doing naturalistic inquiry: A guide to methods*. Sage.

Finch, C., Emrich, C. T., & Cutter, S. L. (2010). Disaster disparities and differential recovery in New Orleans. *Population and Environment, 31*, 179-202. https://doi.org/10.1007/s11111-009-0099-8

Fothergill, A., & Peek, L. A. (2004). Poverty and disasters in the United States: A review of recent sociological findings. *Natural hazards*, *32*(1), 89-110. https://doi.org/10.1177/0192513X11412494

Fraser, S., Leonard, G. S., Matsuo, I., & Murakami, H. (2012). Tsunami evacuation: Lessons from the Great East Japan earthquake and tsunami of March 11th 2011. *GNS Science Report, 17*, 89.

Friedman, D., Nessler, D., Cycowicz, Y. M., & Horton, C. (2009). Development of and change in cognitive control: A comparison of children, young adults, and older adults. *Cognitive, Affective, & Behavioral Neuroscience*, *9*(1), 91-102. https://doi.org/10.1177/0192513X11412494

Goenjian, A. K., Molina, L., Steinberg, A. M., Fairbanks, L. A., Alvarez, M. L., Goenjian, H. A., & Pynoos, R. S. (2001). Posttraumatic stress and depressive reactions among Nicaraguan adolescents after Hurricane Mitch. *American Journal of Psychiatry, 158*(5), 788-794. https://doi.org/10.1177/0192513X11412494

Grazulis, T. P. (1993). *Significant Tornadoes, 1680-1991*. St. Johnsbury, VT: Environmental Films.

Guba, E. G., & Lincoln, Y. S. (1988). Naturalistic and rationalistic enquiry. In J. P. Keeves (Ed.), *Educational research, methodology and measurement: An international handbook* (pp. 81-85). Sydney, Australia: Pergamon Press.

Hewitt, K. (1983). The idea of calamity in a technocratic age. *Interpretation of Calamity: From the Viewpoint of Human Ecology* (pp. 3-32). Boston: Allen & Unwinn.

Hewitt, K. (1997). *Regions of risk: A geographical introduction to disaster*. New York: Addison Wesley Longman.

Ishinomaki to turn Okawa Elementary ruins into 3/11 monument (2016, March 27). *The Japan Times*. Retrieved from http://www.japantimes.co.jp

Jones, R.T., Frary, R., Cunningham, P., Weddle, J.D. & Kaiser, L. (2001). The psychological effects of Hurricane Andrew on ethnic minority and Caucasian children and adolescents: A case study. *Cultural Diversity and Ethnic Minority Psychology, 7*(1), 103-109. https://doi.org/10.1037/1099-9809.7.1.103

Kano, M., & Bourque, L. B. (2007). Experiences with and preparedness for emergencies and disasters among public schools in California. *NASSP Bulletin, 91*(3), 201-218. https://doi.org/10.1177/0192636507305102

Kelman, I. (2011). Schools. In K.B. Penuel & M. Statler (Eds.), *Encyclopedia of Disaster Relief* (pp. 630-633). London, U.K.: Sage Publications.

Kelman, I., & Stough, L. (Eds.). (2015). *Disability and Disaster: Explorations and Exchanges*. New York, NY: Palgrave Macmillan. https://doi.org/10.1057/9781137486004

Kena, G., Musu-Gillette, L., Robinson, J., Wang, X., Rathbun, A., Zhang, J., . . . Dunlop Velez, E. (2015). *The Condition of Education 2015*. (NCES 2015-144). National Center for Education Statistics U.S. Department of Education. Retrieved from http://nces.ed.gov/pubs2015/2015144.pdf

Kim, S. K. (2015). The Sewol ferry disaster in Korea and maritime safety management. *Ocean Development & International Law, 46*(4), 345-358. https://doi.org/10.1080/00908320.2015.1089748

Kingston, J. (2016, February 6). A Tohoku father seeks accountability for his daughter's death. *The Japan Times*. Retrieved from http://www.japantimes.co.jp

La Greca, A., Silverman, W., Vernberg, E. & Roberts, M. (2002). *Helping children cope with disasters and terrorism*, Washington, DC: American Psychological Association. https://doi.org/10.1037/10454-000

Lai, B. S., Esnard, A. M., Lowe, S. R., & Peek, L. (2016). Schools and disasters: Safety and mental health assessment and interventions for children. *Current Psychiatry Reports*, *18*(12), 109. https://doi.org/10.1007/s11920-016-0743-9

Lewis, J. (1999). *Development in disaster-prone places: Studies of vulnerability*. ITDG Publishing. https://doi.org/10.3362/9781780442013

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Praadigmatic controversies, contradictions, and merging confluences. In N. Densin & Y. S. Lincoln (Eds.), The SAGE handbook of qualitative research (4th ed., pp. 97-128). Thousand Oaks, CA: Sage.

Masten, A. S., & Osofsky, J. D. (2010). Disasters and their impact on child development: Introduction to the special section. *Child Development, 81*(4), 1029-1039. https://doi.org/10.1111/j.1467-8624.2010.01452.x

Morrow, B. H. (1999). Identifying and mapping community vulnerability. *Disasters*, *23*(1), 1-18. https://doi.org/10.1111/1467-7717.00102

National Oceanic and Atmospheric Administration (NOAA). (2016). *Tornado outbreak opened eyes about myths, school safety*.. Retrieved from http://www.publicaffairs.noaa.gov/storms/myths.html

Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981—2001. *Psychiatry, 65*(3), 207-239. https://doi.org/10.1521/psyc.65.3.207.20173

O'Keefe, P., Westgate, K., & Wisner, B. (1976). Taking the naturalness out of natural disasters. *Nature*, *260*, 566-567. https://doi.org/10.1038/260566a0

Pane, J. F., McCaffrey, D. F., Kalra, N., & Zhou, A. J. (2008). Effects of student displacement in Louisiana during the first academic year after the hurricanes of 2005. *Journal of Education for Students Placed at Risk, 13*(2-3), 168-211. https://doi.org/10.1080/10824660802350169

Peacock, W. G., Morrow, B. H., & Gladwin, H. (Eds.). (1997). *Hurricane Andrew: Ethnicity, gender, and the sociology of disasters*. Psychology Press.

Peek, L. (2008). Children and disasters: Understanding vulnerability, developing capacities, and promoting resilience—An introduction. *Children Youth and Environments, 18*(1), 1-29.

Peek, L., Abramson, D. M., Cox, R. S., Fothergill, A., & Tobin, J. (2018). Children and disasters. In H. Rodriguez, J. Trainor, & W. Donner (Eds.), *Handbook of Disaster Research* (2nd ed., pp. 243-262). Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-319-63254-4_13

Peek, L., & Stough, L. M. (2010). Children with disabilities in the context of disaster: A social vulnerability perspective. *Child Development, 81*(4), 1260-1270. https://doi.org/10.1111/j.1467-8624.2010.01466.x

Petal, M. (2007). Disaster risk reduction education material development, organization, and evaluation. *Regional Development Dialogue, 28*(2), 1.

Petal, M., Wisner, B., Kelman, I., Alexander, D., Cardona, O. D., Benouar, D., . . . Kandel, R. C. (2015). School seismic safety and risk mitigation. In *Encyclopedia of earthquake engineering* (pp. 2450-2468). Berlin: Springer.

Piaget, J. (1952). *The origins of intelligence in children* (Vol. 8, No. 5, pp. 18-1952). New York: International Universities Press. https://doi.org/10.1037/11494-000

Phillips, B. D. (2014). *Qualitative disaster research*. New York: Oxford University Press. https://doi.org/10.1093/acprof:osobl/9780199796175.001.0001

Phillips, B. D. (2015). Inclusive emergency management for people with disabilities facing disaster. In I. Kelman, & L. Stough (Eds.), *Disaster and disability: Exchanges and explorations* (pp. 31-49). New York: Palgrave/MacMillan Press. https://doi.org/10.1057/9781137486004_3

Phillips, B. D., & Morrow, B. H. (2007). Social science research needs: Focus on vulnerable populations, forecasting, and warnings. *Natural Hazards Review*, *8*(3), 61-68. https://doi.org/10.1061/(ASCE)1527-6988(2007)8:3(61)

Prinstein, M. J., La Greca, A. M., Vernberg, E. M., & Silverman, W. K. (1996). Children's coping assistance: How parents, teachers, and friends help children cope after a natural disaster. *Journal of Clinical Child Psychology, 25*(4), 463-475. https://doi.org/10.1207/s15374424jccp2504_11

Ranghieri, F., & Ishiwatari, M. (Eds.). (2014). *Learning from megadisasters: Lessons from the Great East Japan Earthquake*. Washington, DC: World Bank Publications. https://doi.org/10.1596/978-1-4648-0153-2

Rohde, D. (2004, July 17). At least 81 children are killed in fire at private school in India. *The New York Times*. https://www.nytimes.com/2004/07/17/world/at-least-81-children-are-killed-in-fire-at-private-school-in-india.html#:~:text=July%2017%2C%202004%20At%20least%2081%20elementary%20school,southern%20India%20on%20Friday%20morning%2C%20Indian%20officials%20said.

Rozelle, R (2012), *My Boys and Girls Are In There: The 1937 New London School Explosion.* College Station, TX: Texas A&M University Press.

Sampath, K. (2005). *Inquiry Commission report on Krishna School Fire.* Government of Tamil Nadu.: http://www.tn.gov.in/schooleducation/Inquiry_Commission/part1_1to139.pdf

Satapathy, S., & Walia, A. (2006). Intervening with the process of recovery from a traumatic life event: Case study of a child victim of a school fire disaster in India. *Australian e-Journal for the Advancement of Mental Health*, *5*(3), 195-201. https://doi.org/10.5172/jamh.5.3.195

Schonfeld, D.J. (2004). Are we ready and willing to address the mental health needs of children? Implications from September 11th. *Pediatrics*, *113*(5), 1400-1401. https://doi.org/10.1542/peds.113.5.1400

School that lost 70% of its pupils mourns. (2011, April 29). *The Japan Times.* Retrieved from https://www.japantimes.co.jp/news/2011/04/29/national/school-that-lost-70-of-its-pupils-mourns/#.W0emvdUzppg

Selby, D., & Kagawa, F. (2012). *Disaster risk reduction in school curricula: Case studies from thirty countries.* United Nations Educational, Scientific and Cultural Organization (UNESCO) and United Nations Children Fund (UNICEF). Retrieved from http://unesdoc.unesco.org/images/0021/002170/217036e.pdf

Stough, L. M. (2009). The effects of disaster on the mental health of individuals with disabilities. In Y. Neria, S. Galea, & F. H. Norris (Eds.), *Mental health and disasters.* (pp. 264-276). New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511730030.015

Stough, L. M., Ducy, E. M., & Kang, D. (2017). Addressing the needs of children with disabilities experiencing disaster or terrorism. *Current Psychiatry Reports, 19*(24), 1-10. https://doi.org/10.1007/s11920-017-0776-8

Stough, L. M., & Kang, D. (2015). The Sendai Framework for disaster risk reduction and persons with disabilities. *International Journal of Disaster Risk Science, 6*(2), 140-149. https://doi.org/10.1007/s13753-015-0051-8

Stough, L. M., & Kelman, I. (2018). People with disabilities and disasters. In H. Rodriguez, J. Trainor, & W. Donner (Eds.), *Handbook of disaster research* (2nd ed., pp. 225-242). Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-319-63254-4_12

Srinivasan, G. (2004, July 17). 87 Children die in school fire. *The Hindu.* Retrieved from https://www.thehindu.com/todays-paper/87-children-die-in-school-fire/article27641374.ece

Tragic events of March 18th, 1937. (2016). *The New London Museum*. Retrieved from http://nlsd.net/index2.html

Twigg, J. (2015). *Disaster risk reduction*. London, UK: Overseas Development Institute.

UNESCO Institute for Statistics. (2015). Education: Enrollment by grade. Retrieved from http://data.uis.unesco.org/Index.aspx?DataSetCode=EDULIT_DS#

UNICEF. (2008). Safe schools in safe territories: Reflections on the role of the educational community in risk management. *United Nations International Strategy for Disaster Reduction (UNISDR).* Retrieved from http://www.unisdr.org/we/inform/publications/8962

UNISDR. (2009). UNISDR Terminology for Disaster Risk Reduction. *United Nations International Strategy for Disaster Reduction (UNISDR).* Retrieved from http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf

U.S. Environmental Protection Agency (EPA). (2008). *EPA's 2008 report on the environment.* National Center for Environmental Assessment. Retrieved from http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=485027

Van Willigen, M., Edwards, T., Edwards, B., & Hessee, S. (2002). Riding out the storm: Experiences of the physically disabled during Hurricanes Bonnie, Dennis, and Floyd. *Natural Hazards Review*, *3*(3), 98-106. https://doi.org/10.1061/(ASCE)1527-6988(2002)3:3(98)

Vernberg, E. M., La Greca, A. M., Silverman, W. K., & Prinstein, M. J. (1996). Prediction of posttraumatic stress symptoms in children after Hurricane Andrew. *Journal of Abnormal Psychology, 105*(2), 237. https://doi.org/10.1037/0021-843X.105.2.237

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (Eds.). (2004). *At risk* (2nd ed.). London: Routledge.

Wong, E. (2008, September 4). Chinese admits building flaws in quake. *The New York Times.* Retrieved from https://www.nytimes.com/2008/09/05/world/asia/05china.html

Yardley, J. (2008, May 2). Chinese are left to ask why schools crumbled. *The New York Times.* Retrieved from https://www.nytimes.com/2008/05/25/world/asia/25schools.html

Yin, R. K. (2013). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage Publications.

About the Authors

Laura M. Stough
Texas A&M University
lstough@tamu.edu
https://orcid.org/0000-0002-0313-5045
Dr. Laura Stough is Associate Professor of Educational Psychology and Assistant Director at the Center for Disability and Development at Texas A&M University. Dr. Stough's research focuses on the psychological and social effects of disaster on children and on individuals with disabilities.

Donghyun Kang
Texas A&M University
junsr30@tamu.edu
https://orcid.org/0000-0003-0636-5716
Donghyun Kang is a Ph.D. student in Department of Educational Psychology. She also is an interdisciplinary training fellow and research assistant for Project REDD (Research and Evaluation in Disability and Disaster) at the Center on Disability and Development at Texas A&M University. Her research interests include teachers' emotional support of at-risk students.

Sungyoon Lee
Texas A&M University
tsy2i@tamu.edu
https://orcid.org/0000-0002-3326-1966
Sungyoon Lee is a Ph.D. student in Department of Teaching, Learning and Culture at Texas A&M University. His research interests revolve around teacher education and literacy development at the elementary school level.

education policy analysis archives

Volume 26 Number 100 August 13, 2018 ISSN 1068-2341

Please send errata notes to Audrey Amrein-Beardsley at audrey.beardsley@asu.edu

Join EPAA's Facebook community at https://www.facebook.com/EPAAAAPE and **Twitter feed** @epaa_aape.

archivos analíticos de políticas educativas
consejo editorial