

**SCHOOL DISASTER PLANNING FOR CHILDREN WITH DISABILITIES
A CRITICAL REVIEW OF THE LITERATURE**

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Human systems have to adapt to climate change and the natural disasters predicted to increase in frequency as a result. These disasters have both direct and indirect health effects. Certain groups, the poor, the elderly, children and those with disabilities are set to be more seriously impacted by disasters because of their greater inherent vulnerability. Adaptation to the health impacts of disasters requires the cooperation and input from all sectors of government and civil society, including schools. This critical literature review examined the body of peer reviewed literature published in English addressing school disaster planning policies with a particular focus on children with disabilities. Results show that children and youth with disabilities are especially vulnerable to disasters because of socioeconomic and health factors inherent to disabilities. While schools in the U.S. have policies to deal with disasters, these policies are neither comprehensive nor inclusive. The empirical evidence base from which they are developed is severely limited. No publications were identified that represent the current disaster planning of schools in countries like Australia, the UK or Canada. Recommendations for future research are outlined to bridge knowledge gaps and help establish appropriate and inclusive school disaster policies for children with disabilities.

The objective of this paper is to present the results of a critical review of literature published in English about schools' preparedness to respond to emergency events or disasters arising from climate change. In particular, this review focuses on school preparedness to protect children with disabilities during disasters. The aim of the review was to identify and evaluate the evidence base for school emergency plans and policies. Further, we wish to highlight issues that, when addressed, will promote the safe and equal participation of children and adolescents with disabilities in schools in a context of climate change.

Climate change is predicted to have serious impacts upon Australia (IPCC, 2007). Despite instances of imperfect scientific peer-synthesis by the Intergovernmental Panel on Climate Change (IPCC), the weight of scientific evidence suggests continuing, serious and potentially catastrophic climate change, largely due to human actions. Climate change risk scenarios for the next two decades show a high probability of increased average temperatures, sea level rises and water cycle implications globally. Across Australia these include higher intensity and frequency of weather-related disasters such as floods, cyclones, droughts, heat waves and fires (Commonwealth Scientific and Industrial Research Organisation (CSIRO) & Bureau of Meteorology (BOM), 2007). Recent reviews of climate change science have resulted in bringing forward the predicted timing of such events, making them more imminent (Steffen, 2009). Since climate change and its ramifications are becoming incontrovertible, increased research on its social and cultural dimensions is necessary (Hulme, 2008).

Human health is one of the areas upon which climate change is set to have an important influence. The Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report declared that climate change will increase threats to human health, particularly in lower-income populations, predominantly within tropical and subtropical countries (McMichael et al., 2001). Health impacts might be directly linked to weather and climate variability, they might result from environmental changes that occur in response to climate variability and change, or they could be a consequence of climate-induced economic dislocation and environmental decline (Costello et al., 2009; Ebi, 2008). Direct health impacts can result from thermal extremes and extreme weather events (i.e. floods, heat waves and droughts). Indirect health impacts, likely to have more widespread effects than direct impacts, might occur through changes in the range and intensity of transmission of infectious diseases and food- and waterborne diseases (Costello et al., 2009). Such indirect health impacts can be brought about from ecosystem changes which can facilitate the emergence and re-emergence of disease vectors or pathogens (National Research Council, 2001).

The causal links from climate change to health impacts are complex and include a range of socio-cultural factors such as wealth, status of the public health infrastructure, provision of medical care, as well as health and environmental factors. Pre-existing medical conditions and disabilities, proper nutrition, safe water, and sanitation can all affect health outcomes. The importance of social and community factors in increasing the risk of mortality from weather related events such as heat waves, for example, have been recognised and identified and include social isolation, ethnicity, socioeconomic status, and neighborhood characteristics (Yardley, Sigal & Kenny, 2010). Therefore, the severity of climate change impacts upon health will be determined not only by changes in climate but also by non-climatic factors and by the adaptation measures implemented to reduce negative health impacts.

In the climate change literature *adaptation* is 'the process of designing, implementing, monitoring, and evaluating strategies, policies, and measures intended to reduce climate change related impacts. In public health the analogous term is considered to be *prevention*' (Ebi & Semenza, 2008, p. 501). Primary prevention aims to prevent the onset of injury or illness; an example includes the use of bicycle helmets to prevent head injuries. Secondary prevention is designed to diagnose disease early to control its advance, for example by screening for breast cancer. Tertiary prevention occurs once disease is diagnosed in an effort to reduce morbidity and avoid complications. In the context of climate change, the American Public Health Association together with a group of federal, state, and local agencies and partners developed a standards framework in 1994 delineating ten Essential Services of Public Health, (Public Health Functions Steering Committee [PHFSC], 1994). One such proposed service is centred on prevention through enforcing laws and regulations that protect health and ensure safety (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008). In the context of climate change, the role of such a service, or prevention measure, is to ensure that adequate emergency management policies are in place to quickly and effectively respond to climate change induced weather impacts, to ensure that everyone's safety is maximised in the event of both rapid onset (e.g. cyclone, flood, fire, heat waves, flu pandemic) and slow onset (e.g. vector borne diseases) disaster events. Having adequate emergency management policies in place is critical in community organizations dealing with a large number of individuals who are likely to have a range of vulnerabilities to climate change impacts. Schools are such an organisation.

Schools cater for children who differ from adults in many ways that are of great importance in building public health emergency response plans. Their unique physiology and psychology renders them more vulnerable to health emergencies and disasters (Balbus & Malina, 2009; Chung, Danielson & Shannon, 2008). Children are particularly vulnerable to heat stress, extreme weather events, food and water borne illness and vector borne illness (Balbus & Malina, 2009). Those with mobility and cognitive disabilities may be at particular risk during heat waves and other extreme weather events (EPA, 2006). Compared to adults, children have differences in breathing rate, skin permeability, innate immunity, fluid reserve, communication skills, and poorly developed self-preservation instincts. This range of differences between children and others requires that disaster response plans be tailored to this population. Since children spend as much as 70-80 % of their waking hours away from their parents in school, schools have a responsibility in assuring that children are cared for and proper preparation and interventions are delivered before, during and after a public health emergency (Chung et al., 2008).

Emergency management policies in schools

Policies for emergency response to climate change contingencies in schools appear non-existent in Australia, though State Governments do have some related policies. For example, Queensland has

policies in place regarding management of heat waves, building safety, and civil issues (Office of the Queensland Parliamentary Counsel, 2010). Student protection mandates in Queensland outline the responsibilities and commitment of Education Queensland to provide a safe and supportive learning environment, and prevent and respond to harm or risk of harm for all students. Harm in this context is limited to that caused by a school employee, another student, someone outside the state education institution environment, and student self-harm. Another example is school closures, which are an important non-pharmaceutical component of controlling outbreaks of infectious diseases such as pandemic influenza, although little research appears to have been done on the effect of such closures on disease transmission and their educational impact (Berkman, 2008), or even the logistics of their management (Cauchemez et al., 2009).

In the wake of rising confidence about the imminent development of climate change contingencies in the next few decades, Costello et al. (2009) stress that the management of the health effects of climate change requires the cooperation, coordination and input from all sectors of government and civil society, and should engage stakeholders (Ebi & Semenza, 2008). Costello et al. (2009) urge ‘...appropriate public health systems should be put into place to deal with adverse outcomes’ (p.1693). Therefore all schools must have emergency management plans and policies to meet the range of forecasted climate emergencies and to address all students’ needs, including the most vulnerable to climate change impacts, students with disabilities or special healthcare needs. Moreover, schools need appropriate curricula to disseminate information about climate change contingencies to their students and to prepare them for any likely emergency situation.

Children with disabilities

Vulnerable populations, including children with disabilities, are especially at risk in disasters (Balbus & Malina, 2009). The aftermath of Hurricane Katrina highlighted how poorly authorities responded to the needs of the most vulnerable of the community (NMA, 2005). Inadequate emergency planning for children, for example, and the rapid pace of evacuation for Hurricanes Katrina and Rita of 2005, led to over 5,000 children being displaced from their families. A nongovernmental U.S. agency, the National Center for Missing and Exploited Children, had to step in and help reunite families, a process that lasted for 18 months (Chung et al., 2008).

Families caring for a child with a disability are among the most vulnerable since disabilities are strongly associated with social, structural and financial disadvantage (AIHW, 2009). To illustrate the point, one can consider the impact of extreme heat events, predicted to become more prevalent in Australia and other parts of the world. The impact of extreme heat events can be ameliorated through the use of air-conditioning. However, access to air-conditioning is less likely to be found in homes of families with low income (Yardley, Sigal & Kenny, 2010). Such lack of access to air-conditioning might explain findings showing those with disabilities, such as autism or developmental disorders of speech and language—and particularly children—were found to be at highest risk of needing hospitalisation during a heat wave in Australia (Hansen et al., 2008). This risk also holds for individuals with chronic pulmonary, renal and cardiovascular conditions or physical disabilities preventing them from taking care of themselves (Bouchama et al., 2007). Such chronic conditions, commonly encountered in children with physical disabilities (Balbus & Malina, 2009; Werts, Culatta & Tompkins 2007) carry with them the highest mortality risk during heat events (Bouchama et al., 2007).

The social context wherein children with disabilities are often found also adds to their potential vulnerability. In addition to health difficulties inherent with having disabilities and their vulnerability to weather related events, children with disabilities are more likely to experience intra- and extra-familial abuse and neglect (AIHW, 2009), adding to their risk during and in the aftermath of emergency situations. This is thought to be linked to the psychological morbidity found in vulnerable groups like the poor, those with chronic health conditions, women, children and adolescents after the experience of a disaster (Beaton et al., 2009; Somasundaram & van de Put, 2006). For example, adolescents exposed to disasters can experience a range of cognitive problems including loss of concentration and memory, develop learning disorders, somatization, anxiety, depression, acute stress disorder, post-traumatic stress disorder, separation problems, sleep difficulties, aggressiveness, and high-risk health behaviours (Somasundaram & van de Put, 2006) adding to the ongoing care management responsibilities of families who care for a child or adolescent with a disability.

Children with disabilities comprise a considerable number in schools. In 2009 an estimated 168,500 Australian children had severe disability with the proportion of children with severe disability highest among low-income households (29%) and lowest among high-income households (7%) (AIHW, 2009). In the U.S. 8.8% of all children 15 and under have a disability, while 3.6% have a severe disability (Brault, 2008). In the age group 15-24, which incorporates the senior years of schooling the figure climbs to 10.4 % in the U.S. (Brault, 2008).

Purpose of literature review

The purpose of this critical literature review was to examine the body of peer reviewed literature published in the English language addressing school preparedness for dealing with climate change induced contingencies and disaster emergencies. Specifically, we sought to gather evidence to develop a framework for future research designed to increase awareness and guide the development and implementation of inclusive and equitable public health policy for schools. Our particular focus in this literature search was children with disabilities.

Methods

Search Strategy

The literature search was designed to be as broad and as inclusive as possible. Four databases were searched: the United States (U.S.) National Library of Medicine (MedLine) using the OvidSP search engine (Ovid Technologies, New York, NY); the Cumulative Index to Nursing and Allied Health Literature (CINAHL) using the EBSCOhost search engine (EBSCO Publishing, Ipswich, MA); the Education Resources Information Center (ERIC) and PsycINFO, both using the CSA Illumina search engine (ProQuest, Ann Arbor, MI). Four independent search strategies, one tailored for each database, were developed to identify four subsets of articles addressing: (1) policy or planning activities; (2) both natural and human made disasters; (3) schools and other educational institutions; and (4) children with either physical or cognitive/psychological/emotional disabilities.

First, a search strategy was developed for Ovid MedLine. Using the advanced search tools to map search terms to Medical Subject Headings (MeSH) and to view the index hierarchy, a list of MeSH search terms expected to exhaustively cover each of the four subsets of articles was generated. Those terms were then individually entered into CINAHL using the *Suggest Subject Terms* tool to identify the most appropriate analogous search terms for that database. That process was then repeated for the ERIC database and the PsychINFO database (individually) using the CSA Illumina search engine's thesaurus tool and visual exploration of the index hierarchies for those databases. The final terms incorporated into the four search strategies for each database are shown in Tables 1 - 4.

Search Execution and Article Screening

A similar process was undertaken to screen citations identified by the intersection of any three of the four search terms (*Near Match*). The titles of these articles were distributed among the study team, again with two authors independently reviewing each title to determine the article's relevance to the research question. If either reviewer identified a title for inclusion or further review, the abstract for that study was obtained with the process of independent blinded review by two authors repeated. Again, studies were only excluded if both reviewing study team members indicated a lack of relevance. The search was executed in October 2010. The search result of primary interest was the intersection of the four search subsets (Figure 1).

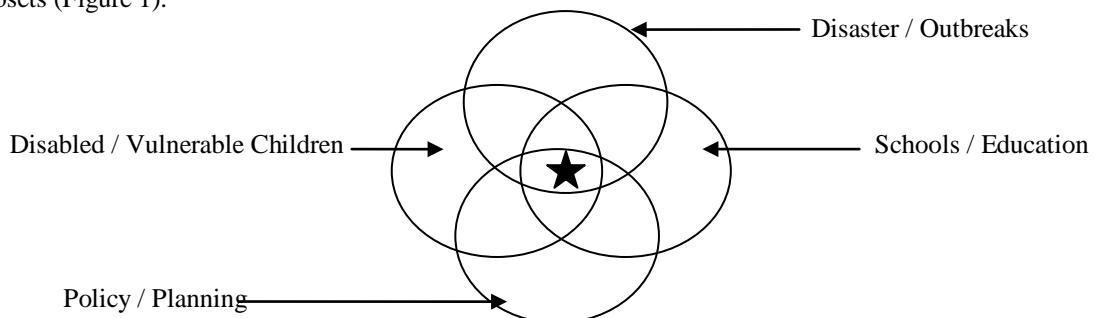


Figure 1: The Exact Match Search Intersection

The citations for all of the articles identified by the intersection of the four search subsets (*Exact Match*) were distributed among two of the authors who independently reviewed each title to determine the article's potential relevance to the research question. Authors were blinded to each other's appraisal. Those titles for which both reviewers indicated a lack of relevance were excluded. For the remaining citations, the study abstracts were obtained, with the process of independent, blinded review repeated. Again, studies were only excluded if both reviewers indicated a lack of relevance. Finally, the full manuscripts for the retained citations were reviewed using a data collection sheet to further screen and characterize the article, and to extract relevant information about each study.

Table 1: Search Strategy Thesaurus for Policy and Planning Activities

MEDLINE MeSH	CINAHL Subject Terms	PsycINFO Terms	ERIC Descriptors
regional health planning/	Health and welfare planning	Management planning	Regional planning
community health planning/			Community planning
state health plans/	state health plans		Statewide planning
federal government/	Government Government programs Government regulations Government agencies	Government Government policy making Government agencies	Federal government Federal regulation
local government/			Local government
state government/			State government State regulation
health planning organizations/			Health programs
<i>state health planning and development agencies/</i>			State agencies
organizational policy/	Organizational policies	Policy making	Policy Policy formation
health policy/	Health policy Health policy studies School policies Public policy Policy and procedure manuals	Health care policy	School policy
Disaster Planning/	Disaster Planning	Emergency preparedness Emergency management	Emergency programs

Table 2: Search Strategy Thesaurus for Natural or Man-Made Disasters

MEDLINE MeSH	CINAHL Subject Terms	PsycINFO Terms	ERIC Descriptors
disease outbreaks/	disease outbreaks	Epidemics pandemics	Communicable diseases diseases
disease vectors/	disease vectors	Disease transmission	
influenza, human/	influenza, human	influenza	viruses
cyclonic storms/	Natural disasters	Natural disasters	
droughts/			
floods/			
tidal waves/			
Tornadoes/			
wind/	weather	Atmospheric conditions	weather
snow/	snow		
cold temperature/	temperature		
hot temperature/			
Fires/	fires		
avalanches/			
earthquakes/			
landslides/			
tsunamis/			
volcanic eruptions/			
disasters/	disasters	disasters	Natural disasters
disaster planning/ or	Disaster planning	Emergency preparedness Emergency management	Emergency programs Civil defense
emergencies/	emergencies		
mass casualty incidents/	Mass casualty incidents		

Table 3: Search Strategy Thesaurus for Schools and Educational Institutions

MEDLINE MeSH	CINAHL Subject Terms	PsycINFO Terms	ERIC Descriptors
Students/	students	Elementary school students High school students Junior high school students Middle school students Special education students	students
Schools/	Schools Schools, elementary Schools, middle Schools, secondary Exp education	Elementary schools High schools Junior high schools Middle schools Education	Schools School districts Elementary schools Middle schools Junior high schools High schools Secondary schools
school health services/	school health services		School health services

Table 4: Search Strategy Thesaurus for Children with Disabilities

MEDLINE MeSH	CINAHL Subject Terms	PsycINFO Terms	ERIC Descriptors
adolescent/ child/	Adolescence Child	*	adolescents children
Mental Disorders/	Mental disorders Mental disorders, chronic	Disorders Mental disorders Emotional disturbances	Mental disorders Emotional disturbances
Anxiety Disorders/	Anxiety disorders Social anxiety disorders	Anxiety disorders Anxiety Generalized anxiety disorder	Anxiety disorders anxiety
Obsessive-Compulsive Disorder/	Obsessive-compulsive disorder	Obsessive-compulsive disorder Obsessive-compulsive personality disorder	
Panic Disorder/	Panic disorder	Panic disorder Panic attack	
Phobic Disorders/	Phobic disorders	phobias	
Stress Disorders, Post-Traumatic/	Stress disorders, post-traumatic	Posttraumatic stress disorder	Posttraumatic stress disorder
Stress Disorders, Traumatic, Acute/		Acute stress disorder Emotional trauma	
Cognition Disorders/	Cognition disorders	Cognitive development Cognitive impairment	Cognitive ability Intelligence Intelligence quotient
exp Dissociative Disorders/	Exp Dissociative disorders	Dissociative disorders	
Impulse Control Disorders/	Impulse control disorders	Impulse control disorders Conduct disorder Impulsiveness Self control	Self control
Mental Disorders Diagnosed in Childhood/	Mental disorders diagnosed in childhood	Psychosis Childhood psychosis	psychosis
Anxiety, Separation/	Separation anxiety	Separation anxiety	Attachment behavior
exp <i>Attention Deficit and Disruptive Behavior Disorders/</i>	Attention deficit hyperactivity disorder	Attention deficit disorder Attention deficit disorder with hyperactivity	Attention deficit disorder Attention deficit hyperactivity disorder
Child Behavior Disorders/	Child behavior disorders Disruptive behavior	Behavior disorders	Behavior disorders
exp Child Development Disorders, Pervasive/	Exp Child Development Disorders, Pervasive	Pervasive development disorders Aspersers' syndrome autism	Child development Developmental delays Pervasive developmental disorders
exp Communication Disorders/	Exp Communicative disorders	Communication disorders	Communication disorders
Developmental Disabilities/	Developmental Disabilities	Learning disorders Developmental disabilities	Asperger syndrome Autism Learning disability Learning problems
Mental Retardation/	Mental Retardation Mental Retardation, X-linked	Mental retardation	Mental retardation
Motor Skills Disorders/	Motor Skills Disorders	Motor skills Motor coordination	Psychomotor skills
Mood Disorders/	Affective disorders	Affective disorders	Psychological patterns

Affective Disorders, Psychotic/	Affective Disorders, Psychotic	Affective psychosis	Affective behavior
Bipolar Disorder/	Bipolar Disorder	Bipolar disorder mania	
Depressive Disorder/		Depression (emotion)	depression
Depressive Disorder, Major/		Major depression	
Dysthymic Disorder/	Dysthymic Disorder	Dysthymic disorder	
Seasonal Affective Disorder/	Seasonal Affective Disorder	Seasonal affective disorder	
exp Personality Disorders/	exp Personality Disorders	Personality disorders	Personality development
exp <i>Schizophrenia and Disorders with Psychotic Features/</i>	Schizophrenia Psychotic disorders	Schizophrenia Paranoid schizophrenia	schizophrenia
mutism/	Mutism	Mutism Language disorders	
substance-related disorders/	Substance use disorders	Drug abuse Drug dependency	Substance abuse
marijuana abuse/	Substance abusers cannabis	Drug use marijuana	Drug abuse marijuana
psychoses, substance-induced/	psychoses, substance-induced		
disabled persons/	Disabled	Physical disorders Special needs disabilities	Disabilities Physical disabilities
amputees/	amputees	amputation	
disabled children/	Child, disabled		
hearing impaired persons/	Deaf-blind disorders deafness	Hearing disorders Deaf blind	Deafness Deaf blind Partial hearing
mentally disabled persons/	Mentally disabled persons	Mental retardation	Mental retardation
mentally ill persons/			
visually impaired persons/	blindness	Blind Vision disorders Eye disorders	Blindness Visual impairments Partial vision
terminally ill/	Terminally ill patients	Terminally ill patients	
vulnerable populations/	Special populations Vulnerability Exp education, special Mainstreaming (education) Students, disabled	At risk populations Special needs Special education mainstreaming	Inclusive schools

Results

Results of the Search

The four searches identified 25 unique *Exact Match* articles indexed by search terms contained in all four search subsets, and another 1,055 *Near Match* articles indexed by search terms contained in at least three of the four search subsets. Ten articles - three of the *Exact Match* and seven of the *Near Match* citations—were identified as meeting the criteria for full manuscript review. Of the remainder, 65 articles were identified as reporting some relevant information even though they did not meet the specific inclusion criteria, and another 35 articles were identified as addressing psychological or emotional

disabilities arising as a result of (rather than existing at the time of) a disaster. Figure 2 shows the screening process and results at each step.

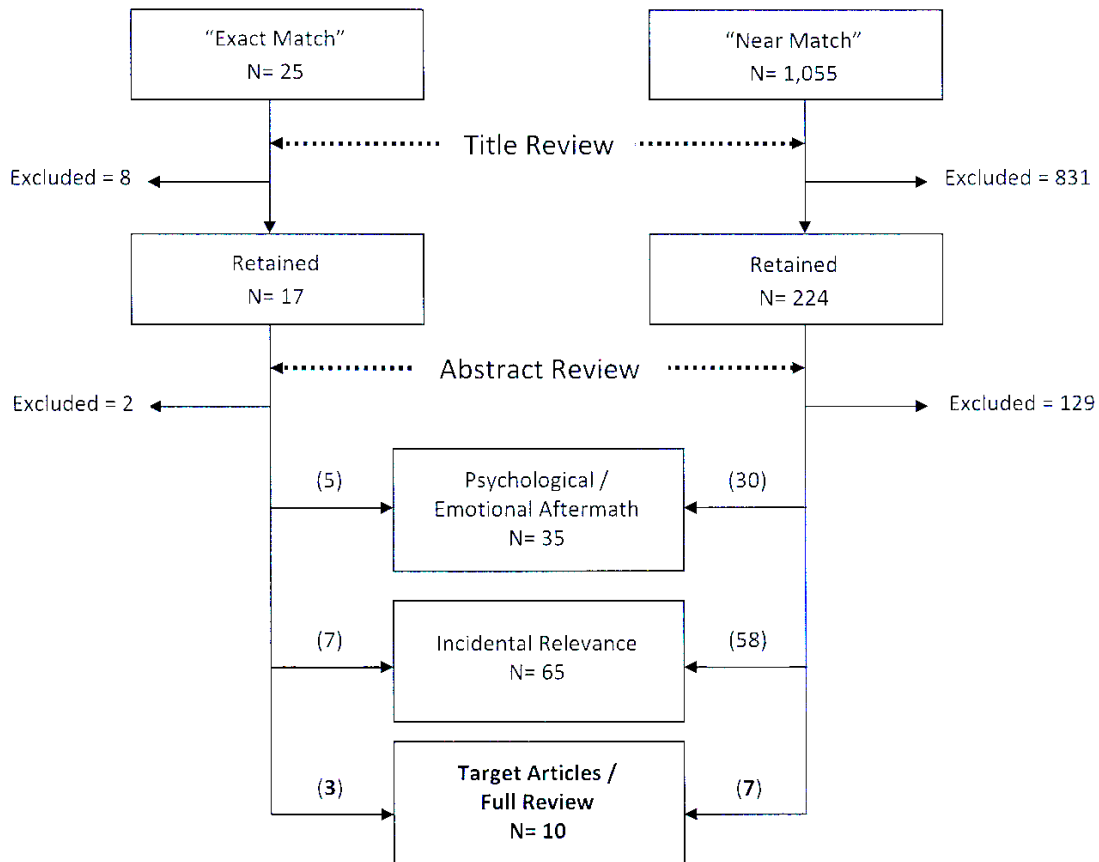


Figure 2: Search and Screening Process Results

Results of the Full Manuscript Review

Our search revealed the scant nature of the empirical research regarding school disaster planning for children with disabilities. Of the ten citations retained for full manuscript review, none explicitly addressed the four inclusion criteria; that is, (1) planning or policies related to (2) natural or human-made disasters in (3) primary and/or secondary (K-12) schools with specific reference to (4) children with disabilities. Review of the articles that were a *near match* also revealed an additional, relevant research report which was not identified by the initial database search as it was not a peer reviewed publication but rather a published U.S. government commissioned research report (Chung et al., 2008). Four of the articles did at least incidentally mention or allude to all four of our criterion issues (Kano & Bourque, 2007; Kano, Ramirez, Ybarra, Frias, & Bourque, 2007; Graham, Shirm, Liggin, Aitken, & Dick, 2006; Peek & Stough, 2010). Two peer reviewed publications and a government report were concerned with either disaster planning in schools or disaster planning for people with disabilities, but not the intersection of those issues (Campbell, Gilyard, Sinclair, Sternberg, & Kailes, 2009; Chung et al., 2008; Tigges, 2008). The remaining four articles addressed various aspects of school medical emergencies (Olympia, Wan, & Avner, 2005; Pines, 2001) or fire/tornado evacuation plans and drills (Asher & Pollak, 2009; Self, Scudder, Weheba, & Crumrine, 2007) but not the broader issue of disaster planning. All of the articles were specific to the U.S. The salient points from the papers are discussed below.

The Challenges

Some of the issues facing children with disabilities are well highlighted in the papers, even if they are not specific to school disaster planning for children with disabilities. Children with disabilities are at the highest risk of being impacted by climate change effects (Peek & Stough, 2010). Although, like other vulnerable populations, they consist of diverse groups with differing circumstances, they all lack access

to social and economic resources, possess limited levels of social capital, power, and autonomy, suffer disproportionately following extreme weather events, and are at greater risk of being affected by ecological change (Peek & Stough, 2010). Extreme weather events and ecosystem changes place children with disabilities at amplified health risk due to their physical, psychological, educational, and/or social vulnerability (Peek & Stough, 2010).

People with disabilities are often dependent on others for important aspects of their daily activities, and their support system can be disrupted in disaster situations (Campbell et al., 2009). This is particularly the case with school children, who might be separated from their parents for prolonged periods (Peek & Stough, 2010). Students with limited mobility are vulnerable in the acute phase of a disaster when evacuation might be necessary (Asher & Pollak, 2009; Peek & Stough, 2010), and additionally vulnerable in the recovery phase when accessibility accommodations are often the last components of infrastructure to be restored (Peek & Stough, 2010). Communication disorders can affect how quickly a student becomes aware of an (impending) disaster, their access to emergency information during a disaster, and their ability to request assistance (Campbell et al., 2009). Children with autism-spectrum disorders can be particularly vulnerable in the high-stimulation setting of emergencies and disasters (Self et al., 2007; Asher & Pollak, 2009).

School Preparedness

One large report commissioned by the U.S. Agency for Healthcare Research and Quality conducted an analysis of emergency response plans from school districts in Massachusetts, Florida, Wisconsin, Colorado, and California (Chung et al., 2008). Despite the fact that of the 20 school districts that the study targeted only 8 agreed to participate, their comprehensive study concluded that while every school had well-established evacuation plans, few had plans for relocation, fewer had lockdown plans, and virtually none had sheltering-in plans which could be vital for cyclones, floods and so on. Many plans were not necessarily practical to implement in the particular school setting and omitted specific guidelines for communication between local emergency responders and the school. Importantly for the purpose of this review, the authors report that none of the schools had planned effectively for the management of special populations, though they do not specify children with disabilities or special health needs.

Five papers reported surveys of school preparedness, although one of these was an unpublished thesis that made no mention of children with disabilities (Tigges, 2008) and another explored preparedness for acute medical emergencies, not the broader issue of disaster planning (Olympia et al., 2005). While the other three published research papers evaluated preparedness for both individual medical emergencies and larger disasters, there was little—if any—distinction between the two in the reported results (Graham et al., 2006; Kano & Bourque 2007; Kano et al., 2007). Indeed, the most commonly reported emergency or disaster events included *animals on campus*, *strangers on campus* and *power failure* (Kano & Bourque 2007; Kano et al., 2007). Similarly, the studies did not differentiate between *children with disabilities* and *children with special health care needs*, which are not necessarily synonymous.

Most schools in the U.S. seem to have an emergency and/or disaster plan of some kind (Chung et al., 2008; Graham et al., 2006; Kano et al., 2007; Kano & Bourque 2007; Olympia et al., 2005; Tigges, 2008), and about three-quarters of U.S. schools have an evacuation plan that explicitly includes provisions for children with special needs (Graham et al., 2006). Graham et al. (2006) noted that of the schools responding to their survey (response rate was 58.2%, 2137 usable surveys returned), most (86.3%) reported having a disaster plan and an evacuation plan (95.6%) but almost one third (30%) had never conducted a drill. Almost one quarter (22.1%) made no disaster plan provisions for children with special health care needs, and one quarter reported having no plans for post-disaster counselling. Almost half (42.8%) had never met with local ambulance officials to discuss emergency planning. Urban school districts were better prepared than rural districts on almost all measures in the survey. A clear and unresolved problem concerns the 41.8% of non-responding schools and the reasons for this lack of participation in such an important research study, a similar issue encountered with the Chung et al. (2008) report.

Olympia et al. (2005) reported that school nurses generally feel prepared to manage acute medical emergencies, including those experienced by children with special needs, but they did not explore school nurses' preparation for, or their perceived confidence with, providing for the chronic or routine care needs of such children as might be required in the context of a disaster. The availability of supplies for children with special medical needs varies by school and school district: 67% of staff at California

elementary schools reported having adequate supplies, but only 37% of staff at California high schools reported having such supplies (Kano & Bourque, 2007); across three school districts in Los Angeles County, the proportion with supplies for children with special needs was about 50% (Kano et al., 2007). Importantly, as all of these reports were centred in the United States, the state of school planning for emergencies in other countries such as Australia cannot be determined from this literature search.

Discussion

Disasters have immediate mortality effects as well as longer term effects, including the mental health consequences of social, economic and demographic dislocation subsequent to disaster (Haines, Kovats, Campbell-Lendrum & Corvalan, 2006; Garnaut, 2008). In addition to the immediate and longer term direct impacts of events such as fire, heat waves, cyclone or flood, climate change is also set to also have indirect health effects through disturbances of natural ecosystems that will affect the distribution and incidence of vector, food-, water-borne and allergen-related respiratory diseases (Haines et al., 2006).

The adverse impacts of climate change will be greatest for those most vulnerable: people on lower incomes, the elderly, the sick, women, members of ethnic minorities, children and those with disabilities (Blaikie, Cannon, Davis & Wisner, 1994; Chou et al., 2004; Curtis, Mills & Leitner, 2007; Garnaut, 2008). The number of Australian children with severe disabilities was estimated to be 168,500 in 2009, the majority of whom were located in families in low-income households (29%) (AIHW, 2009). The most prevalent disabilities among children in Australia are intellectual/learning, estimated at 166,700 children (4.3% of the population), and physical/ diverse, estimated at 162,800 children (4.2% of the population) (AIHW, 2009). Both of these groups of impairments and their socioeconomic correlates are likely to place children with disabilities at increased risk of hospitalisation in the event of a heat wave scenario (Yardley et al., 2010), however no single study has been identified that has specifically examined the health risks faced by children with disabilities in such a weather scenario even though the literature concerned with heat waves is significant (Bouchama et al., 2007). Apart from the direct health impacts upon children with disabilities, it is important to also recognise that climate change health impacts upon these children have considerable ripple effects upon their families and carers. This is because of the demanding caring arrangements that exist between them and their families (Werts et al., 2007). Health impacts upon these children are therefore likely to compound the impacts of climate change upon their families, raising considerably the potential number of people affected by climate change events.

Proactive public policies can help prevent future problems. In Bangladesh, for example, the death toll due to cyclones and flooding in 1970 was 240,000 people. With emergency preparedness and multi-sectoral risk reduction programmes, the death toll of comparable or more severe storms was reduced to 138,000 people in 1991 and 4,500 people in 2007 (WHO, 2008). Effective public policies for disaster response are important (Garnaut, 2008), as a lack of preparedness for disease outbreaks or disasters can be catastrophic. The lack of preparedness and uncoordinated responses of the Canadian and Chinese health systems in response to SARS in 2003 exacerbated that disease outbreak and led to the establishment of a national public health agency in Canada (WHO, 2007). By contrast, effective, rapidly responding, public policies can prevent acute threats to the public's health. Disasters, or disease outbreaks, demand a rapid response capacity whether that is invoking quarantines or travel bans or mobilizing health workers and institutions without delay. Such an effective response is more likely if there have been significant investments in preparedness (WHO, 2008).

Our review of the literature demonstrates that whatever investment in preparedness schools have made, the most vulnerable children—those with disabilities—appear to have been neglected in those efforts. In addition, existing school plans do not seem to include any provisions for what happens during the time when children with disabilities are commuting to and from school. During this time tens of thousands of children with disabilities will be in the care of bus drivers who likely: a) do not have their emergency contact information; b) do not have any information on their life support systems and medications; and c) do not have a plan for where they will take the children in the event of a disaster. While diversion to the nearest school would be an obvious choice if an emergency occurred, generally schools do not have a 'reception plan' to accept such incoming students stranded in the vicinity.

The gaps in school disaster planning for children with disabilities are huge. In all fairness, there appears to be no empirical evidence upon which schools could be expected to develop policies specific to those vulnerable children. Our intent in this literature review was to identify and evaluate the evidence base for

school emergency plans and policies; unfortunately we have discovered that essentially there is not one to be found.

Conclusions and Implications

Notwithstanding the caveat that the reviewed literature does not extend to countries outside of the U.S., there are important consistencies across all of the papers identified in this review. First, there is strikingly little research on school disaster preparedness for disabled children; no paper identified by our search could be classified as research specifically on that topic. The closely related research is inhibited by the use of vague and inconsistent definitions of disability, and a lack of distinction between preparedness for everyday emergencies versus true disasters. Second, from the sparse data that are available we can deduce that most U.S. schools have emergency response and disaster plans (Chung et al., 2008; Graham et al., 2006; Kano & Bourque 2007; Kano et al., 2007; Tigges, 2008), but there are significant shortcomings in the extent to which schools appear to be prepared to assist and support children with disabilities or special needs (Graham et al., 2006; Kano & Bourque, 2007; Kano et al., 2007) beyond care for common emergencies and simple evacuation (Olympia et al., 2005; Graham et al., 2006). Lastly, common themes revealed in these papers show that children with disabilities often have additional vulnerabilities. For example, children with disabilities have a dependence on caregivers, which might be exacerbated during a disaster (Campbell et al., 2009; Peek & Stough, 2010). Students with mobility- and communications-related disabilities remain vulnerable throughout the continuum of the disaster cycle (Asher & Pollak, 2009; Peek & Stough, 2010) and possibly beyond (Somasundaram & van de Put, 2006). Further, children with a range of cognitive/psychological/emotional disabilities, particularly autism-spectrum disorders, can be uniquely vulnerable to the heightened sensory stimulation associated with emergencies and disasters (Self et al., 2007; Asher & Pollak, 2009).

The goal of mitigation is to minimize the effect of the disaster event and decrease the need for response, rather than simply increasing response capability (Council on School Health, 2008). From floods to pandemic influenza, there are measures that schools can take to decrease the risks these events pose to their students. An important first step for each school is to identify situations they are likely to be facing on the basis of geography and community trends.

Schools in Australia and the United Kingdom for which no literature appears to have been published in relation to school preparedness for disasters, will need to ensure that they are able to meet the challenges that weather related disasters impose. To address environmental disasters such as flash floods, cyclones and hurricanes, tornadoes and heat waves, schools should be having discussions with the local emergency planning committees. Together they can identify and catalog potential climate change induced disasters and resources to mitigate them. The local emergency-planning groups can work with schools to address local environmental vulnerabilities and provide resources for examining the school risk potential. Schools can then translate this information into school protocol and emergency/crisis plans.

Evidence-based information to guide school authorities is needed if schools are to play a role in mitigating and adapting to climate change health impacts. Issues surrounding the period pre and post an emergency as well as the response phase need to be examined. The range of questions that must be addressed before evidence-based policies can be developed and implemented include, but are not limited to, the following:

- (1) To what extent do schools in countries other than the U.S. have adequate emergency plans and policies in place for all children including those with disabilities?
- (2) How efficacious are the emergency policies that are in place in schools, for example for mitigating pandemics (Berkman, 2008) and how do those plans affect special populations such as children with disabilities?
- (3) How prepared are school personnel and other personnel associated with schools, such as bus drivers, to deal with climate change induced emergency events and the particular, additional, needs of children with disabilities?
- (4) Are school nurses available to attend to the needs of students with disabilities, particularly those with multiple disabilities in an extreme weather event?
- (5) How prepared are school personnel during an emergency to deal with the range of issues attendant to the different types of disabilities that children may have? For example, to assist with evacuation processes for children with mobility impairment compared to those with visual or hearing impairments?

- (6) What structural adjustments do schools need to have in place to meet the evacuation needs of children with a range of mobility issues?
- (7) What facilities do schools need to deal with the contingencies presented by the health needs of children with various disabilities during emergency events, such as heat waves particularly in regards to school location (rural/remote)?
- (8) Given that children experience heightened psychosocial vulnerabilities and lasting psychosocial burdens following disasters (Beaton et al., 2009), what training do teachers and other school personnel need to undergo to be able to meet the mental health impacts that might arise in all children as a result of a climate change event, including those children with particular developmental disabilities such as autism spectrum disorder and speech and language disabilities?
- (9) What curricula are available or need to be developed to inform and prepare all children, including those with disabilities, to best meet the challenges of climate change induced emergencies, taking into account the possible structural disadvantage that particular families might have?
- (10) What plans can be put into place to deal with emergencies that arise during the commuting periods to school, just before and just after regular school attendance times?
- (11) Since schools have been identified as are key places for carrying out hazard education initiatives (for example, Finnis, Johnston, Becker, Ronan, & Paton, 2007) are schools effectively engaging parents of children with disabilities to prepare them to respond to an extreme weather event?

There is consensus among scientists that in a context of unfolding climate change, extreme weather events will impact directly and indirectly upon human health. Most severe impacts will be felt by vulnerable groups such as children with disabilities. Clinicians and researchers have identified a critical need for a framework to improve the care delivered to children during public health emergencies in prior studies (for example, Beaton et al., 2009; Mohr, 2002; Murray, 2006; 2009). Despite the call for such a research focus, it appears the needs of children with disabilities, who form a sizeable proportion of the population of children in most countries, have been neglected. Schools can play a substantial role in supporting public health endeavours to adapt to climate change by protecting children, including those with disabilities. Future research needs to focus on issues outlined here because schools need practical knowledge about disability and evidence based information to guide the formulation of appropriate emergency plans.

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