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Department of Public Health Sciences

Degree Project for the Master's Program in Global Health

**Challenges in access and provision of medical aid for
children after natural disasters in low and lower-middle
income countries: a scoping review**

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Declaration

I hereby certify that I formulated the research question, performed the literature review used in this report, developed and implemented the study design, analysed the data, and interpreted the results. I also confirm that the project presented reflects my own work, that the report was written using my own ideas and words, and that I am the only person held responsible for its contents. All sources of information, printed or electronic, reported by others are indicated in the list of references in accordance with international guideline.

Abstract:

Background: The impact of natural disasters on human populations has become an area of particular interest in global health. Climatic changes have led to an increased frequency of such catastrophes. Although the number of disasters in high income versus low and lower-middle income countries does not differ much, the number of people affected by them are disproportionately larger in low and lower-middle income countries. These countries are also home to majority of the children population in the world and the impacts of natural disasters are particularly challenging for them. The low resources of these countries are put to test in disasters, requiring international aid to alleviate the effects of the disaster. Medical aid appears to be a key component to address the healthcare of the affected population, placing even more importance on children. However, challenges exist which need to be identified and addressed.

Aim: To capture and map the current state of knowledge and to identify gaps in knowledge regarding accessibility of medical aid for children.

Methods: The nature of the research question led to implementation of a scoping review. This allowed incorporation of grey literature along with peer reviewed published literature for the analysis. Scoping review was conducted in six steps, (i) identifying the research question, (ii) identifying relevant studies, (iii) study selection, (iv) charting the data, (v) collating, summarizing and reporting the results, (vi) consultations. Consultations were carried out at Save the Children Sweden Stockholm Office where a two month internship period was also completed during the study period.

Results: A thematic analysis of the findings was done using the SDH for health inequities framework to organize the findings and are presented in combination with the discussion due to the narrative nature of the analysis. Firstly, there is a lack of policies at government and organization level for stratification of medical aid for children. Secondly, exposure of the children population to a natural disaster differs in different contexts, but the recognized effects have not been incorporated into policy development. Thirdly, vulnerabilities of children, which might be worsened, are not taken into account during provision of medical aid due to lack of policies to prioritize them.

Conclusion: There is a significant gap in knowledge regarding medical aid provision for children and the related challenges in the aftermath of a natural disaster. It also points to inequities experienced by children which needs global attention. Policies need to be established to prioritize children after natural disasters to improve provision of medical aid.

Keywords: Children, natural disasters, health inequities, medical aid

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List of abbreviations (in order of appearance)

UNISDR	United Nations Office for Disaster Risk Reduction
CRED	Centre for Research on the Epidemiology of Disasters
WHO	World Health Organization
EM-DAT	Emergency Events Database
LIC	Low Income Country
LMIC	Lower-Middle Income Country
GNI	Gross National Income
UN	United Nations
NGO	Non-Governmental Organization
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
MDGs	Millennium Development Goals
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
DAC	Development Assistance Committee
SDGs	Sustainable Development Goals
UNICEF	United Nations Children’s Emergency Fund
MSF	Medecins Sans Frontieres
ICRC	International Committee of Red Cross
IRIS	Institutional Repository for Information Sharing
SDH	Social Determinants of Health
US	United States
SAM	Severe Acute Malnutrition
IDPs	Internally Displaced Persons
FATA	Federally Administered Tribal Areas
UNDP	United Nations Development Programme

1) Introduction

Disasters:

The escalation in humanitarian crisis has increasingly become an area of great concern in the international community. Humanitarian crisis and emergencies are often interchangeably used in literature and can be defined as “an event or series of events that represents a critical threat to the health, safety, security or wellbeing of a community or other large group of people, usually over a wide area” (1). Another word for the often used term, humanitarian crisis is disasters. According to the United Nations Office for Disaster Risk Reduction (UNISDR) a disaster is “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (2). The Centre for Research on the Epidemiology of Disasters (CRED) defines disasters as “a situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering” (3). CRED has been active in the areas of international disaster and conflict health studies for over 40 years and has been collaborating with the World Health Organization (WHO) since 1980 (4).

Natural hazard, vulnerability and capacity to cope are sometimes used in combination to describe disasters (5). Hazards are described as “a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (2), while vulnerability is “the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards” (5). This thesis focuses on the definition of disaster given by UNISDR and CRED.

Data regarding disasters has been maintained by CRED in the form of the Emergency Events Database, EM-DAT database based in University of Louvain, Belgium. According to the database, since 1900 the world has seen more than 18000 disasters that have killed millions and affected billions (3).

Natural disasters:

According to EM-DAT, disasters are divided into two categories: natural and technological (4). Natural disasters (3) included in the EM-DAT database must result in one of the following

- kill 10 or more people
- affect 100 or more people
- resulting in declaration of an emergency
- lead to call for international assistance

These events have been further divided into biological, geophysical, meteorological, hydrological and climatological (6). This study does not include biological disasters, such as epidemics, in the analysis due to difference in epidemiology from other natural disasters. According to the WHO, natural disasters have tripled since 1960s (7). Moreover, since 2000 the world has seen 5949 natural disasters killing around 1 billion people (8).

The impact of natural disasters on Low and Lower-Middle Income Countries:

The effects of natural disasters on populations have increasingly become a focus in global health. Although disasters do not differentiate among the countries they strike (9), differences in their effects among High Income Countries (HIC) and, Low and Lower-Middle Income Countries (LICs and LMICs), have been identified in literature. The World Bank defines high income countries as countries with Gross National Income (GNI) per capita over \$12.736, lower-middle income countries are those earning GNI per capita between \$1.045 and \$4.125 while low income countries are ones with GNI per capita of \$1.045 or below (10). While the number of natural disasters that affect HICs and, LICs and LMICs, does not differ much, however, the number of lives lost and affected along with the damage to infrastructure is disproportionate (11). Even though the regions occupied by LICs and LMICs are smaller than HICs, more than half the world's population resides in LICs and LMICs (10), and over two-thirds of the population in low income countries are affected by natural disasters (12). Some disasters are predicted to increase in frequency due to various causes in the times to come. The number of casualties by floods, for instance, is expected to increase on account of urbanization and industrialization (13) along with growing population and settlement nearer to vulnerable coastal regions (14).

Impact of natural disasters on children:

Although the number of disasters in recent times has increased the focus on triage and treatment of injured patients (15), focus from children has been overlooked. While men overwhelmingly bear the brunt of conflict related injuries, due to biological and sociocultural reasons women and children endure more in natural disasters (16). In the past century disasters have affected over 67 million children (17). It is estimated that natural disasters result in child fatalities of up to 30-50% (18). These two factors might be related to the fact that child especially children under 5 are more vulnerable compared to adults. Children are different in their constitution, with closely-placed organs (19), smaller lungs, higher heart and respiratory rates (20) and less blood volume. This makes them more likely to get injured, inhale debris and experience fatal blood loss (21). This results in need of management different from adults. Although the unique anatomical and physiological differences in children's bodies have been recognised in literature (20), application of this knowledge has been overlooked in preparing for disaster planning (19).

Humanitarian assistance/aid:

In a natural disaster, architecture is demolished, infrastructure damaged, and lives are lost presenting human and economic losses simultaneously-a difficult situation for governments to provide necessary care and support for the survivors. In such an event, there may be international call for assistance. Humanitarian assistance has been accepted by the WHO to be "aid that seeks to save lives, and alleviate suffering of a crisis affected population" (5). In the past decade, this aid has witnessed a constant rise (22) in contributions from humanitarian partners which include many United Nations (UN) agencies, international organizations, non-governmental organizations (NGOs) and specialized agencies from Member States of the European Union. This can be attributed to a recognisable rise in natural disasters and conflicts. In 2004 and 2010, unprecedented amounts of international aid poured in after the Indian Ocean Tsunami and Haiti earthquake respectively (23). As 2014 saw several natural disasters along with on-going conflicts, a new record of international assistance, 24.5 billion, was also witnessed (12). However, the large amount of funding still fell short of addressing the demands of people in need. According to current estimates made by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), humanitarian partners need \$20.1 billion in order to cover the requirements of 87.6 million civilians around the globe (24) this year.

Medical aid:

There are five determinants for human survival: water and sanitation, food, shelter, healthcare and protection and security (25). While medical aid is not explicitly defined in literature but implicitly understood as aid provided to address healthcare problems. The concept of medical aid can be derived from UNISDR's definition of "response", "the provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected" (2), for instance, medical and surgical care, and vaccination against infectious outbreaks. In the setting of a natural disaster, medical aid becomes essential to support human survival. Medical aid to address the healthcare of the affected population by a natural disaster has become an area of global attention (26). In the time period after a disaster, the population might suffer from immediate effects of the event such as injury, or other conditions, that may continue to manifest weeks after the disaster, sometimes in the form of epidemics (27) requiring medical aid. LICs and LMICs are considered under-resourced in terms of healthcare provision, with increasing need for healthcare but low capacity to provide healthcare (28), and require assistance to address these issues. A low resourced healthcare system that suffers loss of life and infrastructure after a natural disaster, poses challenges for the population (29). It poses greater challenges for children (20) which is the focus of this thesis.

Medical aid for children-the current state:

The research base to support humanitarian intervention for children is surprisingly small, with practice often guided by tradition and received wisdom. Many international aid actors have conducted internal evaluations of aid programmes but these are not always formally or transparently shared. Aid is mostly directed towards adults with less focus on children. Although children comprise more than half the population in low and lower-middle income countries, and they are among the most vulnerable population, there is particularly little research on barriers to accessing aid that is child-specific.

2) Background:

As the year 2015 came to its end so did the timeline set for the Millennium Development Goals (MDGs). While some goals have seen considerable progress (30), gaps in a few areas including global partnership towards development (MDG 8) were identified (31). The aim behind the

MDG 8 was to assist less developed countries. In the past decade efforts have been made in order to direct efforts towards joining hands to alleviate suffering of people in testing circumstances through international aid in the form of Official Development Assistance (ODA). According to the Millennium Development Goals Report 2015, aid from Organisation for Economic Co-operation and Development (OECD) through member states of the Development Assistance Committee (DAC) increased 66% from 2000 to 2014 (30) while bilateral aid for least developed countries saw a decrease of 16% in 2014.

Another reason for the failure to achieve the MDGs has been owing to the worldwide growing number of occurrences of disasters in the form of floods, tsunamis, earthquakes, hurricanes and man-made conflict. Many of these disasters occur in low income and lower-middle income countries and such situations result in increasing strain on the country to deal with them. Health interventions in humanitarian crises are an important focus within the broader field of global health (32). The attention to disaster medicine to the sphere of global health has also been increasing. However attention to children is inadequate. According to the MDGs, child mortality due to preventable causes, has halved (30). But further reductions require consistent global efforts.

As pointed out before, natural disasters are especially testing for health issues related to children. Their specific anatomical and physiological differences make them liable to infections, dehydration, malnutrition and penetrative injuries more than adults making them the most vulnerable population to suffer from events brought about from climatic change.

Disasters have delayed progress in MDGs (18), and they are expected to affect the progress of Sustainable Development Goals (SDGs) as well. The MDGs did not throw much light on climate change, however, the SDGs do (33,34). Goal 13 of SDGs is “to take urgent action to combat climate change and its impacts”. This would indirectly lead to alleviation of morbidity and mortality from natural disasters among children, which happens to be an area of great concern in global health.

a. Research question:

What are the challenges in providing medical aid to children after a natural disaster?

b. Aim:

To capture current state of knowledge regarding accessibility of medical aid for children from the perspective of aid organizations and affected children, in order to make recommendations to fill gaps in the area.

c. Specific aims:

1. What are the challenges in providing and accessing medical aid?
2. Does the existing evidence examine contextual factors (context, type of natural disaster)?
3. What were the challenges to medical aid access in Pakistan during the flood of 2010?

3) Methodology

a) *Study design:* Due to the nature of the research question, the thesis was executed by employing a scoping review (35). According to Arksey, a scoping review can be defined as a study that ‘aims to map the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone project in their own right, especially where an area is complex or has not been reviewed comprehensively before’. The purpose therefore is to find gaps in knowledge by mapping literature to ascertain the existing state of knowledge (36), and addressing them by bringing published and grey literature closer. There are five steps to a scoping review;

- (i) identifying the research question,
- (ii) identifying relevant studies,
- (iii) study selection,
- (iv) charting the data,
- (v) collating, summarizing and reporting the results.

There is an optional sixth step, consultation exercise with stakeholders, which could be used to validate findings from the afore-mentioned five steps.

For the research question, children affected by natural disasters were identified as the study population, medical aid was considered the intervention and increased mortality or morbidity as a result of inaccessibility to medical aid was the outcome.

A case study has been done at the end of the analysis to allow contextualization of challenges regarding medical aid for children in a particular disaster. The natural disaster chosen to fulfil this purpose was the flood of 2010 in Pakistan. The justifications for choosing this particular are multi-fold. Firstly floods are the most frequently occurring natural disaster (8). Secondly, the 2010 flood was the biggest flood in the recorded history of Pakistan. The loss of life was not comparable to the Indian Ocean tsunami but it affected over 20 million people including 6 million children (37). Also in comparison with the tsunami the flood was a more recent event and the on-going conflict in certain areas of Pakistan present itself as a much more difficult situation to approach in the aftermath of a natural disaster for aid provision.

- b) **Sampling strategy:** A systematic search of the academic database PubMed and Web of Science was done to identify relevant articles from existing evidence.

Key Terms

The terms in the research question were defined according to those provided by the World Health Organization.

Figure 1 Definition of key terms

Child An individual under 18 years of age (137).

Disaster A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (2).

Assistance Aid that seeks, to save lives and alleviate suffering of a crisis- affected population (5).

Search Strategy

Synonyms for the words, aid, disasters, children and challenge (aid: assistance, relief, support, help; disaster: crisis, emergencies; children: child, adolescents; challenge: barriers, constraints) were found and grouped under each keyword. Search on Pubmed and Web of Science was done using a combination of three words from each group at

a time. Using more focussed terms such as, flood, earthquake, tsunami, storm, cyclone, landslides did not yield any relevant results.

For the case study presented at the end of the analysis/discussion, a separate search was conducted. Search terms included “Pakistan”, “floods 2010”, “children” and “medical aid”. The search engines and websites used for the search were similar to the analysis.

Inclusion criteria

- Publications that were between January 1, 2000 and March 1, 2016. The cut off of 2000 was chosen because it was felt that the findings for question of access or provision of aid from that point onwards might be more relevant to present day and for future recommendations for policy making. Furthermore, most of the humanitarian aid raised in the 1990s, was a consequence of conflicts, Hurricane Mitch being the only natural disaster to increase aid flow during that time period (22). Although conflicts continued in the study duration, attention to natural disasters increased. Also the year of 2000 witnessed a peak in natural disasters in history that amounted to 414 in total (8). Since this study focuses to analyse a component of the affected population namely children after the disaster therefore it was considered to be a valid cut off.
- Natural disasters were included (earthquakes, floods, storms, cyclones, tsunamis, droughts) but not biological disasters (epidemics) were excluded
- Low and lower-middle income countries (based on World Bank country classification of GNI per capita, 2013). Countries that had transitioned from lower-middle income to high middle income groups were not included
- Population of interest was identified as children
- Phase of the disaster was immediately after a natural disaster or early recovery phase.
- Studies or articles that focused on public health outcomes in accessibility to medical aid (morbidity, mortality, vaccination status, disease outbreak) were included. These included quantitative and qualitative studies, perspectives, and correspondences

As stated above the purpose of using a scoping review was to be able to include grey literature, i.e. materials beyond academic peer reviewed publications such as reports, news releases, updates, conference notes by organizations, and newspaper and magazine articles in the analysis. Grey literature was found using the aid organizations

identified from the citation search of the selected studies and included documentation from the World Health Organization (WHO), United Nations Children's Emergency Fund (UNICEF), Medecins Sans Frontieres (MSF), Save the Children, International Committee of Red Cross (ICRC) and United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). A few other United Nations (UN) organizations were also observed among citations in the chosen articles, but they were not included due to irrelevancy to the subject of the thesis. The sources were also confirmed with stakeholders at Save the Children where an internship was ongoing during the research period. Applying the same search strategy for these websites rendered a very large number of results containing many irrelevant results as well. In order to acquire more focussed results the terms were modified to, "flood/earthquake/tsunami", "medical aid" and "children".

Since the websites differed in interface and arrangement of how the information was made available, the search strategy to manoeuvre access to data was slightly modified for each website. In order to have focussed results, the websites were hand searched for press releases, operational updates, reports, documents, publications and news notes while using the above-mentioned search terms. On the WHO website after conducting the search using these terms, it was repeated using the WHO's Institutional Repository for Information Sharing (IRIS). Filters for time duration, disaster and emergency medical services were used.

Data was searched for using the search terms and was refined using filters for emergencies, hygiene, healthcare, water and sanitation, transportation and nutrition, on the UNICEF website. All relevant documents and webpages were collected.

On the MSF website after conducting search using the same search terms, the findings were collected using filters for disasters and child health along with using the country tab form which all low and lower-middle income countries that have suffered a natural disaster were chosen one by one. All relevant news, coverage, interviews, notes from the field and press releases were collected.

On the Save the Children International website, the search terms were entered which led to a large number of irrelevant results. The search was modified by using the tabs for each geographic region and then looking for relevant news and documents.

The website of UNOCHA also employed the same search terms. The findings were rechecked with the media resources tab and press releases were looked into.

The citation search of selected articles also led to further peer reviewed studies. The chosen articles for the analysis was a total of 85 which included quantitative and qualitative studies, review, correspondence, perspectives, organization reports, news releases, notes from the field, operational updates, activity reports and magazine articles.

c. Study screening:

Data was screened in the following stages

Stage One: PubMed and Web of Science search

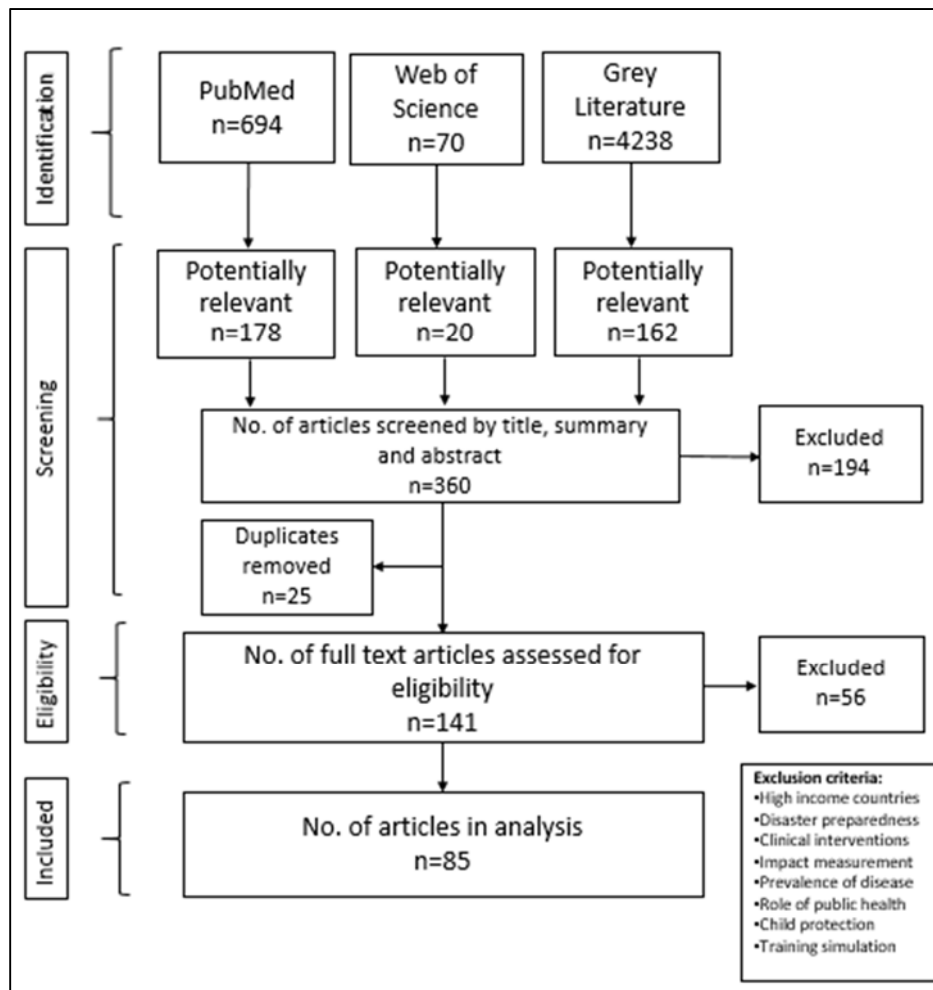
Stage Two: Title review to remove studies not fulfilling the criteria

Stage Three: Abstract and manuscript review to remove studies that did not meet the above mentioned criteria

Stage Four: Citation search of studies identified in Stage Three

Stage Five: Final article selection

Figure 2. Study selection



Articles that were about disasters in high and high middle income countries, or that had been published after 2000 but were about a disaster that happened earlier, articles focussed on impacts of disasters, prenatal studies and clinical studies, interventions, simulations, parents with children, role of public health in disasters were excluded. However, all studies that referred to barriers or challenges or experiences in providing or accessing aid, medical aid in particular were included

- d. **Conceptual framework:** The findings from the chosen literature was organized using the framework for tackling Social Determinants of Health (SDH) inequities as shown in Figure 2. To our knowledge medical aid for children has not been analyzed according

to the inequity perspective. The framework was constructed to analyze disadvantaged populations, identify gaps through a gradient approach leading to policy making (38).

Equity can be described as the “*absence of unfair and avoidable or remediable differences in health among social groups. Health inequity involves more than mere inequality, since some health inequalities (e.g., the gap in average life expectancy between women and men) cannot reasonably be described as unfair, and some are neither preventable nor remediable. Inequity implies a failure to avoid or overcome inequalities in health that infringes human rights norms or is otherwise unfair. Health inequities have their roots in social stratification*” (39).

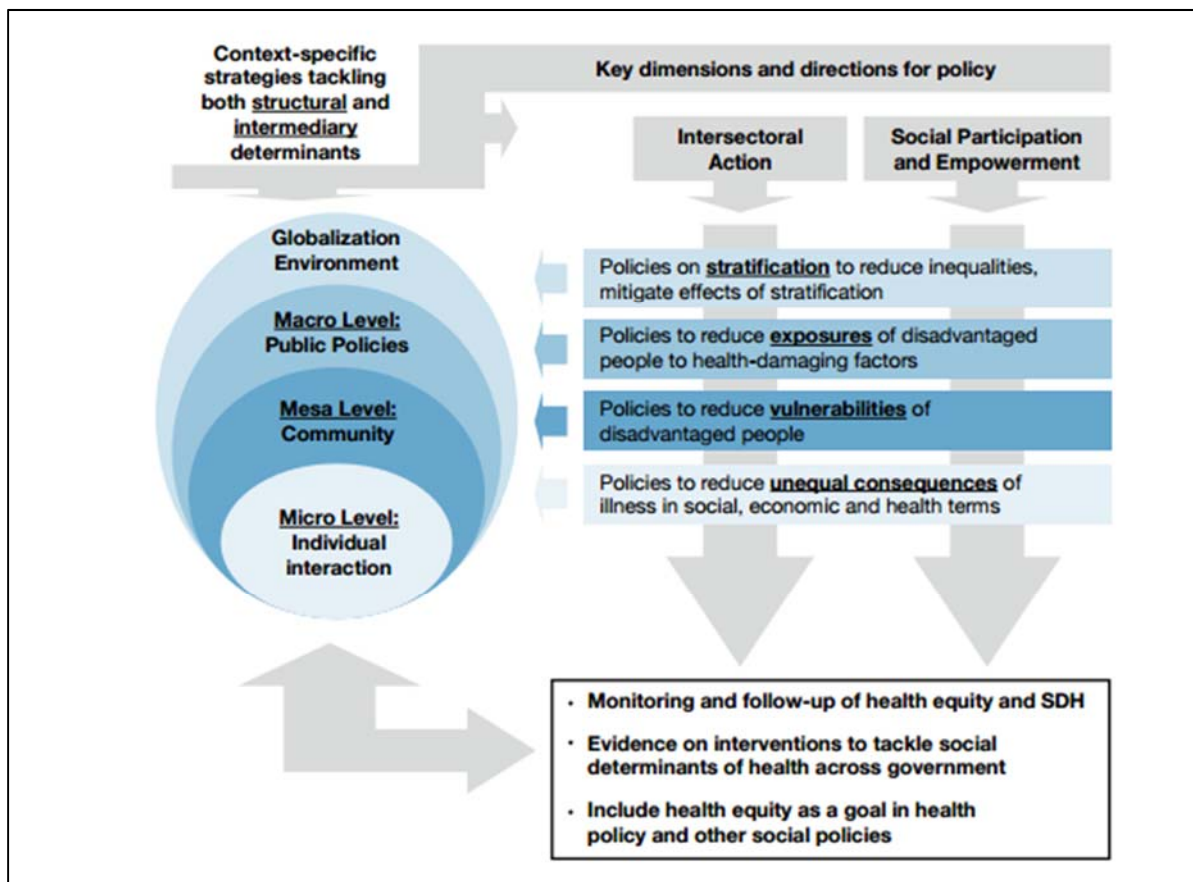
Social determinants of health may be considered as the “*social conditions in which people live and work... SDH point to both specific features of the social context that affect health and to the pathways by which social conditions translate into health impacts. The SDH that merit attention are those that can potentially be altered by informed action*” (39).

The framework was applied in the time period following a natural disaster during the response phase, the time period immediately following a disaster, the length of which may vary depending on the magnitude of the disaster (2) along with early recovery phase.

- i) **Social stratification:** This addresses inequities in wealth and socioeconomic conditions. It is the most critical for lessening inequities in health. This was modified to demographic stratification to account for the age group of children. Demographic and socioeconomic stratification may also be present in combination and observed in children in natural disasters.
- ii) **Exposures:** Socially disadvantaged positions like nutritional deficiencies, housing conditions, result in varied exposure leading to different health consequences. Exposure to natural disasters may result in infectious diseases and disrupt on-going immunization programmes.

iii) **Vulnerabilities:** The exposure to disadvantaged situations in a underprivileged population can increase vulnerability to conditions detrimental to health. The vulnerability of children in a disaster setting due to their age, different physical and physiological health needs from adults, restricted mobility, increases likelihood of adverse events, many of which are related to health.

Figure 3. Framework for tackling SDH inequities (38)



These three areas would be possible entry points to policy change which constitute the macro, meso and micro levels for public policies that interplay with the global environment, community and individual interactions respectively. This framework also allows one to identify context specific gaps that may be addressed with an intersectoral approach along with social participation and empowerment for a positive policy agenda.

Figure 3 gives examples of stratification, exposure and vulnerabilities specific to children in disaster setting.

Figure 4. Inequities in disaster

Stratification	Exposures	Vulnerabilities
<ul style="list-style-type: none"> • Socioeconomic status • Population with nomadic lifestyles • Women headed families • Demographic differences • Military involvement in aid 	<ul style="list-style-type: none"> • Restricted mobility • Staying in inaccessible areas • Inadequate medical supplies • Destruction of transportation routes • Food and water insecurity 	<ul style="list-style-type: none"> • Injury • Disease • Unhealthy behaviour • Personal practices • Affected parents • Abandonment • Being orphaned

d. Setting: The study was done in collaboration with Save the Children and was conducted at the Save the Children Sweden’s office and the Karolinska Institutet library.

e. Data extraction: Data was charted using a summary matrix (Annex 1) approach stated by Pawson (40). Data was extracted manually, through reading and identification of challenges stated or alluded to in the chosen articles. This approach was used to locate findings of interest within articles which did not focus on areas key to the research question.

Data was organised in Excel, according to the following points

- Study title
- Study author/organization
- Year of study
- Type of article
- Natural disaster, year, country
- Target population
- Focus of the article
- Main findings
- Outcomes

This facilitated a thematic analysis, and the themes were divided into categories that could be put under the headings of stratification, exposure and vulnerability or challenges at macro, meso and micro level in the afore-mentioned framework.

The results were used to apply to the Sendai Framework 2015 which aims at identifying gaps in risk, vulnerability and exposure (41). The findings of this thesis could help in identifying gaps in policies regarding children in disaster and the steps taken for them or the lack of it.

f. Consultations: The consultations were made in the form of a focussed group discussion where the findings of the thesis were presented to the stakeholders at Save the Children. The purpose of this was to validate the findings of the research and incorporate any additional suggestions made by the group.

Ethical considerations: A two month internship at Save the Children Sweden was completed during the period dedicated for the thesis. This provided an opportunity to gain access to the organizations online repository of data consisting of a rich database of published and grey literature, shared with the supervisor of this thesis. This allowed for better understanding of the workings of organizations during humanitarian crises. The fact that the organization predominantly works for children was helpful in understanding the problems children and aid organizations working for them may come across during disaster situations, such as abandonment, political decisions and logistic problems. Since no interviews were held and the analysis was conducted independently by the researcher no ethical issues required addressing. Consultations were held as a last step of the scoping review, but did not alter the analysis or the conclusion of the study.

4) Results and discussion:

“While catastrophes do not discriminate, they most severely affect those least able to withstand them: The most vulnerable children, living in the poorest and most isolated places, subject to the greatest deprivations.” (42)

Anthony Lake

UNICEF Executive Director

Foreword, 2012 UNICEF

Humanitarian Action for Children

Owing to the nature of the research question, a scoping review was chosen which allowed the analysis of peer reviewed articles and grey literature. The descriptive nature of the findings acquired through the literature review led to a narrative thematic analysis in which the results and the discussion are presented together.

The chosen literature was analyzed using the framework for tackling SDH inequalities. The purpose for choosing this particular framework stems from the need to reduce inequalities in vulnerable and high risk populations, namely children during challenging circumstances particularly after natural disasters. The emergent themes from the literature have been categorized in consistence with the three themes of the SDH framework.

1. Firstly, there is a lack of development and implementation of public policies at national and organization level for stratification of the subjective population into demographic groups to differentiate between children and adults.
2. Secondly, exposure of the children population to a natural disaster which might differ in different contexts and geographical areas, but the effects that have been recognized have not been incorporated into policy development.
3. Thirdly, vulnerabilities of children, which might be worsened in the event of loss of one or both parents, may not be taken into account during provision of medical aid or medical services due to lack of policies to prioritize unaccompanied children.

The aim of applying the SDH framework is to identify gaps in knowledge and establish areas that require attention specific to children in a natural disaster. Disasters such as earthquakes, floods, famines and droughts, increase mortality and morbidity exclusively for children

(43,44). These events not only disrupt health systems by destroying health facilities, domestic buildings, infrastructure for transport, water and sanitation, communication and lead to food insecurity, but also impact negatively on health indicators for children. Health programs might come to a halt resulting in permanent alterations in health trajectories of children, for instance lack of vaccines during disasters might cause disease or death due to infectious diseases. Therefore, in the setting of a low or low middle income country, the situation may become more testing for children during or after a natural disaster. This observation has been well documented in literature as well (44,45). These dilemmas necessitate a global response for medical aid, which has become a chief feature of global medicine now (26). Addressing inequality and inequity in medical aid of children in natural disasters may prove instrumental in the reduction of child mortality and morbidity after such events.

Findings of the thematic analysis have been summarized in the table below (Table 1)

Table 1 Summary of analysis

#	Challenges	Number of articles	Articles
1	Stratification		
	National governments/ Local authorities		
i	Political decisions	6	11, 34, 54, 67, 70, 71
ii	Conflict and involvement of military	7	2, 4, 15, 24, 35, 45, 70
iii	Government capacity	17	2, 9, 10, 11, 15, 16, 18,23, 36, 42, 44, 59, 66, 67, 70, 71, 81
iv	Financial constraints	6	10, 17, 65, 70, 75, 78
b	Aid organizations		
i	Policies and guidelines	12	6, 7, 8, 10, 15, 18, 19, 33, 45, 47, 60, 61
ii	Lack of child specific healthcare	14	19, 20, 24, 29, 32, 33, 39, 41, 46, 47, 49, 50, 66, 78

iii	Decreasing international attention	3	21, 24, 68
2 Exposure			
i	Low resource healthcare system	39	5, 10, 11, 12, 13, 15, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 29, 31, 33, 34, 37, 38, 40, 41, 42, 45, 47, 48, 50, 53, 59, 61, 70, 73, 75, 80, 81, 82, 84
ii	Communication and transportation	34	1, 2, 4, 9, 10, 12, 17, 22, 30, 32, 40, 41, 43, 44, 46, 50, 51, 53, 55, 57, 58, 62, 63, 64, 67, 69, 70, 76, 77, 79, 80, 81, 82, 85
iii	Water and food insecurity	16	26,27, 28, 38, 41, 45, 51, 52, 56, 57, 59, 62, 64, 70, 72, 74
iv	Migration and IDP camps	12	10, 11, 12, 41, 45, 48, 58, 70, 72, 74, 78, 81
3 Vulnerability			
i	Loss of one or both parents	6	12, 14, 33, 41, 60, 78
ii	Parents impacted by natural disaster	3	13, 19, 71
iii	Unhealthy practices	7	3, 10, 14, 32, 41, 52, 64

a. Lack of stratification: shortfalls of countries and aid organizations:

Stated below are factors that might affect the stratification process or consequences that may ensue due to lack of stratification for children after natural disasters.

i. Role of national governments

Prior to a disaster, children in LICs and LMICs may already be exposed to health inequities due to deficiency of or absence of prioritization of children in health policies. There is an urgent need to address the lack of policies at government level for health information provision, health systems, surveillance systems, rescue and response phase strategies, and also coordination and cooperation with national as well as international

non-government organizations (NGOs) for health inequities for children. To our knowledge no study has been conducted to study the inequities experienced by children, even lesser concern has been dedicated to children in natural disasters. In 2011, the Red Cross and the Red Crescent Movement passed a resolution to end health inequities for women and children (46). WHO published a report in 2015 on a similar subject (47). But both these reports focus only on children under 5 years of age. Peek (48) however, has commented on the vulnerability of children with disabilities in natural disasters.

After a natural disaster, the government might ask for assistance from the international community leading to an influx of aid organizations to deliver aid. Medical aid is essential to address medical challenges that come forth following the disaster, in the form of injury, disease and death. This aid should be prioritized according to needs of the most in need, that is, children. The process from planning to provision of medical aid is dependent upon a number of factors gathered from the analysis and are elaborated below.

- (1) **Political decisions:** Political decisions regarding entry into the country of disaster and to support humanitarian assistance may alter the process of medical aid provision. Reasons behind such decisions could be due to logistics, conflict or the magnitude of the disaster itself, straining the government's ability to cope with the crisis. A low resourced country with conflict subjected to a disaster situation presents itself with a triple burden. According to Ranson, conflict is a key driver for health inequity in fragile states (49). Lack of government stability in the face of recurrent conflict and natural disasters can deter efforts towards policy development leading to further unpleasant consequences. Such challenges were experienced after the 2010 Haiti earthquake (50), 2015 Nepal earthquake (51), 2013 Typhoon Haiyan in Philippines (52), and several South East African states (53). While these decisions might seem indiscriminate yet, the burden of such decisions is discriminatorily borne by children. Such challenges coupled with conflict and recurrent disasters manifested in the form of a cohort of one million non-immunized children in Somalia in 2012, as a result of disruption of vaccination programs (54).

Certain countries constantly face difficulty in implementing immunization programs which may become worse during a natural disaster. In Pakistan

healthcare workers delivering polio vaccines had been suffering from security threats along the Afghanistan border. After the flood of 2010, the interrupted immunization programs led to a sharp rise in the number of polio cases from 22 in 2009 to 29 after the flood (53).

- (2) **Military involvement in aid:** In countries with the afore-mentioned triple burden, that is, low resources, disaster and conflict, military intervention might seem appropriate and life-saving due to the availability of military transport vehicles and human resources. Such situations came across in Afghanistan (55,56), Pakistan (57–59), Ethiopia and Somalia (53,60) where the military played a key part in aid provision. However, such interventions do not adhere to neutrality, impartiality and independence, the core underpinnings of humanitarian aid. Military approach to a disaster is more utilitarian, to have “greatest good for the greatest number” (61). This might be attributable to their primary obligation of defense and protection of the state and its citizens. In Pakistan, flood response conducted through military action in 2010, led to misunderstandings between the incoming aid organizations and the military due to restrictions for transport of volunteers to affected areas, leading to damaged relationships. In addition, the intentions of the aid organizations were not always understood uniformly. While they were allowed access by national government in major cities, local authorities sometimes were less cooperative (57).

This points towards a need for harmonized protocols that prioritize children, to be followed by all entities providing aid in a disaster. However, it was pointed out during the stakeholder consultations that the relief operations being conducted by military are being strengthened in some countries where it happens to be the first responder after a natural disaster.

- (3) **Government capacity:** Even in the absence of conflict pointed out above, stratification and identification of children as a vulnerable group after a disaster, is primarily reliant on the health information system of the country of disaster. The purpose is to provide information regarding the demographic information and population distribution before and after the disaster. This might previously

be inadequate or collapse completely during a disaster. Lack or destruction of such a system affects not only provision but also stratification of aid. Weak health system coupled with poor political coordination, poor governance worsen government capacity to respond, in addition to deterring the aid process conducted by incoming aid organizations. Such short comings of health information system were experienced after the 2015 earthquakes in Afghanistan and Pakistan (55), Myanmar (62) and Nepal (63), 2010 flood in Pakistan (57,64–67), 2010 earthquake in Haiti (50,68), 2007 flood in India (69), the 2008 earthquake in Myanmar (70), the 2014 cyclones in the Pacific islands (71), the 2013 typhoon in Philippines , and the alternating floods and droughts of 2009 and 2010 in several African countries (53,72).

Lack of government capacity also impedes in formulation of interventions that would address children as a priority. According to a review by Xu, not having interventions tailored for children leads to increased risk of children suffering from consequences of events brought about by climatic change like floods (73).

- (4) **Financial resources:** Another key barrier that came across in this study was the dearth of financial means (74) which limits access to medical services and food supplies. These constraints may be present in both provision and access, on part of the government or the affected population respectively. National authorities with low resources or that have suffered collapse may not have the financial means to invest and segregate in medical aid specific for children. Financial constraints during the aid process also allude to lack or gradual reduction of funding to provide medical aid. Such restraints, that affected children, were particularly reported in reports from UNICEF after the flood of 2010 in Pakistan (64,75), the 205 Cyclone Pam in Vanuatu (76), alternating floods and droughts in Ethiopia, Kenya, Namibia and Somalia in 2010 (53) and the 2004 Indian Ocean tsunami in Indonesia (77) and a Cochrane review (74). These conditions pose risk for children's health in particular. This points towards the need for policies to be implemented for resource poor circumstances to put preference to children's needs.

ii. Policies of aid organizations

(1) **Policies and guidelines for organizations:** Some organization policies might be in contradiction to those of the authorities of the country of disaster. This has been reported by MSF. Since the organization does not allow arms in health facilities and does not accept armed escorts therefore their access to affected regions was hindered in the flood disaster in Pakistan in 2010 (59).

Furthermore, according to the literature analyzed for this study, there is a noticeable lack of guidelines for aid organizations to provide medical aid to children in disasters. Although there is evidence of improved provision and outcomes in mortality and morbidity after segregation of children into a pediatric tents in an Israeli field hospital in Haiti after the 2010 earthquake (15), rescue efforts are usually deficient in course of action to segregate patients into children and adult groups.

Additionally, guidelines are mostly tailored for medical personnel with extensive training which are of limited use for community health workers and volunteers during emergencies (45). Furthermore, modes of care are not always shaped according to the needs of the children in a cultural context, for instance, definitions of certain problems such as Post Traumatic Stress Disorder (PTSD) might change across cultures (77).

In Haiti after the 2010 earthquake, lack of refined medical equipment and supplies led to the use of "Civil War Medicine" (78). Such crude form of medicine might be better suited to soldiers in the field but may prove adverse for children who have weaker immune systems. Besides Haiti (15,68,79–81) these observations have been recorded from experiences in Philippines (82) and Pakistan as well and have been reiterated by Burton (43), Moss (45) and Kelly (83) with reported outcomes of increased risk of infection, malnutrition, diarrheal disease and epidemics among children.

(2) **Lack of child specific (paediatric) healthcare:** As pointed out before, anatomical and physiological differences exist for children which need to be

taken into account when providing them with medical aid. The dosage of medicine, equipment for ventilation, venesection, hydration tend to be different than adults.

Lack of a pharmacist to determine paediatric dosage of medicines has been reported in a qualitative study by Burnweit that discusses the evolution of an Israeli field hospital after the 2010 earthquake in Haiti (15). In Haiti, one of the first amputations performed used hacksaws as bone cutters and vodka as disinfectant (78). Due to lack of suitable medical equipment, American doctors reported having had to leave children to succumb to death (78). Similar dilemma was stated after the 2014 typhoon in Philippines (84) US Navy nurses also reported a lack of paediatric nursing (85) and a lack of training regarding paediatric deaths after the tsunami in 2004. Lack of pediatric specialists was also confirmed by an MSF report regarding 2010 floods in Pakistan (86,87). In Pakistan lack of newborn care was observed (58). Lack of segregation of paediatric beds has been reported to hinder care for children as well (83).

Applying the three delays model by Thaddeus and Maine (88), which is usually used in obstetric situations, this appears as a barrier to receive care after reaching place of healthcare provision. Shortage of medical supplies for simple ailments (81,83) also pose adverse outcomes for children. Lack of laboratory tests, autoclave for sterilization, anaesthetic machine, and pediatric specialists in Haiti resulted in delayed diagnosis, amputations without sedation. Shortage of ventilators led to doctors having to make difficult ethical decision, choosing a child with better chances of survival than to one who was more in need (15). There was also difference in availability of specialized equipment. In the Israeli field hospital set in Haiti, irrespective of the severity of the condition, pediatric patients with neurological conditions were accepted due to availability of expertise, however, due to lack of bronchoscopes, simpler cases requiring aspiration were rejected (15).

Besides lack of specialists in the field, rise in certain conditions like acute respiratory tract infections (89) or diarrheal disease can also be linked to lack of understanding of the affected population regarding children and the need for

addressing these infections to prevent fatality (65). This points towards the need for educating people and volunteers regarding pediatric needs before, during and after a natural disaster.

- (3) **Decreasing international interest:** International aid is ordinarily dependent on funds raised by the global community. Funding is reliant on the interest of the donor countries and organizations. Due to increasing conflicts and other recently occurring natural disaster, countries that suffer repetitive patterns of disasters may be neglected. Decrease in funds has been reported in press releases by UNICEF during the 2006 drought that struck east and horn of Africa (90,91) resulting in severe malnutrition among children. Funding may also decrease due to issues regarding terrorism within the affected country and fear of fund embezzlement (58).

According to Bjorn Ljungqvist, a UNICEF Representative in Ethiopia

“It is becoming increasingly difficult to persuade people that this is a global scandal. A cloud of cynicism has settled over Africa – cynicism caused by everything from corruption to armed conflicts, cynicism felt by everyone from donors to the general public. But this cloud hides the fact that innocent children are dying unnecessarily. There are simple things that we can do and must do to save these children. On average, 500,000 Ethiopian children die every year from preventable diseases and malnourishment. This year could be worse. In total, 7 million Ethiopian children suffer from some form of malnutrition every year, with serious consequences for their health and development. But there is a growing idea that these are ‘normal’ levels of child deaths and malnutrition for Ethiopia – that this is the ‘usual’ situation. There is nothing ‘normal’ about 500,000 children dying every year. That is more than the population of Edinburgh in Scotland or Las Vegas in the US. It would be an unimaginable tragedy if this happened in any country in the developed world.”(91)

b. Differential exposure:

- i. **Damaged healthcare systems:** Local health systems might be damaged during a natural disaster resulting in injured and displaced health workers, inadequately

staffed health facilities (48), destroyed medicine stocks and medical equipment leaving it useless (79). Surviving health facilities might become inaccessible in a natural disaster, a prime issue for access to medical aid, (59,65) or might suffer a lack of adequate resources like water, electricity, equipment and medications, and create obstacles for children to receive medical care (59).

In case of decreased capacity the health of the population will continue to deteriorate long after the disaster has been over. Haiti remained food insecure, deprived of safe and clean drinking water and medically resource challenged after the earthquake of 2010 which led to a cholera epidemic in 2010 (92). The incidence of cholera in Haiti was three times more than Peru which was considered worst in the region (Haiti=4.81 cases/1000, Peru=1.46 cases/1000) (93). The earthquake also destroyed medical records and data collection system which made coordination and prioritization of medical aid a challenge (50).

Prior to the earthquake in 2015, the Nepalese Ministry of Health and the WHO had been making efforts for over a decade to ensure that hospitals remained safe and it appears to have reaped its benefits during the earthquake of 2015 (94). Nevertheless damaged facilities had been reported UNICEF that prevented medical aid provision to children (63,95–99)

Damage to health facilities threatened spread of communicable disease especially among children was reported by UNICEF after the 2015 Cyclone Pam hit Vanuatu (76,100). Similar issues were witnessed in Pakistan in 2010 flood (57–59,64,67,75,101–104), in the recent earthquake in Ecuador (105), Ethiopia in 2008 (106) and 2016 (107), India in 2007 (69), Indonesia in 2004 (85,108), Philippines in 2013 (109,110), Ethiopia and Namibia in 2010 (53), Myanmar in 2008 (111). All these cases have reported probable outcomes of increased morbidity and mortality among children as a result of the above mentioned factors.

- ii) **Communication and transportation:** Natural disasters are notorious for causing physical damage to architecture and telecommunication. Earthquakes demolish buildings and houses, while floods and hurricanes wash them away, diminishing the chances of the affected population to leave the affected area and gain access to

safety and medical aid. This conversely affects access, of local authorities or aid organizations, to people who might need aid. Such conditions have been witnessed in Yemen (112), Pakistan (65,87,113–116), Nepal (51), Bangladesh (117) and India (118). These present themselves as the major bottlenecks in aid delivery In countries like Pakistan (86,119) and Afghanistan (55) where some areas lack roads and are reached on foot in usual circumstances may require helicopters, which are not always available or in sufficient numbers (120).

In Nepal landslides that occurred as an aftereffect of the earthquake in 2015 created further blockages (63). According to a press release by UNICEF after the disaster, around 1 million affected children continued to live in areas at high risk of landslides and floods (121). Similar circumstances were experienced by children in India after the flood of 2013 (118), in Ecuador after the earthquake of 2016 (105) and in Nepal after the flood of 2015 (122).

In Philippines while the roads were in good condition they were, however, blocked by rubble as a result of the Typhoon Haiyan (123), and in Typhoon Bopha (124), restricting movement. Similar were conditions in Sri Lanka after the Tsunami in 2004 (125) forcing people to walk for hours before accessing medical aid.

"Many roads are still impassable. The journey to the town where my grandmother lives normally takes two hours – today it took eight. " (125)

Dr Gaya Gamhewage,
WHO's Health Action in Crises

This also impedes assessment teams from ascertaining the magnitude of damage (62) and gauging the volume of assistance required for children.

- iii) **Water and food insecurity:** Natural disasters may lead to grave nutritional consequences for children in the form of severe acute malnutrition (SAM). However, barriers to investing in treatment for or prevention of SAM by some organizations and nutritionists exist, with ideological debate about the kind of food

to be provided. The area remains ignored due to inadequate understanding among policy makers and limited number of medical professionals who have sufficient understand of SAM (126). Some countries like Somalia and Haiti already had undernourished children due to existent socioeconomic inequities who faced a serious threat of malnutrition due to scarcity of food (65). Similar dilemmas persist in Ethiopia (106). In Somalia, misconceptions regarding the nutritional needs of an infant and unborn children were reported (127).

Furthermore, food insecurity worsens health of children in areas where malnutrition is prevalent. Children in Pakistan already had a high rate of chronic malnutrition with 30-35% being stunted (67) when the flood hit in 2010 (101). The government decision also limited provision of food assistance further threatened the well-being of the children (53).

Lack of water supply also poses risk of unhealthy sanitation practices, which cause diarrheal disease epidemics. These instances have been noted in Nepal (96,121), Pakistan (53,59,65,119,128), Philippines (109,124), Sri Lanka (125) and Sahel (129). These instances can be identified as catalysts for national level assessments of environment, infrastructure, health and nutrition needs of populations. They also call for community level preparedness for disaster, preparing healthcare professionals for needs assessment and information sharing at regional and national level (68).

Medical aid for addressing malnutrition among children may be over shadowed by media reports. Information the media receives from the NGOs may or may not be accurate or may be misconstrued. The 2008 earthquake in Myanmar saw an increased donation of infant formula and breast milk substitutes due to perceived shortage of infant food after reports of lack of food for children and women being too stressed to produce milk (70). This led to an influx of infant formula donations. However, what was not reported was the adverse effects of consuming infant formula which may lead to diarrheal disease or even death.

The Sphere project, developed by over 150 humanitarian organizations, have developed guidelines for interventions to address malnutrition during disaster and conflict (130) which need to be adopted uniformly.

- iv) **Migration and Internally Displaced Persons (IDP) camp:** Natural disasters inadvertently lead to migration of the affected population which is particularly challenging for children. In Pakistan after the 2010 flood, constant movement of the affected population (53,59,103) resulted in affected children being deprived of medical aid. This was also observed previously in earthquake in 2005 that struck Kashmir in Pakistan in 2005 (128). This also prevented aid organizations from reaching the population as well (64). Displacement was also reported as a challenge in a report by UNICEF after the 2010 Haiti earthquake (50) and the 2016 earthquake in Ecuador (105), the 2012 drought in Sahel, Indonesia in 2004 (77) and Nepal in 2015 (63).

Instead of making medical aid available to them, life at an IDP camp may be a cause of disease due to cramped and unhealthy circumstances (65,113,128). Children may still live far from medical camps causing parents to travel for hours to reach care (113) which may not always be possible due to disease or injury. One of the factors associated with decreased healthcare seeking behavior in Indonesians after the 2004 Tsunami, in the study by Rassekh, was whether the child was living at an IDP household (77). According to this, non-IDPs were 2.4 times more likely to access healthcare. This can also be due to relatively lower priority for children's health for people who had been displaced after a natural disaster. Continuous movement of populations keeps aid organizations from accessing children in need and also care givers of these children to access aid (64).

c. Vulnerability

Need for stratification for children lies in their physical and physiologically different requirements which make them a part of a more and vulnerable and high risk population.

- i. **Loss of one or both parents:** In the study by Rassekh, it was also found that children who had lost a parent were less likely to receive medical care. In Indonesia after the Indian Ocean tsunami in 2004, this was the most important factor to determine health seeking behavior. Children who had lost both parents were the least likely to receive healthcare (131). The quasi experimental study showed that children who had neither of the parents alive had healthcare seeking behavior only 11.36% of the time, 22.38% of the time if the only the father was alive, 51.00% when the child was left with the mother and 85.01% if both the parents were alive. Health of the child also becomes up-staged by other pressing needs for instance re-establishing homes and jobs and other aspects of their lives.

This finding was consistent with another study done after the earthquake in Haiti in 2010 (132) which stated that such children experience more psychological stress as well. Yet another barrier was gender of the child. This was however, contrary to the findings obtained from the study from Indonesia mentioned earlier (77), according to which gender along with age, disease, if the child was the eldest one, age of caregiver, education of caregiver, distance to healthcare, caregiver's main reasons for returning to healthcare, monetary savings, effect of tsunami on the mood the caregiver proved insignificant.

After the earthquake in 2016 Ecuador reported missing children (105) who might have needed medical attention. Loss of parents was also a challenge to accessing medical aid for children in Haiti after the earthquake (80,132). While these issues are challenging for children in all age brackets, children under 5 are particularly vulnerable according to a review by Kelly (83). Many children were separated from their families in the floods of 2010 (65). This brings into focus the need for addressing children who have lost their parents or have been abandoned as a priority population to provide medical aid to.

- ii. **Parents affected by natural disasters:** A disaster may dampen the ability of the parent to take care of their children. Lack of attention paid to maternal depression result in pediatric consequences (133). In Haiti many parents abandoned their children to be taken to the United States for adoption (15) which displayed a lack of understanding of parental responsibilities (72). Parents felt they could not take care of their children and asked about orphanages where they could put their children (15). Some asked to take their child to US for adoption and not just for healthcare. This increases the vulnerability of the children as they become further exposed to another psychological crisis after a disaster. According to Rassekh there needs to be an increased focus on children who have lost one or both parents, as was apparent after the Indian Ocean Tsunami in 2004 (77). This emphasizes the need the address parents with children in order to prioritize the healthcare for children.
- iii. **Unhealthy practices.** Individual practices may be influenced as a result of loss of clean water and basic sanitation (58,109). This leaves adults and children to consume water from contaminated sources resulting in outbreaks of diarrhea (75) and cholera. According to an operational update by WHO, in the aftermath of the flood in 2010, a nomadic family from Pakistan would drink from places where even their animals would not drink (134). Lack of food and water may lead to parents resorting to baby formula that might be made available through aid (70). But formula made with contaminated water also leads to diarrhea which might prove fatal (82).

In one instance quoted in a news release by the ICRC, during the drought of 2015, a Somalian mother with a chance of being pregnant had ceased to breast feed her baby for fear of harming the unborn child (127). According to Tomoo Hozumi, UNICEF Representative in Nepal,

"We know that when going through difficult times, poor households often resort to harmful coping strategies, such as reducing their food consumption, cutting down their health and education expenditure, and sending their children to work – all of which can have irreversible negative consequences on them and more so on their children." (121)

The need for conducting this research is embedded in the aims of the Sendai Framework 2015 which states the need to identify gaps in knowledge. These are meant to help to devise policies to improve disaster response and reduce disaster risk. Such findings as of this thesis have effects on policies, projects and practices.

The flood of 2010: a case study from Pakistan:

In order to make a more in depth analysis of the interplay between governments, resources and natural disasters and aid organizations, a case study was considered. This also helped to contextualize challenges in a particular disaster suffered by the children population in a specific country. Reasons for choosing the 2010 flood in Pakistan were multi-fold. Statistics from the EM-DAT database show, among the natural disasters floods are the most frequently occurring phenomenon. Even though drought and famine claim the most lives but floods are more significant in terms of number of lives affected (135). The number of floods that have affected human population is 2634 since 2000, affecting over 90,000 people every year (8). The causes of increasing floods are mostly attributed to climate change, global warming (136). There have been several incidents of countries affected by floods every year. In 2010 heavy floods were experienced by India, Pakistan and China. In 2011, floods visited many African (South Africa, Namibia, Mozambique and Uganda), Asian (China, India, Pakistan, Cambodia, Korea, Philippines and Thailand) and American countries (Colombia, Brazil, Mexico and the United States). In 2012 “killer floods” affected many countries in the same regions (136).

Moreover, the above mentioned natural disaster was the biggest flood in Pakistan in recorded history. While the death toll due to the flood was not high in comparison to the Indian Ocean tsunami in 2004 or the Haiti earthquake earlier in 2010 however, it affected over 21 million people including more than 6 million children (37). Pakistan posed as an interesting case study also due to internal instability prior and during the onset of the flood, which appeared to help in uncovering more challenges in delivering and acquiring medical aid.

The disaster and the healthcare system

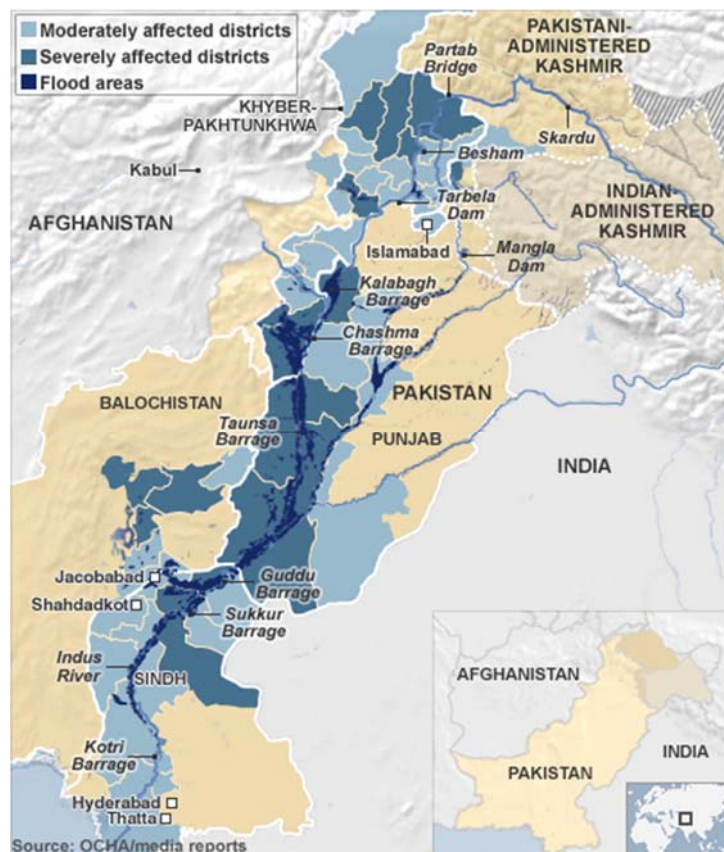
In July 2010, Pakistan experienced one of the worst floods caused by torrential monsoon rains, engulfing an area one fifth of the country, approximately the size of England (64). In over two months, according to the WHO, more than 21 million people had been affected by the waters (67) in all four provinces.

41 bridges in Upper Dir district and more than 60 bridges in Swat district were destroyed, and seven major landslides blocked access by road to flood-stricken areas of Pakistan-administered Kashmir. Road access to some areas in the north-west was restored, however, some areas of the north-east remained completely inaccessible (115). Satellite imagery showed that 2300 villages along with 40 towns had been affected by flood in Sindh. According to the estimates of the UN 1500km of roads and 300km of railway lines had been submerged by the flood waters (114).

The capacity of the health system was stretched with severely damaged health facilities (77). Only 68% of the health facilities were reported to be adequately stocked and if not replenished were threatened to suffer acute shortage (102). Many facilities had been destroyed resulting in loss of tonnes of medical supplies, threatening the immunization of children against measles and polio (104).

Figure 5 Affected areas of Pakistan during 2010

Inadequate healthcare system combined with a large displaced population proved problematic for the Pakistani government. The lack of social security system coupled with a damaged health system was not able to cope with the on-going crisis. Previously prevalent malnutrition among children (30-35% stunted), food insecurity along with risk of disease worsened the condition. By early September, assessments showed that 436/2957 health facilities had been damaged or destroyed. Medical supplies and equipment has been rendered



unusable. 412,800 women were pregnant at the time of disaster which was estimated to result in 45,000 deliveries per month while 4500 were expected to have complications which would need emergency services (67). Other barriers to provision of medical aid proved to be problems in obtaining access were weather conditions (66), security problems and logistical constraints which presented problems for deployment of health workers.

There was an obvious lack of clinical staff, medical supplies, and ambulances, access to mother and child health services, knowledge and awareness regarding infectious diseases, all of which hindered accessibility and provision of medical aid. There was a decreased inclination towards health seeking behaviour and health care which led to unhealthy practices. Lack of knowledge cost one nomadic family, which travelled between Waziristan and Bhakkar district, a few lives due to unhealthy drinking water practices. According to an account given by a member of a nomadic family from Waziristan,

“We travel more than 300 km from the mountains to the plains and drink any water we find on the way. Most of the time, it is surface water, and we and our animals drink the same water. Sometimes we drink stagnant, bad-smelling water that even our animals will not drink”. (134)

Impact on Children

“I had faced the worst days of my life, after the floods started. When I heard about the floods, the first thing came in to my mind was that, oh God! We are all going to die tomorrow.” said Naila, ten year old child from Mirpur Buriro in Tehsil Thul, district Jacobabad (65)

Previously undernourished children faced a serious threat of malnutrition due to scarcity of food. Cramped conditions in the IDP camps along with unsanitary practices of open defecation led to diarrheal diseases running rampant particularly among children in these living conditions (65). It took hours to reach a medical facility. Upon reaching the facility the lack of financial resources to pay for medical treatment prevented receiving care (113). Therefore confirming the presence of all three phases of delay to receive medical care (88).

Moreover, there was a lack of paediatric specialists for the field (87) and lack of newborn care was also observed. Immunization campaigns were disrupted resulting in rise in polio cases and some vaccines were given priority than the others (64). Flu vaccine was given while cholera vaccines despite the prevalence of lack of safe drinking water and unhealthy sanitation practices which resulted in diarrheal outbreaks.

According to a report by UNICEF continuous movement of populations kept aid organizations from accessing children in need and also care givers of these children to access medical aid and food (64,103). Additionally the continuously changing climate created issues of new disease. Some areas in northern Pakistan were cut off as winter approached. Lack of focus on malnutrition in children despite high prevalence rates worsened the nutritional situation. A dearth of baseline data regarding children and updated information was found to impede quick delivery of interventions. There was lack of training of teachers to provide psychological support to children during disasters or after them. Girls experienced cultural limitations to mobility and access healthcare, and were also reluctant to use lavatory due to lack of privacy. At one point, 50,000 people were trapped in Dadu and medical cover was not provided until the army accessed them using boats and hovercrafts (64). This report also confirmed that girls were more malnourished than boys.

In Khyber Pakhtunkhwa and Federally Administered Tribal Areas (FATA), conflict and violence shut down hospitals, and ceased access to roads and transport of medical supplies. Even if emergency patients found their way to hospital, the limitations of nursing care and low standards of equipment and hygiene did not ensure good quality services. Conflict and terrorism along with perceptions of corruption and mismanagement adds to impeding medical aid (64). Donor fatigue, global financial recession, fear of fund fraud, negative image of Pakistan regarding terrorism and security threats for health workers (58) also added to on-going challenges.

More than one million people depended on aid organizations to provide free emergency surgery (86).

“I had been sick for a week and I didn’t have enough food for my six children, let alone to pay to see the doctor. I am glad that now we can get medicine for free in this centre.” - Patient at an MSF diarrhoea treatment centre in Kot Addu, Punjab (59).

According to Warraich, many of the volunteers working for national and international organizations were not experienced in disaster management (64).

People who eventually returned to their homes needed external support for resettlement and also education regarding healthy practices (65). But returning to flood affected areas posed additional risks for the people especially children. In Dera Ismail Khan, three children were injured by an explosive device that was believed to have moved in floodwaters (115).

6) Conclusions and recommendations:

Effects of natural disasters on children are witnessed and noted by all working within the realm of disaster management. Most of these observations were uncovered from grey literature. Differences between children and adults is recognized in literature however differences in guidelines for provision of medical aid to children in contrast to adults in difficult times has not been commented on. There appears to be a significant gap in knowledge about providing medical aid for children and the challenges in its provision and access in the aftermath of a natural disaster. This also relates to inequities experienced by children which requires further global attention. This aligns with the aim of the Sendai Framework 2015 to minimize adverse consequences of disasters.

LICs and LMICs continue to experience weak governance and poor government capacity to respond sometimes requiring military services. Poor political coordination and financial constraints further fails the aid mission. Gradual reduction in interest of donor countries and aid organizations threatens improvements that might have occurred in disaster countries owing to diminished funding. While these dilemmas seem to be equally unsettling for the entire affected population but children on account of their anatomical and physiological vulnerability and dependence on their caregivers suffer more.

Exposure to dilemmas created by the disaster in the form of damaged healthcare facilities, transportation and communication, water and food insecurity, migration and stay at IDP camps challenge health equality. While children are already physically and emotionally vulnerable, this weakness might be compounded by loss of parents, parents affected by disaster and unhealthy practices resulting in increased risk of morbidity and mortality.

The categories presented in this thesis may be considered starting points for establishing policies regarding prioritization of children as recipients of medical aid at individual, community, national and international levels.

Although, as pointed out by stakeholder consultations, guidelines have been established by WHO along with United Nations for Disaster Programme (UNDP) for such situations but these need to be harmonised. In some countries the military is the primary responder following a natural disaster. This creates the need to develop harmonised protocols for governments, aid organizations and militaries to follow in crisis.

Strengths: To our knowledge no study examines health inequities for children, especially those suffered by children in the period following natural disasters. This thesis provides entry points at individual (micro), community (meso), national and global (macro) level, for healthcare authorities and policy makers to create or improve policies to reduce challenges to provide medical aid to children after natural disasters. This also fulfils one of the aims of the Sendai Framework 2015 that pertains to identifying gaps in knowledge to minimize disaster effects.

Limitations: Only two databases were searched for peer reviewed literature, PubMed and Web of Science. Although PubMed has a significantly large collection of peer reviewed articles, however, most of the articles are clinical and specialized in nature. The focus of this thesis was LICs and LMICs, countries that had transitioned from LMICs to HMIC group over the study period were not considered. The benefit of holding consultations with stakeholders, Save the Children, might have been limited due to the fact that Save the Children has a more pronounced role in child protection and has limited experience in medical aid.

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Annex 1 Data extraction sheet

• #	Title of Article/ study	Author/ Organization	Year of Study	Type of Article	Natural disaster	Country of Disaster	Year of disaster	Target population	Focus of the paper	Main findings (Challenges/Barriers in Medical aid)	Outcomes
1	320,000 children homeless in Nepal	Save the Children	2015	News	Flood	Nepal	2015	Children	Current situation of children after disaster	Difficulty in accessing mountainous regions. Exposure of children to harsh weather.	Outbreak of diarrheal disease and pneumonia
2	Afghanistan and Pakistan Earthquake: Children cut off from aid - UNICEF	WHO	2015	News note	Earthquake	Afghanistan	2015	Children	Post disaster assessment with focus on children	Difficult weather conditions. Poor communication. Difficult access. Security issues. Inaccessible areas.	Safety and well-being of children at risk
3	Acute watery diarrhea-the Saleem Khan family's tale	Maria Anguera de Sojo and Irfan Ullah Khan	2010	Personal account	Flood	Pakistan	2010	General population	Hygiene behaviours of nomadic families in the aftermath of 2010 flood	Unhealthy practices	Increased morbidity in the form of diarrheal disease that might become fatal
4	Afghanistan: spring floods force thousands in conflict-affected areas to flee	ICRC	2010	Operational update	Flood	Afghanistan	2010	General population	Currents conditions of aid provision	Difficulty in aid delivery. Poor security. Damaged road conditions.	Food insecurity, diarrheal disease and epidemics in the population.
5	At least 54,000 children affected by cyclone Pam in Vanuatu	UNICEF	2015	Press release	Cyclone	Vanuatu	2015	Children	Post disaster assessment with focus on children	Damage to health facilities, electrical utilities, water supply and telephone systems.	Spread of communicable diseases
6	Breastfeeding is life-saving for babies in Philippines typhoon emergency	UNICEF	2013	Joint press release	Typhoon (Haiyan)	Philippines	2013	Children	Breastfeeding for children life-saving after disasters	Consumption of baby formula made with contaminated water. Lack of sufficient funding, planning and implementing of emergency response.	Diarrhoeal disease
7	Caring for children amidst chaos-guidelines to maintain health	Adrian Burton	2006	Focus	Natural disasters in general			Children	Differences in medical care for children by different organizations	Lack clinical guidelines for children in natural disasters. Lack of consent on guidelines among organizations	Lack of guidelines affects morbidity and mortality of children

8	Child health in complex emergencies	William J Moss, Meenakshi Ramakrishnan, Dory Storms, Anne Henderson Siegle, William M Weiss, Ivan Lejnev and Lulu Muhe	2006	Review	Natural disasters in general			Children	Identification of research needs and improvement of guidelines for care of children	Varied levels of expertise and experience among staff members. Differences in guidelines. Little attention on neonatal health. Guidelines developed mostly for stable situations. Guidelines mostly tailored for medical personnel with extensive training which are of limited use for community health workers and volunteers.	Lack of or differences in guidelines affect medical aid provided to children
9	Children in Myanmar face a 'double catastrophe' as floods hit the most vulnerable, UNICEF says	UNICEF	2015	News note	Earthquake	Myanmar	2015	Children	Post disaster assessment with focus on children	Limited information of affected population. Lack of access due to flooding, road blockages and landslides.	Water borne diseases.
10	Children in Pakistan	UNICEF	2010	Progress report	Flood	Pakistan	2010	Children	Post disaster assessment with focus on children	Continuous movement of populations. Financial constraints. Worsening weather. Collapsed management capacity. Inaccessible areas. Shortage of female health workers. Inadequate health policy. Lack of nutrition services. Lack of privacy in camps. Dearth of baseline data and updated information. Delay in identification of unhealthy practices. Lack of training of teachers to provide psychological support. Cultural limitations for girls to mobility and access healthcare. Problems in transportation of medical aid.	Constraints in addressing issues regarding child health
11	Children of Haiti- Milestones and looking forward at six months	UNICEF	2010	Report	Earthquake	Haiti	2010		Post disaster assessment with focus on children	Socioeconomic divides within society. Challenges in information management. Loss of government records in the earthquake. Collapse of data collection systems. Lack of coordination and prioritisation of interventions. Lack of trained staff. Lack of facilities. Lack of harmonised treatment protocols. Displaced population. Cramped camps conditions.	Risk of epidemics or vaccine preventable disease outbreaks among children
12	Children pulled alive from the rubble after Ecuador's worst quake in decades	Save the Children	2016	News	Earthquake	Ecuador	2016	Children	Post disaster assessment with focus on children	Critical damage to infrastructure. Missing infants. Devastating damage to healthcare facilities. Blocked roads. Displaced population.	
13	Children with disabilities in the context of disaster: a social vulnerability perspective	Lori Peek and Laura M. Stough	2010	Review	Disasters in general			Children with disabilities	Effects of disasters on vulnerability of children with disabilities	Stigmatization and exclusion of children with disabilities. Inadequately staffed health facilities. People with disabilities abandoned during disasters. Parents' ability to parent/take care might be affected due to trauma from the disaster.	Health needs for children with disabilities ignored during or after disasters

14	Chronic aftershocks of an earthquake on the well-being of children in Haiti: violence, psychosocial health and slavery	Jhumka Gupta and Alpna Agrawal	2010	Analysis	Earthquake	Haiti	2010	Children	Post disaster assessment with focus on children	Loss of parents. Being a girl hindered access to medical aid. Children abandoned if the parents or caregivers experienced delay in recovery.	Delay in acquiring medical aid
15	Civil-military relations in natural disasters: a case study of the 2010 Pakistan floods	Ajay Madiwale and Kudrat Virk	2011	Report	Flood	Pakistan	2010	General	Interaction between military and humanitarian community	Damage to land, commodities, water supply, sanitation facilities and infrastructure. Weak disaster preparedness. Military's lack of impartiality for the affected and restriction to transportation of supplies. Restriction of transportation of other volunteers on military flights. Need for police escorts to access sensitive areas. Lack of uniform understanding for humanitarian assistance. Misunderstandings between aid organizations and military. Acceptance of aid organization.	Problems in provision of medical aid to affected population
16	Climate change and children's health-a call for research on what works to protect children	Zhiwei Xu, Perry E. Sheffield, Wenbiao Hu, Hong Su, Weiwei Yu, Xin Qi and Shilu Tong	2012	Review	Natural disasters in general			Children	Effect of climate on health of children	Measures for adaptation to climate affects not tailored according to children's need	Lack of focus leading to increased number of children population suffering consequences of climatic events
17	Cyclone Pam: new appeal for children amid critical funding shortfall - UNICEF	UNICEF	2015	Press release	Cyclone	Vanuatu	2015	Children	Post disaster assessment with focus on children	Shortage of funds. Children present in inaccessible areas. Acute water shortage. Poor sanitation and limited medical care. Logistical challenges.	Risk of disease for children
18	Disasters and their effects on children	Julia Lynch, Joe Wathen, Eric Tham, Patrick Mahar, Stephen Berman	2010	Review	Earthquake	Haiti	2010	Children	Reducing mortality and morbidity by planning and preparation for response after a disaster	Lack of medical supplies, such as anaesthesia. Lack of resources. Lack of appropriate planning. Inability of local facilities to cope with disaster effects. Displaced children at high risk of adverse situations. Challenges in communication between volunteers and aid organization workers. Lack of technology. Destruction of telecommunication systems. Differences in cellular standards.	Increased child mortality and morbidity.

19	Disaster response in a paediatric field hospital: lessons learned in Haiti	Cathy Burnweit, Steven Stylianos	2011	Qualitative	Earthquake	Haiti	2010	Children	Evolution of an Israeli field hospital over time and the ethical issues experienced	Lack of supplies i.e. running water, laboratory, autoclave, anaesthetic machine, ventilators, equipment for vital signs, specialized equipment, paper. Lack of segregation of paediatric patients. Lack of pharmacist. Lack of segregation of paediatric medicine. Deficient number of staff. Lack of maintenance of medical records. Abandoned children. Literacy rate of parents. Homelessness made things worse. Lack of medical guidelines for paediatric patients. Lack of organization of supplies. Lack of parenting ability of parents. Unprepared volunteers. Shortage of food.	Increased child mortality and morbidity
20	Doctors haunted by Haitians they couldn't help	Deborah Sontag	2010			Haiti	2010	General population and children	Description of doctors' experiences in Haiti	Loss of patients due to contaminated conditions. Lack of medical equipment and supplies. Lack of human resources. Dilemmas of transportation of doctors.	Increased child morbidity and mortality
21	Drought creating crisis for children in Horn of Africa	UNICEF	2006	Press release	Drought	East and Horn of Africa	2006	Children	Post disaster assessment with focus on children	Lack of international attention. Lack of sufficient funds.	Risk of malnutrition and infectious diseases
22	Ethiopia: Pastoral communities badly hit by the worst drought in 30 years	MSF	2016	Activity report	Drought	Ethiopia	2016	Children	Post disaster assessment with focus on children	Distance from health facilities.	Malnutrition and respiratory problems for children
23	Evaluation of UNICEF's flood emergency response in Bihar and Uttar Pardesh	UNICEF	2008	Report	Flood	India	2007	General population	Post disaster assessment with focus on children	Gradual reduction of relief operation. Transfers of key persons at district level and their government counter parts to other regions and lack of new persons regarding interventions done earlier. Lack of sufficient district level documentation. Lack of uniformity in documentation practices. Limited knowledge of nature and volume of support to be received from UNICEF leading to difficulty in planning. Shortage and delay in delivery of aid. Looting relief materials reported. Poor institutional memory.	Threat of water borne diseases
24	Floods in Pakistan: a public health crisis	Haider Warraich, Anita KM Zaidi and Kavita Patel	2011	Perspective	Flood	Pakistan	2010	General population	Description of health conditions and barriers faced by relief organizations	Inexperienced staff. Perceptions of corruption, fund embezzlement and mismanagement of the government agencies. Differences in priority for vaccines. Disruption of immunization campaign. Lack of safe and clean drinking water. Lack of newborn care. Presence of donor fatigue. Negative image of the country. Security issues due to terrorism.	Increased morbidity in the form of diarrheal disease and epidemics.

25	Health authorities' leadership reduces cholera deaths in Haiti	*Mohamed Ag Ayoya, Ariel Higgins-Steele, Donatella Massai, Chantal Umutoni, Asako Saegusa, Jean-Claude Mubalama, Stephanie Kleschnitzki, Sandra Lattouf, Solofo Ramaroson and Françoise Gruloos-Ackermans	2012	Correspondence	Earthquake	Haiti	2010	General	Capacity of health system to respond to impending epidemic	Low capacity to respond to the epidemic.	Cholera epidemic after the earthquake
26	Health risks add to crisis in Ethiopia	WHO	2008	News release	Drought	Ethiopia	2008	General population and children in particular	Health conditions due to flood in the country with on-going crisis	Lack of access to safe drinking water. Shortages of drugs and medical supplies. Insufficient human resources.	Diarrhoeal diseases, measles and meningitis.
27	Health sector treats almost 6 million in flood-affected Pakistan, but great challenges persist	WHO	2010	News release	Earthquake	Pakistan	2010	General population	Post disaster assessment with focus on children	Insufficient access to health services especially in rural areas. Massive disruption of healthcare system. Rise in food insecurity.	Malnutrition, acute diarrhoea, acute respiratory infections, malaria, measles and neo-natal illness and death
28	Helping mothers improve child nutrition in Somalia	ICRC	2015	Article	Drought	Somalia	2015	Children	Misconceptions regarding nutrition of children	Acute shortage of food. Lack of knowledge and misconceptions among care givers regarding children's nutritional needs.	Acute malnutrition in children
29	Humanitarian Nursing Challenges: A Grounded Theory Study	CDR Angelica L. C. Almonte NC USN	2009	Qualitative	Tsunami and earthquake	Indonesia, East Timor, Nias Island, Papua New Guinea	2004	General population	Experiences and challenges faced by navy nurses in countries facing natural disasters	Lack of paediatric nursing. Lack of training regarding paediatric deaths. Time constraints. Limited care in the host nation's infrastructure. Lack of adequate treatment.	Increase child mortality
30	ICRC and Pakistan Red Crescent ramp up aid effort as floods spread to south	ICRC	2010	Operational update	Flood	Pakistan	2010	General population	Continuing aid efforts	Extensive destruction of roads. Movement of mines and unexploded ordinance	Water borne diseases

31	Indonesia: ICRC emergency field hospital closes in Aceh	ICRC	2005	News release	Tsunami	Indonesia	2005	General population	Currents conditions	Severely damaged healthcare facilities	
32	International activity report 2010-Pakistan	MSF	2010	Activity report	Flood	Pakistan	2010	General population	Currents conditions	Closure of hospitals and roads due to violence. Interruption in transport of medical supplies. Limitations of nursing care. Low standards of equipment and hygiene.	Increased risk of illness and contagion.
33	Keeping paediatrics in paediatric disaster management: before, during and in the aftermath of the complex emergencies	Frances Kelly	2010	Review		Disasters in general		Children	Review of characteristics of children that make them high disaster risk, and their needs before, during, and after complex emergencies	Children under 5 most at risk if abandoned, orphaned or displaced. Lack of guidelines for children in humanitarian crisis. Deficient number of paediatric beds. Lack of staff. Lack of electricity, clean and running water, food, shelter, clothing. Interrupted supply of medicines, food, water, soap, vaccines and antibiotics. Low number of mental health workers.	Risk of infectious diseases in children
34	Life-saving UNICEF supplies reach Nepal to help 1.7 million children severely affected by earthquake	UNICEF	2015	News note	Earthquake	Nepal	2015	Children	Post disaster assessment with focus on children	Lack of medical supplies and beds in hospitals. Delays due to technical restrictions on maximum landing weight. Constrained warehousing capacity at Kathmandu airport. Limited means to distribute incoming cargo.	Water borne diseases
35	Malnutrition and disease pose grave risks to children in drought-ravaged areas of Ethiopia, Kenya and Somalia	UNICEF	2006	News note	Drought	Somalia	2006	Children	Currents conditions	On-going violence. Lack of basic social services. Low resources for immunization projects.	3 out 10 children expected to suffer from malnutrition. Risk of infectious diseases and measles epidemic.
36	Media messages and the needs of infants and young children after Cyclone Nargis and the Wenchuan Earthquake	Karleen D. Gribble	2013	Review	Earthquake	Myanmar and China	2008	infants and children	Effects on child mortality and morbidity as a result of media reporting regarding needs of infants and children	Prevalent disaster myths. Perceived shortage of infant formula. Media reports left out the fact that artificial feeding led to diarrhoea and sometimes death and breastfeeding is protective for children in emergencies. Aid organizations unaware of the IYCF-E guidelines or might not agree with them. Lack of medical care in case of adverse effects from consuming infant formula	Perceived shortage of infant formula and consequent adverse effects lead to increased child morbidity and mortality

37	Nepal Earthquakes: 12 babies born every hour without basic healthcare in worst hit areas – UNICEF	UNICEF	2015	News note	Earthquake	Nepal	2015	Children and pregnant women	Post disaster assessment with focus on children	Damage to 70% of the birthing centres. Lack of healthcare for newborns.	Risk of complications for newborns
38	Nepal Earthquake: New appeal for children amid growing need - UNICEF	UNICEF	2015	News note	Earthquake	Nepal	2015	Children	Growing needs for children	Extensively damaged health facilities. Lack of water supply and shelter.	Risk of disease outbreaks
39	Nepal Earthquakes: One month on from first quake, malnutrition a growing threat for children - UNICEF	UNICEF	2015	News note	Earthquake	Nepal	2015	Children	Post disaster assessment with focus on children	Growth in chronic conditions e.g. children with acute respiratory infections caused by dust from debris.	Acute malnutrition, acute respiratory infections and anxiety problems in children
40	One week after Nepal earthquake UNICEF warns of disease risk for children	UNICEF	2015	News note	Earthquake	Nepal	2015	Children	Post disaster assessment with focus on children	Lack of access to basic care. Overburdened hospitals. Scarcity of water. Delay in removing bodies from the rubble. Lack of shelter.	Infectious disease outbreaks
41	Pakistan floods 2010 six months on	Save the children	2011	Report	Flood	Pakistan	2010	Children	Post disaster assessment	Destruction of infrastructure including health facilities, roads and water and sanitation systems. Lack of clinical staff, medical supplies and ambulances. Lack of access to mother and child health services. Lack of knowledge and awareness regarding infectious diseases. Presence of unhealthy practices. Presence of malnutrition prior to the disaster. Cramped conditions in the IDP camps along with unsanitary practices. Children separated from family.	Healthcare services for children ignored
42	Pakistan floods donor alert	WHO	2010	Summary	Flood	Pakistan	2010	General population	Conditions of health system	Over stretched capacity of health systems. Damaged facilities. Inadequately stocked health facilities.	Increased prevalence of moderate and severe acute malnutrition
43	Pakistan: no respite in devastating floods	ICRC	2010	Operational update	Flood	Pakistan	2010	General population	Currents conditions	Difficulty in assessment of devastation. Blockage of roads. Inaccessibility to some areas.	Food insecurity, diarrheal disease and epidemics in the population.

44	Pakistan red crescent relief distributions continue amid persisting heavy rains	ICRC	2010	News release	Flood	Pakistan	2010	General population	Transport of relief supplies to the affected	Transportation problems. Presence of bad weather. Incomplete assessment of damage.	Risk of water borne diseases
45	Pakistan-six months after the floods	Medecins sans frontieres	2011	Report	Flood	Pakistan	2010	General	Post disaster assessment	Communities residing in inaccessible areas often due to security issues. Organization policies in contradiction with government policies or military policies. Damaged and collapsed health facilities. Non-functional health facilities due to lack of safe water supply, electricity, equipment and medications. Frequent movement of the families. Damage of essential infrastructure of water supply.	
46	Pakistan: trapped between a natural disaster and armed violence	ICRC	2010	Interview	Flood	Pakistan	2010	General population	Currents conditions	Problems in gaining access to inaccessible areas. Security problems. Logistical constraints. Lack of specialists for the field. Mistrust towards international aid organizations.	Food insecurity and threat of diarrheal diseases
47	Paediatric ventilation in disaster: Clinical and ethical decision making	Amir Yzthak et al	2012	Qualitative	Earthquake	Haiti	2010	Children	Medical/ethical dilemmas regarding paediatric patients in a field hospital after the Haiti 2010 earthquake	Lack of segregation of paediatric patients. Damaged healthcare facilities. Limited medical supplies. Lack of guidelines for paediatric patients.	Increased child mortality and morbidity
48	People returning home after Pakistan floods has impact on feeding programmes	MSF	2010	Activity report	Flood	Pakistan	2010	General population	Currents conditions	Constant population movements.	Incomplete treatment of malnutrition leading to worsened health.
49	Philippines-Health cluster bulletin	WHO	2014	Bulletin	Typhoon	Philippines	2014		Currents conditions	Difficulty in delivery of primary care services. Lack of basic equipment.	Risk of vector borne diseases
50	Philippines: Helping communities recover	OCHA	2013	Stories	Typhoon Haiyan	Philippines	2013	General population	Post disaster assessment	Logistical problems. Insufficient immediate life-saving aid. Blocked roads made timely delivery impossible. Lack of telephone connections and electricity. Poor weather conditions. Closure of airports. Contaminated fuel sources.	

51	Philippines: People desperate to regain some degree of normality, says UN Humanitarian Chief	OCHA	2013	Stories	Typhoon Haiyan	Philippines	2013	General population	Post disaster assessment	Lack of medical facilities, food, clean water and basic sanitation. Logistical challenges. Insufficient funding.	
52	Philippines: Seven months since Typhoon Bopha, children are still at risk of malnutrition	Save the Children	2013	News	Typhoon Bopha	Philippines	2012	Children	Post disaster assessment with focus on children	Women forced to leave children to earn. Acute shortage of food.	Risk of acute malnutrition among children
53	Philippines: Specialised care for mothers and babies in devastated Tacloban	MSF	2013	Activity report	Typhoon (Haiyan)	Philippines	2013	Children	Post disaster assessment with focus on children	Lack of electricity. Non-functioning health system. Lack of treatment of chronic illnesses.	Respiratory tract infections in children
54	Polio outbreak investigation and response in Somalia, 2013.	Raoul Kamadjeu, Abdirahman Mahamud, Jenna Webeck, Marie Therese Baranyikwa, Anirban Chatterjee, Yassin Nur Bile, Julianne Birungi, Chukwuma Mbaeyi, and Abraham	2014	Supplement article	Recurrent drought and flood	Somalia	2014	children under 5	Description of polio outbreak in 2013	Worsening of humanitarian crisis due to on-going conflicts and recurrent natural disasters. Lack of access to lifesaving health services, including vaccination for the past 5 years.	Worsening health status of children
55	Relief arriving in the Philippines, challenges for delivery persist	WHO	2013	News release	Typhoon (Haiyan)	Philippines	2013	General population	Post disaster assessment	Inaccessible populations. Logistical challenges.	Wounds, broken bones and chronic diseases.
56	Severe acute malnutrition during emergencies: Burden, management and gaps	Paluku Bahwere	2014	Review	Natural disasters in general			Children	Post disaster assessment with focus on children	Barriers to investing in treatment for SAM by some organizations and nutritionists. Ideological debate about the kind of food to be provided. Inadequate understanding among policy makers. Limited medical professionals who have sufficient understand of SAM.	Worsened nutritional problems for children after disaster
57	South Asia earthquake: the injured keep coming	ICRC	2005	News release	Earthquake	Pakistan	2005	General population	Currents conditions	Inability to access mountainous regions. Destruction of roads and bridges. Lack of sufficient rations.	Infected wounds

58	Tales of sickness, hunger and hope in Southern Sindh	WHO	2010	Report/Press release?	Flood	Sindh, Pakistan	2010	General	Post disaster conditions of people who need to access medical aid	Unsanitary conditions in IDP camps. Transportation problems to access medical aid. Lack of finances.	Dilemmas in accessing healthcare fore children
59	The humanitarian health cluster response to the Pakistan floods	WHO	2010	Report	Flood	Pakistan	2010	General population and children	Currents conditions	Inadequate healthcare system combined with a large displaced population. Already prevalent malnutrition among children. Food insecurity. 436/2957 health facilities damaged or destroyed. Medical supplies and equipment has been rendered unusable. Lack of social security system.	Inadequate healthcare system unable to respond to children's needs
60	The Israeli Field Hospital in Haiti — Ethical Dilemmas in Early Disaster Response	Ofer Merin, Nachman Ash, Gad Levy, Mitchell J. Schwaber and Yitshak Kreiss	2010	Perspective	Earthquake	Haiti	2010	General population	Experiences at Haiti and ethical decisions taken	Challenges in management of limited resources. Lack of establishment of an ethical and practical system of medical priorities. Lack of clinical guidelines to provide and deny treatment. Loss of parents.	Infection, gas gangrene and death among people with crush injuries or infected wounds.
61	The response of academic medical centres to the 2010 Haiti earthquake: The Mount Sinai School of Medicine Experience	Jonathan A. Ripp ,* Jacqueline Bork , Holly Koncicki , and Ramin Asgary	2012	Retrospective	Earthquake	Haiti	2010	General	Challenges faced by team from Mount Sinai School of Medicine in providing medical aid after earthquake	Limited experience of volunteers for disaster response. Limited resources. Limited laboratory diagnostics. Limited radiological equipment. Limited medications therefore limited treatment options. Lack of sterile conditions. Damaged infrastructure. Unpredictability of receiving medical supplies from outside. Patients left without medications or follow-up appointments due to limited supplies resulting in readmissions. Lack of cultural understanding and presence of linguistic barriers. Lack of privacy in over-crowded wards. High burden of work, weather, food scarcity, and dehydration. Ethical issue of choosing between ration and medications. Exposure to infectious diseases in the field hospital. Challenge to maintain volunteer interest and support.	Dilemmas in provision of medical aid to children resulting in worsened prognosis and readmissions
62	The week the tsunami struck – a personal account	WHO	2005	Personal account	Tsunami	Sri Lanka	2004/5	General population	Post disaster assessment	Challenges in transportation due to blockage of roads. Lack of safe water and proper sanitation	Risk of spread of communicable diseases

63	Thousands of children at risk of disease after being cut off by monsoon flooding in India, Save the Children warns	Save the Children	2013	News	Flood	India	2013	Children	Post disaster assessment with focus on children	Challenges of children being stranded in inaccessible regions. Destruction of roads and bridges. Limited access to newborn healthcare. Adverse weather conditions.	Risk of diarrhoea, fever and skin infections among children
64	Three months on from first Nepal quake, children still at risk	UNICEF	2015	Press release	Earthquake	Nepal	2015	Children	Post disaster assessment	Living in high risk of landslides and floods after disaster. Challenges in accessibility. Lack of access to water, sanitation, education and health services. Reducing of food consumption, health and education expenditure by poor families.	Malnutrition in children
65	Unconditional cash transfers for Unconditional cash transfers for assistance in humanitarian disasters: effect on use of health services and health outcomes in low- and middle-income countries (Review)	Pega F, Liu SY, Walter S, Lhachimi SK	2015	Review	Natural disasters in general	Low and low middle income countries		General population	Outcomes of unconditional cash transfers in LIC and LMICs	Lack of financial resources	Lack of access to medical aid leading to adverse health consequences for children
66	UNICEF annual report 2014-Pacific Island Multi-country programme	UNICEF	2014	Report	Cyclones	Pacific island	2014	Children	Challenges in providing medical aid and steps taken	Limited capacity to monitor situation of children and track progress. Weak and under resourced statistical systems. Lack of high quality data sources. Weak coordination and cooperation between government ministries. Low capacity for data analysis. Poor governance and management. Lack of accountability.	Risk of water and vector borne diseases
67	UNICEF Annual Report 2014-Philippines	UNICEF	2013	Report	Typhoon (Haiyan)	Philippines	2013	Children	Currents conditions	Weak political coordination. Widening disparities that revealing excluded populations. Low access, poor quality, and weak governance. Difficulties in collection of accurate data. Difficulties in selection of neutral, independent and well-reputed NGOs provide coverage in conflict areas.	Risk of vaccine preventable and vector borne diseases

68	UNICEF calls for end to compassion fatigue over Ethiopia's dying children	UNICEF	2005	News note	Drought	Ethiopia	2005	Children	Post disaster assessment with focus on children	Lack of global interest. Lack of sufficient funding.	Malnutrition in children
69	UNICEF concerned about looming health threat while stepping up programmes for children affected by Cyclone Sidr	UNICEF	2007	News note	Cyclone	Bangladesh	2007	Children	Post disaster assessment with focus on children	Inability to reach remote and inaccessible areas. Separated and unaccompanied children. Lack of access to clean water and sanitation.	Risk of diarrhoeal and water borne diseases
70	UNICEF humanitarian action: Partnering for children in emergencies	UNICEF	2010	Progress report	Flood, droughts, landslides	Ethiopia, Kenya, Namibia, Zambia, Tanzania, Botswana, Uganda, Madagascar, Somalia and Pakistan	2010	Children	Assessment of current conditions in countries having undergone natural disasters	Security issues create limited access. Displaced population. Lack of funds. Lack of clarity of role of clusters after the response phase is over. Destruction of water and sanitation infrastructure. Lack of information at field level. Lack of coordination at national level in emergency preparedness. Lack of access to affected areas. Provision of food assistance limited by government decisions. Security issues and limited human resources. Political decisions have ceased humanitarian support. Adverse political situation. On-going conflict. Shifts in geographical control. Logistic problems. Continued disruption of supplies and services delivery along with increased cost of aid supply. Down scaling of nutrition services.	Multiple causes of decreased medical aid provision for children
71	UNICEF humanitarian action report 2009 midyear review	UNICEF	2009	Report	Drought and cyclones, minor floods, drought, hurricanes	Madagascar, Malawi, Mozambique, Haiti	2009	Children	Challenges in providing medical aid and steps taken	Political crisis leading to suspension of aid. Collapse of basic social services. Weakened capacity to assess and respond to emergency situations quickly and efficiently. Difficulty in securing funds. Challenges in disease surveillance. Non-availability of reliable data and partners on ground. Difficulties in security and accessibility. High costs for basic services. Lack of understanding on parental responsibilities.	Risk of cholera, diarrhoea, acute respiratory infection, vector and water borne diseases and malnutrition among children

72	UNICEF measles immunization campaign to reach 800,000 children of quake-hit Pakistan administered Kashmir	UNICEF	2005	News note	Earthquake	Pakistan	2005	General population	Post disaster assessment with focus on children	Cramped conditions in IDP camps. On-going undernourishment in children.	High risk of respiratory infection in children
73	UNICEF: Nearly 700,000 children still in need of assistance in Myanmar	UNICEF	2008	News note	Cyclone	Myanmar	2008	Children	Post disaster assessment with focus on children	Damage to 75 per cent of health facilities	Risk to child health and nutrition
74	UNICEF needs \$146 million to assist children and women in the Sahel in 2012	UNICEF	2012	News note	Drought	Sahel	2012	General population and children	Post disaster assessment with focus on children	Migration to already overburdened regions. Presence of food insecurity. Lack of access to basic social services.	Cholera outbreak among children
75	UNICEF: Underfunding for Pakistan flood emergency jeopardizing life-saving operations for children	UNICEF	2010	News note	Flood	Pakistan	2010	Children	Post disaster assessment with focus on children	Lack of sufficient funding. Lack of clean drinking water. Inability to sustain lady health workers.	Exposure of children to acute watery diarrhoea, waterborne diseases and malnutrition
76	UNICEF warns thousands of children are at risk in mountains of Pakistan	UNICEF	2005	Press release	Earthquake	Pakistan	2005	General population	Post disaster assessment with focus on children	Children stuck in accessible areas. Food insecurity. Challenges in transporting life-saving medical supplies for children. Lack of sufficient humanitarian partners to deliver medical aid. Challenging weather conditions. Blocked roads. Lack of medical assistance.	Dehydration and malnutrition in children
77	Up to 80,000 children in need of urgent support in flood hit Myanmar	Save the Children	2015	News	Flood	Myanmar	2015	Children	Post disaster assessment with focus on children	Whole regions submerged under water.	

78	Utilization of formal health services for children aged 1-5 in Aceh after the 2004 tsunami: Which children did not receive the health care they needed? Implications for other natural disaster relief efforts	Bahie Mary Rassekh and Mathuram Santosham	2014	Quantitative	Indian ocean tsunami	Aceh, Indonesia	2004	Children under 5	Healthcare seeking behaviour among parents for their children after tsunami	Loss of parent. Displacement. Living at IDP camps. Low priority of children's health. Caregiver not the mother. Large number of people in the household. Having monetary savings.	Neglect of children's health with health of under 5 children ignored in particular
79	WHO and partners begin reaching people in need on many Philippine islands hit by typhoon	WHO	2013	News release	Typhoon (Haiyan)	Philippines	2013	General population	Post disaster assessment	Damaged health infrastructure. Storage and transportation of vaccines damaged. Non-functional health facilities.	Child health compromised
80	WHO coordinating the health response to Nepal earthquake; working to prevent spread of disease	WHO	2015	News release	Earthquake	Nepal	2015	General population	Post-earthquake assessment	Diminished effectiveness of health services delivery. Lack of sustainability.	Spread of infectious diseases
81	WHO, health partners striving to treat quake survivors in Nepal's remote regions	WHO	2015	News release	Earthquake	Nepal	2015	General population	Post-earthquake assessment	Displaced population. Blockage of transport arteries. Inaccessible terrain. Conflicting information regarding damages. Poor weather conditions	Spread of infectious diseases, including diarrhoea.
82	WHO issues rapid health assessment on impact of Nepal earthquake	WHO	2015	News release	Earthquake	Nepal	2015	General population	Post-earthquake assessment	Shortage of medical supplies.	Communicable disease outbreaks, like diarrhoea
83	WHO responding to health needs caused by Typhoon Haiyan ("Yolanda")	WHO	2013	News release	Typhoon (Haiyan)	Philippines	2013	General population	Post disaster assessment	Damaged and overstretched health services. Shortage of medical supplies. Logistical challenges. Limited quantification of death and destruction. Interrupted telecommunications and electricity supplies. Closure of air and seaports. Blocked roads. Limited financial contributions.	

84	WHO responds to health needs in Pakistan floods	WHO	2010	News release	Flood	Pakistan	2010	General population and children	Post disaster assessment	Destruction of health facilities. Loss of medicines.	Negative impact on health status of population including children
85	WHO rushes medical aid to flood-hit areas of Yemen	WHO	2008	News release	Flood	Yemen	2008	General population	Provision of medical aid to flood hit areas	Damaged or washed away roads	Water borne diseases and malaria. Malnutrition. Acute respiratory infection. Measles.